Town of Needham, Massachusetts

Sewer Infiltration Investigation Phase II

March 2017

TV Inspection Report Analysis and Recommendations



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Executive Summary

Purpose of Report

Needham has been addressing its sewer infiltration and inflow (I/I) sources in an effort to reduce extraneous clear water flow into the sewer system since 1985. The presence of excessive infiltration and inflow in a sewer system reduces the effective capacity of the system and wastewater treatment facility by occupying volume that could otherwise be used for transporting or treating wastewater. In 2013, BETA began a town-wide infiltration/inflow investigation. This report is Phase II of the study and presents the results of TV investigations to locate and quantify infiltration sources. Subareas televised as part of this report were primarily selected based on the "Townwide Inflow & infiltration Study Phase I Report", April 2015 draft.

Project Scope

EST Associates of Needham, MA was contracted to televise approximately 168,950 feet of sewer main and National Water Main (NWM) was contracted to televise approximately 7,200 feet of sewer main. BETA conducted manhole observations looking for sources of clear flow simultaneously with the TV inspection to direct work towards suspect I/I areas. Flow rates at 12 different meter locations were monitored daily and compared to previous readings to ensure groundwater levels were elevated during the investigation and to help target timing of suspect areas to televise.

BETA reviewed the TV videos and logs in order to determine sewer main reaches in need of rehabilitation. Based on TV inspection findings, BETA performed a cost-effective analysis and recommended rehabilitation to remove I/I from the sewer system.

Study Area

The study area encompasses the Town of Needham's sewer subareas 3, 4, 5, 11, 14, 17 19-1, 20, 21, 22, 24, 25, 27, 30, 31 and 32. A sewer system map identifying these subareas is included as **Figure ES-1** with a larger version located in **Appendix A** of this report. These areas were designated for inspection as part of the Phase I study based on high peak infiltration rates.

Investigation Procedures

Tasks performed under this study were conducted in accordance with the Massachusetts Department of Environmental Protection (DEP) "Guidelines for Performing Infiltration/Inflow Analyses and Sewer Systems Evaluation Surveys" revised January 1993. The investigation included continuous groundwater level monitoring, flow monitoring, manhole inspections and internal Closed Circuit Television (TV) inspection.

Approximately 168,950 linear feet of sanitary sewer mains were TV inspected in the spring from March 18, 2014 to May 23, 2014; in 2014 from December 18 to December 19; in the spring of 2015 from March 24 to May 19; and in 2016 from April 9 to June 13 by EST Associates, Inc. (EST) of Needham, Massachusetts. Approximately 7,200 linear feet of sanitary sewer mains were TV inspected in the spring

of 2015 from March 20 to March 23 by National Water Main Cleaning Company (NWM) of Canton, Massachusetts. TV inspections identified defects in sewer lines and manholes allowed for determination of rehabilitation methods and costs to reduce infiltration. Over 690,000 gallons per day (gpd) of estimated sewer main infiltration was located and quantified.

Phase II Completed Rehabilitation

During 2014-2106 TV investigations (Phase II), the Town completed two sewer rehabilitation projects. These contracts, 15DPW137C and 15DPW037C designed by Wright-Pierce and BETA, respectively, included rehabilitation of sewer defects observed by BETA during this TV investigation. The Town also contracted BETA to design a third project to rehabilitate sewer defects observed during Phase II TV investigations, contract 17DPW158C. These locations and infiltration quantities are summarized in **Table 4-5** through **4-7**. Although these defects were observed during Phase II TV investigations, they were not included in the Cost Effective Analysis (CEA) as the defects had already been rehabilitated or were scheduled for rehabilitation prior to the conclusion of the Phase II study.

Recommendations

Based on the CEA, BETA recommends rehabilitation in several subareas throughout Needham. Rehabilitation methods include cured-in-place-pipe, dig and replace sewer main and laterals, seal lateral connections, grout manholes, replace manholes, point repairs, heavy cleaning, and chemical root treatment. It is estimated that only 50% of the total observed infiltration can be removed by rehabilitation. A total of 464,880 gpd of observed infiltration is recommended for rehabilitation. **Table ES-1** summarizes total infiltration observed during this investigation, infiltration removed under contracts 15DPW137C and 15DPW037C and designed under contract 17DPW158C, recommended infiltration quantities for removal and associated costs for all recommended rehabilitation methods based upon this investigation. Subareas are prioritized by the estimated cost per gallon per day to remove observed infiltration. Subarea 28 is the most cost effective at $0.19/gpd and subarea 17 is the least cost effective as no infiltration is removed from recommended rehabilitation. The CEA was based on Needham Sewer Enterprise appropriations and MWRA assessment for FY15.

Table ES-2 breaks down the estimate construction costs, including contingency and engineering costs for the recommended rehabilitation.

BETA also recommends continued TV inspection to identify specific locations and sources of infiltration entering the sewer system and to provide a record of the actual conditions within the sewer lines. **Table ES-3** lists additional subareas recommended for inspection, in order of initial priority.

Table ES-1: Recommended Removable Infiltration

Subarea	Date of TV Inspection	Observed Infiltration (gpd)	2015/2016 Rehab (gpd)	Observed Infiltration Recommended for Rehab (gpd)	Estimated Construction Cost	$/gpd
28	Apr 2016	2,880		2,880	$550.00	$0.19
15	Apr 2016	41,940		41,940	$28,575.00	$0.68
12	May 2016	38,520		38,520	$33,200.00	$0.86
13	Apr 2016	10,440		10,440	$12,750.00	$1.22
30	May 2015	360		360	$550.00	$1.53
21	Apr 2015	56,520		56,520	$117,263.25	$2.07
26	Apr 2016	14,220		14,220	$30,155.25	$2.12
29	Apr 2016	7,920		7,920	$17,050.00	$2.15
22	Apr, May & Dec 2014	73,620	-18,720	54,720	$126,802.00	$2.32
27	May 2014	5,980		5,980	$14,450.00	$2.42
3	Apr 2015	10,440		10,440	$25,500.00	$2.44
14	May 2014 Mar 2015 June 2016	90,720	-46,260	44,460	$120,844.50	$2.72
24	Apr 2015	49,140		49,140	$142,465.00	$2.90
19.1	May 2014	39,880	-6,760	33,120	$110,245.00	$3.33
5	Apr & May 2015	2,340		2,340	$8,000.00	$3.42
25	Mar & Apr 2015	32,040	-27,720	4,320	$15,100.00	$3.50
4	Apr 2015	7,920		7,920	$28,000.00	$3.54
11	Apr 2014	49,920	-720	48,120	$252,214.00	$5.24
32	Mar & Apr 2015 June 2016	37,980	-33,120	4,860	$26,380.00	$5.43
20	Mar & Apr 2014	29,640	-3,160	25,940	$168,315.75	$6.49
31	Apr 2015	720		720	$6,600.00	$9.17
17	Mar & Apr 2015	90,060	-90,060	0	$2,050.00	-
6	0	0	0	0	$0.00	-
TOTAL		**693,200**	**-226,520**	**464,880**	**$1,287,060**	**TOTAL**

Table ES-2: Estimated Rehabilitation Costs

Est. Construction Costs:		
	Recommended Rehabilitation	$1,287,100
	20% Contingency	$257,420
	Total Construction Cost	**$1,544,520**
Est. Engineering Costs:		
	Design	$128,700
	Construction Services and Resident Inspection	$154,500
	Total Engineering Costs	**$283,200**
Total Engineering and Construction Costs:		**$1,827,720**

Actual construction costs may differ from the presented costs, depending on the magnitude of the overall project and the specialized subcontracts.

MWRA Assessment Considerations

For FY15 MWRA assessed Needham sewer at $5,466,144 with an estimated flow of 3.54 MGD. The assessment was based on the average of flows from 2011 to 2013. Average annual infiltration for FY15 was estimated by MWRA at 1.17 MGD. Based on these quantities, MWRA charged Needham approximately $1.8 million to treat and transport infiltration in FY15. That cost does not factor in town operation and maintenance costs.

Table ES-3: Recommended TV Locations

Priority TV Inspection Subareas				Spring 2013 Data		Previous TV Work	
Priority	**Subarea**	**Length of Pipe in Subarea (ft)**	**Length of Pipe to be Inspected (ft)**	**Infiltration Flow Rate (GPD/in-mi)**	**Peak Inflow Corrected for 1.7" Storm (GPD)**	**Year Last TV'd**	**Partial or Complete Subarea**
1	6	3,537	1,414	8,100	-	2016	Partial
2	21	54,127	39,367	5,100	654,200	2015	Partial
3	18	9,362	5,929	-	-	-	-
4	lower 22	27,096	2,939	-	-	2012	Complete
5	29	9,364	9,364	3,800	103,100	-	-
6	31	6,234	6,234	3,600	51,800	2015	Partial
7	23	18,786	18,786	2,800	54,500	-	-
8	12	27,487	26,975	2,600	34,200	2012	Partial
9	10	15,140	15,140	2,100	101,800	-	-
10	9	1,016	1,016	1,800	-	-	-
11	28	5,392	5,392	1,700	22,100	-	-
12	13	22,958	22,740	1,600	40,100	-	-
13	33	6,818	2,926	1,600	54,900	2010	Partial
14	26	34,521	31,400	1,300	303,500	-	-
15	15	31,959	30,110	1,200	128,800	2012	Partial
16	19-2	8,798	8,798	300	0	-	-
17	1	17,765	15,001	-	-	2004	Partial
18	2	6,624	2,442	-	-	2005	Partial
19	16	45,181	4,308	11,600	1,124,300	2012	Complete
20	7	1,618	0	-	-	2012	Complete

SECTION 1 - Introduction

1.1 Background

This report is Phase II of a Town-wide I/I investigation study. As part of Phase I, BETA developed the Town-wide Inflow and Infiltration Study. BETA assessed 30 out of 33 subareas throughout the Town containing approximately 125 miles of sanitary sewer pipe and 3,700 manholes. A flow metering program was developed in which 10 permanent, 2 portable, and 13 temporary flow meters were installed.

The Town of Needham owns, operates and maintains a wastewater collection system, servicing the majority of Town and discharges to the Framingham Extension Sewer, owned and operated by the MWRA. From the Extension Sewer, wastewater is conveyed through the MWRA's collection system to the Deer Island Wastewater Treatment Facility for treatment.

The sewer system is comprised of a combination of old and new sewers. Prior to 1977, small diameter sewers primarily consisted of vitrified clay (VC) pipe; beginning in 1977, most small diameter sewers were polyvinyl chloride (PVC) pipe. Large diameter sewers are typically reinforced concrete (RC) pipe. Like many communities throughout New England, due to the age of portions of the sewer system, Needham experiences significant infiltration, which is defined as groundwater entering the sewer system through pipe and manhole defects. Infiltration rates are dependent on groundwater elevation and rainfall permeation through soil. Sewer Subareas televised as part of this report were selected based on historical flow rate assessments determined in the Phase I Town-wide Infiltration and Inflow Study conducted in 2013.

Phase I of the Town-wide study involved installing 25 temporary flow meters for a period of 12 weeks from March 18 through June 27, 2013. Flow metering locations are summarized in Table 1-1. Groundwater and rainfall gauging were conducted during that period and flow metering data from MWRA's two flow meters was also provided. Flow metering results were compiled and evaluated to identify locations and magnitude of infiltration/inflow. BETA prepared flow reports and hydrographs for each flow meter and studied nighttime dry and wet weather flow from that data to determine infiltration rates and inflow volumes. Following the initial 12 week study period, 10 permanent and 2 temporary flow meters were installed by EST, of Needham, on December 7, 2013. Meter locations during Phase II of the I/I investigation are summarized in Section 2.

Table 1-1: Spring 2013 Flow Metering Locations

Flow Meter No.	SMH No.	Location	Subarea	Installation Date
5	S55-010	176 Whitman Road	5	4/10/2013
10	S64-002	19 Russel Road	10	3/18/2013
11	S29-003	1394 Great Plain Avenue	11	3/20/2013
12	S15-060	276 West Street	12	3/20/2013
13	S15-092	Hillside Middle School	13	3/21/2013
14	S05-108	Crawford Street Easement	14	3/21/2013
15	S15-070	Tillotson Road Easement	15	3/20/2013
16	S40-044	92 Lincoln Street	16	3/20/2013
17	S11-028	A Street and First Avenue	17	3/20/2013
19-1	S39-121	14 Maple Place	19-1	3/21/2013
19-2	S39-124	66 Maple Street	19-2	3/20/2013
20	S40-113	266 Dedham Avenue	20	3/20/2013
21	S52-111	215 Valley Road	21	3/21/2013
22	S41-054	Prince Street and Cook Street	22	3/18/2013
23	S51-035	South Street and Dedham Ave	23	3/20/2013
24	S52-086	146 Great Plain Avenue	24	3/20/2013
25	S05-104	Reservoir Street Easement	25	3/21/2013 (Removed 4/10/13)
26	At house #47	Southwood Lane	33	3/18/2013
27	S29-008	16 Abbott Street	27	3/21/2013
28	S29-007	1347 Great Plain Avenue	28	3/20/2013
29	S15-074	245 West Street	29	3/20/2013
30	S59-047	69 Wildwood Drive	30	3/18/2013
31	S59-044	30 Wildwood Drive	31	3/18/2013
32	S05-109	292 Reservoir Street	32	3/21/2013
26 Howland 20”	S50-098	30 Howland Street	26	3/18/2013
26 Howland 30”	S50-107	30 Howland Street	26	3/18/2013

1.2 Project Objectives

BETA was commissioned to locate and quantify infiltration sources throughout the Town. Subareas 3, 4, 5, 11, 14, 17, 19-1, 20, 21, upper 22, 24, 25, 27, 30, 31, and 32 were targeted for TV inspection based on Phase I metering results. Subareas are shown in Appendix A with a

smaller figure, Figure ES-1, in the previous section of this report. Work for this investigation was to be conducted in accordance with guidance from the DEP "Guidelines for Performing Infiltration/Inflow Analysis and Sewer System Evaluation Survey", revised January 1993.

1.3 Project Approach

In the Phase I study, BETA recommended and prioritized TV inspection in sewer subareas town-wide. Subareas with significant infiltration rates were given highest priority. Also taken into consideration was the year each subarea was last televised, previous rehabilitation efforts, and whether the entire subarea or only part of the subarea was inspected. Areas where inspection or rehabilitation work was completed from 2004 through 2013 were eliminated from review as we assumed previous TV inspection and rehabilitation efforts remain effective for 10 years. See Appendix E for locations of previous TV inspections and rehabilitation. New sewer mains installed within the last 10 years were also eliminated from TV inspection study.

Subareas 11, 14, 19-1, 20, upper 22, and 27 were selected for further investigation in 2014 based on their significant infiltration rates. Subareas 17, 25, and 32 were targeted for investigation in 2015 based on anticipated flow increase at the Reservoir B Pump Station due to development. Reaches in Subarea 14 exhibiting infiltration and not televised in 2014 were also included in television inspections for 2015. Portions of subareas 21 and 24 were televised in 2015 as flow from these subareas and Reservoir B Pump Station are tributary to the same meter located on Valley Road, where anticipated flow increases ultimately discharge into MWRA pipeline. During field TV inspection operations, reaches of sewer clearly indicating no evidence of infiltration were not recommended for inspection.

Reaches in subareas 3, 4, 30, and 31 were televised in 2015 based on high infiltration rates and evidence of infiltration during field investigations. Reaches in subarea 5 were televised in 2015 due to evidence of infiltration observed during field TV inspection operations.

Table 1-2 summarizes infiltration data measured and calculated during Phase I in subareas scheduled for TV investigation during Phase II of the Town-wide I/I investigation study.

Table 1-2: Phase I Infiltration Rates

Subarea	Peak Infiltration Flow Rate (gpd/in-mi)	Inch-Miles of Sewer Pipe
3*	6,000	5.06
4*	16,200	2.68
5	300	11.12
11	8,100	69.19
14	8,500	66.82
17	4,600	24.10
19-1	5,500	54.07
20	6,600	49.75
21	5,100	108.04
22	6,200	106.49
24	2,200	37.53
25	-	20.51
27	6,000	10.23
30	4,200	13.47
31	3,600	9.63
32 & 18	7,000	46.50

*Instantaneous measurements

Phase II included TV inspection of 16 targeted sewer subareas where meter data indicated infiltration was likely to be found. Simultaneously with that program, 10 permanent flow meters and 2 temporary flow meters were monitored in multiple subareas throughout town. BETA monitored flows from each meter daily and compared daily flows to high groundwater flows measured during Phase I to identify when groundwater levels were elevated and to target suspect areas. This made TV investigation more effective by ensuring inspection was conducted during periods of seasonally high groundwater. In general, TV inspection began when flow meter data showed flows were at least 100% of the 2013 peak infiltration rates calculated in Phase I. Inspections stopped when flows fell below 100% of the 2013 peak infiltration rates.

BETA also attempted to locate sewer reaches within the identified subareas where infiltration was likely to be found. BETA field personnel opened manholes at sewer junctions to identify reaches exhibiting signs of infiltration i.e. clear flow. TV inspections were directed toward those reaches. Infiltration observed in manholes was also estimated and documented. This made TV inspection more cost efficient by reducing chances of inspecting sewers with no defects or signs of infiltration.

Data collected during Phase II was compiled and a Cost Effectiveness Analysis was completed to determine which of the sewer and manhole defects found are either contributing infiltration and/or are in poor condition that failure to address those defects may lead to some degree of system failure and possibly contribute infiltration to the Town's sewer system in the future.

1.4 Definitions and Abbreviations Used in This Report

1.4.1. Definitions

a. Infiltration. Infiltration is defined as the water entering a sewer system, including building sewers, from the ground, through such means as defective pipes, pipe joints, connections, or manhole walls. Infiltration rates are dependent on groundwater elevation as well as rainfall permeation through soil. Infiltration does not include inflow.

b. Inflow. Inflow is defined as water discharged into a sewer system, including service connections, from such sources as roof leaders, cellar drains, foundation drains and storm drains. Inflow consists of two components, direct and delayed inflow. Direct inflow consists of flow from direct connections to the sewerage system such as cross connections from storm sewers, combined sewers, catch basins, roof leaders and inflow from manhole covers. Delayed inflow consists of extraneous flow that continues for a period after a rainfall and is caused by basement drains, foundation drains and sump pumps tied into the system. Inflow does not include infiltration.

c. Structural Integrity. The structural integrity evaluation criteria consist of: vertical deflection/cracks; missing sections; sagging; root intrusion; structural damage and corrosion.

1.4.2. Abbreviations

BETA	BETA Group, Inc.
CEA	Cost Effective Analysis
DEP	Massachusetts Department of Environmental Protection
DPW	Needham Department of Public Works
EST	EST Associates, Inc.
GIS	Geographic Information System
gpd	gallons per day
I/I	Infiltration/Inflow
MWRA	Massachusetts Water Resources Authority
NASSCO	National Association of Sewer Service Companies
NWM	National Water Main Cleaning Co.
PACP	Pipeline Assessment and Certification Program
T&T	Transport and Treatment
TV	Closed Circuit Television
USGS	United States Geological Survey

Section 2 –Rain Gauging and Groundwater Monitoring

2.1 Rain Gauging

2.1.1 General

Rain gauging was used to gather and measure rainfall data between 2014 and 2016. In this investigation, daily rainfall data was collected from the permanent rain gauge at the Charles River Street Water Treatment Facility during the TV inspection period. This data was used to provide a comparison to 2013 rainfall amounts collected from the same rain gauge during the high groundwater period, March to June.

Storm-induced infiltration can occur following wet weather when stormwater and/or snowmelt infiltrating into the ground either raises the groundwater table or makes its way into the sewer while permeating the surrounding soil.

2.1.2 Results

Table 2-1 shows the monthly rainfall amounts recorded from the permanent rain gauge at the Charles River Street Water Treatment Facility during the TV inspection period. The table encompasses data from January 2013 to September 2016. Appendix B presents the daily rainfall data taken from the rain gauge.

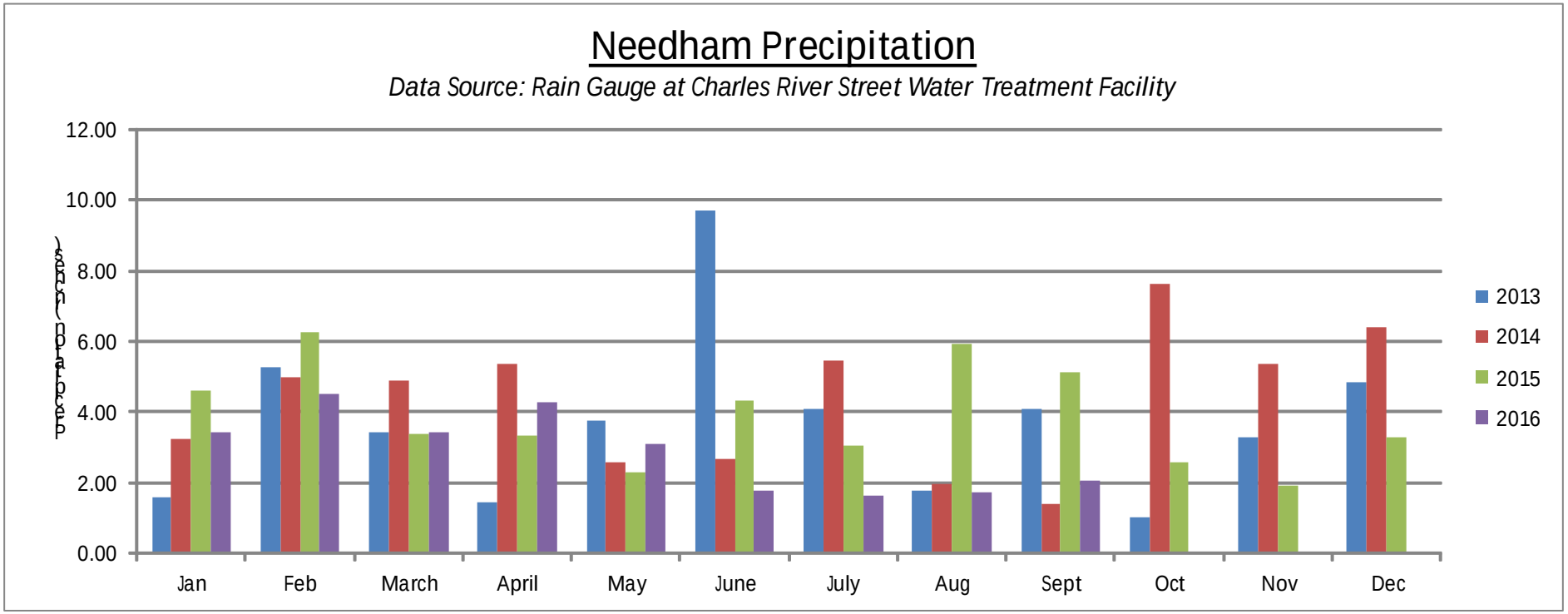
Table 2-1: Monthly Rainfall

Rainfall Amount (inches)												
Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2013	1.60	5.29	3.44	1.42	3.73	9.70	4.08	1.79	4.08	1.00	3.26	4.82
2014	3.24	4.99	4.89	5.36	2.58	2.68	5.47	1.95	1.40	7.62	5.36	6.38
2015	4.62	6.24	3.39	3.33	2.30	4.31	3.03	5.94	5.14	2.56	1.89	3.29
2016	3.44	4.54	3.44	4.27	3.09	1.78	1.62	1.72	2.04	6.50	3.09	3.28

As seen in Table 2-1, rainfall amounts in March 2015 and March 2016 were similar to rainfall in March 2013. April's rainfall amounts in 2013 were significantly less than subsequent years. May 2013 rainfall amounts were greater than rainfall amounts from 2014 to 2016. June's rainfall amounts in 2013 were substantially higher than rainfall amounts from 2014 to 2016.

Figure 2-1 presents a visual comparison of precipitation recorded each month in Needham and where rainfall amounts gauged during this study period compare to rainfall gauged in 2013 during Phase I of the infiltration/inflow investigation.

Figure 2-2 below presents a visual comparison of precipitation totals recorded for the spring high groundwater period (March-June) between 2013 and 2016. As shown, the spring of 2013 was wetter than subsequent years.

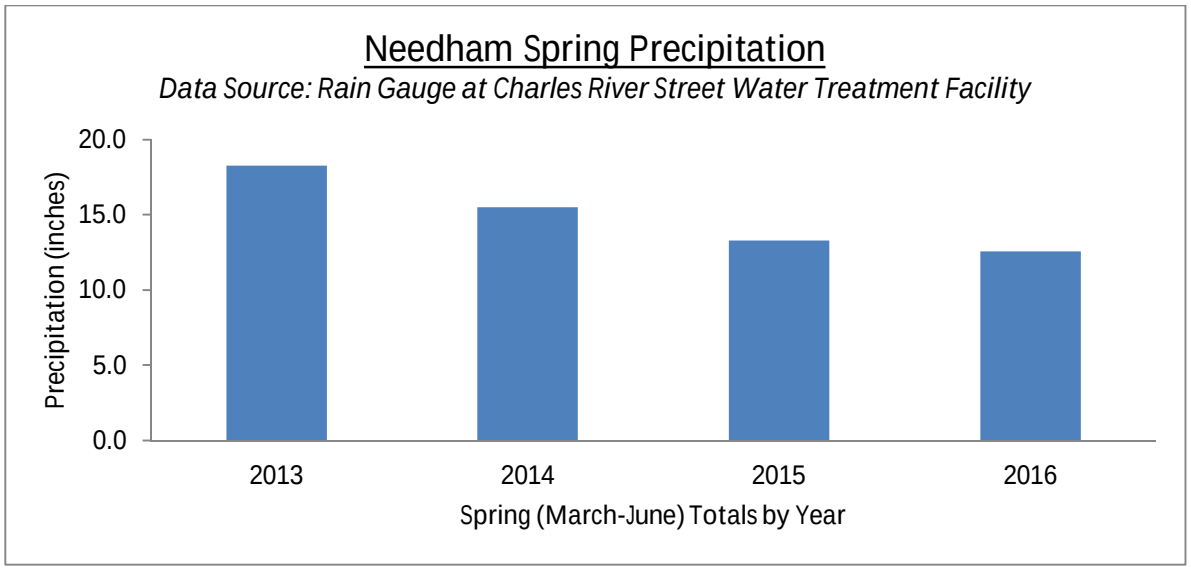


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FIGURE 2-1

Needham Monthly Precipitation Trends
(2013-2016)

Figure 2-2: Needham Spring Precipitation Trends



2.2 Groundwater Monitoring

2.2.1 General

The purpose of groundwater monitoring was to obtain current groundwater data throughout the studied sewer subareas. By measuring groundwater level in feet below land surface, a correlation between groundwater elevations and infiltration may be made.

Infiltration rates are dependent on groundwater table elevation as well as on rainfall permeation through soil. Infiltration is a steady 24-hour flow that usually varies during the year in relation to the groundwater levels above the sewer. It is a function of groundwater level above the sewer pipe, therefore, most sources of infiltration are impacted by changes in groundwater levels. The higher the groundwater table rises above the sewer, the more infiltration will enter the system through defects.

2.2.2 Results

Historically, spring (March-June) is the period of highest groundwater due to peak seasonal rainfall. USGS takes monthly readings at an observation well in Dover. Figure 2-3 shows the USGS groundwater levels recorded in Dover each month over the past 4 years with corresponding monthly precipitation totals to compare seasonal trends and to see how groundwater levels in 2013 compared to subsequent years.

Figure 2-3 shows the seasonal trend of highest groundwater readings in March tapering off into June. Maximum groundwater elevation was 128.58 feet in April 2015 and minimum elevation was 124.79 feet in September 2016 indicating a groundwater range of 3.79' and average groundwater elevation of 126.6 feet over the past 4 years.

Figure 2-3: USGS Groundwater Readings (Jan 2014 – Sept 2016)

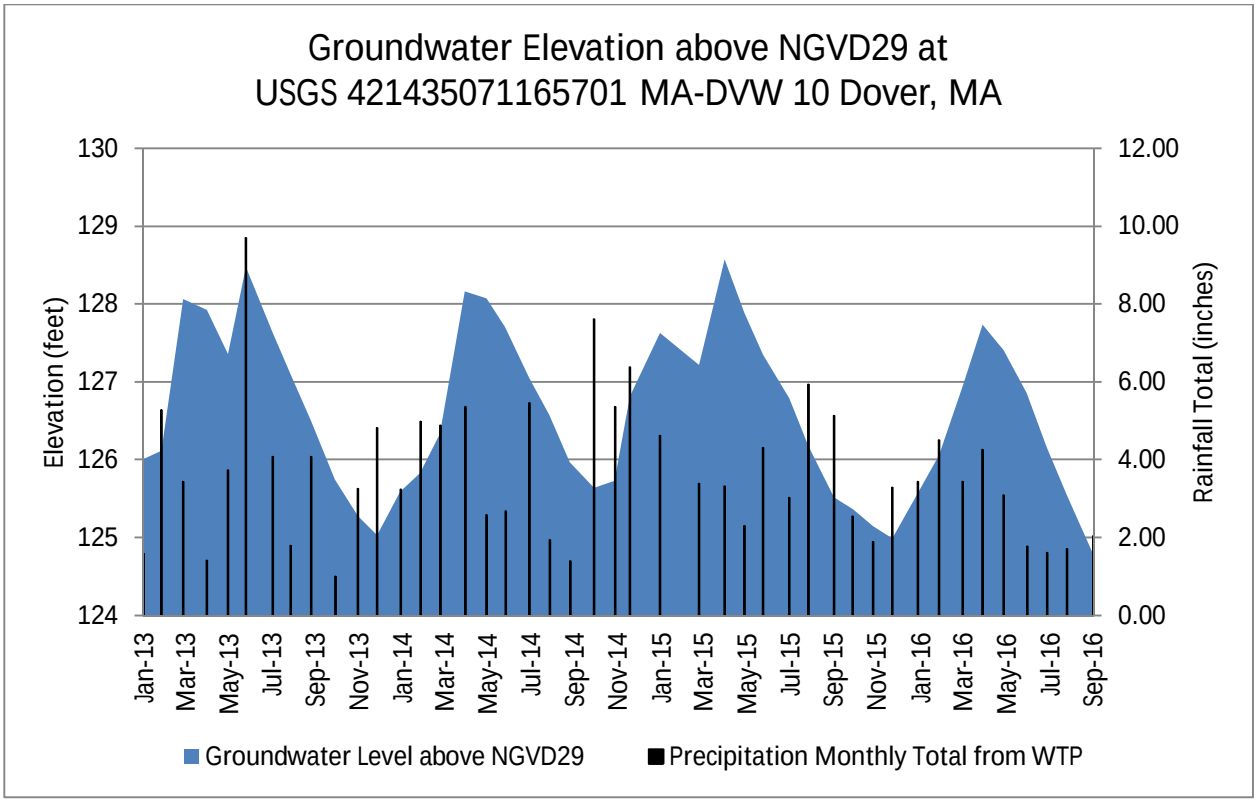


Figure 2-4 shows groundwater elevations in Dover in spring (March-June) of each year over the past 4 years and Table 2-2 compares groundwater elevations in spring of 2013 to monthly averages over the subsequent 3 years.

Figure 2-4: USGS Spring Groundwater Readings (2014 –2016)

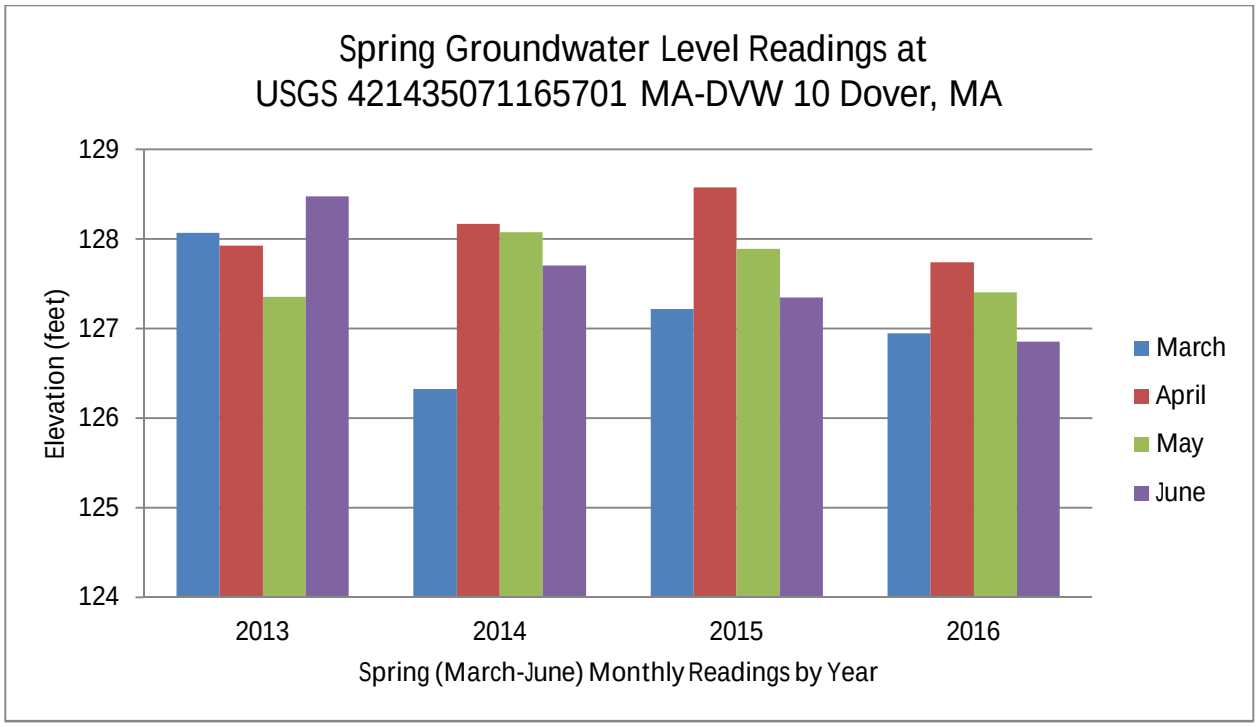


Table 2-2: Spring Groundwater Elevation Comparisons – Dover, MA

	2013 Groundwater Elevation	2014 Groundwater Elevation	2015 Groundwater Elevation	2016 Groundwater Elevation
March	128.07	126.33	127.22	126.95
April	127.93	128.17	128.58	127.74
May	127.36	128.08	127.89	127.41
June	128.48	127.71	127.35	126.86
Spring Average	127.96	127.57	127.76	127.24

As shown in Figure 2-4 and Table 2-2, the March 2013 groundwater elevation was greater than subsequent years by as much as 1.74'. April and May 2013 groundwater levels were average as compared to subsequent years. June 2013 groundwater level was greater than subsequent years by as much as 1.62'. When looking at the 4-month combined spring average, 2014-2016 spring groundwater elevations were typical compared to 2013 spring groundwater elevation.

Based on groundwater elevations, April and May observed infiltration rates during TV inspections are representative of calculated infiltration rates from the 2013 Phase I Infiltration/Inflow Investigation. March and June observed infiltration rates during TV inspections may be lower than rates calculated during Phase I.

Section 3 – Flow Monitoring

3.1 General

As part of the Phase I Town-wide I/I investigation study, Needham purchased ten permanent and two portable flow meters that were installed following the spring 2013 I/I investigation. All flow meters were installed, calibrated, and maintained monthly by EST Associates. Real time data from the 10 permanent flow meters was available through an online web portal. Data from the two portable meters was downloaded from each unit directly and periodically uploaded. Flow rate graphs for each meter during the high groundwater period 2014-2016 are presented in Appendix C.

3.2 Meter Locations

The Town purchased ten permanent and two portable flow meters that were installed as part of Phase I on December 7, 2013 by EST. Table 3-1 shows the location of each meter.

Table 3-1: Flow Meter Locations

Subarea	SMH No.	Location	Tributary Flow Measured	Type of Meter
11	S29-003	1394 Great Plain Avenue	-	Permanent
14*	S05-083	24 Crawford Street	-	Permanent
15	S15-070	Tillotson Road Easement	-	Permanent
16	S40-044	92 Lincoln Street	8, 12, 13, 15, 29	Permanent
19-1	S39-121	14 Maple Place	-	Permanent
20	S40-113	266 Dedham Avenue	-	Permanent
21	S52-111	215 Valley Road	14, 17, 18, 25, 32	Permanent
22	S41-054	Prince Street and Cook Street	-	Permanent
24	S52-086	146 Great Plain Avenue	-	Permanent
27	S29-008	16 Abbott Street	-	Portable
30	S59-047	69 Wildwood Drive	-	Portable
32	S05-109	292 Reservoir Street	17, 18	Permanent

*The meter for Subarea 14 was originally located in SMH No. S05-108 in the Crawford Street Easement and relocated to its permanent location on January 15, 2015.

3.3 Meter Operation and Maintenance

As stated in the Phase I report, all meters installed are Isco 2150 Area Velocity Flow modules that use continuous wave Doppler technology to measure flow levels and average flow velocity and calculate the flow rate and total flow.

Permanent meter flow modules were coupled with two batteries and an Isco 2130c Cellular Modem Module for automated remote retrieval of data. Real-time data from the 10 permanent flow meters was available through an online web portal hosted by EST, using a username and password.

Portable meters did not include Modem Modules for automated remote retrieval of data. Data was stored in secure flash memory, manually retrieved on-site by EST, and uploaded to the web portal.

3.4 Infiltration Comparison

As part of Phase II of the town-wide I/I investigation study, BETA monitored data from permanent flow meters. Daily infiltration rates for the permanent meters were calculated by taking the minimum nighttime flow and dividing it by inch diameter of pipes in the subarea to get an infiltration flow rate in gallons per day per inch-mile (gpd/in-mi).

Daily infiltration rates for each permanent flow meter were compared to peak infiltration rates calculated for the each subarea during Phase I of the I/I investigation study. Table 3-2 shows an example of this comparison from March 30, 2014.

Table 3-2: Infiltration Rate Comparisons Example

Meter Name	Sewer Subarea	3/30/14 Minimum Nighttime Flow Rate (GPD/in-mi)	2013 Peak Infiltration Flow Rate (GPD/in-mi)	2014 Flow Rate as a Percentage of 2013 Peak Infiltration Flow Rate
1394 Great Plain Ave	11	7,000	8,100	86%
146 Great Plain Ave	24	1,100	2,200	50%
215 Valley	21	4,300	6,400	67%
266 Dedham Ave	20	5,900	6,600	89%
292 Reservoir St	32	5,600	6,200	90%
Lincoln St	16	2,300	4,300	53%
Maple Place	19-1	5,800	5,500	105%
Prince & Cook	22	6,300	6,200	102%
Reservoir St Station B	14	4,400	8,500	52%
West St Pump Station	15	1,600	1,100	145%
69 Wildwood Drive	30	8,400	4,200	200%
Abbott Street	27	3,400	6,000	57%

If daily infiltration rates were greater than or equal to 100% of the peak infiltration rates from Phase I, flows were considered to be elevated in that subarea and BETA recommended TV inspection begin or resume in that subarea. If flows were less than 100% of the peak infiltration rates from Phase I, flows were considered to be down in that subarea and BETA recommended TV inspection to be put on hold until flows were elevated again.

Section 4 – Television and Manhole Inspections

4.1 General

Phase II of the town-wide I/I investigation involved internal TV inspection of sewer lines in multiple subareas. The purpose of TV inspection was to identify specific locations and sources of infiltration entering the sewer system and to provide a record of the actual conditions within the sewer lines for subsequent review and recommendations for rehabilitation of the sewer system. Sewer subareas recommended for TV inspection were those subareas determined by the results of the Phase I flow metering and isolation gaging program to have excessive infiltration and subareas exhibiting signs of infiltration during field investigations. Recommendations were ranked based primarily on infiltration values as it is often difficult to see signs of inflow during TV inspections. Also taken into consideration, was location of each subarea, the year each subarea was last TV'd, previous rehabilitation efforts, and whether the entire subarea or only part of the subarea was inspected. Throughout the TV inspection period, BETA opened sewer manholes at major sewer junctions to better locate sources of clear flow in each sewer subarea. Sewer reaches with little to no flow observed were not inspected.

EST televised approximately 168,950 linear feet of sewer. The TV inspection took place in the spring of 2014 from March 18 to May 23, again in 2014 from December 18 to December 19, in the spring of 2015 from March 24 to May 18 and in 2016 from April 9 to June 13. National Water Main Cleaning Company (NWM) conducted 7,200 linear feet of light sewer cleaning and televising of sewers from March 20, 2015 to March 23, 2015. Results from these inspections, which were conducted during high groundwater periods, were reviewed for infiltration and structural integrity.

4.2 TV Inspection Procedure

The TV inspection procedure was as follows:

1. The TV camera was placed in the manhole at the entry point for the pipe. The cable counter was set to zero. The video recording then commenced and all defects and features were recorded as the camera moved through the pipeline.
2. During TV inspection, logs and DVDs were created for defects observed including: leaking joints; cracked pipe; leaking services and connection caps; manhole leaks; and root intrusion.
3. To evaluate and compare the pipeline condition of sewers, Pipeline Assessment Certification Program (PACP) codes developed by the National Association of Sewer Service Companies (NASSCO) were used for naming and rating defects found. Table 4-1 represents the numerical importance weighting factors or "scoring points" identified in "Sewer System Defects".

Table 4-1: NASSCO Grade Summary

Rating Factor	General Description	Pipeline Failure
5	Defects requiring immediate attention.	Pipe has failed or will likely fail within the next 5 years.
4	Severe defects that will become Grade 5 defects within the foreseeable future.	Pipe will probably fail in the next 5 to 10 years.
3	Moderate defects that will continue to deteriorate.	Pipe may fail in 10 to 20 years.
2	Defects that have not begun to deteriorate.	Pipe unlikely to fail for at least 20 years.
1	Minor Defects.	Failure unlikely in the foreseeable future.

Defects with a NASSCO rating of three (3) or higher were recommended for rehabilitation.

4.3 TV Inspection Dates

As stated in Section 3, flow meters were monitored daily to ensure groundwater was sufficiently high in sewer subareas allowing the TV inspection program to be conducted during a period of seasonally high groundwater. TV inspection was also conducted during rain events which produced infiltration rates greater than 2013 peak infiltration rates. Table 4-2 outlines dates TV inspection occurred and the reasoning for starting and ending inspection.

Table 4-2: TV Inspection Dates

Starting Date	Reason for Starting Inspection	Ending Date	Reason for Ending Inspection	Subareas Inspected
3/18/14	Rain event	3/21/14	Low groundwater	20
4/2/14	Rain event	4/3/14	Low groundwater	20
4/9/14	Spring high groundwater	5/23/14	Low groundwater	11, 14, 19-1, 20, 22, 27
12/18/14	Rain event	12/19/14	Low groundwater	22
3/20/15	Spring high groundwater	5/18/15	Low groundwater	3, 4, 5, 14, 17, 21, 24, 25, 31, 32
4/9/16	Spring high groundwater	5/6/16	Low groundwater	6, 12, 13, 15, 26, 28, 29
6/6/16	Rain event	6/13/16	Low groundwater	14 & 32

EST began TV inspection on March 18, 2014. BETA recommended inspection begin on that date due to a rain event on March 13 and 14, 2014 where 0.55 inches of precipitation fell. Flow

meter data showed flows in Subarea 20 were up as a result of this rain event. Nighttime flow rate was measured at 103% of 2013 peak infiltration rates calculated in Phase I of the Town-wide I/I investigation. EST stopped inspection on March 21, 2014 due to low flow rates in all subareas recommended for inspection.

EST started inspections again on April 2, 2014. A rain event from March 29 – 31, 2014 produced 3.92 inches of precipitation. Meter data showed flows in all subareas were up over 100% of the 2013 peak infiltration rates. EST continued inspection of Subarea 20 where flows reached 165% of the 2013 peak rates. EST stopped inspection on April 3, 2014 due to low flow rates in Subarea 20.

EST resumed TV inspections on April 9, 2014. Flow meter data consistently showed flows in multiple subareas were elevated; indicating the start of spring high groundwater period. EST stopped inspection on May 23, 2014. Meter data consistently showed flows in all subareas were down; indicating the end of spring high groundwater period.

2.59 inches of precipitation fell during a rain event on December 10, 2014. As a result, flow in Subarea 22 was measured at 290% of the 2013 peak infiltration rate for that subarea. EST resumed TV inspections on December 18, 2014 while flows in Subarea 22 were up and ended inspections the next day as flows decreased.

NWM began TV inspections on March 20, 2015. Flow meter data consistently showed flows in multiple subareas were elevated; indicating the start of spring high groundwater period. NWM stopped inspection on March 23, 2105 and EST resumed inspections on March 24, 2015. EST continued inspections until May 18, 2015 due to consistently low flow rates; indicating the end of spring high groundwater period.

EST started inspections again on April 9, 2016. BETA recommended inspection begin on that date due to a rain event from April 1 – 4, 2016 where 2.04 inches of precipitation fell and a rain event on April 7, 2016 where 1.35 inches of precipitation fell. Meter data showed flows in all subareas were up over 100% of the 2013 peak infiltration rates. EST continued inspection of Subarea 20 where flows reached 165% of the 2013 peak rates. EST stopped inspection on April 3, 2014 due to low flow rates in Subarea 20.

4.4 Findings

4.4.1 TV Inspection

During the TV Inspection, logs and DVDs were created for defects observed including: leaking joints; cracked pipe; leaking services; leaking service connection caps; manhole leaks; and roots. Figures 4-3 thru 4-6 show typical defects found during the internal TV inspection in the Sewer Subareas.

Sewer System Defects

Figure 4-3
Leaking Service Lateral Joint
SMH S31-167:S31-165 Arch Street



Figure 4-4
Broken Pipe
SMH S23-012:S23-011 Brookline Street

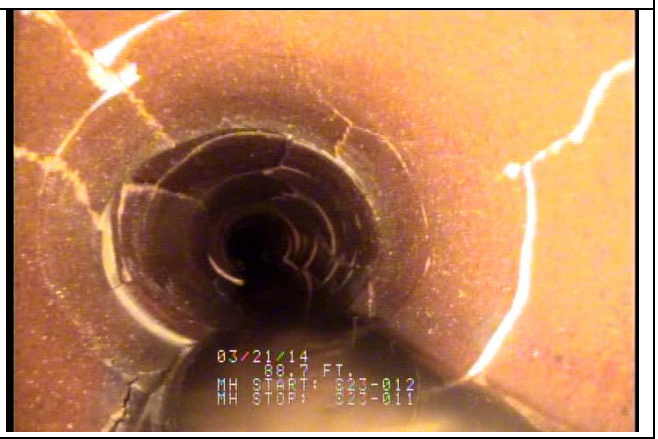


Figure 4-5
Roots at Joint
SMH S19-032: S27-009 Whiting Way

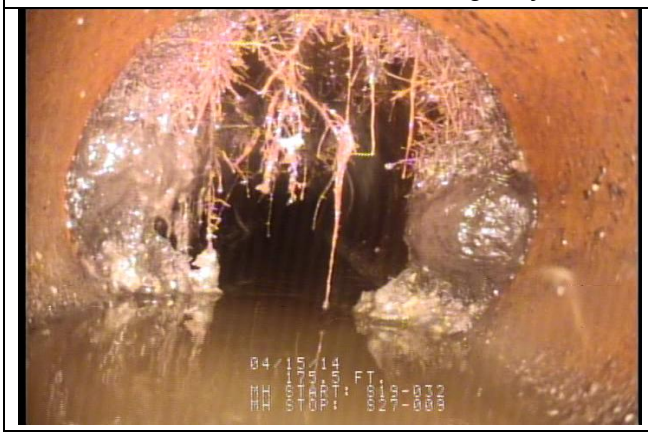


Figure 4-6
Leaking Joint
SMH S38-019 : S38-020 Central Ave



From the information gathered during the TV Inspection, a TV inspection summary was created. The summary, presented in Appendix D encompasses all sewer segments televised, regardless if they require rehabilitation or not. Appendix D provides a breakdown of each sewer reach, potential recommended type of rehabilitation for the sewer defect, an approximate cost for rehabilitation, and the removable amount of infiltration, although not all of these defects are recommended to be repaired. See the map in Appendix E for locations televised during Phase II and prior TV investigations. See Section 5 for recommended rehabilitation.

Table 4-3 summarizes the estimated infiltration found during TV inspections in sewer mains, laterals and manholes. An estimated 693,200 gpd of infiltration was observed during TV

inspection. Subareas 14 & 17 had the most observed infiltration, each with almost 13% of the total infiltration observed.

Table 4-3: Observed Infiltration

Subarea	Total Pipe Length (feet)	Total Inspection Length (feet)	Inspection Length with Infiltration (feet)	Estimated Observed Infiltration (gpd)
3	3,340	1,219	627	10,440
4	1,768	1,299	590	7,920
5	7,104	2,708	340	2,340
6	3,537	512	0	0
11	40,183	25,080	9,143	49,920
12	27,673	4,177	1,061	38,520
13	21,108	3,116	863	10,440
14	40,670	18,767	3,385	90,720
15	32,068	3,760	1,519	41,940
17	15,339	4,240	1,433	90,060
19-1	34,525	25,746	5,573	39,880
20	31,448	18,707	6,316	29,640
21	54,696	12,008	5,270	56,520
22	69,844	19,912	5,214	73,620
24	23,861	13,497	4,590	49,140
25	13,014	5,550	1,600	32,040
26	34,183	2,445	811	14,220
27	6,753	1,819	996	5,980
28	4,829	563	91	2,880
29	5,033	1,188	492	7,920
30	8,925	898	114	360
31	6,293	1,093	696	720
32	13,782	7,849	1,789	37,980
Total	371,545	176,153	52,513	693,200

4.4.2 Manhole Inspections

Manhole inspections were primarily conducted to isolate potential sources of infiltration. During TV inspections, EST noted observed manhole defects encountered and estimated infiltration observed. BETA externally inspected priority manholes at major sewer junctions in order to identify possible locations of I/I for sewer investigation. Defects observed in these manholes were noted and observed infiltration from manholes was estimated. Table 4-4 lists manholes with infiltration observed by EST and BETA. Estimated infiltration from manhole defects are included in infiltration quantities listed in Table 4-3. Manhole infiltration and rehabilitation is

included with the TV inspection summary in Appendix C. See Section 5 for recommended rehabilitation.

Table 4-4: Observed Manhole Defects

Date Inspected	Location	Manhole	Subarea	Observed Defect
4/16/2014	Canavan Circle	S27-018	11	Leak at pipe connection to manhole
4/23/2014	Mackintosh Avenue	S20-021	11	Leak at pipe connection to manhole
4/25/2014	Gay Street	S39-024	11	Leak at pipe connection to manhole
12/18/2014	Holmes Street	S31-029	22	Leak at connection to manhole
12/18/2014	Holmes Street	S31-052	22	Major infiltration runner in invert
12/19/2014	Hazelton Avenue	S31-093	22	Major leak in manhole bench
5/3/2014	Overlook Road	S39-036	19-1	Heavy leak at pipe connection to manhole
5/7/2014	Robinwood Avenue Easement	S49-024	19-1	Heavy leak at connection to manhole
5/20/2014	Yurick Road	S49-062	19-1	Roots in manhole
3/20/2015	Lynn Road	S10-034	14	Infiltration at connection to manhole
3/30/2015	Webster Street	S10-018	14	Major infiltration in bench
3/26/2015	Hazel Lane	S17-093	17	Major infiltration in bench
3/26/2015	Hazel Lane	S17-094	17	Major infiltration in bench
3/26/2015	Fay Lane	S17-091	17	Major infiltration in bench
3/31/2015	Hazel Lane	S17-092	17	Infiltration in bench
4/1/2015	Hazel Lane	S17-089	17	Major infiltration in bench
4/1/2015	Hazel Lane	S17-090	17	Major infiltration in bench
4/13/2015	Woodbine Circle	S17-087	17	Major infiltration in bench
4/13/2015	Woodbine Circle	S16-126	17	Infiltration in bench
4/13/2015	Fay Lane	S16-131	17	Infiltration in bench
4/6/2015	Brookline Street	S23-096	21	Infiltration runner in bench
4/7/2015	Falcon Street	S23-139	21	Leaking manhole
4/21/2015	Edgewater Drive	S60-001	4	Major leak in manhole bench
4/21/2015	Edgewater Drive	S60-020	3	Major leak in manhole bench
5/18/2015	South Street Easement	S59-017	30	Leak at connection to manhole

4.5 Rehabilitation Methods

Many methods of sewer system rehabilitation are available. BETA considered the following list of prevailing pipeline rehabilitation methods along with a general description of each rehabilitation technique during our review of the data provided.

1. Cured-In-Place Pipe (CIPP)

This is an alternative to sewer pipe replacement. Cured-in-place pipe (CIPP) is installed in an entire sewer reach (manhole to manhole) without the need for excavation. Costs include preparatory sewer cleaning and television inspection, installation of the liner, robotic cutting of service connection inlets, and sealing of the connection between the service and the main. Costs for sewer reaches with numerous service taps become excessively expensive and are not recommended.



Figure 4-7: CIPP

2. Dig and Replace Sewer Main

Sewer main replacements are recommended when the main line is in poor structural condition. Rehabilitation cost is based on a digging the old pipe and replacing a section with a new PVC pipe and couplings.

3. Seal Service Wye

Wye sealing is used to seal leaks at the connection between the sewer main and lateral connections. A "T" shaped packer is inserted into the sewer main along with a TV camera and is inflated into a lateral approximately 12 inches. The three ends are sealed off and grout is pumped into the connection.

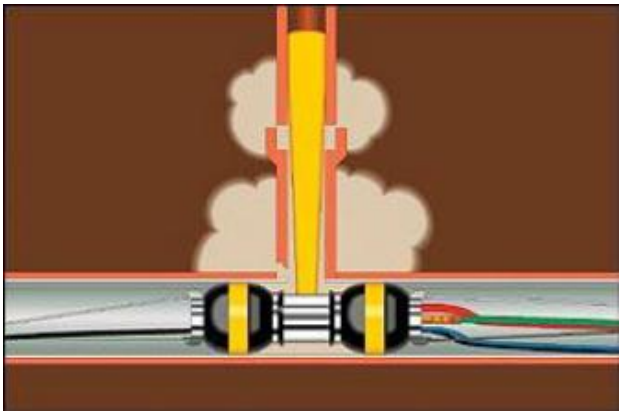


Figure 4-8: Seal Service Wye

4. Point Repairs

Point repairs are used to fix a minor defect or seal off a service connection in an existing pipe. A tube of fiberglass fabric is pulled into the sewer at the correct location, is saturated with an epoxy resin, secured to the pipe interior by inflating a bladder, and cured using steam or hot water. Leakage or minor damage is rectified. No digging is required for this technique.

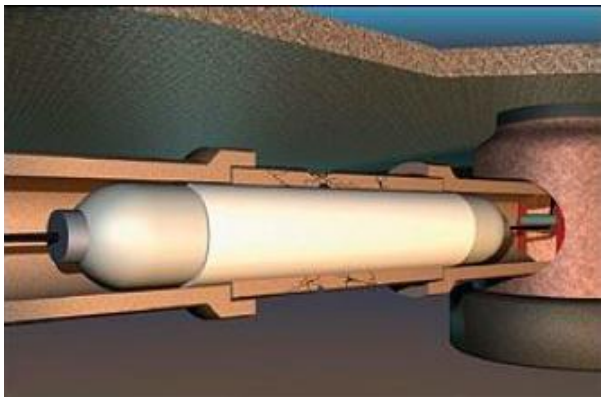


Figure 4-9: Point Repair

5. Chemical Root Treatment

Chemical Root Treatment involves pumping foam into a sewer main reach until the foam is forced into cracks and joints to maximize contact with roots. The roots die and stop growing upon contact with the foam. This repair cost is presented as a price-per-foot.

6. Dig and Replace Service Connections

Service connection replacements are recommended when a sewer connection is in poor structural condition. Rehabilitation cost is based on a digging and replacing the old connection and replacing it with a new PVC pipe and wye.



Figure 4-10: Dig and Replace Service Connection

7. T-Liner

T-liners are cured-in-place liners used to rehabilitation the main and lateral junction. T-liners can renew laterals up to 200 feet from the mainline with lateral diameters between 3 and 8 inches. No digging is required for this technique.

4.6 Work Completed to Date

Throughout the inspection period, BETA recommended rehabilitation of significant defects found during TV investigations and presented findings to the Town of Needham. Under separate contracts with Wright-Pierce and BETA, the Town completed some of those recommendations while TV investigations were ongoing. Table 4-5 lists sewer main rehabilitation work completed under contracts 15DPW137C and 15DPW037C. Table 4-6 lists sewer manhole rehabilitation work completed under contract 15DPW037C.

Table 4-5: Sewer Main Defects Observed During Phase II and Rehabilitated as of October 2016

Inspection Date	Street	Subarea	From Manhole	To Manhole	Infiltration (gpd)	Rehabilitation
3/19/2014	Donna Road	20	S22-109	S22-108		Seal Lateral
3/19/2014	Donna Road	20	S22-108	S22-107	180	Point Repair, Seal Lateral
3/19/2014	Donna Road	20	S22-107	S22-106		Seal Lateral
3/19/2014	Donna Road	20	S22-106	S22-080	180	CIPP, Seal Lateral
3/21/2014	Brookline Street	20	S23-012	S23-011		CIPP, Seal Lateral
3/21/2014	Hemlock Street	20	S31-022	S30-090		Chemical Root Treatment
4/2/2014	Brookline Street	20	S23-006	S22-074	2,800	Point Repair
4/18/2014	Great Plain Ave	11	S28-034	S28-033	540	Seal Lateral
4/18/2014	Great Plain Ave	11	S28-035	S28-034	180	CIPP, Seal Lateral
5/1/2014	Helen Road	22	S31-152	S31-159	3,600	CIPP, Seal Lateral
5/1/2014	Ina Road	22	S31-159	S31-158	1,980	CIPP, Seal Lateral
5/1/2014	Helen Road	22	S31-151	S31-150	7,200	Seal Lateral
5/1/2014	Helen Road	22	S31-148	S31-149	180	Point Repair
5/2/2014	Rae Avenue	22	S31-167	S31-168	5,760	Seal Lateral, Chemical Root Treatment
5/5/2014	Barrett Street	19-1	S49-008	S49-018	4,320	CIPP, Seal Lateral
5/5/2014	Barrett Street	19-1	S49-014	S49-015	2,440	Point Repair, Seal Lateral
3/26/2015	Fay Lane	17	S17-090	S17-091	17,280	CIPP
3/26/2015	Woodbine Circle	17	S17-090	S17-093		CIPP
3/26/2015	Woodbine Circle	17	S10-108	S17-092	900	Seal Laterals
3/31/2015	Hazel Lane	17	S17-093	S17-094		Remove and Replace Pipe
4/1/2015	Hazel Lane	17	S17-089	S17-090		CIPP
4/1/2015	Hazel Lane	17	S17-089	S17-088	720	CIPP
4/13/2015	Fay Lane	17	S16-131	S17-091	24,360	Remove and Replace Pipe
4/13/2015	Woodbine Circle	17	S16-125	S16-126	2,880	Seal Lateral
4/13/2015	Woodbine Circle	17	S16-126	S17-087		Remove and Replace Pipe
4/13/2015	Woodbine Circle	17	S17-087	S17-088	720	CIPP
5/13/2014	Jennifer Circle	14	S09-091	S09-090	28,800	Remove and Replace Pipe
				TOTAL:	117,980	

Table 4-6: Sewer Manhole Infiltration Observed During Phase II and Rehabilitated as of October 2016

Inspection Date	Street	Subarea	Manhole	Infiltration (gpd)	Rehabilitation
3/26/2015	Fay Lane	17	S17-090	7,200	Replace Manhole
3/26/2015	Fay Lane	17	S17-091	7,200	Replace Manhole
3/31/2015	Hazel Lane	17	S17-094	2,880	Replace Manhole
3/31/2015	Hazel Lane	17	S17-093	7,200	Replace Manhole
3/31/2015	Hazel Lane	17	S17-092	1,440	Replace Manhole
4/1/2015	Hazel Lane	17	S17-089	7,200	Replace Manhole
4/13/2015	Fay Lane	17	S16-131	1,440	Replace Manhole
4/13/2015	Woodbine Circle	17	S16-126	1,440	Replace Manhole
4/13/2015	Woodbine Circle	17	S17-087	7,200	Replace Manhole
			TOTAL:	43,200	

An additional sewer rehabilitation design is was completed by BETA, rehabilitating defects observed during Phase II TV investigations. Table 4-7 lists defects found during TV investigations that are scheduled for rehabilitation under contract 17DPW158C.

Table 4-7: Sewer Main Defects Observed During Phase II and Designed for Rehabilitation Under Contract 17DPW158C

Inspection Date	Street	Subarea	From Manhole	To Manhole	Observed Infiltration (gpd)	Recommended Rehabilitation
3/27/2015	Hillside Avenue	14	S10-016	S10-017	3,060	CIPP
3/27/2015	Hillside Avenue	14	S10-017	S10-018	14,400	CIPP
4/1/2015	Reservoir Street ROW	25	S05-102	S05-103	1,440	CIPP
4/1/2015	Reservoir Street ROW	25	S05-103	S05-104	11,160	CIPP
4/1/2015	Reservoir Street ROW	25	S05-104	S05-105	5,580	CIPP
4/1/2015	Reservoir Street ROW	25	S05-105	S05-106	9,540	CIPP
3/31/2015	First Avenue	32	S11-027	S11-026	14,400	CIPP
3/31/2015	First Avenue	32	S11-028	S11-027		CIPP
3/31/2015	First Avenue	32	S11-029	S11-028	3,600	CIPP
3/31/2015	First Avenue	32	S11-029	S17-095	720	CIPP
4/8/2015	Wexford/Charles Easement	32	S06-017	S06-024		CIPP
4/8/2015	Wexford Street	32	S06-016	S06-017	8,640	CIPP
4/8/2015	Franklin Street	32	S06-014	S06-016	5,760	CIPP

4.7 GIS Updates

As part of Phase II TV inspections, BETA updated the Town of Needham's sewer main GIS datbase. BETA created new fields in the shapefile to reflect TV work completed 2014 to 2016. To retain all previous known years of TV inspection, two fields were created within the Sewer_Main_2016_Update shapefile: Prev_TV and TV_Update. TV_Update encompasses all TV inspection done by EST and NWM during 2014, 2015, and 2016. Prev_TV is the last known TV

inspection year, prior to inspections completed as part of Phase II of the town wide I/I investigation. Updated fields for sewer main rehabilitation were added as well. Table 4-8 summarizes GIS shapefile updates completed by BETA during Phase II. The map in Appendix E depicts the GIS updates.

Table 4-8 GIS Shapefile Updates

Shapefile	Field Name	Description
Sewer_Main_2016_Update	Prev_TV	Year of prior known TV inspection
	TV_Update	Year of latest known TV inspection
	Reh_Upd_Yr	Year of latest known sewer rehabilitation
	Reh_Up_Typ	Latest known sewer rehabilitation method

SECTION 5 - Recommendations

5.1 General

Needham is currently experiencing high wet weather flows in certain portions of its sewer system. Information from previous reports, suggestions from the Department of Public Works (DPW), television inspection, and manhole inspections have indicated that significant infiltration exists in multiple sewer subareas. Recommendations for rehabilitation are based on TV inspections and manhole inspections conducted from March 18, 2014 through June 13, 2016.

5.2 Cost Effective Analysis Methodology

Infiltration sources and physical deficiencies requiring rehabilitation in sewer mains, services, or manholes are summarized in **Appendix F**, based on the severity of the defect. Each defect is broken down into location, defect, observed I/I, rehabilitation method and estimated cost of repair. These tables do not include defects found during Phase II TV inspection and rehabilitated under contracts 15DPW137C and 15DPW037C or rehabilitation designed under contract 17DPW158C.

Included in the summary in **Appendix F**, a cost effective analysis (CEA) was performed for each sewer segment with deficiencies requiring rehabilitation to determine if it is cost effective to eliminate infiltration. It is considered cost effective to remove infiltration if it is less costly to eliminate than to transport and treat over a 20-year design period.

The CEA involved determining the rehabilitation costs for each sewer segment to eliminate infiltration or repair deficiencies. Videotapes and inspection logs were reviewed and a rehabilitation method was recommended for each defect with a PACP rating of 3 or higher. Based on the recommended rehabilitation method, a rehabilitation cost was determined for use in the CEA.

Transportation and Treatment (T&T) costs were calculated using actual Needham sewer enterprise appropriation funds from FY15. In compliance with DEP "Guidelines for Performing Infiltration/Inflow Analysis and Sewer System Evaluation Survey", revised January 1993, the T&T costs were converted to a 20-year present worth to be compared to the rehabilitation improvements. The present worth of the T&T cost for the 20-year period, with a discount rate of 3.25% is $28.01/gpd. A breakdown of how these costs were generated can be found in **Table 5-1**.

The CEA included in **Appendix F** lists all sewer segments requiring rehabilitation including estimated infiltration rates, estimated T&T costs, estimated rehabilitation costs, and whether or not it is cost effective to rehabilitate the sewer segment. T&T costs are based on an infiltration removal rate of 50% of the estimated infiltration rate.

Table 5-1: T&T Costs for the Town of Needham

Sewer Enterprise Fund Appropriations FY15

Item	Flow (MGD)	Flow (gal/day)	MWRA & Town Appropriation	Cost ($/GPD)
Annual Wastewater Volume	3.54	3,540,000	$6,820,898	$1.92681

Present Worth Analysis
Town of Needham

Discount Rate = 3.250%
Number of years = 20
2015 T&T Cost $1.92681

Present Worth Factor:

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

$$\frac{(1+i)^{n}-1}{i(1+i)^{n}} = \mathbf{14.54}$$

Present Worth T&T Costs:

(Present worth Factor)x(2015 T&T Costs)

$28.01

*Flows taken from 3 year average as presented in 2016 MWRA I-I Questionnaire
*Costs taken from FY15 sewer enterprise budget for Town of Needham

5.3 Rehabilitation Recommendations

Based on the results of the CEA, there are numerous locations that would be cost effective to rehabilitate the observed defect. In addition, there are some areas within the sewer system that are not cost effective to rehabilitate but may be value effective since some defects are severe enough to warrant repair regardless of the cost effective analysis. Final recommendations are presented in **Appendix G**. Rehabilitation methods include cured-in-place-pipe, dig and replace sewer main, seal later connections, grout manholes, replace manholes, point repairs, heavy cleaning, and chemical root treatment.

Table 5-2 presents a summary of the estimated amount of infiltration that can be removed by cost effective and value effective rehabilitation. As shown in **Table 5-2,** infiltration found during Phase II TV inspections that was removed under contracts 15DPW137C and 15DPW037C or designed under contract 17DPW158C was not included in the estimated cost of rehabilitation per gpd of infiltration. A total of 464,880 gpd of observed infiltration is recommended for rehabilitation. **Table 5-2** is prioritized by estimated construction cost to remove observed infiltration in each subarea.

Table 5-2: Cost Effective Rehabilitation Prioritized by Subarea

Subarea	Date of TV Inspection	Observed Infiltration (gpd)	2015/2016 Rehab (gpd)	Observed Infiltration Recommended for Rehab (gpd)	Estimated Construction Cost	$/gpd
28	Apr 2016	2,880		2,880	$550.00	$0.19
15	Apr 2016	41,940		41,940	$28,575.00	$0.68
12	May 2016	38,520		38,520	$33,200.00	$0.86
13	Apr 2016	10,440		10,440	$12,750.00	$1.22
30	May 2015	360		360	$550.00	$1.53
21	Apr 2015	56,520		56,520	$117,263.25	$2.07
26	Apr 2016	14,220		14,220	$30,155.25	$2.12
29	Apr 2016	7,920		7,920	$17,050.00	$2.15
22	Apr, May & Dec 2014	73,620	-18,720	54,720	$126,802.00	$2.32
27	May 2014	5,980		5,980	$14,450.00	$2.42
3	Apr 2015	10,440		10,440	$25,500.00	$2.44
14	May 2014 Mar 2015 June 2016	90,720	-46,260	44,460	$120,844.50	$2.72
24	Apr 2015	49,140		49,140	$142,465.00	$2.90
19.1	May 2014	39,880	-6,760	33,120	$110,245.00	$3.33
5	Apr & May 2015	2,340		2,340	$8,000.00	$3.42
25	Mar & Apr 2015	32,040	-27,720	4,320	$15,100.00	$3.50
4	Apr 2015	7,920		7,920	$28,000.00	$3.54
11	Apr 2014	49,920	-720	48,120	$252,214.00	$5.24
32	Mar & Apr 2015 June 2016	37,980	-33,120	4,860	$26,380.00	$5.43
20	Mar & Apr 2014	29,640	-3,160	25,940	$168,315.75	$6.49
31	Apr 2015	720		720	$6,600.00	$9.17
17	Mar & Apr 2015	90,060	-90,060	0	$2,050.00	-
TOTAL		**693,200**	**-226,520**	**464,880**	**$1,287,060**	

5.4 Estimated Project Costs

Based on the investigation results, BETA recommends a sewer system rehabilitation construction contract based on the recommended rehabilitation presented in **Appendix G**. Improvements consist of rehabilitating sewer system defects using cured in place pipe (CIPP), sealing service laterals, dig & replace, point repairs, heavy cleaning, and chemical root treatment. An overall estimated cost breakdown is presented in **Table 5-2**. **Table 5-2** does not include rehabilitation costs to repair defects found during Phase II TV inspections that were rehabilitated under contracts 15DPW137C and 15DPW037C or designed under contract 17DPW158C. As shown in **Table 5-2**, subarea 28 is the most cost effective at $0.19/gpd and subarea 17 least cost effective as no infiltration is removed from recommended rehabilitation. An estimated cost breakdown including contingency and engineering costs is presented in **Table 5-3**.

Table 5-3: Estimated Rehabilitation Costs

Est. Construction Costs:		
	Recommended Rehabilitation	$1,287,100
	20% Contingency	$257,420
	Total Construction Cost	**$1,544,520**
Est. Engineering Costs:		
	Design	$128,700
	Construction Services and Resident Inspection	$154,500
	Total Engineering Costs	**$283,200**
Total Engineering and Construction Costs:		**$1,827,720**

Actual construction costs may differ from the presented costs, depending on the magnitude of the overall project and the specialized subcontracts.

5.5 TV Inspection Recommendations

Sewer subareas recommended for TV inspection during this study period were those subareas determined by the results of the Phase I flow metering and isolation gaging program to have excessive infiltration and subareas exhibiting signs of infiltration during field investigations. Also taken into consideration, was location of each subarea, the year each subarea was last TV'd, previous rehabilitation efforts, and whether the entire subarea or only part of the subarea was inspected as indicated by the map in **Appendix E**. During this study period, approximately 176,150 linear feet of sewer was televised.

BETA recommends the Town continue TV inspection to identify specific locations and sources of infiltration entering the sewer system and to provide a record of the actual conditions within the

sewer lines. External inspection of priority manholes at major sewer junctions should also be completed to identify possible locations of I/I for sewer investigation. **Table 5-4** lists subareas recommended for TV inspection in the short term, in order of initial priority.

Table 5-4: Recommended TV Locations

Priority TV Inspection Subareas				Spring 2013 Data		Previous TV Work	
Priority	**Subarea**	**Length of Pipe in Subarea (ft)**	**Length of Pipe to be Inspected (ft)**	**Infiltration Flow Rate (GPD/in-mi)**	**Peak Inflow Corrected for 1.7" Storm (GPD)**	**Year Last TV'd**	**Partial or Complete Subarea**
1	6	3,537	1,414	8,100	-	2016	Partial
2	21	54,127	39,367	5,100	654,200	2015	Partial
3	18	9,362	5,929	-	-	-	-
4	lower 22	27,096	2,939	-	-	2012	Complete
5	29	9,364	9,364	3,800	103,100	-	-
6	31	6,234	6,234	3,600	51,800	2015	Partial
7	23	18,786	18,786	2,800	54,500	-	-
8	12	27,487	26,975	2,600	34,200	2012	Partial
9	10	15,140	15,140	2,100	101,800	-	-
10	9	1,016	1,016	1,800	-	-	-
11	28	5,392	5,392	1,700	22,100	-	-
12	13	22,958	22,740	1,600	40,100	-	-
13	33	6,818	2,926	1,600	54,900	2010	Partial
14	26	34,521	31,400	1,300	303,500	-	-
15	15	31,959	30,110	1,200	128,800	2012	Partial
16	19-2	8,798	8,798	300	0	-	-
17	1	17,765	15,001	-	-	2004	Partial
18	2	6,624	2,442	-	-	2005	Partial
19	16	45,181	4,308	11,600	1,124,300	2012	Complete
20	7	1,618	0	-	-	2012	Complete

According to DEP guidelines, the recommended inspection period is between March 1 and June 30. An exception to this rule is noted if groundwater levels are known to be sufficient beyond this time period. BETA recommends monitoring real time flow rates from the 12 meters in Town and use flow rates as a guide for TV inspection periods.

Appendix A
Sewer System Map

Town of Needham, MA
Sewer System Map

N
W E
S

Legend

- Sewer Manhole
- Force Main
- Unknown
- 4" - 6"
- 8"
- 10" - 12"
- 15"
- 18" - 24"
- 27" - 60"
- MWRA
- Sewer Subareas

Sewer Pump Station Locations

1. West Street Pump Station
2. Reservoir B Pump Station
3. Great Plain Avenue Pump Station
4. Kendrick Street Pump Station
5. Alden Road Pump Station
6. Milo Circle Pump Station
7. Reservoir A Pump Station
8. Lake Drive Pump Station
9. Warren Street Pump Station

1,000 500 0 1,000 Feet

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ENGINEERING SUCCESS TOGETHER

October 27, 2016

Appendix B
Daily Rainfall Data

2013 Precipatation Totals

Day	January	Jan-Snow	Feb	Feb-Snow	March	Mar-Snow	April	April-Snow	May	June	July	Aug	Sept	October	Nov	Nov-Snow	Dec	Dec-Snow
1							0.08				0.01		2.58		0.16		0.10	
2													0.18					
3			0.01	T	0.01					0.53		0.15						
4														0.58				
5			0.04										0.06				T	
6					0.2									0.28				
7										3.84				0.05	0.26		0.15	
8			1.85	27"	1.52	18"			0.20			0.14						
9							0.09		0.29			1.38					0.57	0.5"
10							0.13			1.30	0.06		0.05	0.02			0.33	1"
11			0.27				0.35			0.26	0.31							
12	0.16				0.48		0.61		0.06		0.03		0.63		0.16			
13	0.02									1.92			0.06					
14										0.21								
15									0.01								0.98	8"
16	0.45	3"											0.03					
17			0.18							0.43							0.50	6"
18				2"						0.82				0.03	0.30			
19			0.35		1.16													
20	0.03	T																
21									0.48									
22													0.48		0.19			
23			0.23	T			0.13		0.20		1.49						0.76	
24			0.86	23					0.19	0.05	0.07							
25							0.03		1.00		1.58							
26									0.20		0.17			0.02			0.06	
27			1.5							0.30		0.12			2.19			
28	0.20	1"							1.10	0.02								
29	0.09										0.36		0.01	0.02			1.37	
30										0.02								
31	0.65				0.07													
Total	**1.60**	**4"**	**5.29**	**32"**	**3.44**	**18"**	**1.42**	**0**	**3.73**	**9.70**	**4.08**	**1.79**	**4.08**	**1.00**	**3.26**	**0**	**4.82**	**15.5"**

Month	Total
January	1.60
February	5.29
March	3.44
April	1.42
May	3.73
June	9.70
July	4.08
August	1.79
September	4.08
October	1.00
November	3.26
December	4.82
2013	**44.21**

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2014 Precipitation Totals

Day	January	Jan-Snow	Feb	Feb-Snow	March	Mar-Snow	April	April-Snow	May	June	July	Aug	Sept	October	Nov	Nov-Snow	Dec	Dec-Snow
1									0.11					1.33	0.62		0.02	
2	0.67	12"	0.02										0.55	0.06	0.10			
3			0.27	2.5"						0.18	0.25	0.04					0.50	
4									0.01	0.61	1.84			0.23				
5			0.92	10"			0.41											
6	0.38											0.05	0.09		0.52		1.27	
7																		
8							0.66							0.09			2.93	
9			0.04	T					0.08								0.16	
10	0.02				0.01				0.02	0.01							0.05	
11	0.65													0.35				
12							0.13											
13			1.76	10"	0.48					1.04		1.49	0.18					
14	0.79				0.07						1.07				0.38			
15			1.08	8"			1.88				0.05							
16									0.72		0.77	0.03		0.63				
17									0.42	0.17					1.54	0.50	0.35	
18	0.40	3"	0.52	4"						0.03				0.13			0.03	
19									0.04									
20			0.15		0.31													
21	0.31	5"	0.23										0.47					
22					0.09				0.27			0.04		3.97				
23							0.65							0.78				
24					0.01										0.43		0.28	
25									0.10								0.57	
26										0.64		0.03			1.48	2"	0.19	
27	0.02						0.32		0.67		0.64				0.29			
28									0.05		0.85							
29					1.48									0.05			0.03	
30					2.32		1.31		0.09				0.11					
31					0.12							0.27						
Total	**3.24**	**20"**	**4.99**	**34.5"**	**4.89**	**18"**	**5.36**	**0**	**2.58**	**2.68**	**5.47**	**1.95**	**1.4**	**7.62**	**5.36**	**2.5"**	**6.38**	

Month	Total
January	3.24
February	4.99
March	4.89
April	5.36
May	2.58
June	2.68
July	5.47
August	1.95
September	1.40
October	7.62
November	5.36
December	6.38
2014	**51.92**

BETA

2015 Precipitation Totals

Day	January	Jan-Snow	Feb	Feb-Snow	March	Mar-Snow	April	May	June	July	Aug	Sept	October	Nov	Dec	Dec-Snow
1					0.17	2"			1.04	0.45			0.07		0.15	
2									0.18				0.08		0.18	
3	1.10	2"	1.81	17"	0.44	2"	0.46						0.16			
4	0.18									0.01	0.46	0.09				
5			0.35	2.5"				0.02								
6		T														
7			0.24	3"			0.10									
8			1.45	18"			0.55									
9	0.06	1.5"					0.17		0.05				0.21			
10			0.12	0.75"			0.03			2.07		0.51				
11					0.06						0.69	0.11		0.31		
12	0.20		0.16	0.75"				0.05						0.11		
13												0.08	0.15			
14			1.45	18"	0.93		0.02			0.02			0.01			
15	0.02	T			0.04	T			0.65	0.05	2.78				0.66	
16																
17	0.37			T	0.22		0.07								0.61	
18			0.26	2"						0.32	0.11				0.03	
19								0.24						0.76		
20							1.73							0.27		
21			0.31	3"	0.14	1.5"			1.12		1.83		0.02			
22							0.03							0.18	0.27	
23									0.03		0.06				0.79	
24	0.61	5"	0.09	1"							0.01					
25				T	0.09								0.05			
26	2.05	26"			0.91					0.11						
27					0.16		0.17		0.16						0.23	
28					0.23				1.08				1.81	0.26		
29																
30	0.03	1"										4.35			0.37	1
31								1.99								
Total	**4.62**	**35.5**	**6.24**	**66"**	**3.39**	**5.5"**	**3.33**	**2.3**	**4.31**	**3.03**	**5.94**	**5.14**	**2.56**	**1.89**	**3.29**	**1**

Month	Total
January	4.62
February	6.24
March	3.39
April	3.33
May	2.30
June	4.31
July	3.03
August	5.94
September	5.14
October	2.56
November	1.89
December	3.29
2015	**46.04**

BETA

2016 Precipation Totals

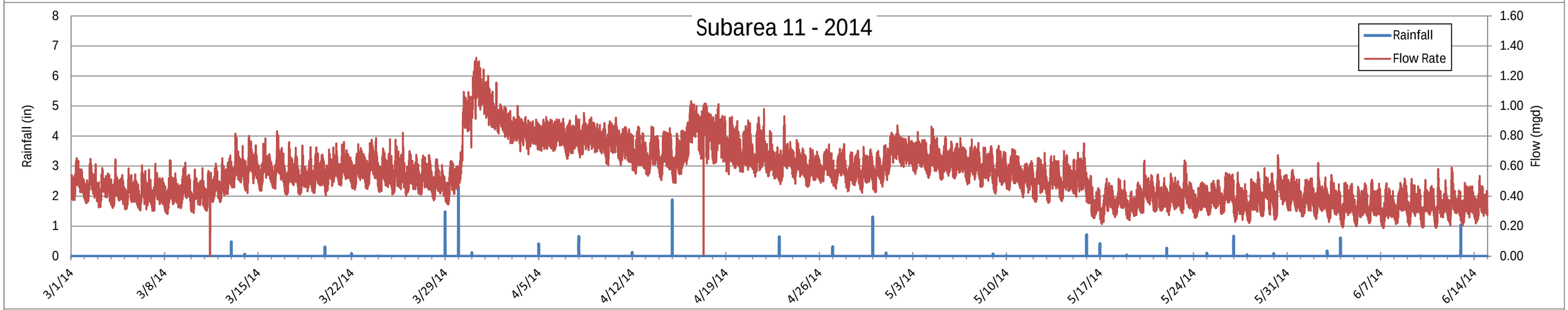
Day	January	Jan-Snow	Feb	Feb-Snow	March	Mar-Snow	April	April Snow	May	June	July	Aug	Sept	October	Nov	Dec	Dec-Snow
1							0.08	1"	0.1		0.55		0.05				
2					0.64		0.76		0.34			0.29					
3			0.47				0.69	3"	0.19								
4			0.09				0.51		0.5								
5			1.29	7"					0.14	0.89	0.17		0.30				
6									T				0.07				
7							1.35	3"	0.02	0.38	0.01						
8			0.38	5"					0.16								
9											0.02						
10	1.64				0.26						0.15	0.23					
11					0.11		0.03			0.08			0.11				
12	0.10	1"					0.25										
13									0.18			0.39					
14					0.76						0.06	0.12					
15			0.27	0.5	0.24												
16	1.01		0.42		0.20							0.05					
17					0.04												
18	0.18	3"								0.02	0.33						
19			0.01				0.03		0.32				0.29				
20																	
21					0.41	4				0.16							
22											0.10	0.64					
23	0.51	5"	0.28				0.21						0.20				
24			1.24						0.21								
25			0.06		0.24												
26							0.36										
27													0.26				
28					0.54					0.17							
29										0.08	0.18						
30									0.93				0.76				
31											0.05						
Total	**3.44**	**9"**	**4.51**	**12.5"**	**3.44**	**4**	**4.27**		**3.09**	**1.78**	**1.62**	**1.72**	**2.04**	**0.00**	**0**	**0.00**	**0**

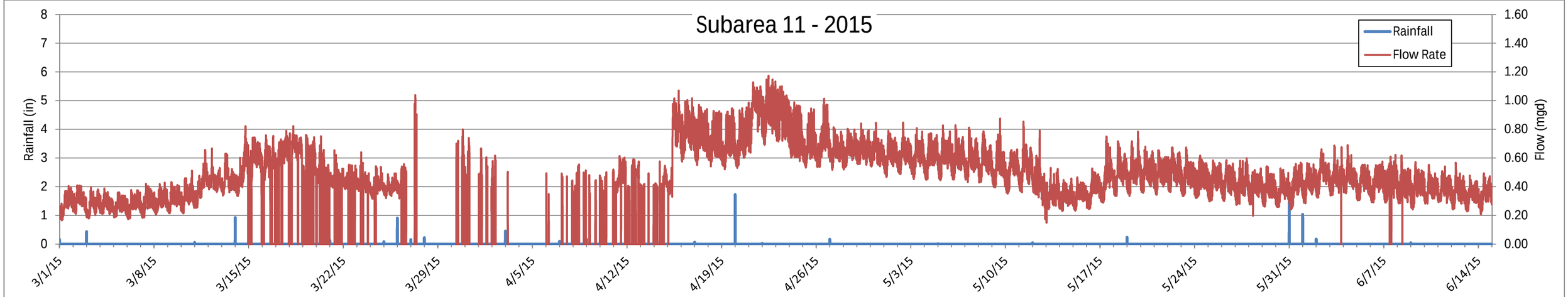
Month	Total
January	3.44
February	4.51
March	3.44
April	4.27
May	3.09
June	1.78
July	1.62
August	1.72
September	2.04
October	0.00
November	0.00
December	0.00
2015	**25.91**

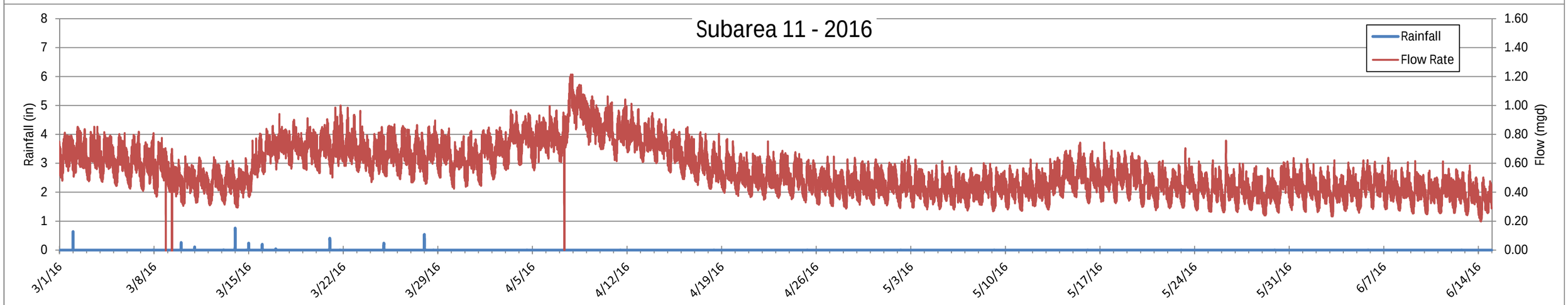
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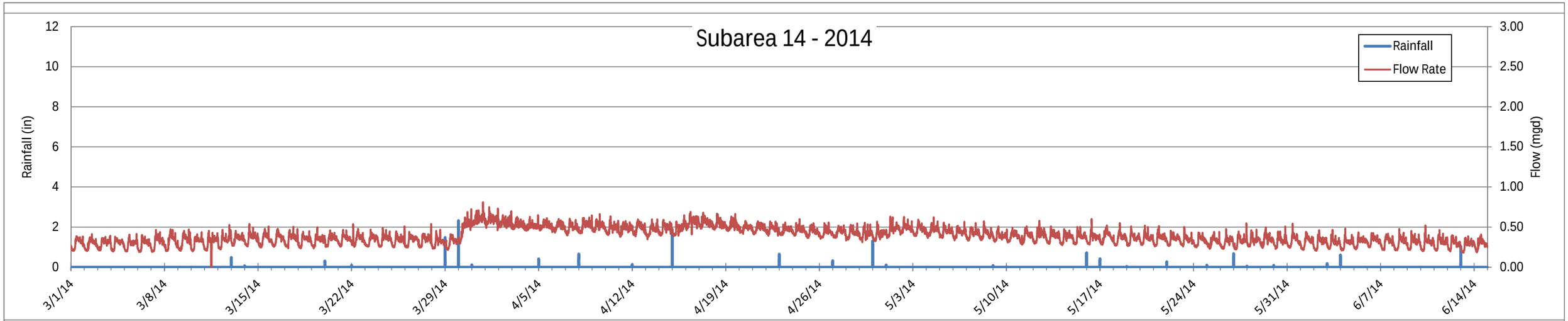
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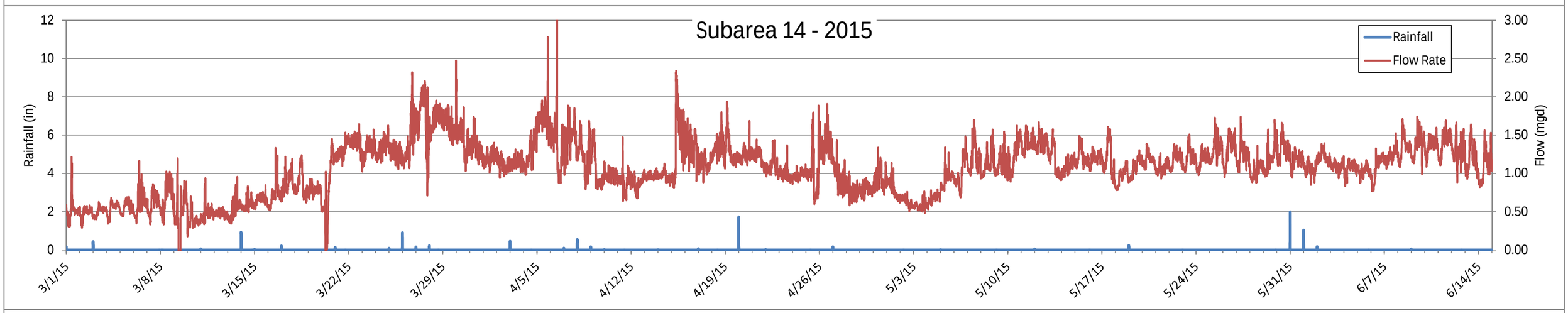
Flow Meter Graph High Groundwater Period 2014 - 2016

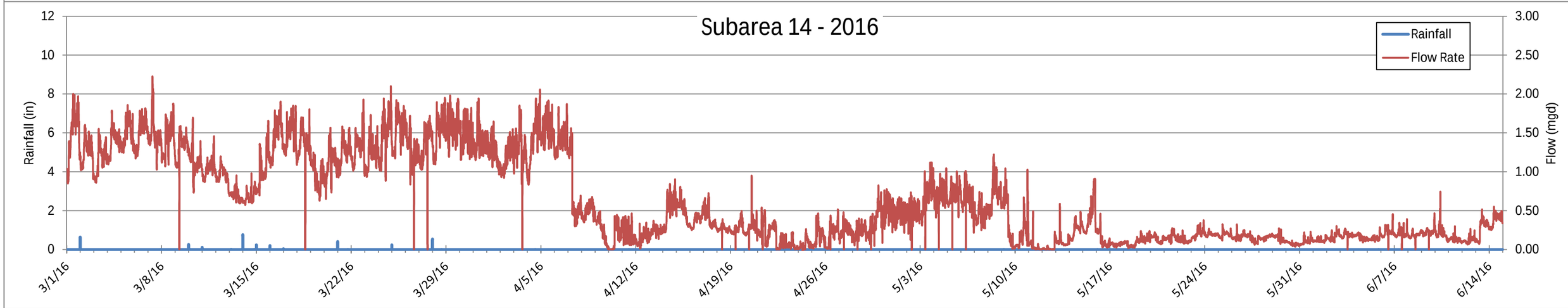

Subarea 11 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
1
2
3
4
5
6
7
8
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
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5/31/14
6/7/14
6/14/14

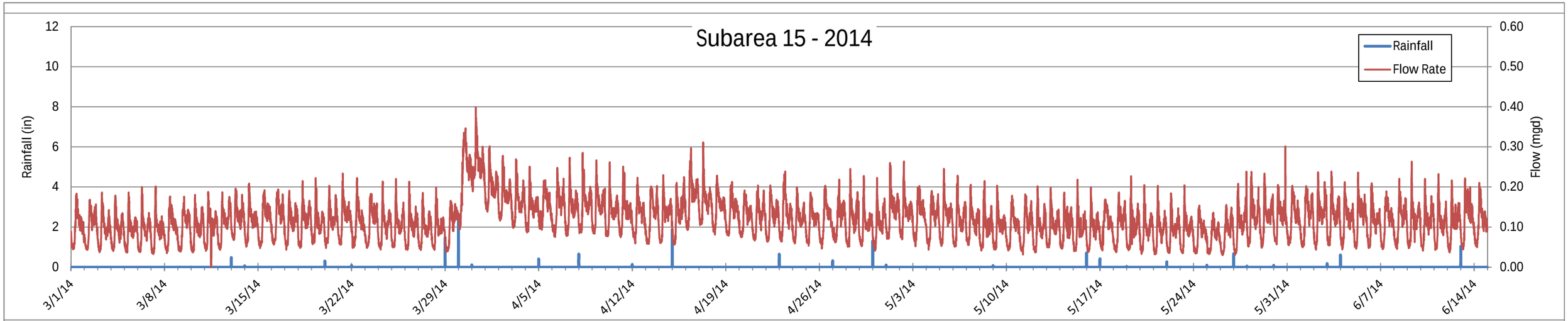

Subarea 11 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
1
2
3
4
5
6
7
8
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
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6/7/15
6/14/15

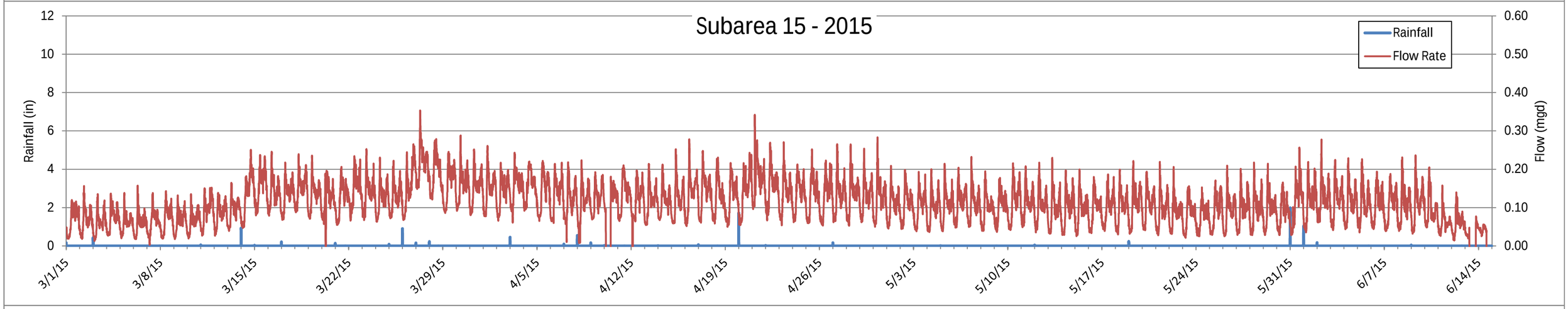

Subarea 11 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
1
2
3
4
5
6
7
8
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
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5/17/16
5/24/16
5/31/16
6/7/16
6/14/16

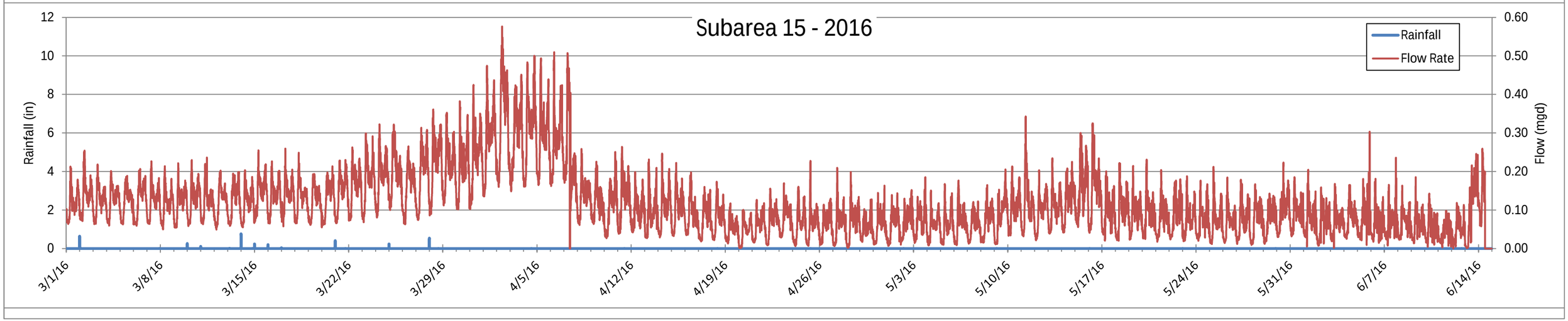

Subarea 14 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
12
10
8
6
4
2
0
3.00
2.50
2.00
1.50
1.00
0.50
0.00
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14

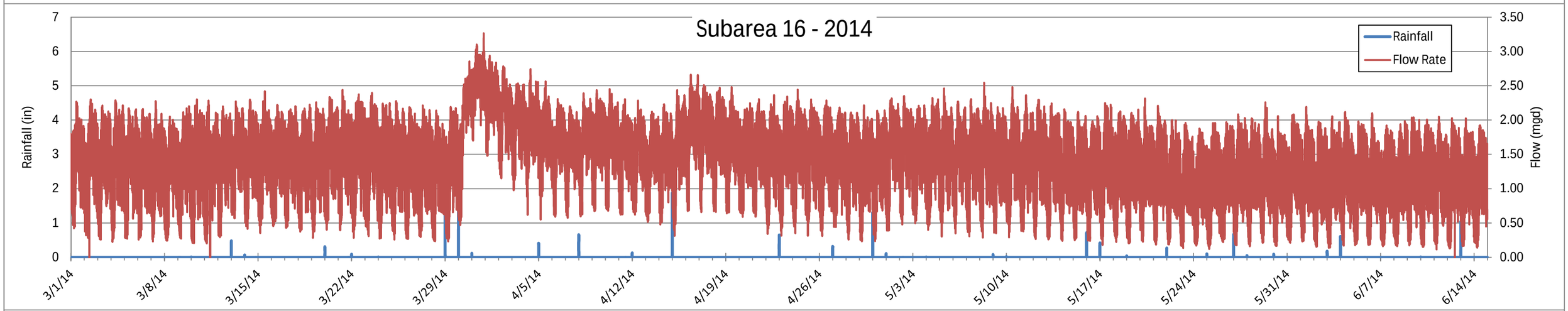

Subarea 14 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
12
10
8
6
4
2
0
3.00
2.50
2.00
1.50
1.00
0.50
0.00
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15

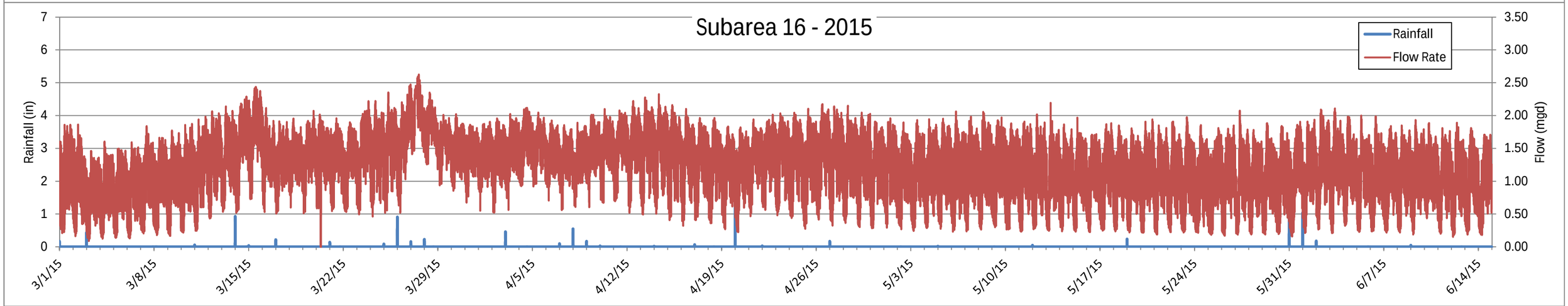

Subarea 14 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
12
10
8
6
4
2
0
3.00
2.50
2.00
1.50
1.00
0.50
0.00
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16

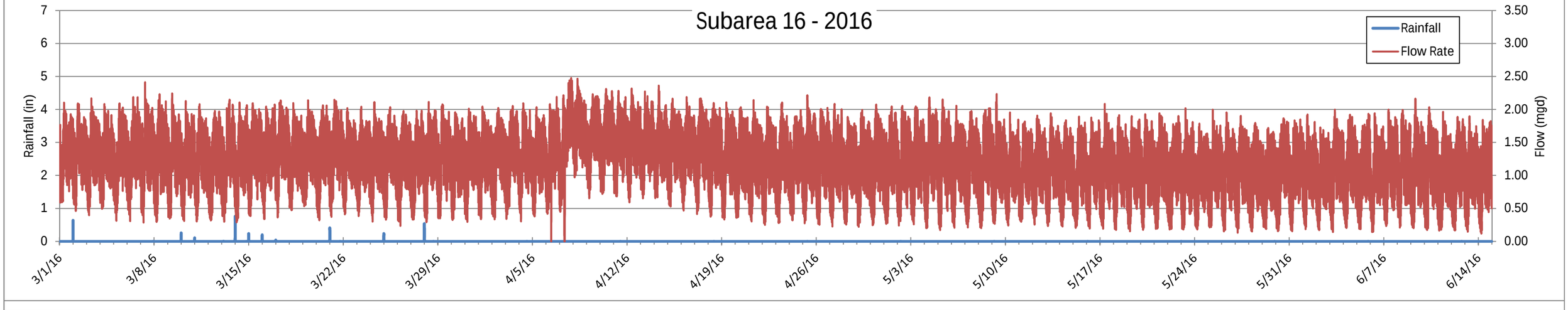

Subarea 15 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
12
10
8
6
4
2
0
0.60
0.50
0.40
0.30
0.20
0.10
0.00
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14

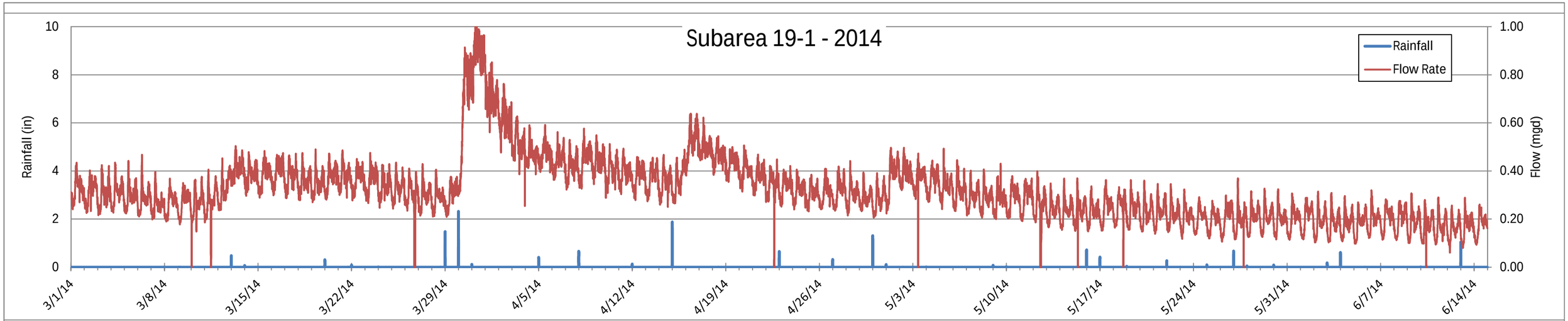

Subarea 15 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
12
10
8
6
4
2
0
0.60
0.50
0.40
0.30
0.20
0.10
0.00
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15

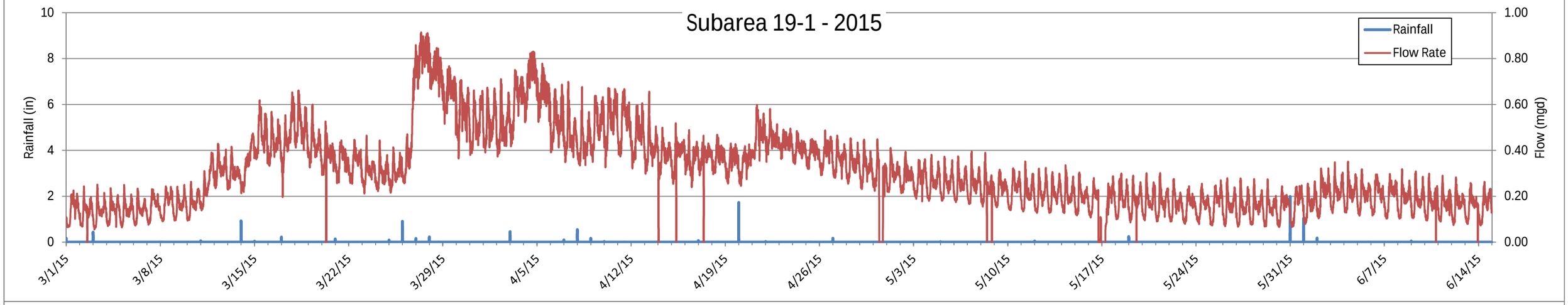

Subarea 15 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
12
10
8
6
4
2
0
0.60
0.50
0.40
0.30
0.20
0.10
0.00
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16

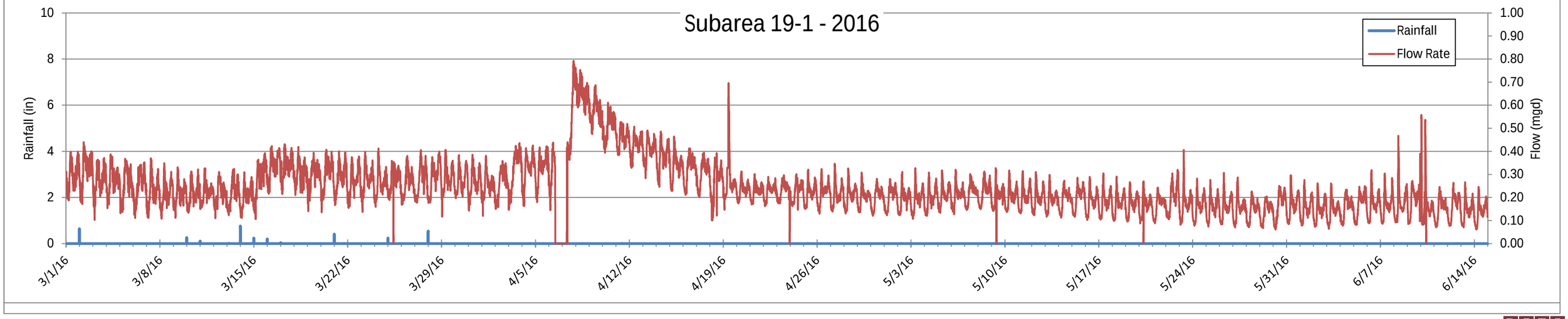

Subarea 16 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
1
2
3
4
5
6
7
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14


Subarea 16 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
1
2
3
4
5
6
7
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15

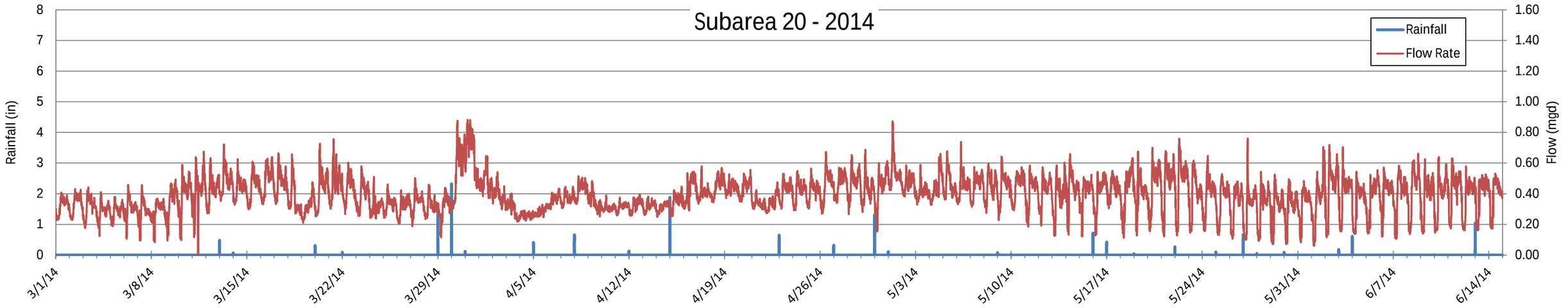

Subarea 16 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
1
2
3
4
5
6
7
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16


Subarea 19-1 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
1.00
0.80
0.60
0.40
0.20
0.00
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14

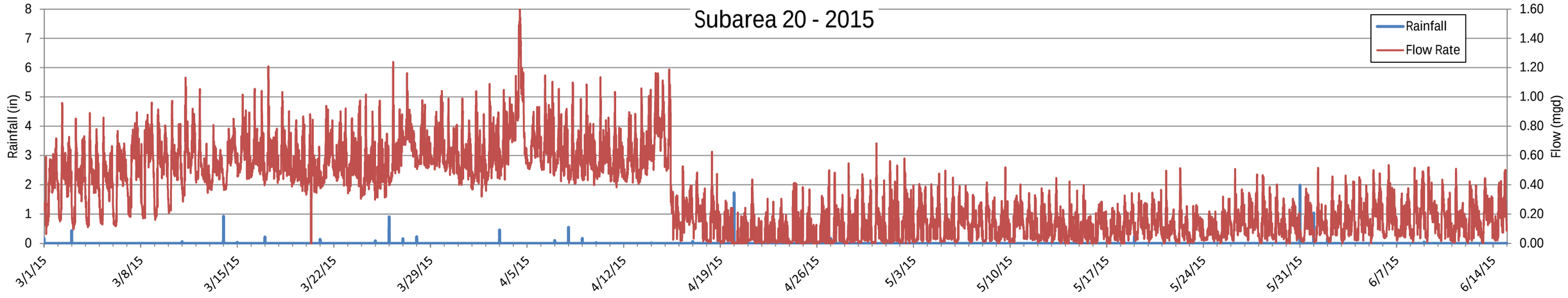

Subarea 19-1 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
1.00
0.80
0.60
0.40
0.20
0.00
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15


Subarea 19-1 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16

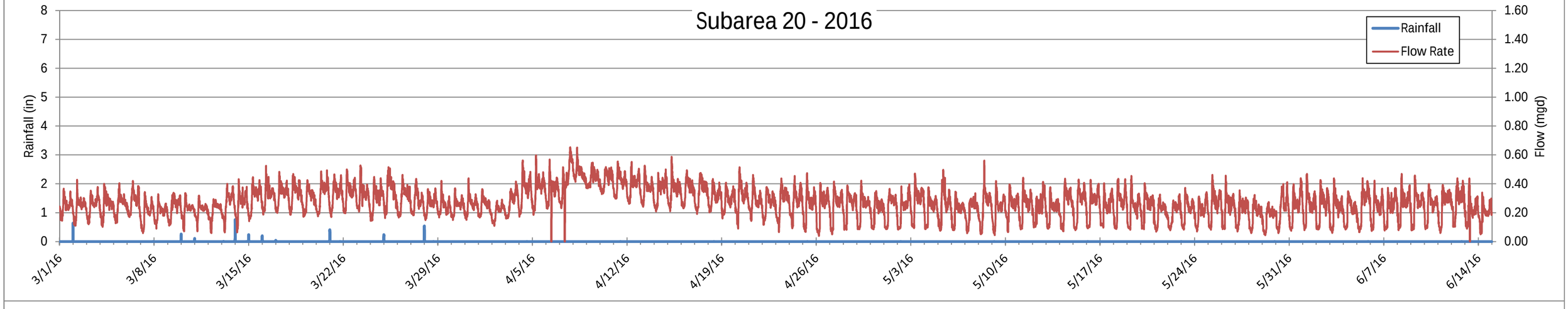
Subarea 20 - 2014

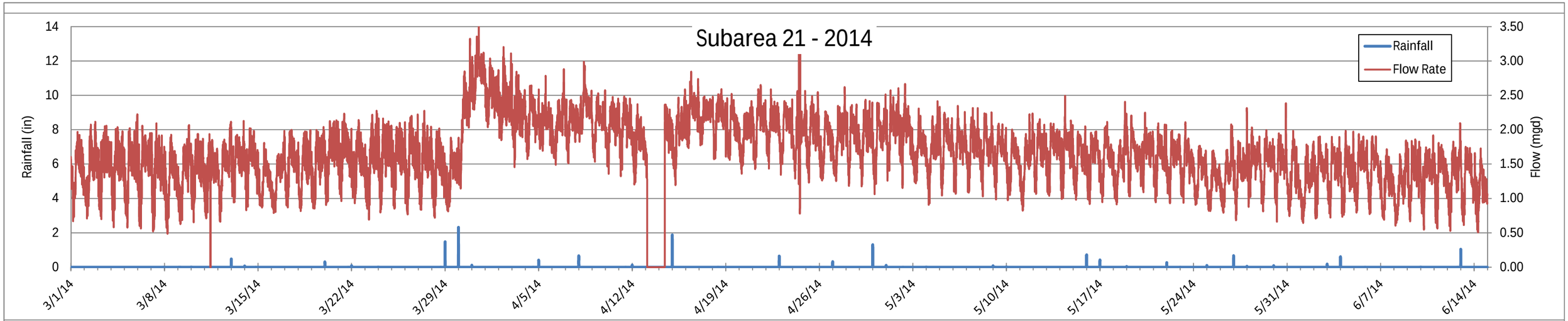


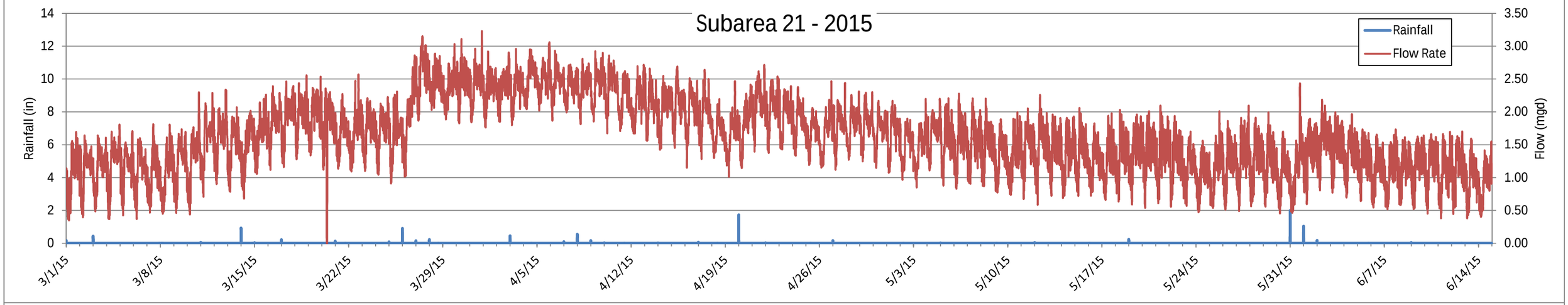
Subarea 20 - 2015

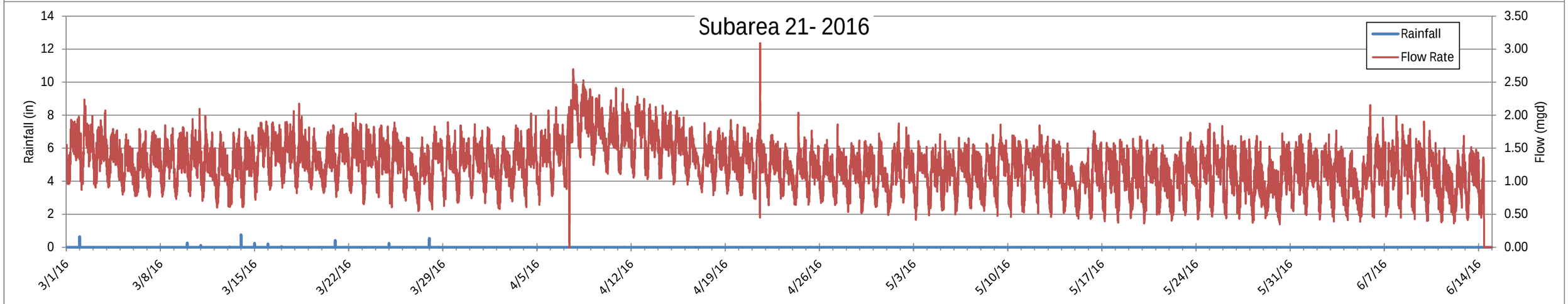


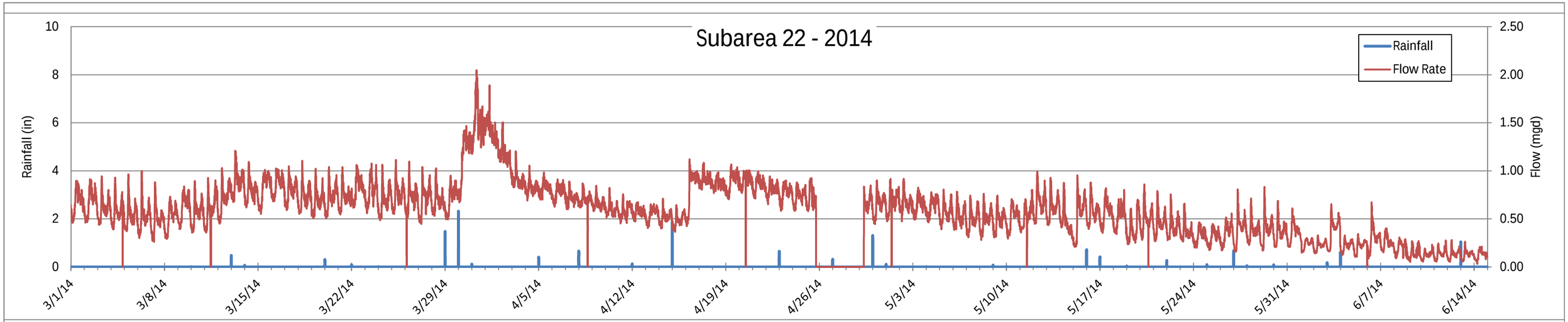
Subarea 20 - 2016

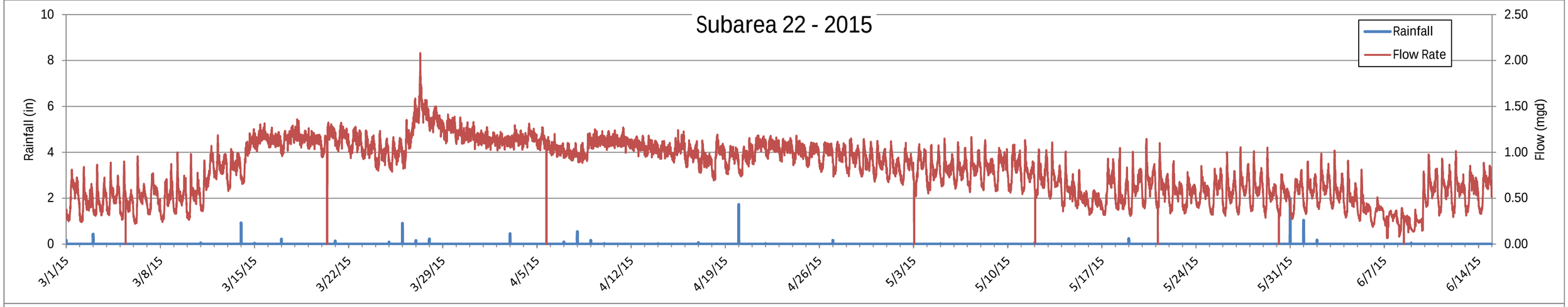


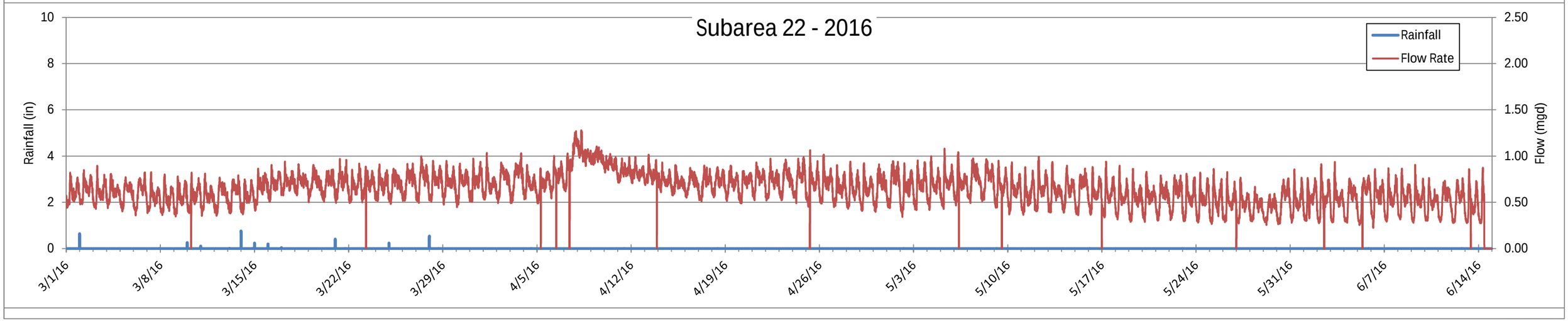

Subarea 21 - 2014
Rainfall (in)
Flow (mgd)
Rainfall
Flow Rate
0
2
4
6
8
10
12
14
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14

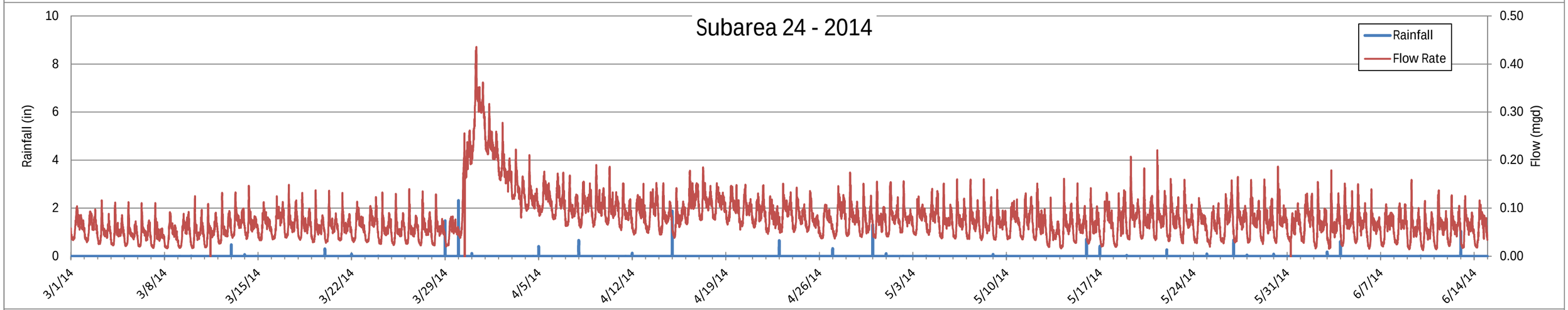

Subarea 21 - 2015
Rainfall (in)
Flow (mgd)
Rainfall
Flow Rate
0
2
4
6
8
10
12
14
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15

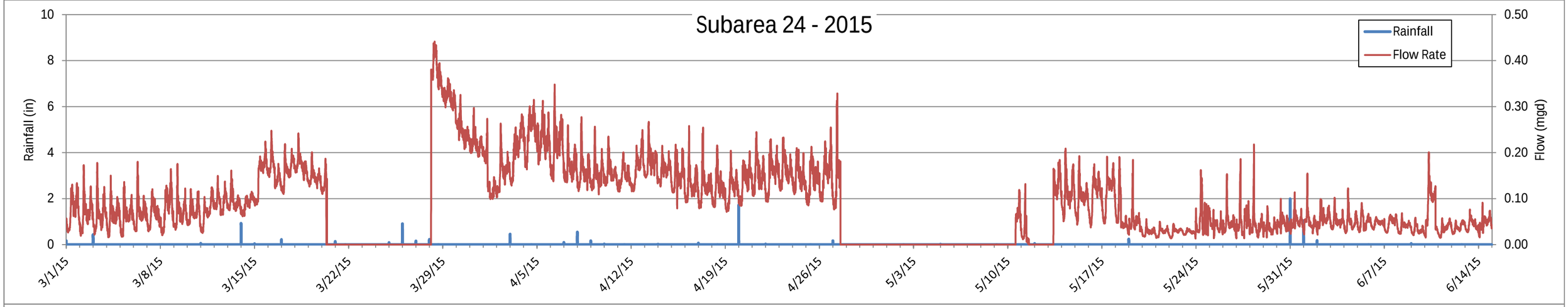

Subarea 21- 2016
Rainfall (in)
Flow (mgd)
Rainfall
Flow Rate
0
2
4
6
8
10
12
14
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16

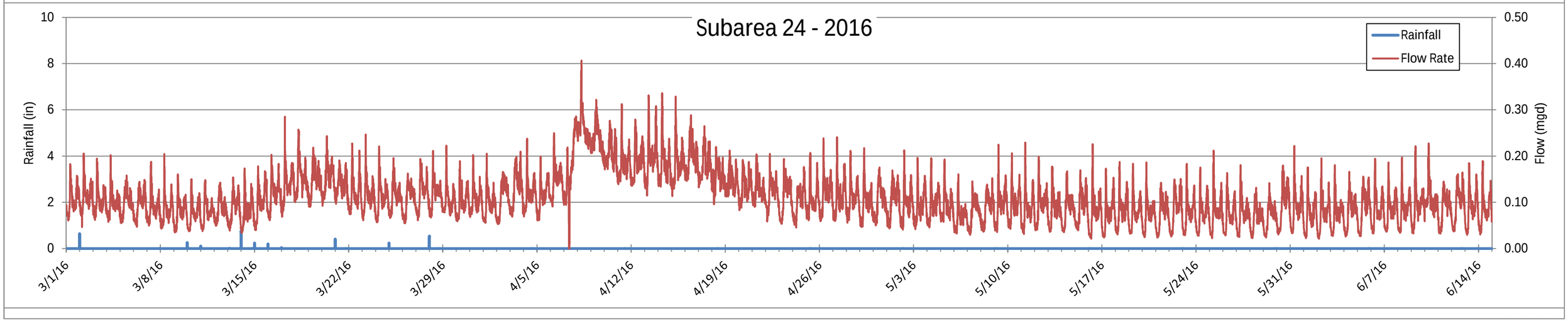

Subarea 22 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
2.50
2.00
1.50
1.00
0.50
0.00
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14

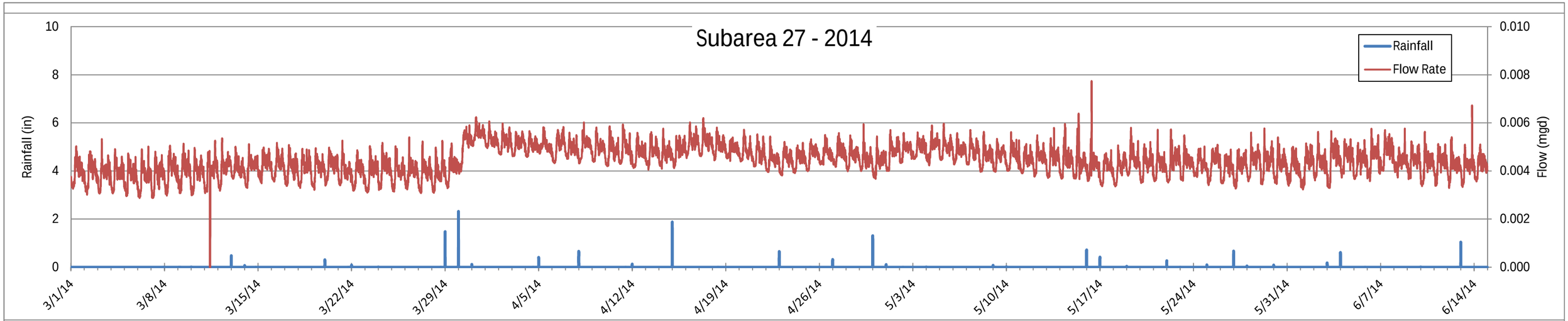

Subarea 22 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
2.50
2.00
1.50
1.00
0.50
0.00
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15

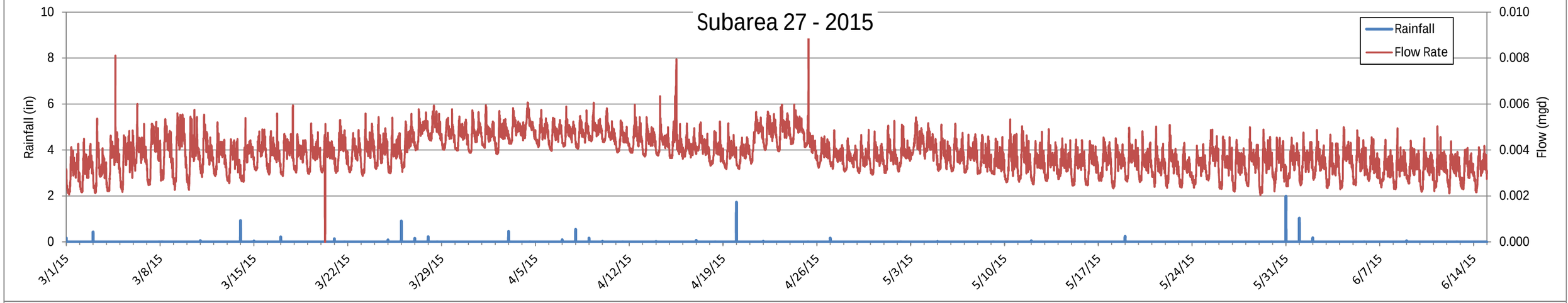

Subarea 22 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
2.50
2.00
1.50
1.00
0.50
0.00
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16

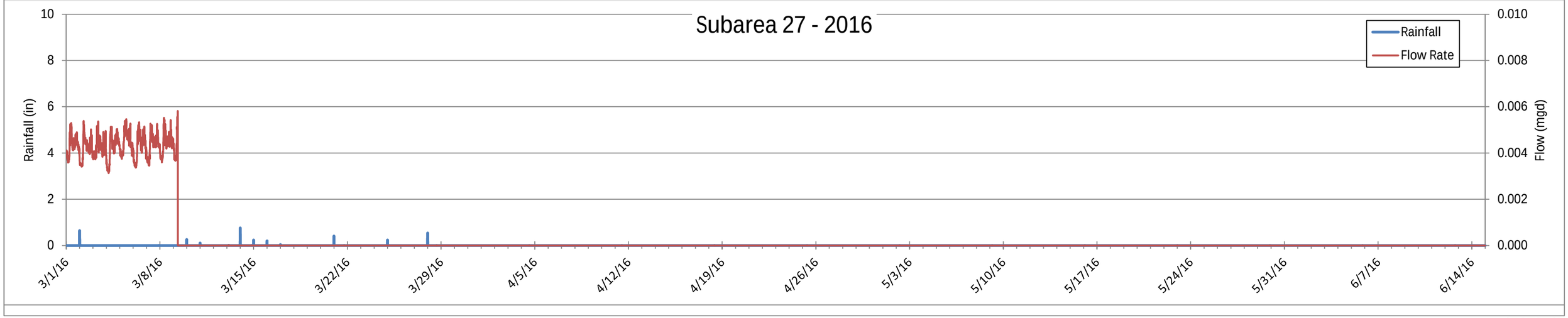

Subarea 24 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
0.50
0.40
0.30
0.20
0.10
0.00
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14

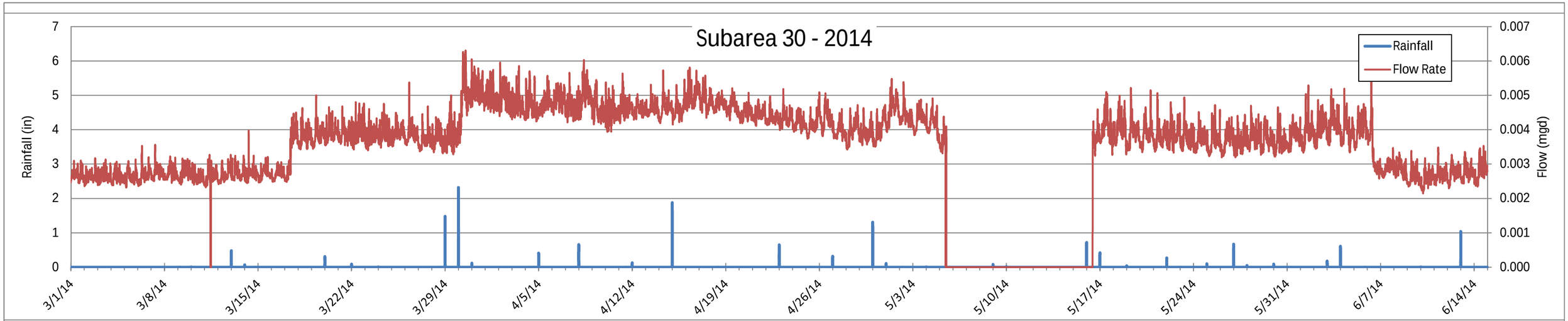

Subarea 24 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
0.50
0.40
0.30
0.20
0.10
0.00
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15

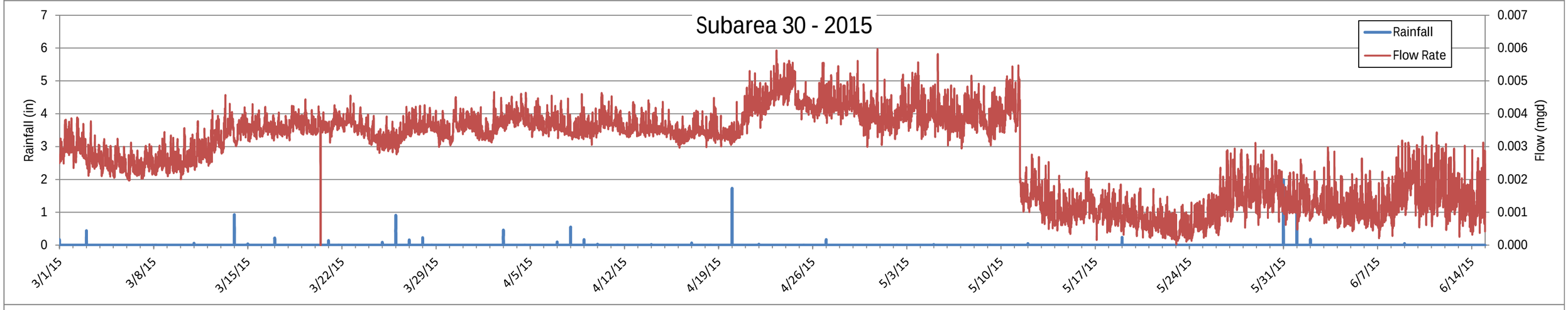

Subarea 24 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
0.50
0.40
0.30
0.20
0.10
0.00
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16

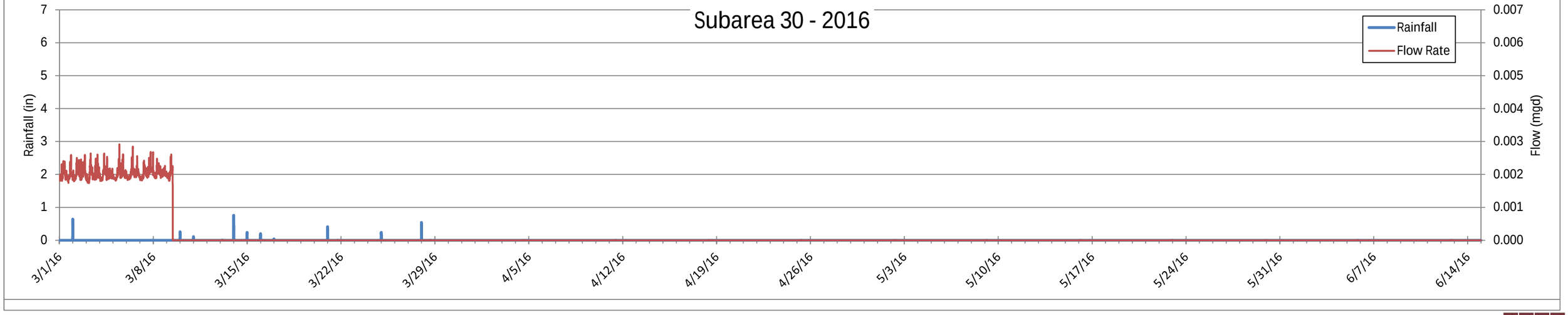

Subarea 27 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
0.010
0.008
0.006
0.004
0.002
0.000
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14

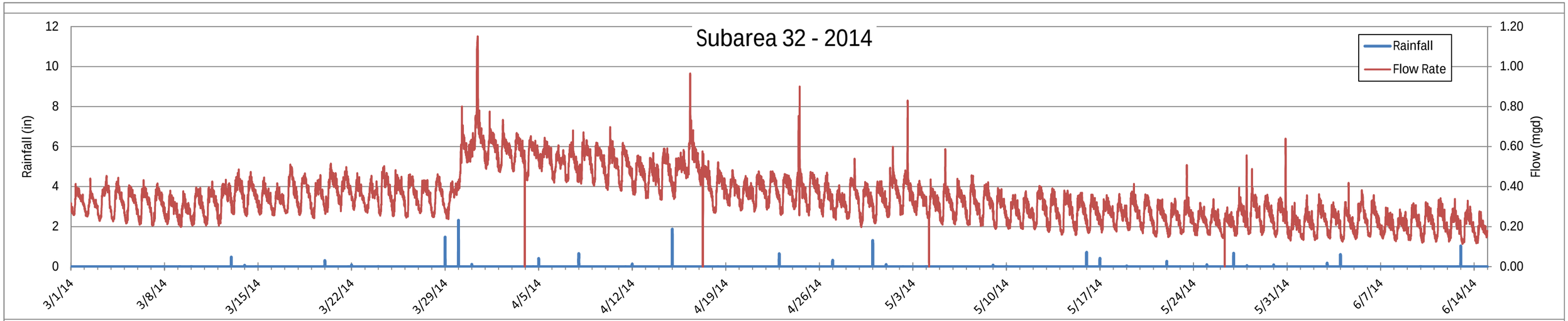

Subarea 27 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
0.010
0.008
0.006
0.004
0.002
0.000
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15

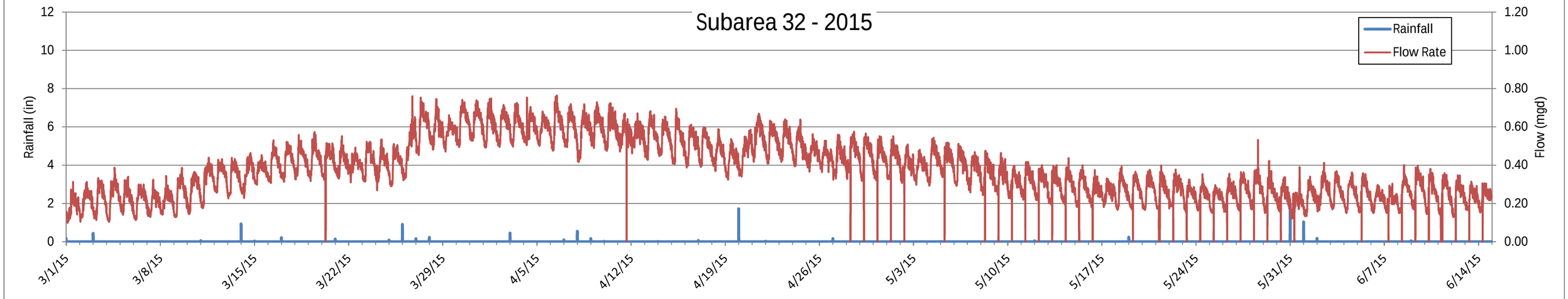

Subarea 27 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
10
8
6
4
2
0
0.010
0.008
0.006
0.004
0.002
0.000
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16

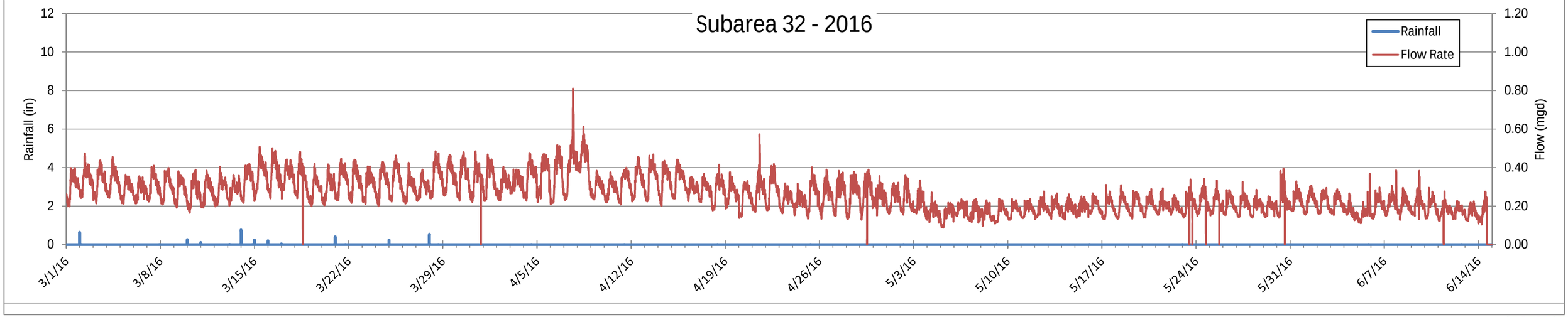

Subarea 30 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
1
2
3
4
5
6
7
0.000
0.001
0.002
0.003
0.004
0.005
0.006
0.007
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14


Subarea 30 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
1
2
3
4
5
6
7
0.000
0.001
0.002
0.003
0.004
0.005
0.006
0.007
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15


Subarea 30 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
1
2
3
4
5
6
7
0.000
0.001
0.002
0.003
0.004
0.005
0.006
0.007
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16


Subarea 32 - 2014
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
2
4
6
8
10
12
0.00
0.20
0.40
0.60
0.80
1.00
1.20
3/1/14
3/8/14
3/15/14
3/22/14
3/29/14
4/5/14
4/12/14
4/19/14
4/26/14
5/3/14
5/10/14
5/17/14
5/24/14
5/31/14
6/7/14
6/14/14


Subarea 32 - 2015
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
2
4
6
8
10
12
0.00
0.20
0.40
0.60
0.80
1.00
1.20
3/1/15
3/8/15
3/15/15
3/22/15
3/29/15
4/5/15
4/12/15
4/19/15
4/26/15
5/3/15
5/10/15
5/17/15
5/24/15
5/31/15
6/7/15
6/14/15


Subarea 32 - 2016
Rainfall
Flow Rate
Rainfall (in)
Flow (mgd)
0
2
4
6
8
10
12
0.00
0.20
0.40
0.60
0.80
1.00
1.20
3/1/16
3/8/16
3/15/16
3/22/16
3/29/16
4/5/16
4/12/16
4/19/16
4/26/16
5/3/16
5/10/16
5/17/16
5/24/16
5/31/16
6/7/16
6/14/16

Appendix D
TV Inspection Summary

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 3

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/21/2015	Edgewater Dr	S60-019	S60-020	8	225	VCP	3							3								$15,000.00
								224		Infiltration Gusher in bench	4,320	2,160	5		Replace Manhole		1	EA	$15,000.00	$15,000.00		
4/21/2015	Edgewater Dr	S60-020	S60-021	8		VCP	3							3								$2,050.00
								13		Defective Tap, cracked cap			3		Point Repair, up to 4ft		1	EA	$2,050.00		$2,050.00	
4/21/2015	Edgewater Dr	S60-021	S60-022	8	197	VCP	3							3								$8,000.00
								29		Infiltration Dripper at service connection to pipe	180	90	2		Seal Lateral		1	EA	$2,500.00		$2,500.00	
								49		Infiltration Gusher at service connection to pipe	5,760	2,880	5		Remove and Replace		1	EA	$5,500.00	$5,500.00		
4/21/2015	Edgewater Dr	S60-022	S60-023	8	205	VCP	3							3								$2,500.00
								77		Infiltration Runner from inside service	180	90	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/21/2015	Edgewater Dr	S60-016	S60-015	8	149	AC	13							3								
4/22/2015	Edgewater Dr	S60-016	S60-017	8	173	VCP	3							3								
								137		Fine Roots at Joint			1									
								144		Fine Roots at Joint			1									
4/22/2015	Edgewater Dr	S60-018	S60-022	8	270	VCP	3							3								
								91		Fine Roots at Joint			1									
								103		Fine Roots at Joint			1									
										TOTAL	10,440	5,220							TOTAL	$20,500	$7,050	$27,550

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 4

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/21/2015	Edgewater Dr	S60-002	S60-001	8	317	VCP	3							4								$17,500.00
								171		Infiltration Dripper at tap connection to pipe	1,080	540	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
								317		Major Leaking through Bench	4,320	2,160	5		Replace Manhole		1	EA	$15,000.00	$15,000.00		
4/21/2015	Edgewater Dr	S60-002	S60-003	8	146	VCP	3							4								$2,500.00
								49		Infiltration Dripper at service connection to pipe	180	90	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/21/2015	Edgewater Dr	S60-009	S60-007	8	60	VCP	3							4								
								36		Minor Deposits attached start			1									
								53		Minor Deposits attached finish			1									
4/21/2015	Edgewater Dr	S60-007	S60-006	8	67	VCP	3							4								$2,500.00
								3		Fine Roots at Joint			1									
								21		Fine Roots at Joint			1									
								36		Fine Roots at Joint start			1									
								40		Infiltration Dripper	180	90	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
								62		Fine Roots at Joint finish			1									
4/21/2015	Edgewater Dr	S60-006	S60-003	8	147	VCP	3							4								
								3		Fine Roots at Joint start			1									
								50		Fine Roots at Joint finish			1									
4/21/2015	Edgewater Dr	S60-009	S60-010	8	60	VCP	3							4								$5,605.00
								5		Infiltration Runner	2,160	1,080	4		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
								5		Fine Roots at Joint start			3		Chemical Root Treatment		60	LF	$1.75	$105.00		
								53		Fine Roots at Joint finish			1									
4/21/2015	Edgewater Dr	S60-010	S60-012	8	193	VCP	3							4								
								39		Fine Roots at Joint			1									
								126		Fine Roots at Joint			1									
								141		Fine Roots at Joint			1									
4/21/2015	Edgewater Dr	S60-012	S60-013	8	195	VCP	3							4								
4/21/2015	Edgewater Dr	S60-014	S60-013	8	114	VCP	3							4								
										TOTAL	7,920	3,960							TOTAL	$15,105	$13,000	$28,105

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 5

																	EST. REHAB COSTS			
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/22/2015	Whitman Rd	S55-002	S55-003	8	296	AC	3							5								
4/22/2015	Whitman Rd	S55-003	S55-004	8	91	AC	13							5								
4/22/2015	Whitman Rd	S55-004	S55-003	8	83	AC	13							5								
4/22/2015	Whitman Rd	S55-004	S55-005	8	166	AC	13							5								
4/22/2015	Whitman Rd	S55-005	S55-006	8	170	AC	13							5								
4/22/2015	Whitman Rd	S55-006	S55-007	8	4	AC	13							5								
4/22/2015	Whitman Rd	S55-007	S55-007.1	8	117	AC	13							5								
4/22/2015	Whitman Rd	S55-007.1	S55-009	8	168	AC	13							5								$2,500.00
								25		Infiltration Dripper at tap connection to pipe	180	90	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/22/2015	Whitman Rd	S55-009	S55-010	8	76	AC	13							5								
4/22/2015	Whitman Rd	S55-010	S55-011	8	172	AC	13							5								$5,500.00
								26		Infiltration Runner at tap connection to pipe	2,160	1,080	3		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
								40		Defective Tap			2									
4/22/2015	Foxhill Rd	S59-028	S59-029	8	88	AC	13							5								
4/22/2015	Foxhill Rd	S59-028	S59-027	8	213	AC	13							5								
5/18/2015	Charles River Street	S46-012	S46-029	6	211	AC	12							5								
5/18/2015	Charles River Street	S46-012	S46-013	6	137	AC	12							5								
5/18/2015	Charles River Street	S46-013	S46-014	8	141	Pitch Fiber	12							5								
5/18/2015	Charles River Street	S46-014	S46-023	8	70	Pitch Fiber	12							5								
5/18/2015	Charles River Street	S46-023	S46-024	8	238	PVC	12							5								
5/18/2015	Charles River Street	S46-024	S46-025	8	204	PVC	12							5								
5/18/2015	Charles River Street	S46-025	S46-026	8	63	PVC	12							5								
										TOTAL	2,340	1,170							TOTAL	$0	$8,000	$8,000

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea Subarea 6

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/11/2016	Oxbow Rd	S56-023	S56-022	8	279	AC	13							6								
4/11/2016	Oxbow Rd	S56-023	S56-004	8	233	AC	13							6								$4,100.00
								107		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050.00	$2,050.00		
								110		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050.00	$2,050.00		
								222		Hole			2									
										TOTAL	0	0							TOTAL	$4,100	$0	$4,100

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D

TV Inspection Summary Subarea 11

																	EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/15/2014	Mayflower Rd.	S19-029	S19-030	8	284	VCP	3							11								$16,160.00
									2	Moderate Multiple Fractures			3		CIPP	1	284	LF	$40.00	$11,360.00		
								63		Moderate Longitudinal Crack			2		CIPP (Included Above)	2						
								66		Moderate Multiple Cracks			2		CIPP (Included Above)	4						
								72		Moderate Multiple Fractures			2		CIPP (Included Above)	7						
								82		Moderate Multiple Cracks			2		CIPP (Included Above)	14						
								120		Moderate Multiple Fractures			2		CIPP (Included Above)	6						
								125		Moderate Multiple Fractures			2		CIPP (Included Above)	2						
									129	Moderate Multiple Fractures			2		CIPP (Included Above)	12						
								145		Moderate Multiple Fractures			2		CIPP (Included Above)	7						
								157		Moderate Multiple Fractures			2		CIPP (Included Above)	34						
								163		Moderate Multiple Fractures			2		CIPP (Included Above)	1						
								167		Moderate Multiple Fractures			2		CIPP (Included Above)	1						
									203	Moderate Multiple Fractures			2		CIPP (Included Above)	3						
									224	Moderate Multiple Fractures			2		CIPP (Included Above)	6						
								233		Light Roots at Joint			1									
								235		Light Roots at Joint			1									
								238		Light Roots at Joint			1									
									252	Moderate Multiple Fractures			1		seal all laterals (6)		6	EA	$800.00		$4,800.00	
4/15/2014	Mayflower Rd.	S19-030	S19-031	8	286	VCP	3							11								$500.50
								62		Light Roots at Joint			3		Chemical Root Treatment		286	LF	$1.75	$500.50		
								65		Light Mineral Deposits Attached			1									
								67		Moderate Roots at Joint			1									
								181		Minor Longitudinal Fracture			2			20						
								220		Light Roots at Joint			1									
								224		Light Roots at Joint			1									
								230		Light Roots at Joint			1									
								242		Moderate Roots at Joint			1									
4/15/2014	Mayflower Rd.	S19-031	S27-006	8	288	VCP	3							11								
								12		Light Roots at Joint			1									
								21		Light Roots at Joint			1									
									24	Light Roots at Joint			1									
									27	Light Roots at Joint			1									
								42		Light Roots at Joint			1									
								55		Light Roots at Joint			1									
								73		Light Roots at Joint			1									
								84		Light Roots at Joint			1									
								95		Light Roots at Joint			1									
								108		Light Roots at Joint			1									
								175		Water Level 45%			1									
								195		Water Level 25%			1									
								263		Light Roots at Joint			1									
4/15/2014	Mayflower Rd.	S27-006	S27-004	8	290	VCP	3							11								
									47	Minor Multiple Fractures			1			7						
									217	Light Mineral Deposits Attached			2			20						
								252		Water level 25%			1									
									254	Minor Multiple Fractures			1			16						
4/15/2014	Whiting Way	S20-004	S19-033	8	194	VCP	3							11								
								134		Light Roots at Joint			1									
								150		Light Roots at Joint			1									
								156		Light Roots at Joint			1									
								171		Light Roots at Joint			1									
4/15/2014	Whiting Way	S19-033	S19-032	8	188	VCP	3							11								$2,050.00
								158		Broken			3		Point Repair, up to 4 ft		1	EA	$2,050.00	$2,050.00		
4/15/2014	Whiting Way	S19-032	S27-009	8	290	VCP	3							11								$2,557.50
									21	Obstacle Blocking Flow 10%			2									
								28		Light Grease Deposits Attached			1									
								56		Light Grease Deposits Attached			1									
								170		Heavy Roots at Joint			3		Chemical Root Treatment		290	LF	$1.75	$507.50		
									176	Heavy Roots at Joint			3									
								196		Heavy Roots at Joint			3									
									200	Moderate Roots at Joint			2									
									202	Heavy Roots at Joint			3									
									208	Light Roots at Joint			1									
								215		Leaking at Joint	180	90	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
									215	Light Roots at Joint			1									
								280		Light Roots at Joint			1									

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
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Appendix D

TV Inspection Summary Subarea 11

																		EST. REHAB COSTS	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/15/2014	Whiting Way	S27-009	S27-007	8	289	VCP	3							11								$5,500.00
									7	Service Lateral Leaking at Joint	2160	1080	4		Replace Service Wye	1	1	EA	$5,500.00	$5,500.00		
									81	Minor Longitudinal Crack			1			4						
								86		Light Roots at Joint			1									
								92		Light Roots at Joint			1									
								207					1			2						
4/16/2014	Alden Rd	S20-004	S27-005	8	224	VCP	3							11								$12,160.00
								38		Leaking Joint	180	90	3		CIPP	1	224	LF	$40.00	$8,960.00		
								137		Leaking Joint	180	90	3		CIPP (Included Above)	1						
								137		Longitudinal Fracture			3		CIPP (Included Above)	3						
								181		Leaking Joint	180	90	3		CIPP (Included Above)	1						
								223		Minor Spiral Crack			1		CIPP (Included Above)	1						
								223		Leaking Joint	180	90	3		CIPP (Included Above)	1						
															seal all laterals (4)		4	EA	$800.00		$3,200.00	
4/16/2014	Alden Rd	S27-005	S27-002	8	148	VCP	3							11								$5,500.00
								79		Service Lateral Leaking at Joint	2440	1,220	4		Replace Service Wye	1	1	EA	$5,500.00		$5,500.00	
4/16/2014	Canavan Cr	S27-017	S27-018	8	56	AC	12							11								$2,500.00
								45		Service Lateral Leaking at Main	360	180	3		Seal lateral	1	1	EA	$2,500.00		$2,500.00	
4/16/2014	Canavan Cr	S27-018	S27-008	8	144	AC	12							11								$5,500.00
								0		Leaking Joint	2160	1,080	3		Remove and Replace	1	1	EA	$5,500.00	$5,500.00		
4/16/2014	Alden Rd	S27-005	S27-007	13	260	PVC	12							11								
4/16/2014	Alden Rd	S27-007	S27-008	13	102	PVC	12							11								
4/16/2014	Alden Rd	S27-008	S27-008.1	13	131	PVC	12							11								
4/16/2014	Alden Rd	S27-008	S27-009A	13	248	PVC	12							11								
4/16/2014	Alden Rd	S28-009A	S28-004	13	156	PVC	12							11								
4/17/2014	Brewster Dr.	S28-001	S28-002	8	142	Other	13							11								
4/17/2014	Brewster Dr.	S28-002	S28-005	8	344	VCP	3							11								
4/17/2014	Brewster Dr.	S28-011	S28-005	8	310	AC	13							11								$2,315.00
									152	Obstacle Blocking Flow 10%			3		Heavy Cleaning		1	HR	$265.00	$265.00		
								308		Leaking Joint	1080	540	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
4/17/2014	Standish Rd	S27-019	S27-020	8	195	AC	13							11								$265.00
									154	Light Roots through Barrel			2									
									154	Obstacle Blocking Flow			3		Heavy Cleaning		1	HR	$265.00	$265.00		
4/17/2014	Standish Rd	S27-020	S27-021	8	43	AC	13							11								
4/17/2014	Standish Rd	S27-021	S27-022	8	209	AC	13							11								$2,050.00
								0		Leaking Joint	180	90	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								50		Light Grease Deposits Attached			1									
									54	Light Grease Deposits Attached			1									
4/17/2014	Standish Rd	S27-022	S27-023	8	97	AC	13							11								$2,050.00
								11		Hole in side of Pipeline			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
4/17/2014	Standish Rd	S27-024	S27-025	8	261	AC	13							11								
4/17/2014	Standish Rd	S27-025	S28-009A	8	18	AC	13							11								$325.00
									18	Protruding Lateral			5		Cut lateral Protrusion		1	EA	$325.00		$325.00	
4/17/2014	Standish Rd	S28-009A	S27-025	8	316	AC	13							11								$325.00
								143		Light Mineral Deposits Attached			1									
								316		Protruding Lateral			5		Cut lateral Protrusion		1	EA	$325.00		$325.00	
4/18/2014	Canavan Cr	S27-016	S27-015	8	207	AC	13							11								
4/18/2014	Canavan Cr	S27-015	S27-014	8	47	AC	13							11								
4/18/2014	Canavan Cr	S27-014	S27-013	8	93	AC	13							11								$325.00
								92		Protruding Lateral			5		Cut lateral Protrusion		1	EA	$325.00		$325.00	
4/18/2014	Canavan Cr	S27-013	S27-014	8	321	AC	13							11								$2,375.00
								195		Circumferential Fracture			1			1						
									284	Light Grease Deposits Attached			2									
									287	Hole			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
									321	Protruding Lateral			5		Cut lateral Protrusion		1	EA	$325.00		$325.00	
4/18/2014	Canavan Cr	S27-013	S27-012	8	73	AC	13							11								
4/18/2014	Canavan Cr	S27-012	S27-004.1	8	170	AC	13							11								
4/18/2014	Canavan Cr	S28-014	S28-015	8	193	VCP	3							11								$915.00
								59		Light Roots at Joint			1									
									99	Heavy Roots in Service			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
									107	Obstacle Blocking Flow			1		Heavy Cleaning		1	HR	$265.00	$265.00		
4/18/2014	Carol Rd	S28-015	S28-016	8	276	VCP	3							11								$14,240.00
									27	Leak through Service Cap	1440	720	3		CIPP		276	LF	$40.00	$11,040.00		
									86	Service Lateral Leaking	720	360	3									
								88		Joint Leaking	720	360	3			1						
								276		Leaking at Pipe Connection to Bench	360	180	3			1						
										seal all laterals (4)							4	EA	$800.00	$3,200.00		
4/18/2014	Carol Rd	S28-016	S28-017	8	18	VCP	3							11								
4/18/2014	Carol Rd	S28-007	S28-008	15	293	PVC	13							11								

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Appendix D

TV Inspection Summary Subarea 11

																	EST. REHAB COSTS			
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/18/2014	Curtis Rd	S20-007	S20-006	8	180	VCP	3							11								$315.00
								42		Minor Circumferential Fracture			1			1						
									57	Minor Longitudinal Crack			1			3						
								66		Minor Spiral Crack			1			3						
								111		Light Roots at Joint			1									
								120		Light Roots at Joint			1									
								138		Light Roots at Joint			1									
								144		Light Roots at Joint			1									
								150		Medium Roots at Joint			2									
								168		Heavy Roots at Joint			3		Chemical Root Treatment		180	LF	$1.75	$315.00		
4/22/2014	Mackintosh Ave	S20-036	S20-035	8	46	PVC	13							11								
								25		Water Level 40%												
4/22/2014	Mackintosh Ave	S20-035	S20-034	8	94	PVC	13							11								
								68		Water Level 30%												
								94		Offset Joint			2									
4/22/2014	Mackintosh Ave	S20-034	S20-033	8	287	PVC	13							11								$4,100.00
								94		Leaking Joint	180	90	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
									215	Light Mineral Deposits Attached			1									
									215	Hole			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								260		Water Level 45%												
4/24/2014	Curtis Rd	S20-005	S20-006	8	235	PVC	13							11								
								4		Minor Longitudinal Fracture			1			2						
									7	Light Mineral Deposits Attached			1									
								71		Minor Longitudinal Fracture			2			5						
								106		Minor Longitudinal Fracture			1			2						
								124		Minor Circumferential Fracture			1									
								149		Minor Spiral Crack			1			1						
								173		Minor Longitudinal Fracture			1			1						
								181		Minor Longitudinal Crack			1			1						
									193	Moderate Roots at Service			1									
								193		Minor Longitudinal Fracture			2			1						
								196		Light Roots at Joint			1									
									229	Water Level 30%												
4/24/2014	Mackintosh Ave	S20-006	S20-008	8	9	PVC	13							11								
								9		Offset Joint			2									
4/24/2014	Mackintosh Ave	S20-008	S20-006	8	4	PVC	13							11								
								4		Offset Joint			2									
4/24/2014	Mackintosh Ave	S20-008	S20-009	8	105	PVC	13							11								$8,265.00
								36		Surface Roughness			3		Heavy Cleaning		1	HR	$265.00	$265.00		
									42	Service Lateral Leaking	1080	540	3		Lateral Grout	1	1	EA	$2,500.00		$2,500.00	
								62		Leaking at Chimney	4320	2,160	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
									90	Water Level 50%												
4/24/2014	George St	S28-071	S28-072	8	146	VCP	3							11								
									8	Minor Multiple Fractures			1			2						
								19		Fine Roots at Joint			1									
									93	Moderate Roots at Joint			2									
								107		Fine Roots at Joint			1									
								116		Minor Longitudinal Fracture			2			1						
4/24/2014	Colonial Rd	S39-015	S39-016	8	232	AC	13							11								
4/24/2014	Colonial Rd	S39-016	S39-017	8	201	AC	13							11								
4/24/2014	Colonial Rd	S39-017	S39-018	8	258	AC	13							11								
4/24/2014	Gay St	S39-019	S39-022	8	91	AC	13							11								
4/24/2014	Gay St	S39-022	S39-023	8	48	AC	13							11								
4/10/2014	Mary Chilton Rd	S19-011	S19-010	8	73	AC	12							11								
4/10/2014	Mary Chilton Rd	S19-010	S19-009	8	237	AC	12							11								
								7		Fine Roots at Joint			1									
								21		Medium Roots at Joint			2									
								233		Chip at Joint			2			1						
4/10/2014	Mary Chilton Rd	S19-012	S19-009	8	148	AC	12							11								
								4		Minor Circumferential Fracture			1			1						
4/10/2014	Mary Chilton Rd	S19-009	S19-008	8	117	AC	12							11								
4/10/2014	Mary Chilton Rd	S19-008	S19-007	8	147	AC	12							11								$4,100.00
								48		Multiple Cracks			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								103		Hole in side of pipe			5		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
4/10/2014	Mary Chilton Rd	S19-007	S19-005	8	94	AC	12							11								
								5		Minor Circumferential Fracture			1			1						
4/10/2014	Mary Chilton Rd	S19-006	S19-005	8	246	AC	12							11								
								73		Circumferential Fracture			1									
4/10/2014	Mary Chilton Rd	S19-005	S19-004	8	220	AC	12							11								

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																	EST. REHAB COSTS			
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/10/2014	Mary Chilton Rd	S19-004	S19-003	8	228	AC	12							11								
4/10/2014	Mary Chilton Rd	S19-003	S19-002	8	51	AC	12							11								
4/10/2014	Pilgrim Rd	S19-016	S19-018	8	105	PVC	13							11								
4/10/2014	Pilgrim Rd	S19-017	S19-018	8	84	PVC	13							11								
4/10/2014	Pilgrim Rd	S19-018	S19-019	8	148	AC	12							11								
4/10/2014	Pilgrim Rd	S19-019	S19-020	8	207	VCP	3							11								
								6		Protruding Lateral			1									
4/11/2014	Pilgrim Rd	S19-020	S19-021	8	247	VCP	3							11								$432.25
								14		Medium Roots at Joint			3		Chemical Root Treatment		247	LF	$1.75	$432.25		
								36		Medium Roots at Joint			3									
								38		Fine Roots at Joint			1									
									40	Minor Multiple Fractures			1			3						
									47	Minor Multiple Fractures			1			5						
								50		Fine Roots at Joint			1									
								56		Fine Roots at Joint			1									
								60		Roots in Lateral Service			1									
								91		Minor Longitudinal Crack			1			1						
								119		Minor Longitudinal Crack			1			1						
								122		Roots in Lateral Service			1									
								138		Multiple Minor Cracks			2			1						
								169		Multiple Minor Cracks			2			1						
								177		Multiple Minor Cracks			2			1						
								196		Medium Roots at Joint			3									
								215		Multiple Minor Cracks			2			1						
								218		Multiple Minor Cracks			2			1						
								247		Fine Roots at Joint			1									
4/11/2014	Pilgrim Rd	S19-021	S19-001	8	198	VCP	3							11								$3,250.00
								91		Minor Longitudinal Crack			1			1						
								109		Minor Longitudinal Crack			1			1						
								115		Fine Roots at Joint			1									
								126		Fine Roots at Joint			1									
								129		Fine Roots at Joint			1									
								159		Fine Roots at Joint			1									
								167		Minor Longitudinal Crack			1			1						
								177		Minor Longitudinal Crack			1			1						
								180		Minor Longitudinal Crack			1			1						
								186		Fine Roots at Joint			1									
								186		Moderate Multiple Cracks			3		Point Repair up to 16 ft	1	1	EA	$3,250.00	$3,250.00		
								192		Moderate Longitudinal Fracture			2			1						
								197		Moderate Circumferential Fracture			2			1						
								197		Fine Roots at Barrel			1									
								198		Fine Roots at Joint			1									
4/11/2014	Alden Rd	S19-001	S27-002	8	231	AC	12							11								$530.00
								1		Surface Roughness - START			2									
								1		Heavy Mineral Deposits Attached - START			4		Heavy Cleaning		2	HR	$265.00	$530.00		
								14		Surface Roughness - FINISH			2									
								14		Heavy Mineral Deposits Attached - FINISH			4		Heavy Cleaning							
4/11/2014	Stockdale Rd	S19-027	S19-026	8	172	AC	12							11								
4/11/2014	Stockdale Rd	S19-026	S19-025	8	183	AC	12							11								$2,700.00
								50		Moderate Multiple Fractures			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								152		Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00	
								152		Fine Roots at Joint			1									
4/11/2014	Stockdale Rd	S19-025	S19-024	8	155	VCP	3							11								$9,400.00
								18		Moderate Longitudinal Fracture			4		CIPP	1	155	LF	$40.00	$6,200.00		
								21		Minor Multiple Cracks			1		CIPP (Included Above)	1						
								28		Moderate Multiple Fractures			3		CIPP (Included Above)	1						
								40		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								47		Leaking from connection to main	180	90	3		CIPP (Included Above)							
								52		Leaking from connection to main	180	90	3		CIPP (Included Above)							
								72		Fine Roots at Joint			1		CIPP (Included Above)							
								83		Fine Roots at Joint			1		CIPP (Included Above)							
								95		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								108		Leaking from connection to main	1220	610	3		CIPP (Included Above)							
								151		Minor Longitudinal Crack			1		seal all laterals (4)		4	EA	$800.00		$3,200.00	

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																	EST. REHAB COSTS			
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/11/2014	Stockdale Rd	S19-024	S19-023	8	257	VCP	3							11								$15,880.00
								1		Moderate Circumferential Crack			3		CIPP	1	257	LF	$40.00	$10,280.00		
								13		Minor Circumferential Crack			1		CIPP (Included Above)	1						
								19		Minor Multiple Cracks			2		CIPP (Included Above)	1						
								33		Leaking at Joint	180	90	1		CIPP (Included Above)	1						
								33		Minor Multiple Cracks			2		CIPP (Included Above)	1						
								49		Water Level 15%			1		CIPP (Included Above)							
								75		Water Level 5%			1		CIPP (Included Above)							
								79		Hole in side of pipe			4		CIPP (Included Above)	1						
								125		Fine Roots at Joint			1		CIPP (Included Above)							
								160		Minor Multiple Cracks			2		CIPP (Included Above)	1						
								172		Minor Longitudinal Crack			2		CIPP (Included Above)	1						
								178		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1						
								205		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								226		Minor Longitudinal Crack			2		CIPP (Included Above)	1						
								232		Minor Longitudinal Crack			2		CIPP (Included Above)	1						
								240		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
										seal all laterals (7)							7	EA	$800.00		$5,600.00	
4/11/2014	Stockdale Rd	S19-023	S19-022	8	258	VCP	3							11								$15,120.00
								23		Water Level 15%			1		CIPP		258	LF	$40.00	$10,320.00		
								41		Water Level 5%			1		CIPP (Included Above)							
								61		Moderate Longitudinal Crack			3		CIPP (Included Above)	1						
								92		Light Mineral Deposits Attached			1		CIPP (Included Above)							
								95		Light Mineral Deposits Attached			1		CIPP (Included Above)							
								100		Light Mineral Deposits Attached			1		CIPP (Included Above)							
								159		Light Mineral Deposits Attached			1		CIPP (Included Above)							
								164		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								171		Moderate Longitudinal Crack			2		CIPP (Included Above)	1						
								171		Leaking at Joint	180	90	3		CIPP (Included Above)	1						
								175		Leaking at service Connection			1		CIPP (Included Above)							
								175		Leaking Service	180	90	1		CIPP (Included Above)	1						
								182		Light Mineral Deposits Attached			1		CIPP (Included Above)							
								203		Light Mineral Deposits Attached			1		CIPP (Included Above)							
								239		Leaking at Joint	180	90	1		CIPP (Included Above)	1						
										seal all laterals (6)							6	EA	$800.00		$4,800.00	
4/11/2014	Stockdale Rd	S19-022	S27-003	8	257	VCP	3							11								$2,500.00
								31		Leak at service connection to main	1080	540	3		Seal lateral		1	EA	$2,500.00		$2,500.00	
								39		water level 15%			1									
								46		water level 5%			1									
								75		fine root at joint			1									
								78		Minor Multiple Cracks			1									
								81		fine root at joint			1									
								100		Minor Longitudinal fracture			1									
								123		minor circumferential fracture			1									
								152		minor longitudinal crack			1									
								164		minor longitudinal crack			1									
								171		Minor Multiple Cracks			1									
								186		minor longitudinal crack			1									
								230		minor multiple cracks - START			1									
								233		Minor longitudinal fracture			1									
								257		minor multiple cracks - FINISH			1									
4/11/2014	Powder House Cir	S19-014	S19-014A	8	119	PVC	13							11								$208.25
								63		Heavy Roots at Joint			4		Chemical Root Treatment		119	LF	$1.75	$208.25		
								71		Fine Roots at Joint			1									
								73		Fine Roots at Joint			1									
4/11/2014	Powder House Cir	S19-014A	S19-012	8	125	AC	12							11								$218.75
								3		Multiple Cracks			2			1						
								10		Fine Roots at Joint			1									
								21		Deposits Attached			1									
								50		Deposits Attached			1									
								76		Deposits Attached			1									
								125		Heavy Roots at Joint 55%			3		Chemical Root Treatment		125	LF	$1.75	$218.75		
4/16/2014	Stewart Rd	S20-003	S20-002	8	159	AC	12							11								
4/16/2014	Stewart Rd	S20-002	S20-001	8	284	AC	12							11								$497.00
								261		Roots in service lateral			1									
								261		Heavy Roots at Tap 55%			3		Chemical Root Treatment		284	LF	$1.75	$497.00		
4/16/2014	Stewart Rd	S20-001	S27-026	8	274	AC	12							11								

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DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/16/2014	Stewart Rd	S27-026	S27-011	8	300	AC	12							11								$2,500.00
								72		Fine Roots at Joint			1									
								89		Leaking at Service Connection to Main	180	90	3		Seal lateral	1	1	EA	$2,500.00		$2,500.00	
4/16/2014	Standish Rd	S20-018	S20-019	8	75	AC	12							11								
								2		Defective Repair												
								60		Water Level 10%			1									
								72		Water Level 5%			1									
4/16/2014	Standish Rd	S20-019	S28-010	8	293	AC	12							11								
								65		Minor Circumferential Fracture			2			1						
								134		Minor Circumferential Fracture			1			1						
4/16/2014	Standish Rd	S28-010	S28-009	8	236	AC	12							11								
4/16/2014	Standish Rd	S28-009	S28-003	8	297	AC	12							11								
4/16/2014	Brewster Dr.	S28-012	S28-013	8	74	AC	12							11								
4/16/2014	Brewster Dr.	S28-012	S28-011	8	229	AC	12							11								
4/17/2014	Pond St	S28-070		8	131	VCP	3							11								$17,050.00
								23		Leaking from Joint	1440	720	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								122		Fine Roots at Joint			1									
								131		Install terminal manhole	720	360	3				1	EA	$15,000.00	$15,000.00		
4/17/2014	Pond St	S28-070	S28-071	8	113	VCP	3							11								$5,320.00
								5		Moderate Longitudinal Fracture			3		CIPP	1	113	LF	$40.00	$4,520.00		
								8		Moderate Multiple Fractures			3			1						
								23		Minor Longitudinal Crack			1			1						
								79		Moderate Spiral Fracture			3			1						
								86		Minor Spiral Crack			1		seal all laterals (1)	1	1	EA	$800.00		$800.00	
4/17/2014	Pond St	S38-029	S28-065	8	104	VCP	3							11								
								34		Minor Spiral Crack			1			1						
								48		Minor Circumferential Fracture			1			1						
								64		Minor Circumferential Fracture			1			1						
								104		Fine Roots at Joint			1									
4/17/2014	Pond St	S28-065	S28-066	8	197	VCP	3							11								$4,100.00
								14		Light Mineral Deposits Attached			1									
								40		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								47		Moderate Multiple Cracks			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								141		Minor Longitudinal Cracks			1			1						
4/17/2014	Pond St	S28-066	S29-001	8	163	VCP	3							11								$2,050.00
								10		Leaking from joint	360	180	1		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								11		Water Level 10%			1									
								25		Water Level 5%			1									
								84		Water Level 15%			1									
								94		Water Level 5%			1									
								130		Water Level 20%			1									
								136		Water Level 5%			1									
4/17/2014	Pond St	S29-001	S28-071	8	145	VCP	3							11								
								8		Water Level 20%			1									
								14		Water Level 5%			1									
								42		Water Level 20%			1									
								60		Minor Longitudinal Crack			1			1						
								65		Minor Longitudinal Crack			1			1						
								72		Water Level 5%			1									
								113		Water Level 20%			1									
4/17/2014	Great Plain Ave	S20-017	S20-030	12	154	VCP	3							11								$10,040.00
								8		Infiltration runner at joint	1440	720	3		CIPP	1	154	LF	$60.00	$9,240.00		
								70		Deposits Attached			1									
								76		Infiltration runner at joint	720	360	3			1	1					
								90		Water Level 15%			1									
								105		Water Level 5%			1									
								110		Longitudinal Crack			3			1	1					
								124		Longitudinal Crack			2			1	1					
								139		Water Level 30%			1									
								145		Water Level 5%			1									
															seal all laterals (1)		1	EA	$800.00		$800.00	
4/17/2014	Great Plain Ave	S20-030	S20-031	12	98	VCP	3							11								$7,480.00
								7		Minor Longitudinal Crack			1		CIPP	1	98	LF	$60.00	$5,880.00		
								16		Minor Longitudinal Crack			1			1						
								28		Leaking Joint	1440	720	3			1	1					
								33		Leaking from connection to main	1440	720	4				1					
								86		Leaking at Joint	180	90	4			1	1					
								86		Minor Longitudinal Crack			1		seal all laterals (2)	1	2	EA	$800.00		$1,600.00	

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D

TV Inspection Summary Subarea 11

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/17/2014	Great Plain Ave	S20-031	S28-017	12	217	VCP	3							11								$17,820.00
								2		Moderate Multiple Fractures			3		CIPP		217	LF	$60.00	$13,020.00		
								3		Leaking at Joint	720	360	3		CIPP (Included Above)	20						
								5		Minor Longitudinal Crack - START			1		CIPP (Included Above)							
								14		Moderate Multiple Cracks			4		CIPP (Included Above)							
								25		Minor Longitudinal Crack - FINISH			1		CIPP (Included Above)							
								43		Minor Longitudinal Crack			1		CIPP (Included Above)							
								44		Fine Roots at Joint			1		CIPP (Included Above)							
								98		Moderate Multiple Cracks			4		CIPP (Included Above)							
								141		Minor Longitudinal Crack			1		CIPP (Included Above)							
								170		Minor Longitudinal Crack			1		CIPP (Included Above)							
								183		Moderate Longitudinal Fracture			4		CIPP (Included Above)							
								185		Moderate Multiple Cracks			4		CIPP (Included Above)							
								189		Moderate Multiple Cracks			4		CIPP (Included Above)							
								214		Light Mineral Deposits Attached			1									
								215		Minor Circumferential Fracture			2		seal all laterals (6)		6	EA	$800.00		$4,800.00	
4/17/2014	Great Plain Ave	S28-017	S28-018	12	136	PVC	13							11								
								129		Water Level 20%			1									
4/17/2014	Great Plain Ave	S28-018	S28-019	12	156	PVC	12							11								
								15		Water Level 25%			1									
								40		Water Level 5%			1									
								94		Water Level 25%			1									
								107		Water Level 5%			1									
								135		Light Mineral Deposits Attached			1									
								150		Light Mineral Deposits Attached			1									
4/17/2014	Great Plain Ave	S28-042	S28-041	8	180	VCP	3							11								$2,500.00
								74		Leaking from Service Lateral	180	90	1		Seal lateral	1	1	EA	$2,500.00	$2,500.00		
4/18/2014	Great Plain Ave	S28-041	S28-040	8	213	VCP	3							11								
								109		Fine Roots at Joint			1									
4/18/2014	Great Plain Ave	S28-040	S28-039	8	183	VCP	3							11								
								16		Water Level 15%			1									
								32		Water Level 5%			1									
								37		Minor Longitudinal Crack			1			1						
4/18/2014	Great Plain Ave	S28-039	S28-038	8	106	VCP	3							11								
								106		Fine Roots at Joint			1									
4/18/2014	Great Plain Ave	S28-038	S28-035	8	234	VCP	3							11								$10,960.00
								76		Moderate Multiple Cracks			3		CIPP	1	234	LF	$40.00	$9,360.00		
								80		Moderate Multiple Cracks			3		CIPP (Included Above)	1						
								172		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								188		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1						
								191		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1						
								197		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								200		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1						
								226		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1						
								228		Minor Longitudinal Crack			1		seal all lateral (2)	1	2	EA	$800.00		$1,600.00	

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PROJECT NAME: INFILTRATION-INVESTIGATION
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Appendix D

TV Inspection Summary Subarea 11

																	EST. REHAB COSTS			
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/18/2014	Great Plain Ave	S28-035	S28-034	8	279	VCP	3							11								$22,340.00
								6		Water Level 10%			1									
								9		Multiple Fractures			3		CIPP	1	279	LF	$60.00	$16,740.00		
								9		Infiltration dripper at joint	180	90	3		CIPP (Included Above)	1						
								10		Defective Tap - Cracks			1		CIPP (Included Above)							
								11		Multiple Fractures			3		CIPP (Included Above)	1						
								45		Longitudinal Fractures			4		CIPP (Included Above)	1						
								51		Longitudinal Fractures - START			4		CIPP (Included Above)	6						
								57		Multiple Fractures - START			3		CIPP (Included Above)	43						
								57		Longitudinal Fractures - FINISH			4		CIPP (Included Above)							
								60		Deformed 40%			2									
								100		Multiple Fractures - FINISH			3		CIPP (Included Above)							
								106		Longitudinal Fractures - START			4		CIPP (Included Above)	58						
								164		Longitudinal Fractures - FINISH			4		CIPP (Included Above)							
								168		Defective Tap - Roots			1		CIPP (Included Above)							
								168		Medium Roots at Joint			4		CIPP (Included Above)							
								179		Fine Roots at Joint			1		CIPP (Included Above)							
								200		Multiple Cracks			4		CIPP (Included Above)	1						
								215		Longitudinal Cracks			1		CIPP (Included Above)	1						
								232		Longitudinal Cracks			1		CIPP (Included Above)	1						
								244		Longitudinal Cracks			1		CIPP (Included Above)	1						
								247		Fine Roots at Joint			1		CIPP (Included Above)							
								254		Fine Roots at Joint			1		CIPP (Included Above)							
								255		Spiral Fracture			4		CIPP (Included Above)	1						
								256		Defective Tap - Cracks			4		CIPP (Included Above)							
								263		Longitudinal Crack			1		CIPP (Included Above)	1						
								269		Longitudinal Fractures			4		seal all laterals (7)	1	7	EA	$800.00		$5,600.00	
4/18/2014	Great Plain Ave	S28-034	S28-033	8	240	VCP	3							11								$17,600.00
								42		Defective Tap - Roots			1		CIPP		240	LF	$60.00	$14,400.00		
								46		Longitudinal Crack - START			1		CIPP (Included Above)	29						
								55		Longitudinal Crack			1		CIPP (Included Above)							
								62		Longitudinal Crack			1		CIPP (Included Above)							
								75		Longitudinal Crack - FINISH			1		CIPP (Included Above)							
								77		Longitudinal Crack			1		CIPP (Included Above)							
								81		Longitudinal Fracture - START			4		CIPP (Included Above)	21						
								87		Longitudinal Crack			1		CIPP (Included Above)							
								102		Longitudinal Crack - FINISH			1		CIPP (Included Above)							
								162		Multiple Cracks			4		CIPP (Included Above)							
								180		Defective Tap - Leaking	180	90	1		CIPP (Included Above)							
								180		Infiltration runner at joint	360	180	3		CIPP (Included Above)							
								189		Water Level 15%			1									
								195		Water Level 5%			1									
								206		Water Level 15%			1									
								223		Longitudinal Crack			1		seal all laterals (4)		4	EA	$800.00		$3,200.00	
4/18/2014	Great Plain Ave	S28-033	S28-020	8	113	VCP	3							11								
								5		Minor Longitudinal Fracture			2			1						
								55		Minor Longitudinal Crack			1			1						
								104		Minor Longitudinal Fracture			2			1						
								104		Water Level 25%			1									
								107		Minor Longitudinal Crack			1			1						
4/18/2014	Great Plain Ave	S28-020	S28-019	8	110	VCP	3							11								$4,400.00
								4		Minor Longitudinal Crack			1		CIPP	1	110	LF	$40.00	$4,400.00		
								7		Minor Multiple Cracks - START			1			18						
								15		Water Level 20%			1									
								25		Minor Multiple Cracks - FINISH			1									
								46		Minor Longitudinal Crack			1			1						
								61		Water Level 5%			1									
								67		Minor Longitudinal Crack			1			1						
								73		Moderate Longitudinal Fracture - START			3			12						
								80		Water Level 20%			1									
								83		Water Level 5%			1									
								85		Moderate Longitudinal Fracture - FINISH			1									
								94		Moderate Longitudinal Fracture			3			1						
								100		Minor Longitudinal Crack			1			1						
								105		Water Level 25%			1									
								107		Moderate Multiple Fractures			3		seal all laterals (0)	1						
4/18/2014	High Rock St	S38-017		8	154	AC	12							11								$2,050.00
								154		Leaking at Joint at end cap	1440	720	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		

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Appendix D

TV Inspection Summary Subarea 11

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/18/2014	Central Ave	S38-018	S38-019	8	275	AC	12							11								$2,500.00
								205		Leak at Service joint to main	360	180	3		Seal lateral	1	1	EA	$2,500.00	$2,500.00		
								215		Fine Roots at Joint			1									
								241		Fine Roots at Joint			1									
4/18/2014	Central Ave	S38-019	S38-020	8	167	AC	12							11								$2,050.00
								59		Heavy Leak at Joint	2160	1,080	5		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
4/19/2014	Mason Rd	S20-020	S20-015	10	101	VCP	3							11								$5,850.00
								22		Deposits Attached			1		CIPP		101	LF	$50.00	$5,050.00		
								48		Infiltration runner at joint	720	360	1		CIPP (Included Above)	1						
								60		Multiple Fractures			1		CIPP (Included Above)	1						
								61		Defective Tap - Fractures and Leaking			1		CIPP (Included Above)							
								61		Infiltration gusher at joint	1440	720	5		CIPP (Included Above)	1						
								68		Infiltration runner at joint	360	180	1		CIPP (Included Above)	1						
								84		Water Level 10%			1		CIPP (Included Above)							
								89		Longitudinal Crack			1		CIPP (Included Above)	1						
								101		Spiral Fracture			2		CIPP (Included Above)	1						
															seal all laterals (1)		1	EA	$800.00		$800.00	
4/19/2014	Mason Rd	S20-015	S20-016	10	93	VCP	3							11								$7,050.00
								11		Light Mineral Deposits Attached			1		CIPP		93	LF	$50.00	$4,650.00		
								26		Heavy Leak at Joint	2880	1,440	5		CIPP (Included Above)	1						
								27		Service entrance fractured			1		CIPP (Included Above)	1						
								27		Moderate Multiple Fractures			3		CIPP (Included Above)	1						
								28		Moderate Longitudinal Fractures			4		CIPP (Included Above)	1						
								50		Moderate Longitudinal Fractures			4		CIPP (Included Above)	1						
								58		Moderate Longitudinal Fractures			4		seal all laterals (3)	1	3	EA	$800.00		$2,400.00	
4/19/2014	Mason Rd	S20-016	S20-017	10	194	VCP	3							11								$11,300.00
								29		Minor Multiple Cracks			1		CIPP	1	194	LF	$50.00	$9,700.00		
								36		Moderate Longitudinal Fractures			3			1						
								37		Service Lateral Leaking	2160	1,080	3									
								83		Light Mineral Deposits Attached			1									
								98		Light Mineral Deposits Attached			1									
								104		Light Mineral Deposits Attached			1									
								112		Minor Multiple Cracks			1			1						
								151		Minor Leak at Joint	180	90	3			1						
								170		Minor Multiple Cracks - START			1			3						
								173		Minor Multiple Cracks - FINISH			1			1						
															seal all laterals (2)		2	EA	$800.00		$1,600.00	
4/19/2014	Mason Rd	S20-020	S20-021	10	163	VCP	3							11								
4/19/2014	Mason Rd	S20-023	S20-024	8	167	VCP	3							11								$9,880.00
								1		Light Mineral Deposits Attached			1		CIPP		167	LF	$40.00	$6,680.00		
								4		Light Mineral Deposits Attached			1		CIPP (Included Above)							
								7		Light Mineral Deposits Attached			1		CIPP (Included Above)							
								7		Leak at Joint	180	90	3		CIPP (Included Above)	1						
								48		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								90		Leak at Joint	720	360	3		CIPP (Included Above)	1						
								120		Leak at service connection to main	180	90	3		CIPP (Included Above)	1						
								167		Light Mineral Deposits Attached			1		CIPP (Included Above)							
															seal all laterals (4)		4	EA	$800.00		$3,200.00	
4/19/2014	Fuller Brook Ave	S20-023	S20-022	8	72	VCP	3							11								
								2		Light Mineral Deposits Attached			1									
								19		Light Mineral Deposits Attached			1									
								31		Light Mineral Deposits Attached - START			1									
								72		Light Mineral Deposits Attached - FINISH			1									
4/19/2014	Fuller Brook Ave	S20-022	S20-020	8	221	VCP	3							11								$11,240.00
								3		Longitudinal Crack			1		CIPP	1	221	LF	$40.00	$8,840.00		
								14		Deposits Attached			1		CIPP (Included Above)							
								17		Deposits Attached			1		CIPP (Included Above)							
								57		Infiltration dripper at joint	180	90	3		CIPP (Included Above)	1						
								69		Infiltration dripper at joint	180	90	3		CIPP (Included Above)	1						
								122		Deposits in service lateral			2		CIPP (Included Above)							
								122		Leak in service lateral connection to main	180	90	3		CIPP (Included Above)	1						
								178		Deposits Attached			1		CIPP (Included Above)							
															seal all laterals (3)		3	EA	$800.00		$2,400.00	
4/19/2014	Fuller Brook Ave	S20-027	S20-026	8	69	VCP	3							11								$2,050.00
								11		Leaking Joint	180	90	1		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		

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Appendix D

TV Inspection Summary Subarea 11

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/19/2014	Fuller Brook Ave	S20-026	S20-025	8	69	VCP	3							11								
								23		Minor Longitudinal Crack			1			1						
								45		Water Level 15%			1									
								54		Light Mineral Deposits Attached			1									
								62		Water Level 5%			1									
4/19/2014	Fuller Brook Ave	S20-027	S20-020	8	302	VCP	3							11								$2,050.00
								4		Water Level 15%			1									
								38		Water Level 5%			1									
								61		Water Level 15%			1									
								74		Water Level 5%			1									
								143		Water Level 10%			1									
								170		Water Level 5%			1									
								227		Leaking Joint	360	180	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								231		Fine Roots at Joint			1									
4/19/2014	Howe Rd	S20-029	S20-028	8	257	VCP	3							11								$2,250.00
								6		Minor Circumferential Fracture			1			1						
								18		Fine Roots at Joint			1									
								57		Moderate Longitudinal Fracture - START			4		Point Repair up to 8 ft	1	1	EA	$2,250.00	$2,250.00		
								60		Moderate Longitudinal Fracture - FINISH			4									
								208		Minor Circumferential Fracture			1			1						
4/19/2014	Howe Rd	S20-028	S20-027	8	268	VCP	3							11								$3,250.00
								20		Minor Circumferential Fracture			1									
								26		Minor Longitudinal Crack			1									
								36		Minor Longitudinal Crack			1									
								72		Water Level 15%			1									
								75		Moderate Longitudinal Fracture - START			4		Point Repair up to 12 ft	9	1	EA	$3,250.00	$3,250.00		
								84		Moderate Longitudinal Fracture - FINISH			4									
								97		Water Level 5%			1									
								105		Fine Roots at Joint			1									
4/23/2014	MacIntosh Ave	S20-033	S20-021	8	262	AC	3							11								$15,280.00
								18		Light Mineral Deposits Attached			1		CIPP		262	LF	$40.00	$10,480.00		
								35		Leaking at Joint	180	90	4		CIPP (Included Above)	1						
								35		Leaking at Connection to main	180	90	4		CIPP (Included Above)							
								88		Leaking at Connection to main	180	90	3		CIPP (Included Above)							
								262		Leaking Joint	720	360	3		CIPP (Included Above)	1						
															seal all laterals (6)		6	EA	$800.00		$4,800.00	
4/23/2014	Central Ave	S38-020	S28-062	8	93	AC	12							11								
4/23/2014	Central Ave	S28-062	S28-061	8	251	AC	12							11								$5,000.00
								144		Service Leaking from connection to main	180	90	4		seal lateral	1	1	EA	$2,500.00		$2,500.00	
								152		Water Level 10%			1									
								158		Service Leaking from connection to main	180	90	4		seal lateral	1	1	EA	$2,500.00		$2,500.00	
								158		Water Level 5%			1									
4/23/2014	Central Ave	S28-060	S28-061	8	121	AC	12							11								
								118		Water Level 10%			1									
4/23/2014	Central Ave	S28-059	S28-060	8	245	AC	12							11								
								225		Obstacles 15%			2									
4/23/2014	Central Ave	S28-058	S28-059	8	67	AC	12							11								
								1		Minor Circumferential Fracture			1			1						
								11		Water Level 15%			1									
4/23/2014	Noyes St	S28-057	S28-058	8	91	AC	12							11								
4/23/2014	Noyes St	S28-057	S28-045	8	240	AC	12							11								$325.00
								94		Protruding Lateral			1		Cut Lateral Protrusion		1	EA	$325.00		$325.00	
4/23/2014	Central Ave	S38-015	S38-016	8	128	AC	12							11								
4/23/2014	Central Ave	S38-014	S38-015	8	264	AC	12							11								$3,250.00
								9		Minor Circumferential Fracture			2			1						
								9		Leaking Joint	1440	720	3		Point Repair up to 16 ft	1	1	EA	$3,250.00	$3,250.00		
								22		Leaking Joint	720	360	3		Point Repair up to 16 ft (Included Above)	1						
								104		Vermin Cockroach			1									
								145		Vermin Cockroach			1									
								211		Vermin Cockroach			1									
								250		Vermin Cockroach			1									
4/23/2014	Central Ave	S38-014	S38-006	8	87	AC	12							11								$2,050.00
								82		Moderate Multiple Cracks			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
4/23/2014	Central Ave	S38-004	S38-003	8	39	PVC	13							11								
4/23/2014	Central Ave	S38-004	S38-001	8	160	PVC	13							11								
								1		Offset Joint			2									
4/23/2014	Central Ave	S38-004	S38-005	8	160	PVC	13							11								$2,050.00
										Leaking Joint	720	360	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
										Fine Roots at Joint			2									

CLIENT: TOWN OF NEEDHAM
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Appendix D

TV Inspection Summary Subarea 11

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/23/2014	Central Ave	S38-005	S38-006	8	172	AC	12							11								$301.00
								59		Medium Roots at Joint			3		Chemical Root Treatment		172	LF	$1.75	$301.00		
4/25/2014	Gay St	S39-023	S39-024	8	102	AC	13							11								$550.00
								102		Leak at Connection to manhole	360	180	3		Grout Pipe Connection at Manhole		1	EA	$550.00	$550.00		
4/25/2014	Gay st	S39-023	S39-022	8	90	AC	13							11								$157.50
								37		Root Ball at Joint 50%			5		Chemical Root Treatment		90	LF	$1.75	$157.50		
4/25/2014	Gay st	S39-013	S39-015	8	34	AC	13							11								
4/25/2014	Gay st	S39-019	S39-018	8	145	AC	13							11								
4/25/2014	Brackett St	S39-020	S39-021	8	148	VCP	3							11								
4/25/2014	Brackett St	S39-021	S39-043	8	158	VCP	3							11								
								40		Minor Spiral Crack			2									
								49		Minor Spiral Crack			2									
4/25/2014	Brackett St	S39-043	S39-026	8	127	VCP	3							11								$222.25
								16		Fine Roots at Joint			1									
								22		Fine Roots at Joint			1									
								34		Fine Roots at Joint			1									
								39		Fine Roots at Joint			1									
								44		Fine Roots at Joint			1									
								87		Minor Longitudinal Crack			1			1						
								110		Medium Roots at Joint - START			3		Chemical Root Treatment	17	127	LF	$1.75	$222.25		
								127		Medium Roots at Joint - FINISH			3									
4/25/2014	Tolman St	S38-041	S38-042	8	68	VCP	3							11								$2,169.00
								3		Moderate Multiple Cracks			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								47		Medium Roots at Joint - START			3		Chemical Root Treatment	8	68	LF	$1.75	$119.00		
								65		Medium Roots at Joint - FINISH			3									
4/25/2014	Tolman St	S38-042	S28-064	8	263	VCP	3							11								$2,050.00
								131		Fine Roots at Joint			1									
								227		Leak at Joint	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
4/25/2014	George St	S28-072	S29-002	8	53	VCP	3							11								
										TOTAL	49,920	24,960							TOTAL	$16,468.00	$84,125.00	$364,214.00

CLIENT: TOWN OF NEEDHAM
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Appendix D
TV Inspection Summary Subarea 12

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
5/5/2016	Rolling Ln	S14-040	S14-041	8	328	AC	13							12								
5/5/2016	Rolling Ln	S14-041	S14-042	8	173	AC	13							12								
5/5/2016	Rolling Ln	S14-042	S14-043	8	248	AC	13							12								
								203		Break in Tap Defective			1									
								203		Minor Infiltration Dripper at joint to service	36	18	1									
5/5/2016	Rolling Ln	S14-043	S14-044	8	249	AC	13							12								
5/5/2016	Rolling Ln	S14-044	S15-002	8	93	AC	13							12								
								92		Minor Infiltration Dripper on bench	36	18	1									
5/5/2016	Bess Rd	S21-018	S21-017	8	150	AC	13							12								
5/5/2016	Bess Rd	S21-018	S21-019	8	103	AC	13							12								
5/5/2016	Bess Rd	S21-019	S21-020	8	96	AC	13							12								
5/5/2016	Bess Rd	S21-020	S21-025	8	280	AC	13							12								
5/5/2016	Julia Rd	S21-025	S21-026	8	273	AC	13							12								
5/6/2016	Bess Rd	S21-024	S21-023	8	187	AC	13							12								
									187	Minor Roots in Bench			1									
5/6/2016	Bess Rd	S21-023	S21-022	8	216	AC	13							12								
5/6/2016	Bess Rd	S21-022	S21-021	8	58	AC	13							12								
5/6/2016	Bess Rd	S21-021	S21-020	8	114	AC	13							12								
5/6/2016	Nardone Rd	S21-041	S21-042	8	299	AC	13							12								
5/6/2016	Nardone Rd	S21-042	S21-043	8	87	AC	13							12								
5/6/2016	Nardone Rd	S21-043	S21-026	8	260	AC	13							12								$4,050.00
								222		Moderate Longitudinal Fracture in main and service			3		T-liner		1	EA	$2,000.00		$2,000.00	
								252		Moderate Circumferential Fracture			3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								252		Minor Deposits Attached at Fracture			2									
5/6/2016	Nardone Rd	S21-026	S21-044	8	173	AC	13							12								$2,050.00
								95		Heavy Infiltration Runner	2880	1440	4		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
5/6/2016	Nardone Rd	S21-044	S21-045	8	121	AC	13							12								
5/6/2016	Nardone Rd	S21-045	S21-062	8	107	AC	13							12								$5,500.00
								79		Heavy Infiltration Gusher	14,400	7200	5		Dig and Replace wye		1	EA	$5,500.00	$5,500.00		
5/6/2016	Jarvis Cir	S21-062	S21-061	8	122	AC	13							12								$11,000.00
								39		Heavy Infiltration Runner at joint to service	2880	1440	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00		
								39		Moderate Longitudinal Fracture			2			0.5						
								73		Heavy Infiltration Gusher at joint to service	5760	2880	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00		
5/6/2016	Jarvis Cir	S21-061	S21-060	8	72	AC	13							12								$5,500.00
								25		Heavy Infiltration Gusher at joint to service	3600	1800	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00		
5/6/2016	Jarvis Cir	S21-060	S21-059	8	124	AC	13							12								$5,500.00
								59		Heavy Infiltration Gusher at joint to service	4320	2160	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00		
5/6/2016	Jarvis Cir	S21-059	S21-058	8	122	AC	13							12								$600.00
								122		Heavy Infiltration Runner at bench	4320	2160	4		Grout Manhole		1	EA	$600.00	$600.00		
5/6/2016	Jarvis Cir	S21-058	S21-057	8	122	AC	13							12								
								44		Sag in pipe, 20% of cross sectional area			1									
									169	Minor spalling at joint			1									
										TOTAL	38,232	19,116							TOTAL	$32,200	$2,000	$34,200

CLIENT: TOWN OF NEEDHAM
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Appendix D
TV Inspection Summary Subarea 13

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/13/2016	Crescent Rd	S16-007	S16-008	8	172	AC	13							13								$5,000.00
								100		Moderate Infiltration Runner at chimney connection to main	360	180	3		Grout service lateral		1	EA	$2,500.00		$2,500.00	
								103		Moderate Infiltration Runner at chimney connection to main	360	180	3		Grout service lateral		1	EA	$2,500.00		$2,500.00	
4/13/2016	Crescent Rd	S16-008	S16-009	8	150	AC	13							13								
4/13/2016	Crescent Rd	S16-009	S16-010	8	24	AC	13							13								
4/13/2016	Crescent Rd	S16-010	S16-011	8	135	AC	13							13								
								83		Minor Hole			2									
4/13/2016	Crescent Rd	S16-011	S15-100	8	288	AC	13							13								
4/14/2016	Crescent Rd	S15-100	S15-099	8	175	AC	13							13								
4/15/2016	Crescent Rd	S15-099	S15-098	8	199	AC	13							13								
4/16/2016	Taylor St	S09-035	S09-034	8	177	AC	13							13								
4/16/2016	Taylor St	S09-034	S09-033	8	203	AC	13							13								
4/16/2016	Taylor St	S09-033	S09-032	8	132	AC	13							13								
4/16/2016	Taylor St	S09-032	S09-031	8	228	AC	13							13								
4/16/2016	Grasmere Rd Easement	S09-026	S09-025	8	180	AC	13							13								
4/16/2016	Grasmere Rd	S04-007	S09-026	8	203	AC	13							13								$6,150.00
								85		Sag in pipe			1									
								177		Infiltration at Joint in Pipe	1440	720	5		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
4/16/2016	Lakin St	S09-036	S04-010	8	158	AC	13							13								
								10		Minor Longitudinal Fracture			1									
								10		Minor Infiltration Dripper	180	90	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								33		Minor Obstacles			1									
								119		Moderate Hole			3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
4/16/2016	Lakin St	S04-010	S04-009	8	192	AC	13							13								
4/16/2016	Lakin St	S04-009	S04-008	8	174	AC	13							13								$550.00
								173		Infiltration Runner in Main connection to MH	2160	1080	3		Grout & patch bench, invert, and connection		1	EA	$550.00	$550.00		
4/16/2016	Briarwood Cir	S09-021	S09-022	8	104	AC	13							13								
4/16/2016	Briarwood Cir	S09-022	S09-023	8	66	AC	13							13								
4/16/2016	Briarwood Cir	S09-023	S09-025	8	156	AC	13							13								$3,100.00
								52		Break in Tap defective, minor infiltration	180	90	3		Grout service lateral		1	EA	$2,500.00		$2,500.00	
								155		Infiltration runner at main connection to MH	5760	2880	5		Grout manhole		1	EA	$600.00	$600.00		
										TOTAL	10,440	5,220							TOTAL	$7,300	$7,500	$14,800

CLIENT: TOWN OF NEEDHAM
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Appendix D
TV Inspection Summary Subarea 14

																	EST. REHAB COSTS			
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
5/13/2014	Wayne Road Easement	S09-084	S09-087	8	175	PVC	12							14								
5/13/2014	Wayne Road Easement	S09-087	S09-088	8	370	PVC	12							14								
								250		Water Level 10%			1									
								279		Water Level 10%			1									
5/13/2014	Wayne Road Easement	S09-090	S10-029	8	158	PVC	12							14								
5/13/2014	Wayne Road	S09-075	S09-083	8	164	AC	13							14								
5/13/2014	Wayne Road	S09-083	S09-084	8	110	AC	13							14								$2,500.00
								52		Leak in Service lateral	180	90	3		Seal lateral		1	EA	$2,500.00		$2,500.00	
5/13/2014	Jennifer Cir	S09-091	S09-090	8	325	AC	13							14								$5,500.00
								294		Missing Section of Pipe			5		Dig and Replace 20 ft		1	EA	$5,500.00	$5,500.00		
								294		Heavy Leak from ground	28,800	14,400	5									
5/14/2014	Central Ave	S09-094	S09-094A	8	134	AC	13							14								$2,500.00
								177		Leak from service chimney	180	90	3		Seal lateral		1	EA	$2,500.00		$2,500.00	
5/14/2014	Central Ave	S09-094A	S09-092	8	240	AC	13							14								
5/14/2014	Central Ave	S09-092	S09-073	8	198	AC	13							14								
5/14/2014	Central Ave	S21-001	S20-052	8	3	AC	13							14								$265.00
								3		Moderate Obstruction			3		Heavy Cleaning		1	HR	$265.00	$265.00		
5/14/2014	Central Ave	S20-052	S21-001	8	202	AC	13							14								
5/14/2014	Central Ave	S20-052	S20-053	8	105	AC	13							14								
5/14/2014	Central Ave	S20-053	S20-054	8	208	AC	13							14								
5/14/2014	Central Ave	S20-054	S20-056	8	122	AC	13							14								
5/14/2014	Central Ave	S20-056	S20-055	8	24	AC	13							14								
								23		Minor Obstacle			1									
5/14/2014	Central Ave	S20-055	S20-056	8	121	AC	13							14								$2,500.00
								80		Moderate Leak in Service connection	720	360	3		Seal lateral		1	EA	$2,500.00		$2,500.00	
5/14/2014	Central Ave	S20-055	S20-054	8	250	AC	13							14								
5/14/2014	Neholden St	S21-011	S21-010	8	158	AC	13							14								
5/14/2014	Neholden St	S21-010	S21-001	8	166	AC	13							14								
3/20/2015	Reservoir St	S05-104	S05-105	12	36	VCP	6?							14								$265.00
								17		Moderate Multiple Cracks			3									
								36		Heavy Debris ABANDON survey			3		Heavy Cleaning		1	HR	$265.00	$265.00		
3/20/2015	Pine Grove St	S09-078	S09-077	8	106	AC	3?							14								
								20		Minor Root Ball at Joint			2									
3/20/2015	Pine Grove St	S09-079	S09-078		267	AC	3?							14								
								164		Minor Root Ball at Joint			2									
3/20/2015	Pine Grove St	S09-080	S09-079	8	256	VCP	3?							14								
								244		Minor Circumferential Crack			1									
3/20/2015	Pine Grove St	S09-080	S09-081	8	15	AC	3?							14								
								15		Moderate Deposits			3		Heavy Cleaning							
3/20/2015	Pine Grove St	S09-081	S09-080	8	280	AC	3?							14								
								280		Moderate Deposits			3		Heavy Cleaning							
3/20/2015	Pine Grove St	S10-006	S10-007	8	116	AC	3?							14								
								31		Minor Root Ball at Joint			1									
								116		Minor Root Ball at Joint			1									
3/20/2015	Pine Grove St	S10-007	S10-008	8	65	AC	3?							14								
3/20/2015	Pine Grove St	S10-008	S09-081	8	147	AC	3?							14								
3/20/2015	Greenough St	S10-010	S10-011	8	194	AC	3?							14								
								27		Minor Root Ball at Joint			1									
								53		Minor Root Ball at Joint			1									
								66		Minor Root Ball at Joint			1									
								92		Minor Root Ball at Joint			1									
								118		Minor Root Ball at Joint			1									
								194		Minor Root Ball at Joint			1									
3/20/2015	Greenough St	S10-011	S10-012	8	31	AC	3?							14								
								12.5		Misalignment			1									
3/20/2015	Avery St	S10-012	S10-014	8	205	AC	3?							14								
								96		minor roots at joint			1									
3/20/2015	Avery St	S10-013	S10-012	8	293	AC	3?							14								
								23		Minor root ball at joint start			1									
								285		misalignment			1									
								286		minor root ball at joint end			1									
3/20/2015	Avery St	S10-014	S10-014A	8	225	AC	3?							14								
3/20/2015	William St	S10-027	S10-028	8	387	AC	3?							14								$22,680.00
								16		Hole			5		CIPP		387	LF	$40	$15,480		
								182		Broken			5									
								186		Longitudinal Crack			2									
								187		Hole			5									
								356		Obstruction			3									
										Seal all Laterals (9)							9	EA	$800.00	$7,200.00		

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 14

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/20/2015	William St	S10-028	S10-030	8	365	AC	3?							14								$21,000.00
								2		Heavy Infiltration Runner	8640	4,320	5		CIPP	365	365	LF	$40	$14,600		
								2		Moderate Circumferential Fracture			2									
								48		infiltration weeper	180	90	1									
								48		Broken			5									
								185		Broken			5									
								304		Broken			5									
										Seal all Laterals (8)							8	EA	$800.00	$6,400.00		
3/20/2015	Lynn Rd	S10-034	S10-033	8	294	AC	3?							14								$18,710.00
								0		Heavy Infiltration Runner	7,200	3,600	4		grout manhole		1	EA	$550.00	$550.00		
								54		Hole			4		CIPP		294	LF	$40	$11,760		
								55		Infiltration Dripper	180	90	1									
								56		Infiltration Weeper	180	90	1									
								56		Broken			4									
								153		Broken			4									
								214		Infiltration Dripper	180	90	2									
								214		Hole			2									
								235		Surface Aggregate			2									
										Seal all Laterals (8)							8	EA	$800.00	$6,400.00		
3/20/2015	Lynn Rd	S10-034	S10-035	8	307	AC	3?							14								$17,880.00
								239		Surface Aggregate			2		CIPP		307	LF	$40	$12,280		
								266		Infiltration Runner	2,880	1,440	5									
								266		Broken			4									
										Seal all Laterals (7)							7	EA	$800.00	$5,600.00		
3/20/2015	Lynn Rd	S10-035	S10-036	8	98	AC	3?							14								$6,320.00
								43		Infiltration Runner	1,440	720	4		CIPP		98	LF	$40	$3,920		
										Seal all Laterals (3)							3	EA	$800.00	$2,400.00		
3/20/2015	William St	S10-027	S10-026	8	139	AC	3?							14								
3/20/2015	Pine Grove St	S09-076	S09-077	8	69	AC	13															
								60		Minor Circumferential Fracture			1									
3/20/2015	Pine Grove St	S09-076	S09-075	8	214	AC	13							14								
3/20/2015	Pine Grove St	S09-074	S09-074A	8	119	AC	13							14								
3/20/2015	Pine Grove St	S09-074	S09-075	8	94	AC	13							14								
3/20/2015	Frank St	S10-032	S10-032A	8	124	AC	13							14								
3/20/2015	Frank St	S10-032A	S10-040	8	223	AC	13							14								
3/20/2015	Frank St	S10-040	S10-004	8	55	AC	13							14								
3/20/2015	Frank St	S10-031	S10-032	8	134	AC	13							14								
3/20/2015	Lynn Rd	S10-033	S10-032	8	63	AC	13							14								
3/20/2015	Elder Rd	S10-004	S10-003	10	73	VCP	3							14								
3/23/2015	Noanett Rd	S05-024	S05-024A	10	136	VCP	3?							14								
3/23/2015	Noanett Rd	S05-024	S05-024B	10	174	VCP	3?							14								
3/23/2015	Noanett Rd	S05-036A	S05-034	8	165	AC	3?							14								
3/23/2015	Gary Rd	S05-036	S05-036A	8	57	AC	3?							14								
3/23/2015	Gary Rd	S05-036	S05-038	8	17	DI	3?							14								
								17		Joint Offset Large			2									
3/23/2015	Lee Rd	S05-038	S05-036	8	124	AC	3?							14								
								97		Minor Grease Deposits			2									
								124		Joint Offset Large			2									
3/23/2015	Lee Rd	S05-037	S05-038	8	43	AC	3?							14								
3/23/2015	Gary Rd	S05-040	S05-038	8	176	AC	3?							14								
3/23/2015	Gary Rd	S05-040	S05-041	8	86	AC	3?							14								
3/23/2015	Gary Rd	S05-045	S05-044	8	227	AC	3?							14								
3/23/2015	Gary Rd	S05-045	S05-046	8	174	AC	3?							14								
3/23/2015	Lee Rd	S05-045	S05-047	8	246	AC	3?							14								
3/23/2015	Lee Rd	S05-047	S05-048	8	228	AC	3?							14								
3/23/2015	Lee Rd	S05-048	S05-039	8	190	AC	3?							14								
3/23/2015	Hewett Cir	S05-051	S05-052	8	184	AC	3?							14								
3/27/2015	Hillside Ave	S16-017	S16-018	8	201	VCP	3							14								
								79		Moderate Longitudinal Fracture			2									
3/27/2015	Hillside Ave	S16-017	S10-015	8	203	VCP	3							14								
3/27/2015	Hillside Ave	S10-015	S10-016	8	313	VCP	3							14								
3/27/2015	Hillside Ave	S10-017	S10-016	8	195	VCP	3							14								$9,665.00
								0		Infiltration Runner at invert	2880	1,440	4		CIPP		195	lf	$40.00	$7,800.00		
								97		Infiltration Dripper in service	180	90	1									
								121		Fine Roots at Joint			1									
								136		Fine Roots at Joint			2									
								172		Fine Roots at Joint			1									
								189		Survey Abandoned due to debris					Heavy Cleaning		1	HR	$265.00	$265.00		
										Seal all Laterals (2)							2	EA	$800.00	$1,600.00		

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
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Appendix D
TV Inspection Summary Subarea 14

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/27/2015	Hillside Ave	S10-017	S10-018	8	200	VCP	3							14								$10,400.00
								0		Infiltration Gusher at invert	8640	4,320	5		CIPP		200	lf	$40.00	$8,000.00		
								20		Infiltration Runner in service	2160	1,080	4									
								58		Infiltration Runner at joint	1440	720	4									
								61		Moderate Multiple Fractures			2									
								104		Moderate Longitudinal Fractures			2									
								194		Infiltration Runner in service	2160	1,080	4									
										Seal all Laterals (3)							3	EA	$800.00	$2,400.00		
3/27/2015	Webster Ave	S10-049	S10-050	8	66	AC	13							14								
3/27/2015	Webster Ave	S10-049	S10-048	8	154	AC	13							14								
3/27/2015	Webster Ave	S10-047	S10-048	8	154	AC	13							14								
3/27/2015	Webster Ave	S10-047	S10-046	8	195	AC	13							14								
3/30/2015	Webster St	S10-046	S10-045	8	320	AC	13							14								
3/30/2015	Webster St	S10-045	S10-044	8	93	AC	13							14								
								65		Minor Circular Fracture			2									
								91		Heavy Encrustation/Protrusions			4									
3/30/2015	Webster St/Hillside St	S10-044	S10-018	8	226	PVC	13							14								$15,000
								226		Major Infiltration in Bench s10-018	7,200	3,600	5		replace MH 210-018		1	EA	$15,000	$15,000		
3/30/2015	Guild St	S10-051	S10-052	8	99	AC	13							14								
3/30/2015	Guild St	S10-051	S10-047	8	199	AC	13							14								
3/30/2015	Arnold St	S05-094	S05-093	8	158	AC	13							14								
								158		Moderate Root Ball at end Joint			2									
3/30/2015	Arnold St	S05-094	S05-069	8	283	AC	13							14								$2,050
								14		Minor Circular Fracture at Joint			2									
								26		Minor Circular Fracture at Joint			2									
								166		Infiltration at Joint	360	180	3		Point Repair up to 4 ft		1	EA	$2,050	$2,050		
3/30/2015	Central Ave	S05-029	S05-019.1	10	201	VCP	3							14								
								185		Fine Roots at Joint			1									
3/30/2015	Central Ave	S05-018	S05-019	10	93	VCP	3							14								
3/30/2015	Central Ave	S05-017	S05-018	10	105	VCP	3							14								
								9		Fine Roots at Joint			1									
								28		Multiple Fractures Moderate			2									
								34		Fine Roots at Joint			1									
3/30/2015	Central Ave	S05-016	S05-017	10	34	VCP	3							14								
3/30/2015	Central Ave	S05-008.1	S05-016	10	115	VCP	3							14								
3/30/2015	Central Ave	S05-008	S05-008.1	10	107	VCP	3							14								
								3		Fine Roots at Joint			1									
								88		Moderate Multiple Fractures			2									
3/30/2015	Central Ave	S05-006.1	S05-008	10	359	VCP	3							14								
3/30/2015	Wellesley Ave	S05-006	S05-006.1	10	117	VCP	3							14								
3/30/2015	Wellesley Ave	S04-023	S05-006	8	316	PVC	13							14								
3/30/2015	Wellesley Ave	S04-022	S04-023	8	320	PVC	13							14								$2,500
								104		Leak at connection to pipe	180	90	3		Seal lateral		1	EA	$2,500		$2,500	
3/31/2015	Rosegate Rd	S05-123	S05-008	8	229	PVC	13							14								
								86		Minor Circular Fracture			2									
3/31/2015	Central Ave	S05-005	S05-005.1	8	281	AC	13							14								
3/31/2015	Parkland Rd	S05-021	S05-021.1	8	138	VCP	3							14								
								73		Minor Longitudinal Fracture			2									
								90		Minor Longitudinal Fracture			2									
								106		Moderate Longitudinal Fracture			2									
3/31/2015	Parkland Rd	S05-021	S05-022	8	109	VCP	3							14								
								90		Minor Longitudinal Fracture			2									
3/31/2015	Parkland Rd	S05-022	S05-023	8	193	VCP	3							14								
								80		Minor Longitudinal Fracture			2									
								149		Moderate Circumferential Fracture			2									
3/27/2015	Sunnyside Rd	S10-021	S10-020	8	96	VCP	3							14								
3/27/2015	Sunnyside Rd	S10-020	S10-019	8	157	AC	13							14								$2,050
								76		Hole			3		Point Repair up to 4 ft		1	EA	$2,050	$2,050		
3/27/2015	Sunnyside Rd	S10-019	S10-018	8	244	AC	13							14								$4,550
								145		Infiltration dripper at tap joint to pipe	360	180	3		Seal lateral		1	EA	$2,500		$2,500	
								242		Infiltration Runner at joint	7,200	3,600	5		Point Repair up to 4 ft		1	EA	$2,050	$2,050		
3/27/2015	Horace St	S10-038	S10-039	8	232	AC	13							14								
6/10/2016	Elder Rd	S10-003	S10-004	10	69	VCP	3							14								
6/10/2016	Elder Road	S10-003	S10-002	10	264	VCP	3							14								
								172		Moderate Longitudinal Fracture			2									
								173		Moderate Longitudinal Fracture			2									
								259		Moderate Circumferential Fracture			2									
6/10/2016	Elder Road	S10-002	S10-001	10	60	VCP	3							14								
6/10/2016	Elder Road	S10-001	S10-033	10	59	VCP	3							14								
								22		Minor Longitudinal Fracture			2									

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Appendix D
TV Inspection Summary Subarea 14

																	EST. REHAB COSTS			
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
6/10/2016	Elder Road	S10-033	S10-032	10	243	VCP	3							14								
								45		Minor Longitudinal Fracture			1									
								86		Minor Roots			1									
									128	Broken			1									
									159	Broken			1									
								229		Minor Longitudinal Fracture			2									
6/10/2016	Elder Road	S10-032	S10-031	10	76	VCP	3							14								
6/10/2016	Elder Road	S10-031	S10-030	10	163	VCP	3							14								$2,050
								6		Infiltration Runner at joint	4,320	2,160	5		Point Repair up to 4 ft		1	EA	$2,050	$2,050		
								9		Infiltration Runner at joint	2,880	1,440	4		Point Repair up to 4 ft							
Video problem. Cannot view past 2:05 mark.								134														
Video problem. Cannot view past 2:05 mark.								161														
6/10/2016	Elder Road	S10-030	S10-029A	10	163	VCP	3							14								
6/13/2016	Elder Road	S05-29A	S05-029	10	171	PVC	3							14								
								92		Minor Roots			1									
								131		Minor Roots			1									
6/13/2016	Elder Road	S05-29	S05-028	10	194	PVC	3							14								$340
								33		Minor Roots at Joint			1									
								63		Minor Roots at Joint			1									
								66		Minor Roots at Joint			1									
								69		Minor Roots at Joint			1									
								77		Minor Roots at Joint			1									
								83		Minor Roots at Joint			1									
								92		Minor Roots at Joint			2									
								144		Heavy Roots at Joint			4		Root treatment		194	LF	$2	$340		
								147		Moderate Roots at Joint			3		Root treatment							
								148		Heavy Roots at Capped Service			4		Root treatment							
								149		Minor Roots at Joint			1									
								158		Heavy Roots at Joint			4		Root treatment							
								176		Minor Roots at Joint			1									
								182		Minor Roots at Joint			1									
6/13/2016	Elder Road	S05-28	S05-027	10	107	VCP	3							14								$5,500
								10		Minor Roots at Joint			1									
								61		Minor Sag			1		Dig and replace 20ft		1	EA	$5,500			
								70		Minor Longitudinal Fracture			2		Dig and replace 20ft							
								70		Moderate Joint Offset			3		Dig and replace 20ft							
								77		Minor Obstacles in Joint			1		Dig and replace 20ft							
								80		Moderate Circumferential Fracture			3		Dig and replace 20ft							
6/13/2016	Elder Road	S05-27	S05-026	10	83	VCP	3							14								
								55		Minor Sag			1									
								74		Minor Roots			1									
								78		Minor Roots			2									
6/13/2016	Elder Road	S05-26	S05-025	10	156	VCP	3							14								
										TOTAL	90,720	45,360							TOTAL	$136,225	$12,500	$154,225

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Appendix D
TV Inspection Summary Subarea 15

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/11/2016	Oak Knoll Terrace	S29-076	S29-077	8	150	AC	13							15								
								97		Fine Roots at Joint			1									
4/11/2016	Oak Knoll Terrace	S29-077	S29-078	8	110	AC	13							15								
4/11/2016	Oak Knoll Terrace	S29-078	S29-079	8	85	AC	13							15								
4/11/2016	Oak Knoll Terrace Easemer	S29-079	S29-080	8	126	AC	13							15								
4/12/2016	Meadowbrook Rd	S29-063	S29-064	8	66	AC	13							15								
4/12/2016	Meadowbrook Rd	S29-064	S29-065	8	261	AC	13							15								$2,000.00
								116		Heavy Infiltration Runner at service connection	4320	2160	4		T-liner		1	EA	$2,000.00		$2,000.00	
								116		Break In Tap Defective			2									
4/12/2016	Meadowbrook Rd	S29-065	S29-066	8	259	AC	13							15								$550
								258		Moderate Infiltration Runner at main connection to MH	2880	1440	3		Grout & patch bench, invert, and connection		1	EA	$550.00	$550.00		
4/12/2016	Meadowbrook Rd	S29-066	S29-080	8	135	AC	13							15								
4/12/2016	Meadowbrook Rd Easemer	S29-080	S29-081	8	16	AC	13							15								
4/12/2016	Meadowbrook Rd	S29-066	S29-082	8	69	AC	13							15								
4/12/2016	Meadowbrook Rd	S29-082	S29-083	8	119	AC	13							15								$550.00
								118		Moderate Infiltration Runner at Main connection to MH	2880	1440	4		Grout & patch bench, invert, and connection		1	EA	$550.00	$550.00		
4/12/2016	Meadowbrook Rd	S29-082	S29-085	8	241	AC	13							15								$5,325
								76		Break in Tap defective infiltration at joint	2880	1440	3		Grout lateral		1	EA	$2,500.00		$2,500.00	
								194		Break in Tap defective intruding			3		Cut lateral protrusion		1	EA	$325.00		$325.00	
								194		Infiltration runner at service connection to main	720	360	3		Grout lateral		1	EA	$2,500.00		$2,500.00	
4/12/2016	Blacksmith Dr	S29-085	S29-100	8	277	AC	13							15								
4/12/2016	Elizabeth Cir	S29-056	S29-055	8	37	AC	13							15								
4/12/2016	Elizabeth Cir	S29-053	S29-055	8	188	AC	13							15								
								20		Minor Deposits attached			1									
								39		Minor Deposits attached			1									
								58		Minor Deposits attached			1									
								113		Minor Deposits attached			1									
4/12/2016	Elizabeth Cir	S29-056	S29-057	8	140	AC	13							15								
4/12/2016	Meadow Ln	S29-057	S29-060	8	167	AC	13							15								
								167		Large Joint Offset Survey Abandoned			2									
4/12/2016	Meadow Ln	S29-060	S29-061	8	279	AC	13							15								
4/13/2016	Meadowbrook Rd	S29-059	S29-058	8	83	AC	13							15								$5,500.00
								62		Heavy Infiltration Runner at service connection to main	4320	2160	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00		
4/13/2016	Meadowbrook Rd	S29-058	S29-057	8	54	AC	13							15								$550.00
								53		Moderate Infiltration in MH invert	3600	1800	4		Grout & patch bench, invert, and connection		1	EA	$550.00	$550.00		
4/13/2016	Meadow Ln	S29-060	S29-062	8	196	AC	13							15								
4/13/2016	Meadow Ln	S29-062	S29-085	8	200	AC	13							15								
4/13/2016	Blacksmith Dr	S29-100	S29-99	8	225	AC	13							15								$4,050.00
								88		Heavy Infiltration Runner at chimney connection to main	7200	3600	4		T-liner		1	EA	$2,000.00		$2,000.00	
								185		Moderate Infiltration Runner at chimney connection to main	1440	720	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
4/13/2016	Blacksmith Dr	S29-99	S29-98	8	277	AC	13							15								$10,050.00
								67		Moderate Infiltration Dripper at chimney connection to main	1440	720	3		Grout lateral		1	EA	$2,500.00		$2,500.00	
								161		Heavy Infiltration Runner at chimney connection to service	10080	5040	5		Dig and Replace wye		1	EA	$5,500.00	$5,500.00		
								183		Minor Infiltration Dripper at joint	180	90	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								183		Minor Deposits attached			1									
								201		Minor Deposits attached			1									
										TOTAL	41,940	20,970							TOTAL	$16,750	$11,825	$28,575

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Appendix D
TV Inspection Summary Subarea 17

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/26/2015	Sherman St	S02-018	S02-013	8	170	AC	3							17								
3/26/2015	Sachem St	S10-095	S16-133	8	316	AC	13							17								
								53		Fine Roots at Joint			1									
								80		Fine Roots at Joint			1									
								158		Fine Roots at Joint			1									
3/26/2015	Sachem St	S10-095	S10-096	8	242	VCP	3							17								
								200		Fine Roots at Joint			1									
3/26/2015	Sachem St	S10-096	S10-098	8	243	VCP	3							17								$2,050.00
								14		Moderate Longitudinal Fracture			1									
								129		Broken			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								158		Fine Roots at Joint			1									
								169		Fine Roots at Joint			1									
								184		Fine Roots at Joint			1									
								193		Fine Roots at Joint			1									
								196		Fine Roots at Joint			1									
								201		Fine Roots at Joint			1									
								204		Fine Roots at Joint			1									
								210		Fine Roots at Joint			1									
								218		Fine Roots at Joint			1									
								222		Fine Roots at Joint			1									
								225		Fine Roots at Joint			1									
3/26/2015	Woodbine Circle	S06-109	S16-130	8	114	AC	13							17								
3/26/2015	Woodbine Circle	S10-108	S10-109	8	232	AC	13							17								
								214		Hole			4		Point Repair up to 4 ft							
3/26/2015	Woodbine Circle	S10-108	S17-092	8	258	AC	13							17								$5,000.00
								71		Lateral Leaking	720	360	3		Seal Lateral							
								180		Lateral Leaking	180	90	3		Seal Lateral		2	EA	$2,500.00		$5,000.00	
3/26/2015	Fay Lane	S17-090	S17-091	8	298	AC	13							17								$28,520.00
								106		Infiltration Gusher in capped service	14,400	7,200	5		CIPP		298	LF	$40.00	$11,920.00		
								171		Infiltration Runner in capped service	2,880	1,440	4									
										Seal all Laterals (2)							2	EA	$800.00	$1,600.00		
										MAJOR INFILTRATION IN BENCH S17-091	7,200	3,600	5		Replace Manhole		1	EA	$15,000.00	$15,000.00		
3/26/2015	Woodbine Circle	S17-090	S17-093	8	182	AC	13							17								$9,680.00
															CIPP		182	LF	$40.00	$7,280.00		
										Seal all Laterals (3)							3	EA	$800.00	$2,400.00		
3/31/2015	Hazel Ln	S17-093		8		AC	13							17								$15,000.00
										MAJOR INFILTRATION IN BENCH	7200	3600	5		Replace Manhole		1	EA	$15,000.00	$15,000.00		
3/31/2015	Hazel Ln	S17-093	S017-094	8	7	AC	13							17								$16,050.00
										MAJOR INFILTRATION IN BENCH s017-094	2880	1440	5		Replace Manhole		1	EA	$15,000.00	$15,000.00		
															Remove and Replace Pipe		7	LF	$150.00	$1,050.00		
3/31/2015	Hazel Ln	S17-094	S17-092	8	247	AC	13							17								$29,680.00
										Infiltration in bench S17-092	1,440	720	4		Replace Manhole		1	EA	$15,000.00	$15,000.00		
															CIPP		247	LF	$40.00	$9,880.00		
										seal all laterals (6)							6	EA	$800.00		$4,800.00	
4/1/2015	Hazel Ln	S17-089	S17-090	8	44	AC	13							17								$31,760.00
										MAJOR INFILTRATION IN BENCH s017-089	7200	3600	5		Replace Manhole		1	EA	$15,000.00	$15,000.00		
										MAJOR INFILTRATION IN BENCH s017-090	7200	3600	5		Replace Manhole		1	EA	$15,000.00	$15,000.00		
															CIPP		44	LF	$40.00	$1,760.00		
										seal all laterals (0)												
4/1/2015	Hazel Ln	S17-089	S17-088	8	42	AC	13							17								$1,680.00
								40		Moderate Infiltration runner	720	360	3		CIPP		42	LF	$40.00	$1,680.00		
										Seal all Laterals (0)												
4/1/2015	David Rd	S128-13	S128-13.1	8	106	PVC	13							17								
4/13/2015	Woodbine Cir	S16-128	S16-128.1	8	33	AC	13							17								
									27	Minor Longitudinal Fracture			1									
4/13/2015	Woodbine Cir	S16-128.1	S16-127	8	275	PVC	13							17								
4/13/2015	Fay Ln	S16-128	S16-131	8	284	AC	13							17								
									147	Moderate Longitudinal Fracture			2									
4/13/2015	Fay Ln	S16-131	S17-091	8	296	AC	13							17								$59,400.00
										Infiltration in bench S16-131	1440	720	4		Replace Manhole		1	EA	$15,000.00	$15,000.00		
									73	Infiltration Gusher at tap joint to pipe	14400	7200	5		Remove and Replace Pipe		296	LF	$150.00	$44,400.00		
									88	Infiltration Gusher at tap joint to pipe	4200	2100	5									
									157	Infiltration Runner at tap joint to pipe	2880	1440	5									
									282	Infiltration Runner at tap joint to pipe	2880	1440	5									
4/13/2015	Woodbine Cir	S16-128	S16-129	8	116	AC	13							17								
4/13/2015	Woodbine Cir	S16-124	S16-125	8	122	AC	13							17								
4/13/2015	Woodbine Cir	S16-125	S16-126	8	206	AC	13							17								$2,500.00
									44	Infiltration Runner at tap joint to pipe	2880	1440	4		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/13/2015	Woodbine Cir	S16-126	S17-087	8	39	AC	13							17								$20,850.00
										Infiltration in bench S16-126	1440	720	4		Replace Manhole		1	EA	$15,000.00	$15,000.00		
															Remove and Replace Pipe		39	LF	$150.00	$5,850.00		
4/13/2015	Woodbine Cir	S17-087	S17-088	8	319	AC	13							17								$33,360.00
										MAJOR INFILTRATION IN BENCH S17-087	7200	3600	5		Replace Manhole		1	EA	$15,000.00	$15,000.00		
									315	Infiltration Runner at Joint	720	360	3		CIPP		319	LF	$40.00	$12,760.00		
										Seal all Laterals (7)							7	EA	$800.00	$5,600.00		
4/13/2015	Saint Mary St	S02-038	S02-037	8	49	AC	13							17								
										TOTAL	90,060	45,030							TOTAL	$243,230	$12,300	$255,530

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Appendix D
TV Inspection Summary Subarea 19.1

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
5/2/2014	Oak St	S39-085	S39-106	12	125	CI	12							19.1								
5/2/2014	Oak St	S39-106	S39-107	12	287	CI	18							19.1								
								42		Minor Longitudinal Crack			1			1						
5/2/2014	Oak St	S39-085	S39-062	12	314	CI	18							19.1								
5/2/2014	Oak St	S39-107	S39-108	12	288	PVC	13							19.1								
								77		Water Level 25%			1									
								89		Water Level 5%			1									
5/2/2014	Henderson St	S39-087.1	S39-087	8	97	VCP	3							19.1								
								94		Offset Joint Medium			2									
5/2/2014	Henderson St	S39-087	S39-086	8	146	PVC	3							19.1								
								20		Fine Roots at Joint			1									
								35		Fine Roots at Joint			1									
								57		Fine Roots at Joint			1									
5/2/2014	Walnut St	S39-090	S39-087.1	8	217	VCP	3							19.1								
								28		Light Mineral Deposits Attached			1									
								34		Light Mineral Deposits Attached			1									
								141		Fine Roots at Joint			1									
								200		Fine Roots at Joint			1									
5/2/2014	Henderson St	S39-086	S39-085	8	391	PVC	12							19.1								$2,050.00
								88		Fine Roots at Joint			1									
								320		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
5/2/2014	Walnut St	S39-097	S39-090	8	221	VCP	3							19.1								
								5		Fine Roots at Joint			1									
								58		Fine Roots at Joint			1									
								81		Fine Roots at Joint			1									
								99		Light Mineral Deposits Attached			1									
								110		Light Mineral Deposits Attached			1									
								118		Fine Roots at Joint			1									
								211		Fine Roots at Joint			1									
								214		Fine Roots at Joint			1									
								216		Fine Roots at Joint - START			1			5						
								221		Fine Roots at Joint - FINISH			1									
5/2/2014	Walnut St	S39-097	S39-098	6	104	VCP	3							19.1								
5/3/2014	Blake St	S39-045	S39-046	8	183	PVC	12							19.1								
								177		Offset Joint Medium			2									
5/3/2014	Blake St	S39-047	S39-046	8	135	PVC	12							19.1								
								52		Minor Roots in Lateral Service			1									
								124		Protruding Service Lateral			1									
5/3/2014	Blake St	S39-047	S39-048	8	198	PVC	12							19.1								$2,050.00
								2		Water Level 20%			1									
								5		Offset Joint Medium			1									
								5		Joint Leaking	180	90	4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								24		Water Level 5%			1									
								81		Minor Circumferential Fracture			1			1						
								84		Water Level 20%			1									
								90		Water Level 5%			1									
5/3/2014	Blake St	S39-048	S39-049	8	221	PVC	12							19.1								$2,825.00
								31		Protruding Service Lateral			1									
								110		Protruding Service Lateral			4		Cut protruding lateral		1	EA	$325.00		$325.00	
								110		Service Connection at Main Leaking	180	90	4		Lateral Grout	1	1	EA	$2,500.00		$2,500.00	
5/3/2014	Miller Street Easement	S39-049	S39-050	8	199	PVC	12							19.1								
5/3/2014	Memorial Cir	S49-095	S49-094	8	97	VCP	3							19.1								
								62		Fine Roots at Joint			1									
5/3/2014	Memorial Cir	S49-094	S49-093	8	124	VCP	3							19.1								$217.00
								57		Fine Roots at Joint			1									
								72		Moderate Longitudinal Fracture - START			3		Chemical Root Treatment	21	124	LF	$1.75	$217.00		
								93		Moderate Longitudinal Fracture - FINISH			3									
5/3/2014	Harding Rd	S49-100	S39-032	8	197	PVC	12							19.1								
5/3/2014	Harding Rd	S39-032	S39-034	8	169	PVC	12							19.1								
5/3/2014	Overlook Rd	S39-033	S39-034	8	124	PVC	12							19.1								
5/3/2014	Overlook Rd	S39-034	S39-036	8	140	PVC	12							19.1								$550.00
								140		Heavy Leak at pipeline connection to manhole	1440	720	5		Grout Pipe Connection at Manhole		1	EA	$550.00	$550.00		
5/3/2014	Oakcrest Rd	S39-035	S39-036	8	41	PVC	12							19.1								
5/3/2014	Henderson St	S39-037	S39-052	8	307	VCP	3							19.1								$2,050.00
								62		Leak at Joint	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								97		Obstacle thru Connection 5%			1									
5/3/2014	Henderson St	S39-052	S39-053	8	72	VCP	3							19.1								
5/3/2014	Henderson St	S39-053	S39-054	8	100	VCP	3							19.1								
								60		Light Mineral Deposits Attached			1									
								91		Light Mineral Deposits Attached			1									

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Appendix D
TV Inspection Summary Subarea 19.1

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
5/5/2014	Barrett St	S49-008	S49-018	8	165	PVC	12							19.1								$9,800.00
								3		Minor Circumferential Fracture			1		CIPP		165	LF	$40.00	$6,600.00		
								86		Heavy Leak at Joint	2880	1,440	5		CIPP (Included Above)							
								129		Heavy Leak at Joint	1440	720	4		CIPP (Included Above)							
								143		Lining Failure Defect			3		CIPP (Included Above)							
															seal all laterals (4)		4	EA	$800.00		$3,200.00	
5/5/2014	Barrett St	S49-014	S49-015	8	165	PVC	12							19.1								$2,850.00
								65		Moderate Leak in service connection to main	1000	500	3		lateral grout up to 5 ft		1	EA	$800.00	$800.00		
								110		Fine Roots at Joint			1									
								114		Heavy Leak at Joint	1440	720	4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
5/5/2014	Barrett St	S49-015	S49-017	8	216	PVC	12							19.1								$5,000.00
								62		Moderate Leak in service connection to main	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
								202		Moderate Leak in service connection	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
5/5/2014	Barrett St	S49-015	S49-017	8	216	PVC	12							19.1								$2,500.00
								26		Leak in Service Lateral	360	180	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
								50		Minor Longitudinal Fracture			2									
5/6/2014	Barrett St	S39-002	S39-001	8	198	other	3							19.1								$265.00
								150		Heavy Mineral Buildup in service			4		Heavy Cleaning		1	HR	$265.00	$265.00		
5/6/2014	Barrett St	S39-001	S49-006	8	199	other	3							19.1								$2,500.00
								156		Moderate Leak in service connection to main	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
5/6/2014	Barrett St	S49-006	S49-005	8	128	other	3							19.1								
5/6/2014	Francess St	S49-001	S49-003	8	66	PVC	12							19.1								$2,615.50
								9		Moderate Roots at Joint - START			3		Chemical Root Treatment	27	66	LF	$1.75	$115.50		
								36		Moderate Roots at Joint - FINISH			3									
								49		Minor Leak at service connection to main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
								62		Fine Roots at Joint			1									
5/6/2014	Francess St	S49-003	S49-004	8	129	other	12							19.1								$5,000.00
								4		Minor leak at connection to service	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
								49		Minor leak at connection to service	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
5/6/2014	Francess St	S49-004	S49-005	8	199	other	12							19.1								
								129		Moderate Grease in service			3		Homeowners Responsibility							
5/6/2014	Francess St	S49-005	S49-040	8	328	other	12							19.1								
5/6/2014	Deer Field Rd	S49-013	S49-012	8	179	other	12							19.1								
5/6/2014	Deer Field Rd	S49-012	S49-011	8	104	PVC	12							19.1								$550.00
								0		Minor leak in crack	180	90	3		Grout Pipe Connection at Manhole		1	EA	$550.00	$550.00		
								4		Minor Circumferential Fracture in pipe wall			1									
5/6/2014	Deer Field Rd	S49-011	S49-010	8	43	PVC	12							19.1								
								27		Light Mineral Deposits Attached			1									
5/6/2014	Deer Field Rd	S49-010	S49-010A	8	139	PVC	12							19.1								$2,500.00
								5		Minor Circumferential Fracture			1									
								10		Minor leak at service connection to main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
5/6/2014	Deer Field Rd	S49-010A	S49-009	8	188	PVC	12							19.1								$4,100.00
								76		Moderate leak in service cap	360	180	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								155		Light Mineral Deposits Attached			1									
								169		Minor leak in service cap	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
5/6/2014	Deer Field Rd	S49-010A	S49-016	8	188	other	12							19.1								
5/6/2014	Deer Field Rd	S49-016	S49-017	8	154	other	12							19.1								
5/6/2014	Gilbert Rd	S48-041	S48-040	8	150	PVC	12							19.1								$4,550.00
								24		Minor Leak in capped service	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								105		Minor Leak at Chimney	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
5/6/2014	Gilbert Rd	S48-040	S49-003	8	158	AC	12							19.1								$276.50
								129		Medium Roots at Joint			3		Chemical Root Treatment		158	LF	$1.75	$276.50		
5/7/2014	Gilbert Rd	S38-024	S38-025	8	152	AC	12							19.1								$265.00
								57		Heavy Grease deposits			4		Heavy Cleaning		1	HR	$265.00	$265.00		
5/7/2014	Gilbert Rd	S38-025	S38-026	8	123	AC	12							19.1								$265.00
								79		Moderate Grease deposits			3		Heavy Cleaning		1	HR	$265.00	$265.00		
5/7/2014	Robinwood Ave	S49-025	S49-024	8	142	AC	12							19.1								
								13		Light Mineral Deposits Attached			1									
5/7/2014	Robinwood Ave	S49-026	S49-027	8	83	AC	12							19.1								$2,050.00
								6		Heavy Leak at joint to sealed Chimney Service	2880	1,440	5		Point Repair up to 4 ft		1	EA	$2,050.00		$2,050.00	
								6		Fine Roots at joint to chimney service			1									
5/7/2014	Robinwood Ave Easement	S49-027	S49-024	8	94	PVC	12							19.1								
5/7/2014	Robinwood Ave Easement	S49-024	S49-023	8	141	AC	12							19.1								$7,550.00
								0		Heavy Leak at joint	2160	1,080	4		Remove and Replace		1	EA	$5,500.00	$5,500.00		
								93		Chip at Joint			3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
5/7/2014	Robinwood Ave Easement	S49-023	S49-022	8	221	AC	12							19.1								
								221		Moderate Roots in Manhole			2									
5/7/2014	Robinwood Ave Easement	S49-022	S49-021	8	130	AC	12							19.1								
5/7/2014	Robinwood Ave Easement	S49-021	S49-020	8	140	AC	12							19.1								
5/7/2014	Deer Field Rd Easement	S49-019	S49-012	8	158	PVC	12							19.1								
5/7/2014	Deer Field Rd Easement	S49-019	S49-020	8	146	AC	12							19.1								
								131		Minor Roots at Joint			1									
5/7/2014	Robinwood Ave	S49-031	S49-032	8	78	PVC	12							19.1								

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TV Inspection Summary Subarea 19.1

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
5/7/2014	Robinwood Ave	S49-032	S49-033	8	136	PVC	12							19.1								
								27		Light Mineral Deposit Attachments			1									
								58		Light Grease Deposit Attachments			1									
								76		Light Grease Deposit Attachments - START			1			58						
								134		Light Grease Deposit Attachments - FINISH			1									
5/7/2014	Robinwood Ave	S49-033	S49-005	8	74	PVC	12							19.1								
5/7/2014	Robinwood Ave	S49-005	S49-051A	8	54	PVC	12							19.1								
5/7/2014	Robinwood Ave	S49-029	S49-030	8	66	PVC	12							19.1								
								64		Joint Offset Medium			2									
5/7/2014	Robinwood Ave	S49-029	S49-028	8	202	PVC	12							19.1								
5/9/2014	High Rock St	S49-052	S49-051	8	128	VCP	12							19.1								$2,050.00
								37		Minor Longitudinal Crack			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								38		Leak at Longitudinal Crack	720	360	3		Point Repair up to 4 ft (Included Above)							
5/9/2014	High Rock St	S49-051	S49-034	8	170	VCP	12							19.1								$4,100.00
								33		Multiple Moderate Fractures			3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								75		Chip at Joint			2									
								75		Joint Leaking	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
5/9/2014	High Rock St	S49-034	S49-036	8	336	VCP	12							19.1								$4,100.00
								184		Leak at Capped service entrance	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								204		Leak at Capped service entrance	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								333		Minor Longitudinal Fracture			2									
5/9/2014	High Rock St	S49-036	S49-037	8	249	VCP	12							19.1								
5/9/2014	High Rock St	S49-037	S49-038	8	98	VCP	12							19.1								
5/9/2014	High Rock St	S49-038	S49-039	8	143	VCP	12							19.1								$5,500.00
								19		Multiple Fractures			2									
								67		Water Level 20%			1									
								88		Heavy Leak at service connection to main	5760	2,880	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
								88		Minor Longitudinal Crack			1									
5/9/2014	High Rock St	S49-039	S49-041	10	197	VCP	12							19.1								$7,800.00
								27		Leak at Joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,300.00	$2,300.00		
								56		Minor Longitudinal Crack			1									
								87		Minor Mineral deposits attached			1									
								96		Minor Longitudinal Crack			1									
								171		Heavy Leak in service connection	2880	1,440	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
5/9/2014	Birchwood Rd	S49-041	S49-042	8	195	other	12							19.1								
5/9/2014	Barrett Street Easement	S49-018	S49-038	8	290	other	12							19.1								
								142		Water Level 15%			1									
								245		Water Level 10%			1									
								257		Camera Underwater			1									
								272		Water Level 10%			1									
5/12/2014	High Rock St	S38-038	S39-012	8	226	PVC	12							19.1								$395.50
								102		Medium Roots at Joint			3		remove roots		226	LF	$1.75	$395.50		
5/12/2014	High Rock St	S39-012	S39-011	8	251	PVC	12							19.1								
								158		Fine Roots at Joint			1									
5/12/2014	High Rock St	S39-011	S39-010	8	309	VCP	12							19.1								$15,100.00
								6		Minor Circumferential Crack			2									
								136		Moderate Longitudinal Fracture			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								138		Moderate Circumferential Fracture			3		Point Repair up to 4 ft (Included Above)							
								195		Moderate Leak at Service Connection to Main	720	360	3		Lateral grout up to 5 ft		1	EA	$2,050.00	$2,050.00		
								245		Moderate Longitudinal Fracture			3									
								245		Heavy Leak at Service connection to main	2880	1,440	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
								257		Moderate Circumferential Fracture at Service			3		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
5/12/2014	High Rock St	S39-010	S39-009	8	126	PVC	12							19.1								
5/12/2014	High Rock St	S39-009	S39-008	8	203	VCP	12							19.1								$9,720.00
								53		Moderate Multiple Fractures			3		CIPP		203	LF	$40.00	$8,120.00		
								56		Light Grease Deposits attached			1		CIPP (Included Above)							
								121		Moderate Spiral Fracture	720	360	4		CIPP (Included Above)							
								177		Water Level 10%			1		CIPP (Included Above)							
								180		Water Level 10%			1		CIPP (Included Above)							
								198		Light Mineral Deposits Attached			1		CIPP (Included Above)							
															seal all laterals (2)		2	EA	$800.00		$1,600.00	
5/12/2014	Marked Tree Rd	S39-008	S39-028	8	85	PVC	12							19.1								
5/12/2014	Marked Tree Rd	S39-028	S39-031	8	252	PVC	12							19.1								
5/12/2014	High Rock St	S39-006	S39-007	8	137	PVC	12							19.1								$239.75
								21		Minor Offset Joint			2									
								57		Light Grease Deposits attached			2									
								81		Medium Roots at Joint - START			3		Chemical Root Treatment	53	137	LF	$1.75	$239.75		
								101		Minor Mineral deposits attached			1									
								134		Medium Roots at Joint - FINISH			3									
5/12/2014	High Rock St	S39-007	S39-008	8	195	PVC	12							19.1								
5/15/2014	Fairview Rd	S49-042	S39-029	8	235	other	3							19.1								$2,500.00
								1		Leak at service connection to main	180	90	3		Lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
								4		Water Level 20%			1									
5/15/2014	Fairview Rd	S39-029	S39-030	8	298	other	3							19.1								

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Appendix D
TV Inspection Summary Subarea 19.1

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
5/15/2014	Fairview Rd	S39-030	S39-031	8	194	PVC	12							19.1								
5/15/2014	Mallard Rd	S29-027	S29-026	8	148	VCP	12							19.1								
								123		Water Level 20%			1									
5/15/2014	Mallard Rd	S29-026	S28-048	8	148	AC	12							19.1								
5/15/2014	Noyes St	S28-053	S28-052	8	71	AC	12							19.1								
5/15/2014	Noyes St	S28-052	S28-050	8	221	AC	12							19.1								$386.75
								2		Medium Roots at Joint			3		Chemical Root Treatment		221	LF	$1.75	$386.75		
5/15/2014	Noyes St	S28-050	S28-049	8	170	AC	12							19.1								
								132		Water Level 20%			1									
								140		Water Level 20%			1									
5/15/2014	Pheasant Rd	S28-049	S28-048	8	162	AC	12							19.1								
5/15/2014	Pheasant Rd	S28-048	S29-009	8	198	AC	12							19.1								
								90		Water Level 15%			1									
								167		Water Level 50%			1									
5/15/2014	Pheasant Rd	S29-009	S29-013	8	199	AC	12							19.1								
5/19/2014	Fairview Rd	S49-047	S49-048	8	85	VCP	3							19.1								$650.00
								62		Fine Roots at Joint			1									
								72		Moderate Roots in Service			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
5/19/2014	Fairview Rd	S49-047	S49-046	8	209	VCP	3							19.1								
								23		Fine Roots at Joint			1									
5/19/2014	Fairview Rd	S49-046	S49-045	8	181	VCP	3							19.1								
5/19/2014	Fairview Rd	S49-045	S49-043	8	203	VCP	3							19.1								
								18		Minor Multiple Fractures			2									
								141		Fine Roots at Joint			1									
								171		Minor Multiple Cracks			1									
5/19/2014	Linden St	S49-049	S49-050	8	128	PVC	12							19.1								
5/19/2014	Linden St	S49-050	S49-051A	8	165	PVC	12							19.1								
5/19/2014	Linden St	S49-072	S49-073	8	122	VCP	3							19.1								$5,500.00
								19		Heavy Leak at service connection to Chimney	2880	1,440	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
5/19/2014	Linden St	S49-073	S49-074	8	152	VCP	3							19.1								
5/19/2014	Linden St	S49-074	S49-075	8	126	other	3							19.1								
5/19/2014	Linden St	S49-075	S49-076	8	91	PVC	12							19.1								
5/19/2014	Linden St	S49-076	S49-077	8	109	VCP	3							19.1								
								71		Minor Circumferential Crack			1									
5/19/2014	Linden St	S49-077	S49-078	8	74	VCP	3							19.1								$2,050.00
								4		Minor Circumferential Crack			1									
								40		Leak at Joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
5/19/2014	Linden St	S49-078	S49-079	8	104	PVC	12							19.1								
5/19/2014	Linden St	S49-079	S49-080	8	55	VCP	3							19.1								
5/19/2014	Summit Rd	S49-069	S49-070	8	114	VCP	3							19.1								
								2		Minor Multiple Fractures			1									
5/19/2014	Summit Rd	S49-070	S49-071	8	120	VCP	3							19.1								
5/19/2014	Summit Rd	S49-071	S49-072	8	71	VCP	3							19.1								
5/19/2014	Murphy Rd	S49-057	S49-058	8	303	VCP	3							19.1								$2,500.00
								76		Chip at Joint			1									
								146		Moderate Leak in service	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
5/19/2014	Murphy Rd	S49-058	S49-065	8	175	VCP	3							19.1								$550.00
								0		Minor Leak at joint	360	180	2		Grout Pipe Connection at Manhole		1	EA	$550.00	$550.00		
								63		Fine Roots at Joint			1									
								72		Fine Roots at Joint			1									
								77		Fine Roots at Joint			1									
5/19/2014	Murphy Rd	S49-065	S49-066	8	175	VCP	3							19.1								
								28		Minor Longitudinal Crack			1									
								163		Fine Roots at Joint			1									
								172		Fine Roots at Joint			1									
								174		Minor Circumferential Fracture			1									
5/19/2014	Murphy Rd	S49-066	S49-067	8	128	VCP	3							19.1								
								61		Obstacle 10%			1									
5/19/2014	Murphy Rd	S49-067	S49-075	8	105	VCP	3							19.1								
5/20/2014	Yurick Rd	S49-062	S49-061	8	73	VCP	3							19.1								
								2		Fine Roots at Joint			1									
								2		Minor Multiple Cracks			1									
5/20/2014	Yurick Rd	S49-062	S49-063	8	72	VCP	3							19.1								$126.00
								0		Medium Roots at Joint			3		remove roots		72	LF	$1.75	$126.00		
5/20/2014	Yurick Rd	S49-063	S49-064	8	227	VCP	3							19.1								$2,447.25
								1		Minor Circumferential Fracture			1									
								42		Obstacle			1									
								60		Moderate Longitudinal Fracture			3		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								71		Fine roots at joint			1									
								80		minor multiple fractures			1									
								97		minor multiple cracks			2									
								118		minor multiple fractures			2									
								148		Medium roots out of service joint			3		Chemical Root Treatment		227	LF	$1.75	$397.25		
								171		Minor Circumferential Fracture			1									

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5/20/2014	Yurick Rd	S49-064	S49-077	8	65	VCP	3							19.1								
5/20/2014	Yurick Rd	S49-060	S49-059	8	145	VCP	3							19.1								$253.75
								57		Minor Circumferential Crack			1									
								59		Minor Circumferential Crack			1									
								59		Fine roots at joint			1									
								66		Minor Circumferential Crack			1									
								66		Fine roots at joint			1									
								71		Fine roots at joint - START			1									
								75		Minor Circumferential Fracture			1									
								111		Medium root at joint - START			3		chemical root treatment		145	LF	$1.75	$253.75		
								145		Fine roots at joint - FINISH			1									
								145		Medium root at joint - FINISH			3									
5/20/2014	Yurick Rd	S49-059	S49-058	8	213	VCP	3							19.1								
5/20/2014	Marked Tree Rd	S38-021	S38-022	8	166	PVC	12							19.1								
5/20/2014	Marked Tree Rd	S38-022	S38-023	8	240	PVC	12							19.1								
5/20/2014	Marked Tree Rd	S38-023	S38-027	8	151	PVC	12							19.1								
								67		Fine roots at joint			1									
								113		Fine roots at joint			1									
5/20/2014	Marked Tree Rd	S38-027	S38-028	8	87	PVC	12							19.1								
5/20/2014	Marked Tree Rd	S38-028	S39-003	8	242	PVC	12							19.1								$2,500.00
								67		Fine roots at joint			1									
								149		Moderate leak at service connection to main	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
5/20/2014	Marked Tree Rd	S39-003	S39-008	8	140	PVC	12							19.1								
5/21/2014	Marked Tree Rd	S39-031	S39-041	8	205	PVC	12							19.1								
5/21/2014	Marked Tree Rd	S39-041	S39-042	8	185	PVC	12							19.1								
5/21/2014	Marked Tree Rd	S39-042	S39-043	8	54	PVC	12							19.1								
5/21/2014	Marked Tree Rd	S39-043	S39-044	8	45	PVC	12							19.1								
5/21/2014	Marked Tree Rd	S39-044	S39-055	8	248	PVC	12							19.1								$4,100.00
								114		Leak at Joint	360	180	3		Point repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								133		minor circumferential fracture			1									
								167		Leak at Joint	360	180	3		Point repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								194		Fine roots at joint			1									
								215		minor circumferential fracture			1									
5/21/2014	Marked Tree Rd	S39-055	S39-056	8	93	PVC	12							19.1								
								21		Fine roots at joint			1									
5/21/2014	Marked Tree Rd	S39-056	S39-062	8	96	PVC	12							19.1								
										Minor Longitudinal Fracture			1									
5/21/2014	Marked Tree Rd	S39-084	S39-083	8	180	PVC	6							19.1								
5/21/2014	Marked Tree Rd	S39-083	S39-082	8	296	PVC	12							19.1								
								85		Moderate multiple cracks			1									
								113		Moderate multiple cracks - START			2									
								119		Moderate multiple cracks - FINISH			2									
								123		Moderate multiple cracks - START			2									
								163		Moderate multiple cracks			2									
								292		Moderate multiple cracks - FINISH			2									
5/21/2014	Marked Tree Rd	S39-082	S39-081	8	296	PVC	12							19.1								
								15		Moderate multiple cracks - START			2									
								79		Moderate multiple cracks - FINISH			2									
5/21/2014	Marked Tree Rd	S39-081	S39-064	8	131	PVC	12							19.1								
								121		Minor Circumferential Fracture			1									
5/21/2014	Marked Tree Rd	S39-064	S39-063	8	95	PVC	12							19.1								
								4		Medium offset joint			2									
								43		Fine roots at joint - START			1									
								65		Fine roots at joint - FINISH			1									
5/21/2014	Marked Tree Rd	S39-063	S39-062	8	77	PVC	12							19.1								
								4		Medium offset joint			2									
5/22/2014	Evelyn Rd	S10-071	S10-070	8	193	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-070	S10-069	8	152	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-069	S10-068	8	77	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-068	S10-067	8	123	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-067	S10-066	8	225	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-066	S10-065	8	222	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-064	S10-065	8	67	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-064	S10-063	8	193	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-063	S10-061	8	69	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-061	S10-060	8	127	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-060	S10-059	8	66	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-059	S10-058	8	76	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-058	S10-056	8	96	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-054	S10-053	8	168	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-054	S10-055	8	250	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-055	S10-056	8	12	AC	12							19.1								
5/22/2014	Evelyn Rd	S10-056	S10-055	8	94	AC	12							19.1								
5/23/2014	Harvard Rd	S10-077	S10-076	8	122	AC	12							19.1								

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5/23/2014	Harvard Road Easement	S10-076	S10-073	8	191	AC	12							19.1								
5/23/2014	Yale Rd	S10-073	S10-072	8	50	AC	12							19.1								
5/23/2014	Yale Rd	S10-072	S10-119	8	134	AC	12							19.1								
5/23/2014	Yale Rd	S10-073	S10-074	8	269	AC	12							19.1								
5/23/2014	Yale Rd	S10-074	S10-075	8	178	AC	12							19.1								
5/23/2014	Yale Rd	S10-075	S10-060	8	171	AC	12							19.1								
5/23/2014	Evelyn Road Easement	S10-056	S10-057	8	7	AC	12							19.1								
5/23/2014	Evelyn Road Easement	S10-057	S05-044	8	14	AC	12							19.1								
										TOTAL	39,880	19,940							TOTAL	$94,623	$40,325	$134,948

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TV Inspection Summary Subarea 20

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/18/2014	Dunster Rd	S22-111	S22-110	8	252	VCP	3							20								
3/18/2014	Dunster Rd	S22-110	S23-016	8	251	VCP	3							20								
3/18/2014	Dartmouth Ave	S22-112	S23-021	8	99	VCP	3							20								
3/18/2014	Dartmouth Ave	S23-021	S22-020	8	78	VCP	3							20								
								5		Minor longitudinal crack			1			4						
3/18/2014	Dartmouth Ave	S23-020	S23-019	8	78	VCP	3							20								
3/18/2014	Dartmouth Ave	S23-019	S23-127	8	298	VCP	3							20								$8,000.00
								70		Service Lateral Leaking	4320	2160	4		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
									90	Minor Longitudinal Cracks			1			2.5						
									73	Minor Longitudinal Cracks			1			2.7						
									108	Minor Longitudinal Cracks			1			2.5						
									114	Minor Longitudinal Cracks			1			2.8						
									119	Minor Longitudinal Cracks			1			3						
								156		Service Lateral Leaking	180	90	3		Lateral Grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
									222	Minor Longitudinal Cracks			1			1.2						
									297	Minor Longitudinal Cracks			1			1.5						
3/18/2014	Tower Ave	S23-029	S23-028	8	290	VCP	3							20								
								56		Light Roots at Joint			1									
3/19/2014	Dunster Rd	S23-016	S23-014	8	273	VCP	3							20								
3/19/2014	Dartmouth Ave	S23-018	S23-017	8	56	VCP	3							20								
3/19/2014	Tower Ave	S23-028	S23-027	8	250	VCP	3							20								
								12		Moderate Roots at Service Lateral			2									
								18		Light Roots at Joint			1									
3/19/2014	Tower	S23-027	S23-024	8	250	VCP	3							20								$14,000.00
								48		Leaking Joint	2440	1220	3		CIPP		250	LF	$40.00	$10,000.00		
															Seal all laterals (5)		5	EA	$800.00		$4,000.00	
3/19/2014	Lindbergh Ave	S23-031	S23-030	8	188	VCP	3							20								$5,500.00
								183		Service Joint Connection Leaking	2440	1220	3		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
3/19/2014	Lindbergh Ave	S23-030	S23-024	8	223	VCP	3							20								$2,050.00
								28		Light Mineral Deposits Attached			1									
									71	Mineral Deposits Attached			1									
								214		Minor Longitudinal Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
3/19/2014	Lindbergh Ave	S23-024	S23-022	8	200	VCP	3							20								$5,500.00
								8		Service Connection Leaking	2160	1,080	3		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
3/20/2014	James Ave	S22-105	S22-104	8	295	VCP	3							20								$15,000.00
								156		Leaking Joint	2160	1,080	4		CIPP		295	LF	$40.00	$11,800.00		
								293		Minor longitudinal crack			1			1						
															Seal all laterals (4)		4	EA	$800.00		$3,200.00	
3/20/2014	Lindbergh Ave	S23-022	S23-023	8	199	VCP	3							20								
3/20/2014	Lindbergh Ave	S23-022	S23-017	8	92	VCP	3							20								$2,500.00
								31		Service Connection Leaking	720	360	3		Lateral Grout up to 5 ft		1	EA	$2,500.00	$2,500.00		
3/20/2014	Lindbergh Ave	S23-017	S23-015	8	151	VCP	3							20								$2,050.00
								17		Light Mineral Deposits Attached			1									
								31		Light Mineral Deposits Attached			1									
								151		Multiple Moderate Cracks			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
3/20/2014	Lindbergh Ave	S23-015	S23-014	8	217	VCP	3							20								$11,880.00
								38		Leaking Joint	720	360	1		CIPP		217	LF	$40.00	$8,680.00		
								66		Light Mineral Deposits Attached			1									
								125		Minor Longitudinal Crack			1			4						
								127		Moderate Spiral Fracture			2			1						
								138		Moderate Circumferential Fracture			4			1	1					
								147		Light Roots at Joint			1									
								211		Moderate Circumferential Crack			2			1						
								214		Moderate Circumferential Fracture			4			1	1					
								215		Multiple Moderate Fractures			4			2						
															Seal all laterals (4)		4	EA	$800.00		$3,200.00	
3/20/2014	Lindbergh Ave	S23-014	S23-013	8	143	VCP	3							20								$2,050.00
								2		Multiple Major Fractures			4		point repair up to 4 ft	3	1	EA	$2,050.00	$2,050.00		
								53		Light Roots at Joint			1									
3/20/2014	Lindbergh Ave	S23-013	S22-081	8	184	VCP	3							20								
3/20/2014	Lindbergh Ave	S22-081	S22-080	8	72	VCP	3							20								$2,050.00
								1		Moderate Circumferential Fracture			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
3/20/2014	Lindbergh Ave	S22-080	S22-079	8	112	VCP	3							20								$6,080.00
								95		Leaking Joint	720	360	3		CIPP		112	LF	$40.00	$4,480.00		
															Seal all laterals (2)		2	EA	$800.00		$1,600.00	
3/20/2014	Lindbergh Ave	S22-079	S22-078	8	261	VCP	3							20								$2,500.00
								170		Light Mineral Deposits Attached			1									
								194		Service Lateral Leaking	360	180	3		Lateral Grout up to 5 ft		1	EA	$2,500.00	$2,500.00		
3/20/2014	Lindbergh Ave	S22-076	S22-077	8	264	VCP	3							20								

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Appendix D

TV Inspection Summary Subarea 20

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/20/2014	Lindbergh Ave	S22-077	S22-078	8	250	VCP	3							20								
3/21/2014	Manning Street	S22-084	S22-083	8	230	VCP	3							20								
									1	Minor Longitudinal Crack			1			1						
									151	Minor Longitudinal Crack			1			1						
3/21/2014	Manning Street	S22-083	S22-078	8	320	VCP	3							20								$14,150.00
									120	Heavy Roots at Service Entrance			3		Remove Lateral Roots		1	EA	$650.00	$650.00		
								120		Service Lateral Leaking	360	180	3		Lateral Grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
								124		Leaking Joint in Service	2160	1,080	4		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
									124	Heavy Roots at Service Entrance			2									
								229		Service Lateral Leaking	1080	540	3		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
3/21/2014	Manning Street	S22-078	S22-104	8	187	VCP	3							20								
3/21/2014	Manning Street	S22-104	S22-075	8	119	VCP	3							20								
3/21/2014	Manning Street	S22-075	S22-072	8	264	VCP	3							20								
								61		Minor Circumferential Fracture			1			1						
3/21/2014	Manning Street	S22-072	S30-098	8	280	VCP	3							20								
								141		Moderate Roots In Service			1									
								220		Minor longitudinal crack			1			1						
3/21/2014	Brookline St	S23-012	S23-011	8	299	VCP	3							20								$18,625.00
								52		Minor Circumferential Fracture			2		CIPP		299	LF	$40.00	$11,960.00		
								62		Minor Circumferential Fracture			2		CIPP (Included Above)							
								70		Multiple Moderate Fractures			3		CIPP (Included Above)							
								74		Broken WYE			1		CIPP (Included Above)							
								75		Multiple Moderate Fractures			3		CIPP (Included Above)	10						
								84		Hole - Soil Visible			5		CIPP (Included Above)							
								85		Multiple Heavy Fractures			4		CIPP (Included Above)	21						
								104		Multiple Heavy Fractures			4		CIPP (Included Above)	4						
								120		Multiple Moderate Fractures			3		CIPP (Included Above)	5						
								135		Multiple Moderate Fractures			3		CIPP (Included Above)	11						
								140		Broken - void visible			5		CIPP (Included Above)							
								144		Multiple Moderate Fractures			3		CIPP (Included Above)							
								178		Obstacle			1		Heavy Cleaning		1	HR	$265.00	$265.00		
								196		Multiple Heavy Fractures			3		CIPP (Included Above)	5						
								234		Minor Circumferential Fracture			1		CIPP (Included Above)							
								240		Minor Circumferential Fracture			1		CIPP (Included Above)							
								252		Multiple Heavy Fractures			4		CIPP (Included Above)	8						
								269		Minor Circumferential Fracture			1		CIPP (Included Above)							
								272		Minor Circumferential Fracture			1		seal all laterals (8)		8	EA	$800.00		$6,400.00	
3/19/2014	Donna Rd	S22-109	S22-108	8	145	VCP	5							20								$7,400.00
								0		Light Mineral Deposits Attached			1									
								0		Multiple Minor Cracks - START			2		CIPP	47	145	LF	$40.00	$5,800.00		
								6		Light Mineral Deposits Attached - START			1			41						
									36	Chip at joint			3		CIPP (Included Above)							
								47		Multiple Minor Cracks - FINISH			4		CIPP (Included Above)	1						
								47		Light Mineral Deposits Attached - FINISH			1									
								53		Multiple Minor Cracks			4		CIPP (Included Above)	1						
								57		Defective Tap			4									
								57		Service Lateral Leaking			4									
								59		Light Mineral Deposits Attached			1									
								70		Multiple Fractures			3		CIPP (Included Above)	1						
									70	Chip at joint			3		CIPP (Included Above)							
								74		Light Mineral Deposits Attached			1									
								91		Light Mineral Deposits Attached			1									
								94		Light Mineral Deposits Attached			1									
								103		Light Mineral Deposits Attached			1									
								136		Multiple Minor Cracks			1		CIPP (Included Above)	1						
								139		Multiple Moderate Cracks			4		seal all laterals (2)		2	EA	$800.00		$1,600.00	

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Appendix D

TV Inspection Summary Subarea 20

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/19/2014	Donna Rd	S22-108	S22-107	8	147	VCP	3							20								$8,280.00
								1		Moderate Spiral Fracture			3		CIPP	2	147	LF	$40.00	$5,880.00		
								13		Moderate Circumferential Crack			2		CIPP (Included Above)	1						
								21		Minor Longitudinal Crack			1		CIPP (Included Above)	3						
								32		Minor Circumferential Fracture			1		CIPP (Included Above)	1						
								46		Broken - Soil Visible			5		CIPP (Included Above)							
								49		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								53		Moderate Spiral Fracture			4		CIPP (Included Above)	2						
								59		Minor Mineral Deposits Attached			1									
								71		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								80		Moderate Spiral Fracture			4		CIPP (Included Above)	1						
								86		Minor Multiple Cracks			3		CIPP (Included Above)	2						
									128	Chip at joint			3		CIPP (Included Above)							
								129		Minor Circumferential Fracture			1		CIPP (Included Above)	1						
								130		Heavy Spiral Fracture			4		CIPP (Included Above)	2						
								130		Service Connection to Main Leaking	180	90	4									
									136	Chip at joint			3		CIPP (Included Above)							
								137		Minor Circumferential Fracture			1		CIPP (Included Above)							
															seal all laterals (3)		3	EA	$800.00		$2,400.00	
3/19/2014	Donna Rd	S22-107	S22-106	8	299	VCP	3							20								$2,050.00
								1		Minor Spiral Crack			1			2						
								31		Minor Multiple Cracks			1			5						
								52		Moderate Spiral Fracture			4		point repair up to 4 ft	2	1	EA	$2,050.00	$2,050.00		
								55		Minor Circumferential Fracture			1									
									55	Chip at joint			1									
								87		Fine Roots at Joint			1									
								90		Minor Multiple Cracks			1			1						
								144		Minor Longitudinal Crack			1			1						
								226		Minor Longitudinal Crack			1			1						
								230		Protruding Tap			1									
								297		Minor Longitudinal Crack			1			1						
3/19/2014	Donna Rd	S22-106	S22-080	8	299	VCP	3							20								$14,360.00
								23		Minor Spiral Crack			1		CIPP	2	299	LF	$40.00	$11,960.00		
								33		Water level 10%			1									
								51		Water Level 5%			1									
								89		Water level 10%			1									
									100	Chip in pipe wall			2									
								110		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								113		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								128		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								130		Water Level 5%			1			3						
								165		Multiple Moderate Fractures			3		CIPP (Included Above)	4						
								168		Multiple Moderate Fractures			3		CIPP (Included Above)	1						
								172		Multiple Fractures			3		CIPP (Included Above)	1						
								175		Longitudinal Fractures			4		CIPP (Included Above)	1						
								181		Multiple Minor Cracks			4		CIPP (Included Above)	1						
								184		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								190		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								193		Multiple Minor Cracks			1		CIPP (Included Above)	1						
								196		Multiple Minor Cracks			1		CIPP (Included Above)	1						
								202		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								205		Multiple Moderate Fractures			3		CIPP (Included Above)	1						
								213		Multiple Moderate Fractures			1		CIPP (Included Above)	1						
								224		Light Mineral Deposits Attached			2									
								226		Multiple Moderate Fractures			1		CIPP (Included Above)	1						
								226		Leaking Joint	180	90	1		CIPP (Included Above)							
								245		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								256		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								263		Water Level 10%			1									
								293		Multiple Minor Cracks			1		CIPP (Included Above)	1						
								296		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
															seal all laterals (3)		3	EA	$800.00		$2,400.00	

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Appendix D

TV Inspection Summary Subarea 20

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/19/2014	La Salle Road	S22-115	S22-082	8	262	VCP	3							20								$458.50
								44		Fine Roots at Joint			1									
								77		Medium Roots at Joint			3		Chemical Root Treatment		262	LF	$1.75	$458.50		
								100		Fine Roots at Joint			1									
								104		Fine Roots at Joint			1									
								137		Minor Roots in Service Lateral			1									
								198		Fine Roots at Joint			1									
								203		Fine Roots at Joint			1									
								222		Medium Roots at Joint			3									
								225		Fine Roots at Joint			1									
								235		Water Level 10%			1									
								242		Water Level 5%			1									
								258		Minor Roots and Cracks in Service Lateral			1									
								262		Fine Roots at Joint			1									
3/19/2014	La Salle Road	S22-082	S22-083	8	272	VCP	3							20								$5,768.00
								6		Fine Roots at Joint			1									
								45		Protruding Service Lateral			3		Cut Lateral Protrusion		1					
								57		Fine Roots at Joint			1									
								60		Fine Roots at Joint			1									
								73		Fine Roots at Joint			1									
								92		Minor Roots in Service Lateral			1									
									127	Moderate Longitudinal Cracks			4			2						
								139		Service Connection Cracked			4		CIPP		272	LF	$6.50	$1,768.00		
								139		Moderate Longitudinal Fractures			4		CIPP (Included Above)							
								151		Multiple Moderate Fractures			4		CIPP (Included Above)	1						
								170		Multiple Moderate Fractures			4		CIPP (Included Above)	1						
								183		Multiple Cracks			4		CIPP (Included Above)	1						
								183		Service Connection at Main Cracked			4		CIPP (Included Above)							
								190		Fine Roots at Joint			1									
								232		Minor Spiral Crack			1		CIPP (Included Above)	2						
															seal all laterals (5)		5	EA	$800.00		$4,000.00	
3/19/2014	Mayo Avenue	S40-130	S40-129	8	322	VCP	3							20								$1,213.50
								2		Multiple Minor Cracks			1			1						
								5		Multiple Minor Cracks			1			1						
								94		Minor Longitudinal Cracks			1			1						
								102		Multiple Minor Cracks			1			1						
								114		Multiple Minor Cracks			1			1						
								146		Minor Spiral Crack			1			1						
								149		Fine Roots at Joint			1									
								153		Fine Roots at Joint			1									
								156		Fine Roots at Joint START			3		Chemical Root Treatment		322	LF	$1.75	$563.50		
								160		Moderate Fractures around Service Lateral			2									
								215		Fine Roots at Joint FINISH			1									
								224		Moderate Fractures around Service Lateral			2									
								228		Minor Spiral Crack			1			1						
								231		Fine Roots at Joint			1									
								232		Moderate Roots in Service Lateral			3		remove lateral roots		1	EA	$650.00		$650.00	
								236		Minor Longitudinal Cracks			1			1						
								245		Moderate Roots in Service Lateral			1									
								258		Fine Roots at Joint			1									
								264		Fine Roots at Joint			1									
								305		Fine Roots at Joint			1									
								308		Fine Roots at Joint			1									

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Appendix D

TV Inspection Summary Subarea 20

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/20/2014	Stevens Road	S41-016	S41-015	8	348	VCP	3							20								$2,600.00
								15		Fine Roots at Joint			1									
								19		Fine Roots at Joint			1									
								28		Fine Roots at Joint			1									
								29		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								29		Fine Roots at Joint			1									
								67		Minor Longitudinal Crack			1			1						
								68		Defective Tap - Cracked Cap			1									
								83		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								92		Minor Longitudinal Cracks			1			1						
								147		Moderate Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00	
								167		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								183		Fine Roots at Joint			1									
								222		Fine Roots at Joint			1									
								236		Fine Roots at Joint			1									
								242		Fine Roots at Joint			1									
								247		Fine Roots at Joint			1									
								259		Fine Roots at Joint			1									
								265		Fine Roots at Joint			1									
								334		Water Level 10%			1									
								334		Fine Roots at Joint			1									
								340		Fine Roots at Joint			1									
3/20/2014	Stevens Road	S41-015	S41-014	8	348	VCP	3							20								$1,300.00
								3		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								4		Fine Roots at Joint			1									
								68		Minor Roots in Service Lateral			1									
								99		Minor Longitudinal Crack			1			1						
								150		Fine Roots at Joint			1									
								207		Water Level 10%			1									
								212		Minor Longitudinal Crack			1			1						
								213		Minor Roots in Service Lateral			2									
								220		Fine Roots at Joint			1									
								223		Fine Roots at Joint			1									
								241		Water Level 5%			1									
								307		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								346		Minor Roots in Service Lateral			2									
3/20/2014	Stevens Road	S41-014	S40-133	8	348	VCP	3							20								$2,700.00
								19		Water Level 10%			1									
								28		Water Level 5%			1									
								41		Minor Longitudinal Crack			1			1						
								103		Fine Roots at Joint			1									
								106		Minor Roots in Service Lateral			1									
								119		Fine Roots at Joint			1									
								120		Fine Roots at Joint			1									
								123		Fine Roots at Joint			1									
								129		Fine Roots at Joint - START			1									
								135		Minor Circumferential Fracture			1			1						
								139		Minor Roots in Service Lateral			1									
								159		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								161		Minor Roots in Service Lateral			1									
								200		Fine Roots at Joint - FINISH			1									
								235		Hole at Joint			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								300		Chip at Joint			1			1						

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
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Appendix D

TV Inspection Summary Subarea 20

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/20/2014	Mayo Ave	S40-130	S40-131	8	144	VCP	3							20								$4,152.00
								1		Medium Roots at Joint			2									
								2		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00	$650.00		
								6		Minor Longitudinal Crack			1			1						
								9		Minor Longitudinal Crack			1			1						
								11		Fine Roots at Joint			1									
								23		Fine Roots at Joint			1									
								29		Fine Roots at Joint			1									
								35		Fine Roots at Joint			1									
								36		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								47		Moderate Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00	
									47	Minor Spiral Fracture			1			1						
									48	Minor Longitudinal Crack			1			1						
								49		Water Level 15%			1									
								55		Water Level 5%			1									
								80		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								82		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								83		Fine Roots at Joint			1									
								93		Minor Longitudinal Crack			1			1						
								111		Minor Roots in Service Lateral			2									
								116		Fine Roots at Joint			1									
								122		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								123		Fine Roots at Joint			1									
								129		Fine Roots at Joint			1									
								131		Medium Roots at Joint			3		Chemical Root Treatment		144	LF	$1.75	$252.00		
								135		Minor Multiple Cracks			1			1						
								138		Medium Roots at Joint			3									
								144		Heavy Roots at Joint			5									
								144		Fine Roots at Joint			1									
3/20/2014	Mayo Ave	S40-131	S40-130	8	161	VCP	3							20								
								0		Minor Multiple Fractures			2			1						
								47		Minor Longitudinal Crack			1			1						
								99		Fine Roots at Joint			1									
								129		Moderate Roots in Service Lateral			2									
								132		Moderate Roots in Service Lateral			2									
								144		Fine Roots at Joint			1									
								147		Fine Roots at Joint			1									
								154		Fine Roots at Joint			1									
								161		Medium Roots at Joint			2									
								161		Fine Roots at Joint			1									
3/20/2014	Mayo Ave	S40-131	S40-132	8	346	VCP	3							20								$22,490.00
								19		Fine Roots at Joint			1		CIPP		346	LF	$40.00	$13,840.00		
								26		Fine Roots at Joint			1									
								45		Fine Roots at Joint			1									
								64		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								65		Fine Roots at Joint			1									
								82		Multiple Cracks			2			1						
								85		Fine Roots at Joint			1									
								102		Fine Roots at Joint			1									
								113		Multiple Cracks			2			1						
								131		Fine Roots at Joint			1									
								140		Moderate Roots in Service Lateral			2									
								153		Fine Roots at Joint			1									
								210		Multiple Cracks			2			1						
								234		Fine Roots at Joint			1									
								253		Fine Roots at Joint			1									
								323		Spiral Crack			1			1						
								332		Multiple Cracks			2		seal all laterals (10)	1	10	EA	$800.00		$8,000.00	

CLIENT: TOWN OF NEEDHAM
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Appendix D

TV Inspection Summary Subarea 20

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/20/2014	Harris Ave	S40-133	S40-132	10	261	VCP	3							20								$2,700.00
								8		Minor Longitudinal Crack			1			1						
								47		Fine Roots at Joint			1									
								52		Minor Multiple Fractures			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								52		Fine Roots at Joint			1									
								55		Fine Roots at Joint			1									
								57		Minor Multiple Cracks			1			1						
								59		Minor Multiple Cracks			1			1						
								75		Minor Multiple Cracks			1			5						
								95		Minor Longitudinal Crack			1			1						
								100		Minor Multiple Cracks			1			1						
								136		Minor Longitudinal Crack			1			1						
								138		Fine Roots at Joint			1									
								142		Moderate Roots in Service Lateral			1		Remove Lateral Roots		1	EA	$650.00		$650.00	
								142		Fine Roots at Joint			1									
								145		Fine Roots at Joint			1									
								149		Fine Roots at Joint			1									
								197		Minor Multiple Cracks			1			1						
								238		Fine Roots at Joint			1									
3/20/2014	Harris Ave	S40-132	S40-120	10	319	VCP	3							20								$4,450.00
								60		Leak in main connection to Service Lateral	180	90	1		Lateral Grout	1	1	EA	$2,500.00		$2,500.00	
								61		Minor Multiple Cracks			1			1						
								83		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								127		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								146		Fine Roots at Joint			1									
								182		Fine Roots at Joint			1									
								192		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								289		Water Level 15%			1									
3/21/2014	Upland Drive	S30-099	S30-098	8	247	VCP	3							20								
								8		Water Level 15%			1									
								32		Water Level 5%			1									
								115		Fine Roots at Joint			1									
								123		Water Level 15%			1									
								134		Water Level 5%			1									
								184		Fine Roots at Joint			1									
								202		Water Level 20%			1									
								240		Camera Underwater			3									
								247		Camera Underwater			3									
3/21/2014	Holland St	S30-096	S30-095	8	74	VCP	3							20								
								31		Cracks around Service Lateral			2									
								31		Multiple Cracks			1									
3/21/2014	Holland Ter	S30-097	S30-095	8	252	VCP	3							20								$1,091.00
								107		Fine Roots at Joint			1									
								112		Fine Roots at Joint			1									
								115		Fine Roots at Joint			1									
								118		Fine Roots at Joint			1									
								118		Medium Roots at Joint			3		Chemical Root Treatment		252	LF	$1.75	$441.00		
								119		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								131		Minor Fractures around Service Lateral			1			1						
								131		Minor Longitudinal Crack			1			1						
								131		Fine Roots at Joint			1									
								152		Chips at Joint			2			1						
3/21/2014	Holland Street	S30-094	S30-095	8	254	VCP	3							20								$3,209.50
								81		Cracks around Service Lateral			3		Seal Lateral	1	1	EA	$2,500.00	$2,500.00		
								81		Minor Longitudinal Crack			1									
								140		Fine Roots at Joint			1									
								140		Minor Multiple Cracks			1									
								146		Fine Roots at Joint			1									
								152		Fine Roots at Joint			1									
								162		Minor Roots in Service Lateral			2									
								193		Mineral Deposits around Lateral Service			4		Heavy Cleaning		1	HR	$265.00	$265.00		
								196		Fine Roots at Joint			1									
								196		Medium Roots at Joint			3		Chemical Root Treatment		254	LF	$1.75	$444.50		

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Appendix D

TV Inspection Summary Subarea 20

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/21/2014	Gibson St	S30-092	S30-093	8	323	VCP	3							20								$5,665.25
								15		Minor Longitudinal Crack			1		Chemical Root Treatment		323	LF	$1.75	$565.25		
								27		Minor Longitudinal Crack			1									
								49		Minor Longitudinal Crack			1			1						
								81		Minor Longitudinal Crack			1			1						
								135		Minor Multiple Cracks			1			1						
								138		Minor Multiple Cracks			1			1						
								144		Minor Multiple Cracks			1			1						
								150		Minor Multiple Cracks			1			1						
								166		Minor Longitudinal Crack			1			1						
								168		Minor Circumferential Crack			2			1						
								184		Minor Longitudinal Crack			1			1						
								201		Fine Roots at Joint			1									
								201		Minor Multiple Cracks			1			1						
								216		Fine Roots at Joint			1									
								216		Minor Multiple Cracks			1			1						
								219		Fine Roots at Joint			1									
								225		Fine Roots at Joint			1									
								226		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								226		Leaking Service Lateral	360	180	3		Lateral Grout		1	EA	$2,500.00		$2,500.00	
								228		Moderate Roots in Service Lateral			2		Remove Lateral Roots		1	EA	$650.00		$650.00	
								231		Water Level 10%			1									
								241		Water Level 5%			1									
								247		Minor Longitudinal Crack			1			1						
								250		Minor Multiple Cracks			1			1						
								255		Moderate Roots in Service Lateral - START			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								257		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								284		Minor Multiple Cracks			1			1						
								313		Minor Multiple Cracks			1			1						
								323		Fine Roots at Joint - FINISH			1									
3/21/2014	Hemlock St	S31-022	S30-090	8	494	CVP	3							20								$3,350.00
								15		Minor Multiple Cracks			1			1						
									27	Minor Longitudinal Crack			1			1						
								29		Hole in side of pipe			5		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								52		Minor Longitudinal Crack			1			1						
								58		Minor Multiple Cracks			1			1						
								64		Minor Longitudinal Crack			1			1						
								73		Water Level 10%			1									
								96		Minor Multiple Cracks			1			1						
								100		Minor Longitudinal Crack			1			1						
								100		Water Level 5%			1									
								109		Minor Longitudinal Crack			1			1						
								112		Minor Longitudinal Crack			1			1						
								137		Minor Multiple Cracks			1			1						
								162		Fine Roots at Joint			1									
								180		Minor Longitudinal Crack			1			1						
								203		Fine Roots at Joint			1									
								206		Fine Roots at Joint			1									
								209		Fine Roots at Joint			1									
								222		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								251		Minor Longitudinal Crack			1			1						
									274	Moderate Roots in Service Lateral			2									
								296		Minor Roots in Service Lateral			1		Remove Lateral Roots							
								319		Minor Longitudinal Crack			1			1	1	EA	$650.00		$650.00	
								322		Minor Multiple Cracks			1			1						
								322		Fine Roots at Joint			1									
								347		Minor Longitudinal Crack			1			1						
								378		Minor Longitudinal Crack			1			1						
								424		Minor Roots in Service Lateral			1									
								444		Minor Multiple Cracks			1			1						
								450		Minor Multiple Cracks			1			1						
									450	Minor Longitudinal Crack			1			1						
								477		Minor Multiple Cracks			1			1						
								491		Minor Multiple Cracks			1			4						

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Appendix D

TV Inspection Summary Subarea 20

EST. REHAB COSTS

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4/2/2014	Powers St	S30-089	S30-088	8	349	VCP	3							20								$29,270.75
								3		Fine Roots at Joint			1		Chemical Root Treatment		349	LF	$1.75	$610.75		
								10		Minor Roots in Service Lateral			1									
								12		Moderate Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00	
								13		Minor Longitudinal Crack			1		CIPP	1	349	LF	$40.00	$13,960.00		
								19		Fine Roots at Joint			1		Chemical Root Treatment (included above)							
								22		Fine Roots at Joint			1		Chemical Root Treatment (included above)							
								29		Fine Roots at Joint - START			1		Chemical Root Treatment (included above)							
								45		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								63		Minor Longitudinal Crack			1		CIPP (included above)	1						
								73		Minor Longitudinal Crack			1		CIPP (included above)	1						
								86		Minor Longitudinal Crack			1		CIPP (included above)	1						
								148		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								158		Minor Longitudinal Crack			1		CIPP (included above)	1						
								174		Minor Multiple Fractures			1		CIPP (included above)	1						
								180		Minor Longitudinal Crack			1		CIPP (included above)	1						
								209		Roots in Service Lateral and Leak	180	90	1									
								211		Moderate Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00	
								212		Leaking at Joint	180	90	1		CIPP (included above)							
								231		Minor Longitudinal Crack			1		CIPP (included above)	1						
								238		Fine Roots at Joint - FINISH			1		Chemical Root Treatment (included above)							
								247		Leaking at Service Lateral Connection	180	90	1									
								251		Minor Longitudinal Crack			1		CIPP (included above)	1						
								251		Leaking at Joint	360	180	3		CIPP (included above)	1						
								253		Leaking at Joint	1440	720	5		CIPP (included above)	1						
								276		Water Level 25%			1			1						
								282		Leaking at Service Lateral Connection	180	90	1				1	EA	$2,500.00		$2,500.00	
								297		Minor Multiple Fractures			1		CIPP (included above)	1						
								345		Leaking at Joint	360	180	3		CIPP (included above)	1						
								349		Leaking at Joint	1440	720	3		CIPP (included above)	1						
								349		Light Grease Deposits Attached			1									
															seal all laterals (12)		12	EA	$800.00		$9,600.00	
4/2/2014	Brookline St	S23-011	S23-010	8	295	VCP	3							20								$20,600.00
								0		Minor Circumferential Crack			2		CIPP	1	295	LF	$40.00	$11,800.00		
								9		Minor Circumferential Fracture			1		CIPP (included above)	1						
								13		Minor Spiral Crack			1		CIPP (included above)	1						
								22		Minor Spiral Crack			1		CIPP (included above)	1						
								26		Moderate Multiple Fractures - START			3		CIPP (included above)	1						
								38		Fine Roots at Joint			1									
								41		Fine Roots at Joint			1									
								44		Fine Roots at Joint - START			1									
								47		Roots in Service Lateral			1									
								66		Moderate Multiple Fractures - FINISH			3		CIPP (included above)	1						
								113		Minor Circumferential Fracture			1		CIPP (included above)	1						
								113		Roots in Service Lateral			1									
								126		Minor Circumferential Crack			2		CIPP (included above)	1						
								133		Moderate Multiple Fractures - START			3		CIPP (included above)	1						
								144		Medium Roots at Joint			2									
								148		Moderate Multiple Fractures - FINISH			3		CIPP (included above)	1						
								182		Fine Roots at Joint - FINISH			1									
								196		Minor Longitudinal Crack			1		CIPP (included above)	1						
								249		Minor Longitudinal Crack			1		CIPP (included above)	1						
								257		Fine Roots at Joint			1									
								292		Moderate Multiple Cracks			3		seal all laterals (11)		11	EA	$800.00		$8,800.00	
4/2/2014	Brookline St	S23-010	S23-009	8	245	VCP	3							20								$13,800.00
								3		Fine Roots at Joint			1		CIPP		245	LF	$40.00	$9,800.00		
								11		Fine Roots at Joint			1		CIPP (included above)							
								15		Fine Roots at Joint			1		CIPP (included above)							
								17		Roots in Service Lateral			1		CIPP (included above)							
								25		Minor Multiple Cracks			1		CIPP (included above)	3						
								33		Minor Longitudinal Crack			1		CIPP (included above)	2						
								150		Multiple Fractures			3		CIPP (included above)	6						
								188		Defective Tap - Leaking	360	180	1		CIPP (included above)	1						
								214		Minor Multiple Fractures			2		CIPP (included above)	1						
								245		Leaking at Joint	180	90	4		CIPP (included above)	1						
															seal all laterals (5)		5	EA	$800.00		$4,000.00	
4/2/2014	Brookline St	S23-009	S23-008	8	208	VCP	3							20								
								33		Light Mineral Deposits Attached			1									
								180		Water Level 20%			1									

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D

TV Inspection Summary Subarea 20

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/2/2014	Brookline St	S23-008	S23-007	8	37	VCP	3							20								
								1		Fine Roots at Joint			1									
								19		Fine Roots at Joint			1									
4/2/2014	Brookline St	S23-007	S23-006	8	97	VCP	3							20								
								1		Fine Roots at Joint			1									
4/2/2014	Brookline St	S23-006	S22-074	8	162	VCP	3							20								$4,100.00
								98		Heavy Leaking at Joint	2800	1,400	5		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								153		Moderate Spiral Fracture			4		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
4/2/2014	Brookline St	S22-074	S22-073	8	162	VCP	3							20								$4,100.00
								12		Leaking at Joint	180	90	1		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								34		Fine Roots at Joint			1									
								37		Minor Multiple Crack			1									
								50		Fine Roots at Joint			1									
								59		Leaking at Joint	180	90	3		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								59		Fine Roots at Joint			1									
								89		Light Mineral Deposits Attached			1									
								95		Light Mineral Deposits Attached			1									
								98		Light Mineral Deposits Attached			1									
								116		Fine Roots at Joint			1									
								124		Water Level 5%			1									
								126		Light Mineral Deposits Attached			1									
								128		Water Level 5%			1									
								131		Light Mineral Deposits Attached			1									
4/2/2014	Brookline St	S22-073	S22-072	8	273	VCP	3							20								$6,600.00
								7		Leaking at joint	180	90	3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								7		Light Mineral Deposits Attached			1									
								9		Light Mineral Deposits Attached			1									
								11		Light Mineral Deposits Attached			1									
								23		Leaking at Joint	180	90	3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								62		Water Level 15%			1									
								67		Water Level 5%			1									
								88		Light Mineral Deposits Attached			1									
								104		Cracks around service entrance			1									
								136		Leaking Service at entrance	360	180	3		Seal lateral		1	EA	$2,500.00		$2,500.00	
								191		Fine Roots at Joint			1									
								197		Minor Circumferential Fracture			1			1						
								197		Fine Roots at Joint			1									
								200		Fine Roots at Joint			1									
								204		Roots in Service Lateral			1									
								206		Roots in Service Lateral			1									
								225		Fine Roots at Joint			1									
								232		Roots in Service Lateral			1									
								234		Roots in Service Lateral			1									
								254		Water Level 25%			1									
								266		Camera Underwater			3									
								273		Camera Underwater			3									
4/2/2014	Powers St	S30-086	S30-087	8	209	VCP	3							20								$650.00
								1		Fine Roots at Joint			1									
								4		Minor Longitudinal Crack			1			1						
								16		Moderate Roots in Service Lateral			3		remove lateral roots		1	EA	$650.00		$650.00	
								20		Fine Roots at Joint			1									
								86		Minor Multiple Cracks			2			1						
								116		Minor Longitudinal Crack			1			1						
								139		Minor Longitudinal Crack			1			1						
								171		Minor Multiple Cracks			2			1						
								180		Minor Longitudinal Crack			1			1						
								192		Minor Longitudinal Crack			1			1						

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D

TV Inspection Summary Subarea 20

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/2/2014	Powers St	S30-087	S30-088	8	209	VCP	3							20								$3,250.00
								20		Minor Multiple Cracks			1			1						
								21		Fine Roots at Joint - START			1									
								32		Fine Roots at Joint			1									
								38		Fine Roots at Joint			1									
								42		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								44		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								46		Fine Roots at Joint			1									
								49		Fine Roots at Joint			1									
								89		Minor Longitudinal Crack			1			1						
								100		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								102		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								131		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								159		Minor Longitudinal Crack			1			1						
								209		Fine Roots at Joint - FINISH			1									
4/3/2014	Parkinson St	S30-005	S30-004	8	348	VCP	3							20								$1,259.00
								40		Minor Multiple Cracks			1			1						
								43		Minor Longitudinal Cracks			1			1						
								62		Minor Multiple Cracks			2			1						
								81		Minor Multiple Cracks			1			1						
								99		Minor Multiple Cracks			1			1						
								106		Fine Roots at Joint			1									
								121		Minor Longitudinal Cracks			1			1						
								141		Minor Multiple Cracks			2			1						
								151		Minor Longitudinal Cracks			1			1						
								165		Minor Multiple Cracks			1			1						
								179		Minor Longitudinal Cracks			1			1						
								182		Minor Multiple Cracks			1			1						
								231		Minor Longitudinal Cracks			1			1						
								260		Minor Multiple Cracks			1			1						
								326		Minor Circumferential Fracture			1			1						
								332		Fine Roots at Joint			1									
								335		Medium Roots at Joint			3		Chemical Root Treatment		348	LF	$1.75	$609.00		
								338		Medium Roots at Joint			3									
								341		Fine Roots at Joint			1									
								344		Medium Roots at Joint - START			3									
								348		Heavy Roots in service lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00	
								348		Medium Roots at Joint - FINISH			3									
4/3/2014	Parkinson St	S30-083	S30-084	8	311	VCP	3							20								$3,894.25
									3	Minor Longitudinal Cracks			1			1						
								12		Minor Multiple Cracks			1			1						
								22		Minor Longitudinal Cracks			1			1						
									25	Minor Longitudinal Cracks			1			1						
									28	Minor Longitudinal Cracks			1			1						
								35		Minor Longitudinal Cracks			1			1						
									50	Minor Longitudinal Cracks			1			1						
								63		Minor Spiral Fracture			1			1						
									78	Minor Longitudinal Cracks			1			1						
									82	Minor Longitudinal Cracks			1			1						
									91	Deposits Attached			1									
								94		Fine Roots at Joint			1									
								95		Minor Roots in from Service			1									
								98		Fine Roots at Joint			1									
								102		Fine Roots at Joint			1									
								109		Moderate Roots in Service			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								141		Medium Roots at Joint			3		Chemical Root Treatment		311	LF	$1.75	$544.25		
								142		Defective Tap - Roots			1									
								161		Medium Roots at Joint			3									
									170	Minor Longitudinal Cracks			1			1						
								178		Moderate Roots in Service			1									
									200	Minor Longitudinal Cracks			1			1						
								224		Fine Roots at Joint			1									
								248		Moderate Spiral Fracture			4		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								306		Minor Longitudinal Cracks			1			1						
								310		Service Filled with debris and roots			2									
								311		Moderate Roots in Service			3		Remove Lateral Roots		1	EA	$650.00		$650.00	

CLIENT: TOWN OF NEEDHAM
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Appendix D

TV Inspection Summary Subarea 20

																	EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/3/2014	Parkinson St	S30-085	S30-084	8	72	VCP	3							20								$650.00
									6	Minor Longitudinal Crack			1			1						
								12		Minor Multiple Cracks			1			1						
									21	Minor Longitudinal Crack			1			1						
									27	Minor Multiple Cracks			1			1						
								33		Fine Roots at Joint			1									
								41		Fine Roots at Joint			1									
								50		Fine Roots at Joint			1									
								72		Fine Roots at Joint			1									
								72		Moderate Roots in Lateral Service			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
4/3/2014	Parkinson St	S30-083	S30-084	8	133	VCP	3							20								$232.75
									8	Minor Circumferential Fracture			1			1						
								27		Fine Roots at Joint			1									
								37		Minor Longitudinal Crack			1			1						
								64		Fine Roots at Joint			1									
								65		Minor Roots in Lateral Service			1									
								66		Fine Roots at Joint			1									
								67		Minor Roots in Lateral Service			1									
								71		Fine Roots at Joint			1									
								109		Minor Longitudinal Crack			1			1						
								121		Medium Roots at Joint			3		Chemical Root Treatment		133	LF	$1.75	$232.75		
								127		Medium Roots at Joint			3									
								133		Fine Roots at Joint			1									
								133		Heavy Roots at Joint			4									
4/3/2014	Otis St	S30-079	S30-080	8	296	VCP	3							20								
								5		Fine Roots at Joint			1									
								8		Fine Roots at Joint - START			1									
									35	Minor Roots in Service Lateral			1									
									61	Minor Longitudinal Crack			1			1						
									80	Minor Longitudinal Crack			1			1						
									83	Minor Circumferential Fracture			1			1						
								131		Minor Roots in Service Lateral			1									
								214		Fine Roots at Joint - FINISH			1									
									254	Minor Longitudinal Crack			1			10						
4/3/2014	Otis St	S30-082	S30-081	8	88	VCP	3							20								
								3		Minor Multiple Cracks			1			1						
								9		Minor Longitudinal Crack			1			1						
								25		Minor Multiple Cracks			1			1						
								27		Minor Longitudinal Crack			1			1						
									31	Minor Longitudinal Crack			1			1						
									39	Minor Longitudinal Crack			1			1						
								47		Minor Multiple Cracks			1			1						
								57		Minor Multiple Cracks			1			1						
								78		Minor Circumferential Fracture			1			1						
4/3/2014	Otis St	S30-081	S30-080	8	355	VCP	3							20								
								17		Fine Roots at Joint			1									
								24		Minor Multiple Cracks			1			1						
								29		Fine Roots at Joint			1									
								31		Fine Roots at Joint			1									
									42	Minor Longitudinal Crack			1			1						
									74	Minor Multiple Cracks			1			1						
									78	Minor Longitudinal Crack			1			1						
								96		Minor Longitudinal Crack			1			1						
									113	Minor Longitudinal Crack			1			1						
								149		Fine Roots at Joint			1									
								152		Fine Roots at Joint			1									
								154		Fine Roots at Joint			1									
								165		Fine Roots at Joint			1									
								211		Minor Longitudinal Crack			1									
4/3/2014	Brookline St	S22-072	S22-070	8	286	VCP	3							20								
								0		Water Level 60%			2									
								3		Camera Underwater START			2									
								19		Camera Underwater FINISH			2									
4/3/2014	Brookline St	S22-070	S22-069	8	208	VCP	3							20								
								14		Minor Longitudinal Crack			1			1						
								160		Minor Longitudinal Crack			1			1						

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D

TV Inspection Summary Subarea 20

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/9/2014	Rosemary St	S22-042	S22-043	6	147	VCP	3							20								$2,050.00
								22		Light Mineral Deposits Attached			1									
								26		Fine Roots at Joint			1									
								30		Fine Roots at Joint			1									
								68		Light Mineral Deposits Attached			1									
								145		Minor Multiple Fractures			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
4/9/2014	Rosemary St	S22-044	S22-045	6	146	VCP	3							20								$2,050.00
								54		Protruding Service			1									
								104		Cracks around service entrance			1									
								104		Spiral Fracture			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
4/9/2014	Webster St	S22-061	S22-060	10	219	VCP	3							20								$2,500.00
								9		Minor Longitudinal Crack			1			1						
								154		Service Lateral Leaking at Connection	180	90	1		Sea lateral		1	EA	$2,500.00		$2,500.00	
									164	Minor Circumferential Fracture			1			1						
4/9/2014	Webster St	S22-060	S22-059	10	245	VCP	3							20								$2,050.00
								23		Water Level 10%			1									
								80		Minor Longitudinal Crack			1			1						
								87		Minor Longitudinal Crack			1			1						
								90		Moderate Spiral Fracture			4		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								102		Minor Spiral Crack			1			1						
								162		Water Level 15%			1									
								166		WIRE in Pipe?			1									
								214		Camera Underwater			2									
								245		Camera Underwater			2									
4/9/2014	Webster St	S22-059	S22-058	10	299	VCP	3							20								$265.00
								20		Minor Multiple Fractures			1			1						
								28		Minor Longitudinal Crack			1			1						
								53		Minor Multiple Fractures			1			1						
								79		Minor Multiple Fractures			1			1						
								111		Minor Longitudinal Crack			1			1						
								114		Minor Multiple Fractures			1			1						
								120		Minor Multiple Fractures			1			1						
								151		Minor Longitudinal Crack			1			1						
								163		Minor Multiple Fractures			1			1						
								176		Chip at joint			1			1						
								200		Minor Circumferential Fractures			1			1						
								244		Minor Multiple Fractures			1			1						
								299		Obstacles 85%			5		Heavy Cleaning		1	HR	$265.00	$265.00		
4/9/2014	Webster St	S22-058	S22-059	10	219	VCP	3							20								
								69		Minor Circumferential Fractures			1			1						
								164		Minor Spiral Fracture			1			1						
								176		Minor Longitudinal Crack			1			1						
								179		Minor Multiple Cracks			1			1						
4/9/2014	Webster St	S22-057	S30-076	10	199	VCP	3							20								
								1		Minor Longitudinal Crack			1			1						
								19		Fine Roots at Joint			1									
								78		Minor Multiple Cracks			1			1						
								108		Minor Multiple Cracks			1			1						
								140		Fine Roots at Joint			1									
4/9/2014	Webster St	S30-076	S30-075	10	181	VCP	3							20								
								10		Water Level 25%			1									
									15	Chip at joint			2			1						
								35		Minor Longitudinal Crack			1			1						
								50		Minor Longitudinal Crack			1			1						
								83		Fine Roots at Joint			1									
								125		Debris in service lateral			1									
4/9/2014	Webster St	S30-075	S30-073	10	319	VCP	3							20								
								68		Minor Multiple Fractures			1			1						
								153		Fine Roots at Joint			1									
								162		Minor Longitudinal Crack			1			1						
										TOTAL	29,640	14,820							TOTAL	$189,444.50	$113,050.00	$302,494.50

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 21

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/2/2015	Cimino Rd	S16-121	S17-011	8	116	VCP	3							21								
4/2/2015	Cimino Rd	S16-121	S16-122	8	197	VCP	3							21								$11,080.00
								26		Minor Longitudinal Cracks Start			1		CIPP	13	197	LF	$40.00	$7,880.00		
								39		Minor Longitudinal Cracks End			1									
								59		Moderate Multiple Cracks			1									
								71		Roots coming out of Tap			3									
								88		Broken			3									
								108		Broken			3									
								133		Moderate Multiple Cracks			3									
								158		Moderate Multiple Cracks			3									
										seal all laterals (4)							4	EA	$800.00	$3,200.00		
4/6/2015	Greendale Ave	S52-094	S52-095	8	187	AC	13							21								
4/6/2015	Greendale Ave	S52-095	S42-117	8	265	AC	13							21								$2,050.00
								24		Hole			5		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00		
4/6/2015	Greendale Ave	S42-117	S42-116	8	201	AC	13							21								$2,050.00
								129		Hole			4		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00		
4/6/2015	Greendale Ave	S42-113	S42-115	8	104	AC	13							21								
4/6/2015	Greendale Ave	S42-115	S42-116	8	162	AC	13							21								
								65		Moderate Roots at tap connection			2									
4/6/2015	Greendale Ave	S42-112	S42-111	8	207	AC	13							21								
4/6/2015	Greendale Ave	S42-113	S42-114	8	158	AC	13							21								
4/6/2015	Brookline St	S23-096	S23-095	8	116	AC	13							21								$2,050.00
								30		Hole			5		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00		
								108		Minor Circumferential Fracture			1									
4/6/2015	Brookline St	S23-096	S23-097	8	252	AC	13							21								$2,600.00
								0		Infiltration Runner in Manhole S23-096	720	360	3		Grout Manhole Bench	1	1	EA	$550.00	$550.00		
								58		Minor Circumferential Fracture			1									
								58		Infiltration Runner in crack	720	360	3		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00		
4/6/2015	Brookline St	S23-097	S23-098	8	200	AC	13							21								$2,050.00
								198		Infiltration Runner at Joint	360	180	3		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00		
4/6/2015	Brookline St	S23-098	S23-099	8	183	AC	13							21								
4/6/2015	Brookline St	S23-099	S23-100	8	221	AC	13							21								
								128		Fine Roots at Joint			1									
4/6/2015	Brookline St	S23-100	S23-101	8	65	AC	13							21								$2,050.00
								39		Infiltration Runner at Joint	4320	2160	4		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00		
4/7/2015	Falcon St	S23-140	S23-139	8	36	AC	13							21								$15,000.00
								36		Manhole S23-139 Leaking	7200	3600	5		Replace Manhole	1	1	EA	$15,000.00	$15,000.00		
4/7/2015	Falcon St	S23-139	S23-138	8	210	AC	13							21								
4/7/2015	Oak Hill St	S23-140	S23-141	8	273	AC	13							21								$7,550.00
								173		Defective Break in Tap leaking	2160	1080	4		Replace Service Wye	1	1	EA	$5,500.00		$5,500.00	
								249		Hole			3		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00		
4/7/2015	Oak Hill St	S23-141	S23-142	8	150	AC	13							21								$2,050.00
								23		Hole			5		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00		
4/7/2015	Oak Hill St	S23-142	S23-143	8	109	AC	13							21								$11,000.00
								41		Break in Leaking Tap at joint 12 o'clock			5		Replace Service Wye							
								41		Infiltration Gusher	11520	5760	5		Replace Service Wye (Included Above)	1	1	EA	$5,500.00		$5,500.00	
								43		Break in Leaking Tap at joint 9 o'clock			5		Replace Service Wye	1	1	EA	$5,500.00		$5,500.00	
								43		Infiltration Gusher	4320	2160	5		Replace Service Wye (Included Above)							
4/7/2015	Colgate Rd	S23-088	S23-143	8	43	AC	13							21								
4/7/2015	Colgate Rd	S23-088	S23-089	8	149	AC	13							21								
4/7/2015	Oak Hill St	S23-143	S23-103	8	173	AC	13							21								
4/7/2015	Oak Hill St	S23-103	S23-104	8	153	AC	13							21								
4/7/2015	Oak Hill St	S23-104	S23-105	8	247	AC	13							21								$2,050.00
								107		Broken			4		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00		
4/7/2015	Oak Hill St	S23-105	S23-108	8	183	AC	13							21								
4/7/2015	Rosalie Rd	S17-061	S23-075	8	277	VCP	3							21								$5,684.75
								1		Minor Circumferential Fracture			1									
								110		Infiltration Runner	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								111		Broken Tap leaking from connection	360	180	3		Grout service at connection with main		1	EA	$2,500.00		$2,500.00	
								198		Fine Roots at Joint			1		Chemical Root Treatment		277	FT	$1.75	$484.75		
									200	Moderate Roots in Service Lateral			2		Chemical Root Treatment		1	EA	$650.00		$650.00	
								202		Fine Roots at Joint			1		Chemical Root Treatment (included above)							
								259		Fine Roots at Joint			1		Chemical Root Treatment (included above)							
								265		Fine Roots at Joint			1		Chemical Root Treatment (included above)							
								272		Medium Roots at Joint			3		Chemical Root Treatment (included above)							
4/7/2015	Rosalie Rd	S17-061	S17-060	8	151	VCP	3							21								$2,500.00
								23		Defective tap Leaking from connection												
								23		Infiltration Runner	720	360	3		Grout service at connection with main	1	1	EA	$2,500.00		$2,500.00	
								24		Minor Multiple Fractures			2									
4/7/2015	Rosalie Rd	S17-060	S17-059	8	230	VCP	3							21								
4/7/2015	Brookline St	S23-101	S23-102	8	166	VCP	3							21								$5,500.00
								157		Joint Offset			5		Remove and Replace							
									157	Hole			5		Remove and Replace		1	EA	$5,500.00	$5,500.00		

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Appendix D
TV Inspection Summary Subarea 21

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/8/2015	Brookline St	S23-102	S23-109	8	135	AC	3							21								$236.25
								15		Fine Roots at Joint			1		Chemical Root Treatment		135	FT	$1.75	$236.25		
								29		Fine Roots at Joint			1		Chemical Root Treatment (included above)							
								41		Medium Roots at Joint			3		Chemical Root Treatment (included above)							
								55		Fine Roots at Joint			1		Chemical Root Treatment (included above)							
								82		Fine Roots at Joint			1		Chemical Root Treatment (included above)							
4/8/2015	Paul Revere Rd	S23-061	S23-062	8	129	VCP	3							21								$2,500.00
								29		Service Lateral leaking	360	180	3		Lateral Grout		1	EA	$2,500.00		$2,500.00	
								29		Fine Roots at Joint			1									
4/8/2015	Paul Revere Rd	S23-062	S23-063	8	69	VCP	3							21								$2,500.00
								4		Fine Roots at Joint			1									
								22		Service Lateral Leaking	720	360	3		Lateral Grout		1	EA	$2,500.00		$2,500.00	
4/8/2015	Paul Revere Rd	S23-063	S23-064	8	61	VCP	3							21								$3,240.00
								14		Infiltration Runner at joint	1,440	720	3		CIPP		61	LF	$40.00	$2,440.00		
								35		Infiltration Runner at joint	720	360	3									
								41		Infiltration Runner at joint	2,880	1,440	3									
								55		Fine Roots at Joint			1									
										seal all laterals (1)							1	EA	$800.00	$800.00		
4/8/2015	Paul Revere Rd	S23-064	S23-065	8	94	VCP	3							21								
								5		Fine Roots at Joint start			1									
								94		Fine Roots at Joint finish			1									
4/8/2015	Paul Revere Rd	S23-065	S23-067	8	101	VCP	3							21								$2,500.00
								42		Fine Roots at Joint			1									
								50		Service Lateral Leaking	360	180	3		Lateral Grout		1	EA	$2,500.00		$2,500.00	
4/8/2015	Paul Revere Rd	S23-067	S23-068	8	190	VCP	3							21								$332.50
								44		Fine Roots at Joint			1		Chemical Root Treatment		190	LF	$1.75	$332.50		
								122		Fine Roots at Joint			1									
								141		Fine Roots at Joint			1									
4/8/2015	Paul Revere Rd	S23-068	S23-069	8	69	VCP	3							21								
4/8/2015	Paul Revere Rd	S23-069	S23-070	8	62	VCP	3							21								
4/8/2015	Paul Revere Rd	S23-070	S23-071	8	174	VCP	3							21								
4/8/2015	Paul Revere Rd	S23-071	S23-072	8	85	VCP	3							21								$5,500.00
								85		Infiltration Runner Pipe connection to manhole	3,600	1,800	5		Remove and Replace		1	EA	$5,500.00	$5,500.00		
4/8/2015	Paul Revere Rd	S23-072	S23-073	8	83	VCP	3							21								
4/8/2015	Paul Revere Rd	S23-073	S23-074	8	206	VCP	3							21								
								162		Minor Longitudinal Fracture			1									
4/8/2015	Richdale Rd	S23-129	S23-130	8	131	AC	13							21								$650.00
								41		Moderate Roots at service connection			3		Chemical Root Treatment		1	EA	$650.00		$650.00	
4/8/2015	Richdale Rd	S23-130	S23-131	8	82	AC	13							21								$2,500.00
								61		Service Lateral Leaking	180	90	3		Lateral Grout		1	EA	$2,500.00		$2,500.00	
4/8/2015	Richdale Rd	S23-131	S23-132	8	218	AC	13							21								
								18		Minor Circumferential Fracture			1									
								18		Minor Deposits Attached			1									
4/8/2015	Richdale Rd	S23-132	S23-071	8	242	AC	13							21								$2,500.00
								101		Fine Roots at Joint			1									
								104		Defective Tap - Leaking			4									
								104		Infiltration Runner at breaking connection	3,600	1,800	5		Grout Service at Connection with Main		1	EA	$2,500.00		$2,500.00	
4/9/2015	Cimino Rd	S16-122	S16-123	8	137	VCP	3							21								$4,550.00
								76		Infiltration Runner at Joint	1,440	720	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								84		Infiltration Runner at Joint IN SERVICE	2,880	1,440	4		Lateral Grout		1	EA	$2,500.00		$2,500.00	
4/9/2015	Concord St	S17-011	S17-010	8	126	AC	12							21								
4/9/2015	Lexington Ave	S17-006	S17-007	8	169	AC	12							21								
4/9/2015	Lexington Ave	S17-007	S17-008	8	73	AC	12							21								
4/9/2015	Richdale Rd	S17-004	S17-005	8	313	AC	12							21								
4/9/2015	Richdale Rd	S17-005	S17-008	8	316	AC	12							21								$2,050.00
								16		Broken			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
4/9/2015	Richdale Rd	S17-009	S17-010	8	39	PVC	13							21								
4/9/2015	Richdale Rd	S17-008	S17-009	8	206	AC	12							21								
4/9/2015	Richdale Rd	S17-012	S23-041	8	347	AC	12							21								$13,500.00
								26		Service Lateral Leaking	180	90	3		Lateral Grout		1	EA	$2,500.00		$2,500.00	
								27		Minor Deposits Attached			1									
								51		Broken			3		Remove and Replace Pipe		1	EA	$5,500.00	$5,500.00		
								51		Infiltration Runner at break	360	180	2									
								52		Infiltration Runner at joint connection to service	2,160	1,080	4		Remove and Replace Service Wye		1	EA	$5,500.00		$5,500.00	
4/9/2015	Richdale Rd	S23-041	S17-019	8	141	AC	12							21								
4/9/2015	Richdale Rd	S23-041	S23-040	8	41	AC	12							21								
4/13/2015	Parker Rd	S23-134	S23-133	8	125	VCP	3							21								$7,400.00
								8		Moderate Fracture Circumferential			3		CIPP		125	LF	$40.00	$5,000.00		
								13		Fine Roots at Joint			1									
								15		Moderate Fracture Circumferential			3									
								68		Minor Multiple Fractures			1									
								109		Minor Fracture Circumferential			2		seal all laterals (3)		3	EA	$800.00		$2,400.00	

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Appendix D
TV Inspection Summary Subarea 21

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/13/2015	Parker Rd	S23-133	S23-132	8	173	VCP	3							21								
								12		Fine Roots			1									
4/13/2015	Paul Revere Rd	S23-037	S23-036	8	129	AC	13							21								
4/13/2015	Paul Revere Rd	S23-036	S23-035	8	151	AC	13							21								
4/13/2015	Paul Revere Rd	S23-035	S23-034	8	259	AC	13							21								$2,500.00
								40		Minor Circumferential Fracture			1									
									64	Service Lateral Leaking	720	360	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/13/2015	Paul Revere Rd ROW	S23-036	S23-039	8	136	AC	13							21								
4/13/2015	Paul Revere Rd ROW	S23-039	S23-040	8	139	AC	13							21								
4/13/2015	Paul Revere Rd ROW	S23-038	S23-037	8	172	AC	13							21								
4/13/2015	Paul Revere Rd	S23-036	S23-039	8	185	AC	13							21								
4/13/2015	Paul Revere Rd	S23-065	S23-066	8	139	AC	13							21								$243.25
								135		Heavy Roots Blocking pipe			5		Chemical Root Treatment		139	LF	$1.75	$243.25		
4/13/2015	Richdale Rd	S23-043	S23-042	8	239	AC	13							21								
4/13/2015	Richdale Rd	S23-042	S23-040	8	66	AC	13							21								
4/13/2015	Richdale Rd	S17-020	S17-019	8	137	AC	13							21								
4/14/2015	Highgate St	S32-036	S24-005	8	167	AC	10							21								$2,050.00
								25		Minor Circumferential Fracture			1									
								163		Infiltration Runner at Joint	1,440	720	4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
4/14/2015	Highgate St	S24-005	S24-006	8	229	AC	10							21								$2,050.00
								82		Broken			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
4/14/2015	Highgate St	S24-006	S24-007	8	83	AC	10							21								
4/14/2015	Highgate St	S24-007	S24-008	8	96	AC	10							21								$4,550.00
								20		Hole			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
								85		Service Lateral Leaking	360	180	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/14/2015	Highgate St	S24-008	S24-009	8	160	AC	10							21								
										TOTAL	56,520	28,260							TOTAL	$83,417	$53,200	$136,617

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4/24/2014	Hillcrest Rd	S31-126	S31-125	8	293	VCP	3							22								$650.00
								195		Minor Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								223		Fine Roots at Joint			2									
								288		Fine Roots at Joint			2									
4/24/2014	Hillcrest Rd	S31-127	S31-128	8	245	VCP	3							22								
								4		Fine Roots at Joint			2									
								8		Fine Roots at Joint			2									
								36		Fine Roots at Joint			2									
								56		Fine Roots at Joint			2									
								64		Fine Roots at Joint - START			2			181						
								245		Fine Roots at Joint - FINISH			2									
4/24/2014	Hillcrest Rd	S31-126	S31-127	8	230	VCP	3							22								$11,000.00
								1		Minor Longitudinal Crack			1			1						
								42		Moderate Multiple Fractures			3		Replace Service Wye	1	1	EA	$5,500.00	$5,500.00		
								44		Fractures around Service Lateral Connection			1		Replace Service Wye (Included Above)							
								44		Leaking at Joint to service	180	90	4		Replace Service Wye (Included Above)	1						
								53		Fine Roots at Joint			1									
								65		Fine Roots at Joint			1									
								115		Fine Roots at Joint			1									
								123		Fine Roots at Joint			1									
								174		Minor Longitudinal Crack			1			1						
								183		Moderate Multiple Fractures			3		Replace Service Wye	1	1	EA	$5,500.00	$5,500.00		
								184		Fractures around Service Lateral Connection			3		Replace Service Wye (Included Above)							
								199		Fine Roots at Joint			1									
								203		Fine Roots at Joint			1									
								207		Fine Roots at Joint			1									
								223		Fine Roots at Joint			1									
								225		Fine Roots at Joint - START			1			5						
								230		Fine Roots at Joint - FINISH			1									
4/24/2014	Hillcrest Rd	S31-128	S31-129	6	195	VCP	3							22								$341.25
								70		Medium Roots at Joint			3		Chemical Root Treatment		195	LF	$1.75	$341.25		
								75		Fine Roots at Joint			2									
								93		Fine Roots at Joint - START			2			102						
								195		Fine Roots at Joint - FINISH			2									
4/24/2014	Hillcrest Rd	S31-123	S31-124	8	145	VCP	3							22								$5,500.00
								106		Moderate Multiple Fractures			3		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
4/24/2014	Hillcrest Rd	S31-123	S31-121	8	300	VCP	3							22								$3,025.00
								8		Leaking at Joint to service	180	90	4		Grout Lateral		1	EA	$2,500.00		$2,500.00	
								77		Fine Roots at Joint			1									
								83		Medium Roots at Joint			3		Chemical Root Treatment		300	LF	$1.75	$525.00		
								84		Medium Roots at Joint			3									
4/24/2014	Morningside Rd	S31-122	S31-121	8	70	AC	3							22								
4/24/2014	Hillcrest Rd	S31-121	S31-120	6	64	VCP	3							22								
4/24/2014	Hillcrest Rd	S31-119	S31-120	6	262	VCP	3							22								
4/25/2014	Hillcrest Rd	S31-120	S31-119	6	43	VCP	3							22								
4/25/2014	Hillcrest Rd	S31-119	S31-095	8	115	VCP	3							22								
4/25/2014	Wachusett Rd	S31-117	S31-118	8	36	VCP	3							22								$63.00
								11		Fine Roots at Joint			1									
								13		Fine Roots at Joint			1									
								17		Fine Roots at Joint			1									
								19		Medium Roots at Joint			3		Chemical Root Treatment		36	LF	1.75	$63.00		
								25		Fine Roots at Joint			1									
								34		Medium Roots at Joint			3									
								36		Fine Roots at Joint			1									
4/25/2014	Wachusett Rd	S31-117	S31-116	8	169	VCP	3							22								$4,100.00
								52		Minor Spiral Crack			1			1						
								61		Minor Longitudinal Crack			1			1						
								70		Minor Longitudinal Crack			1			1						
								73		Fine Roots at Joint			1			1						
								75		Fine Roots at Joint			1									
								99		Fine Roots at Joint			1									
								108		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								117		Fine Roots at Joint			1									
								142		Fine Roots at Joint			1									
								147		Fine Roots at Joint - START			1									
								168		Minor Circumferential Crack			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								169		Fine Roots at Joint - FINISH			1									

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TV Inspection Summary Subarea 22

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/24/2014	Hillcrest Rd	S31-126	S31-125	8	293	VCP	3							22								$650.00
								195		Minor Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								223		Fine Roots at Joint			2									
4/25/2014	Wachusett Rd	S31-115	S31-116	8	269	VCP	3							22								$2,785.75
								1		Fine Roots at Joint			1									
								14		Fine Roots at Joint			1									
								15		Cracks along entrance to service			1									
								16		Fine Roots at Joint - START			1									
								99		Minor Longitudinal Crack			1			1						
								113		Moderate Grease Deposits			4		Heavy Cleaning		1	HR	$265.00	$265.00		
								120		Root Ball Connection			3		Chemical Root Treatment		269	LF	$1.75	$470.75		
								164		Minor Longitudinal Crack			1			1						
								232		Hole in side of pipe			5		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								268		Minor Circumferential Fracture			1			1						
								269		Fine Roots at Joint - FINISH			1									
								269		Heavy Grease Deposits Attached			4									
4/25/2014	Wachusett Rd	S31-114	S31-115	8	187	VCP	3							22								
								3		Fine Roots at Joint			1									
								10		Fine Roots at Joint - START			1			169						
								33		Minor Longitudinal Crack			1			1						
								179		Fine Roots at Joint - FINISH			1									
								180		Fine Roots at Joint			1									
4/25/2014	Wachusett Rd	S31-113	S31-114	8	246	VCP	3							22								$650.00
								79		Fine Roots at Joint - START			1			167						
								82		Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								246		Fine Roots at Joint - FINISH			1									
4/25/2014	Wachusett Rd	S31-112	S31-113	8	229	VCP	3							22								$4,100.00
								27		Water Level 10%			1									
								39		Water Level 5%			1									
								66		Minor Longitudinal Crack			1			1						
								72		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								146		Crack in entrance to service lateral			1									
								146		Minor Longitudinal Crack			1			1						
								151		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
4/25/2014	Wachusett Rd	S41-087	S31-112	8	141	VCP	3							22								
								108		Minor Longitudinal Crack			1			1						
								112		Water Level 15%			1									
								120		Water Level 5%			1									
4/25/2014	Wyoming Ave	S31-102	S31-103	6	156	VCP	3							22								$273.00
								44		Fine Roots at Joint			1									
								54		Fine Roots at Joint			1									
								123		Fine Roots at Joint			1									
								137		Medium Roots at Joint			3		Chemical Root Treatment		156	LF	$1.75	$273.00		
								141		Fine Roots at Joint			1									
								146		Fine Roots at Joint - START			1			10						
								152		Medium Roots at Joint			3									
								156		Fine Roots at Joint - FINISH			1									
4/25/2014	Wyoming Ave	S31-103	S31-104	6	206	VCP	2							22								$360.50
								18		Fine Roots at Joint			1									
								25		Hole at joint			1			1						
								25		Fine Roots at Joint			3		Chemical Root Treatment		206	LF	$1.75	$360.50		
								33		Fine Roots at Joint			1									
								34		Roots in service lateral			1									
								35		Medium Roots at Joint			3									
								41		Fine Roots at Joint - START			1									
								58		Minor Longitudinal Crack			1			1						
								64		Debris in service lateral			1									
								129		Fine Roots at Joint - FINISH			1									
								175		Water Level 15%			1									
4/25/2014	Wyoming Ave	S31-104	S31-105	8	61	VCP	3							22								$2,050.00
								24		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								59		Minor Spiral Crack			1			1						
4/25/2014	Audrey Ave	S32-009	S32-010	8	185	VCP	3							22								
								72		Water Level 15%			1									
5/1/2014	Helen Rd	S31-160	S31-159	8	96	VCP	3							22								

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 22

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/24/2014	Hillcrest Rd	S31-126	S31-125	8	293	VCP	3							22								$650.00
								195		Minor Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								223		Fine Roots at Joint			2									
5/1/2014	Helen Rd	S31-152	S31-159	8	333	VCP	3							22								$18,120.00
								25		Water Level 15%			1		CIPP		333	LF	$40.00	$13,320.00		
								47		Light Mineral Deposits Attached			1		CIPP (Included Above)							
								55		Minor Longitudinal Crack			1		CIPP (Included Above)	1						
								117		Service Lateral leaking	360	180	3		CIPP (Included Above)							
								117		Protruding service lateral			4		CIPP (Included Above)							
								152		Minor Longitudinal Crack			2		CIPP (Included Above)							
								213		Leaking Joint	360	180	3		CIPP (Included Above)							
								262		Leaking Service Lateral	2880	1,440	5		CIPP (Included Above)							
								333		Minor Circumferential Fracture			1		CIPP (Included Above)							
															seal all laterals (6)		6	EA	$800.00		$4,800.00	
5/1/2014	Ina Rd	S31-159	S31-158	8	221	VCP	3							22								$12,840.00
								125		Leaking Service Lateral	180	90	4		CIPP	1	221	LF	$40.00	$8,840.00		
								142		Leaking Service Lateral at connection	1440	720	3		CIPP (Included Above)	1						
								149		Leaking Joint	360	180	3		CIPP (Included Above)	1						
															seal all laterals (5)		5	EA	$800.00		$4,000.00	
5/1/2014	Helen Rd	S31-152	S31-151	8	102	PVC	11							22								
5/1/2014	Helen Rd	S31-151	S31-150	8	79	VCP	3							22								$2,500.00
								38		Leaking Joint at Service Lateral Connection - Chimney	7200	3,600	5		Seal Lateral	1	1	EA	$2,500.00		$2,500.00	
								73		Water Level 30%			1									
5/1/2014	Helen Rd	S31-149	S31-150	8	73	PVC	11							22								$2,050.00
								9		Minor Longitudinal Crack			1			1						
								11		Minor Longitudinal Crack			1			1						
								21		Minor Circumferential Fracture			1			1						
								26		Minor Circumferential Fracture			1			1						
								61		Minor Longitudinal Crack			1			1						
								71		Moderate Multiple Cracks			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
5/1/2014	Helen Rd	S31-148	S31-149	8	179	VCP	3							22								$2,050.00
								22		Leaking Joint at Service Lateral Connection	180	90	4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00		
								179		Offset Joint Medium			2									
5/1/2014	Ina Rd	S31-157	S31-158	8	227	VCP	11							22								
								85		Leaking Joint at Service Lateral Connection	1440	720	3		Replace Service Wye	1	1	EA	$5,500.00	$5,500.00		$5,500.00
5/1/2014	Aletha Rd	S31-156	S31-157	8	100	VCP	3							22								
5/1/2014	Aletha Rd	S31-155	S31-156	8	106	VCP	3							22								
5/1/2014	Aletha Rd	S32-013	S32-012	8	112	AC	12							22								
5/1/2014	Aletha Rd	S32-012	S32-011	8	101	AC	12							22								
5/1/2014	Aletha Rd	S32-011	S32-010	8	92	AC	12							22								
								32		Fine Roots at Joint			1									
5/1/2014	Aletha Rd	S32-022	S32-021	8	148	AC	12							22								
5/1/2014	Aletha Rd	S32-021	S32-020	8	199	AC	12							22								
								198		Offset Joint Medium			2									
5/1/2014	Aletha Rd	S31-154	S31-153	8	106	VCP	3							22								
								105		Minor Circumferential Fracture			1			1						
4/28/2014	Tudor Rd	S32-014	S32-015	8	117	VCP	3							22								$2,250.00
								77		Moderate Circumferential Fracture			3		Point Repair up to 8 ft		1	EA	$2,250.00	$2,250.00		
								77		Moderate Longitudinal Crack			3		Point Repair up to 8 ft (Included Above)	5						
4/28/2014	Tudor Rd	S32-015	S32-016	8	229	VCP	3							22								
								229		Offset Joint Medium			2									
4/28/2014	Tudor Rd	S32-016	S32-015	8	105	VCP	3							22								
								105		Deformed 20%			2									
4/28/2014	Tudor Rd	S32-016	S32-017	8	128	VCP	3							22								
								28		Fine Roots at Joint			1									
4/28/2014	Tudor Rd	S32-017	S32-018	8	118	VCP	3							22								
								16		Minor Longitudinal Fracture			2									
4/28/2014	Tudor Rd	S32-018	S32-019	8	147	VCP	3							22								
4/28/2014	Tudor Rd	S32-019	S32-020	8	65	VCP	3							22								
4/28/2014	Tudor Rd	S32-020	S32-023	8	98	VCP	3							22								
								15		Roots in Service Lateral			1									
								67		Minor Circumferential Fracture			1									
								69		Minor Longitudinal Crack			1									
								73		Minor Longitudinal Crack			2									
								79		Minor Longitudinal Crack			2									
4/28/2014	Tudor Rd	S32-023	S32-028	8	129	VCP	3							22								
								11		Lining Defect Failure - START			1									
								16		Lining Defect Failure - FINISH			1									
								31		Minor Multiple Fractures			2									
								31		Lining Defect Failure			1									

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4/24/2014	Hillcrest Rd	S31-126	S31-125	8	293	VCP	3							22								$650.00
								195		Minor Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								223		Fine Roots at Joint			2									
4/28/2014	Tudor Rd	S32-007	S32-006	8	97	VCP	3							22								
								63		Minor Circumferential Fracture			1									
4/28/2014	Tudor Rd	S32-005	S32-006	8	172	VCP	3							22								$301.00
								14		Minor Longitudinal Crack			1									
								119		Root Ball at Joint 50%			5		Chemical Root Treatment		172	LF	$1.75	$301.00		
								147		Fine Roots at Joint			1									
4/28/2014	Tudor Rd	S32-005	S32-006	8	62	VCP	3							22								
4/28/2014	Woodbury Rd	S32-005	S32-004	8	172	VCP	3							22								
4/28/2014	Woodbury Rd	S32-008	S32-009	8	275	VCP	3							22								
								55		Medium Roots at Joint			3		Chemical Root Treatment	275	275	LF	$1.75	$481.25		
								59		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)							
								66		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00	$650.00		$1,131.25
								76		Fine Roots at Joint			1									
								85		Fine Roots at Joint			1									
								118		Fine Roots at Joint			1									
4/29/2014	Audrey Ave	S32-009	S32-010	8	187	VCP	3							22								
								0		Water Level 20%			1									
								78		Water Level 20%			1									
4/29/2014	Audrey Ave	S32-010	S32-024	8	238	VCP	3							22								$7,550.00
								57		Fine Roots at Joint			1									
								65		Fine Roots at Joint			1									
								78		Fine Roots at Joint			1									
								150		Moderate Longitudinal Crack			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								170		Heavy Leak at Joint	2160	1,080	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
4/29/2014	Audrey Ave	S32-024	S32-025	8	250	PVC/VCP	6							22								
								245		Minor Longitudinal Crack			1									
4/29/2014	Audrey Ave	S32-025	S32-027	8	91	VCP	3							22								
4/29/2014	Audrey Ave	S32-027	S32-028	8	94	VCP	3							22								
4/29/2014	Audrey Ave	S32-028	S32-030	8	138	VCP	3							22								
								99		Minor Longitudinal Fracture			2									
								116		Minor Multiple Cracks			2									
4/29/2014	Arch St	S32-032	S32-033	8	116	VCP	3							22								
								34		Fine Roots at Joint			1									
								49		Fine Roots at Joint			1									
								51		Minor Longitudinal Crack - START			1									
								56		Minor Longitudinal Crack - FINISH			1									
4/29/2014	Highgate St	S32-032	S32-031	8	54	VCP	3							22								
								23		Fine Roots at Joint			1									
								29		Fine Roots at Joint			1									
4/29/2014	Highgate St	S32-031	S32-030	8	160	PVC	12							22								
4/29/2014	Highgate St	S32-030	S32-029	8	213	VCP	3							22								
4/29/2014	Highgate St	S32-029	S31-161	8	198	VCP	3							22								
								21		Minor Longitudinal Crack			1									
								59		Minor Longitudinal Crack			1									
4/29/2014	Highgate St	S31-161	S31-162	8	222	other	3							22								$5,000.00
								136		Minor Leak at Joint	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
								141		Minor Leak at Joint	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
4/29/2014	Highgate St	S31-162	S31-163	8	249	VCP	3							22								
								2		Minor Circumferential Fracture			1									
								43		Minor Longitudinal Crack			1									
								58		Deformed 5%			1									
								177		Light Mineral Deposits Attached			1									
								230		Water Level 20%			1									
5/1/2014	Edwardel Rd	S24-001	S32-034	8	197	VCP	3							22								
								69		Minor Roots in Service Lateral			1									
								133		Minor Roots in Service Lateral			1									
5/1/2014	Edwardel Rd	S24-002	S24-001	8	295	VCP	3							22								
								68		Fine Roots at Joint			1									
								94		Minor Circumferential Fracture			1									
								113		Fine Roots at Joint			1									
								125		Fine Roots at Joint			1									
								205		Minor Longitudinal Fracture			1									
								273		Minor Longitudinal Fracture			1									
5/1/2014	Edwardel Rd	S32-034	S32-035	8	249	VCP	3							22								$435.75
								185		Medium Roots at Joint			3		Chemical Root Treatment		249	LF	$1.75	$435.75		
								188		Fine Roots at Joint			1									
								221		Fine Roots at Joint			1									

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EST. REHAB COSTS

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4/24/2014	Hillcrest Rd	S31-126	S31-125	8	293	VCP	3							22								$650.00
								195		Minor Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								223		Fine Roots at Joint			2									
5/1/2014	Arch St	S32-035	S31-163	8	109	VCP	3							22								$190.75
								20		Medium Roots at Joint			3		Chemical Root Treatment		109	LF	$1.75	$190.75		
								24		Fine Roots at Joint			1									
								29		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)							
								32		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)							
								38		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)							
								59		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)							
								65		Fine Roots at Joint			1									
								68		Fine Roots at Joint			1									
								71		Fine Roots at Joint			1									
								95		Fine Roots at Joint			1									
								105		Fine Roots at Joint			1									
								108		Fine Roots at Joint			1									
5/1/2014	Arch St	S31-161	S31-163	8	187	VCP	3							22								$325.00
								107		Minor Multiple Cracks			2									
								187		Protruding service lateral			4		cut protruding lateral		1	EA	$325.00	$325.00		
5/1/2014	Arch St	S31-164	S31-163	8	64	PVC	6							22								$325.00
										Protruding service lateral			3		cut protruding lateral		1	EA	$325.00	$325.00		
5/1/2014	Savoy Rd	S31-164	S23-121	8	204	PVC	6							22								$2,050.00
								3		Moderate Leak at Joint	1440	720	4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
5/1/2014	Arch St	S31-167	S31-165	8	274	PVC	6							22								$7,550.00
								81		Heavy Leak at Joint	2880	1,440	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00		
								98		Leak from service lateral cap	1440	720	4		Point Repair		1	EA	$2,050.00	$2,050.00		
								203		Light Mineral Deposits Attached			1									
								242		Light Mineral Deposits Attached			1									
5/1/2014	Arch St	S31-164	S31-165	8	299	PVC	6							22								$4,100.00
								9		Hole			3		Point repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								156		Moderate Leak at Joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
5/1/2014	Woodledge Rd	S23-144	S23-093	8	329	other	3							22								
5/1/2014	Woodledge Rd	S23-093	S23-094	8	162	other	3							22								
5/1/2014	Woodledge Rd	S23-144	S23-166	8	241	other	3							22								
5/2/2014	Woodledge Rd	S31-166	S31-165	8	242	VCP	3							22								$7,223.50
								71		Medium Roots at Joint			3		Chemical Root Treatment		242	LF	$1.75	$423.50		
								74		Fine Roots at Joint			2									
								79		Medium Roots at Joint			3									
								183		Heavy Leaking at service connection to main	1440	720	4		Seal lateral		1	EA	$2,500.00		$2,500.00	
								187		Light Mineral Deposits Attached			1									
								196		Moderate Longitudinal Crack - START			4		Point Repair up to 8 ft	7	1	EA	$2,250.00	$2,250.00		
								203		Moderate Longitudinal Crack - FINISH			4									
								230		minor leaking at joint	360	180	3	22	Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
5/2/2014	Rae Ave	S31-167	S31-168	8	250	PVC	3							22								
								0		Medium Roots at Joint			3									
								26		Heavy Leak from Service Chimney at connection	5760	2,880	5		Replace Service Wye							
								41		Medium Roots at Joint - START			3		Chemical Root Treatment	50	250	LF	$1.75	$437.50		
								66		Medium Roots at Joint - FINISH			3									
								78		Fine Roots at Joint - START			1									
								88		Fine Roots at Joint - FINISH			1									
								102		Fine Roots at Joint			1									
								102		Light Mineral Deposits Attached			1									
								115		Medium Roots at Joint			3									
								124		Fine Roots at Joint - START			1									
								168		Fine Roots at Joint - FINISH			1									
								186		Fine Roots at Joint - START			1									
								213		Fine Roots at Joint - FINISH			1									
5/2/2014	Woodledge Rd	S31-165	S31-148	8	278	PVC	3							22								

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 22

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/24/2014	Hillcrest Rd	S31-126	S31-125	8	293	VCP	3							22								$650.00
								195		Minor Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								223		Fine Roots at Joint			2									
5/2/2014	Rae Ave	S23-092	S23-091	8	271	VCP	3							22								$474.25
								2		Fine Roots at Joint			1									
								36		Fine Roots at Joint			1									
								39		Fine Roots at Joint			1									
								42		Fine Roots at Joint			1									
								66		Fine Roots at Joint			1									
								68		Fine Roots at Joint			1									
								71		Fine Roots at Joint			1									
								74		Fine Roots at Joint			1									
								80		Fine Roots at Joint			1									
								103		Medium Roots at Joint - START			3		Chemical Root Treatment	34	271	LF	$1.75	$474.25		
								137		Medium Roots at Joint - FINISH			3		Chemical Root Treatment							
								140		Medium Roots at Joint - START			3		Chemical Root Treatment	50						
								183		Minor Longitudinal Fracture - START			2			5						
								188		Minor Longitudinal Fracture - FINISH			2									
								190		Medium Roots at Joint - FINISH			3		Chemical Root Treatment							
								205		Fine Roots at Joint			1									
								208		Fine Roots at Joint			1									
5/2/2014	Rae Ave	S23-091	S31-168	8	223	VCP	3							22								$390.25
								61		Medium Roots at Joint			2			223	223	LF	$1.75	$390.25		
								66		Fine Roots at Joint			1									
								75		Fine Roots at Joint			1									
								80		Fine Roots at Joint			1									
								170		Fine Roots at Joint			1									
5/5/2014	Hillcrest Rd	S23-086	S23-085	8	200	PVC	3							22								
5/5/2014	Hillcrest Rd	S23-086	S23-085	8	90	PVC	3							22								
								19		Minor Longitudinal Crack			1									
								70		Fine Roots at Joint			1									
5/5/2014	Hillcrest Rd	S23-085	S23-084	8	275	PVC	3							22								
5/5/2014	Hillcrest Rd	S23-084	S23-083	8	123	other	12							22								$17,050.00
								0		Leak in Bench	2880	1,440	5		Replace Manhole							
								14		Fine Roots at Joint			1				1	EA	$15,000.00	$15,000.00		
								36		Minor Multiple Fractures			2									
								52		Minor Longitudinal Crack			1									
								60		Moderate Longitudinal Fracture - START			3		Point Repair up to 4 ft	2	1	EA	$2,050.00	$2,050.00		
								62		Moderate Longitudinal Fracture - FINISH			3									
								73		Minor Circumferential Fracture			2									
5/5/2014	Hillcrest Rd	S23-083	S23-082	8	107	VCP	3							22								
5/5/2014	Hillcrest Rd	S23-082	S23-077	8	205	VCP	3							22								
5/5/2014	Hillcrest Rd	S23-077	S23-076	8	221	VCP	3							22								
								89		Light Mineral Deposits Attached			1									
								200		Water Level 20%			1									
5/5/2014	Hillcrest Rd	S23-076	S31-094	8	201	VCP	3							22								
								103		Fine Roots at Joint			1									
								116		Fine Roots at Joint			1									
5/2/2014	Savoy Rd	S23-118	S23-119	8	133	VCP	3							22								
								34		Fine Roots at Joint			1									
								45		Fine Roots at Joint			1									
5/2/2014	Savoy Rd	S23-119	S23-120	8	235	VCP	3							22								$15,261.25
								6		Fine Roots at Joint			1		Chemical Root Treatment		235	LF	$1.75	$411.25		
								9		Fine Roots at Joint - START			1		Chemical Root Treatment (Included Above)							
								40		Fine Roots at Joint - FINISH			1		Chemical Root Treatment (Included Above)							
								53		Moderate Multiple Fractures			3		CIPP		235	LF	$40.00	$9,400.00		
								101		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								101		moderate longitudinal fractures			4		CIPP (Included Above)							
								107		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								110		Minor Circumferential Crack			1		CIPP (Included Above)							
								152		Medium Roots at Joint			3									
								155		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								161		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								165		Moderate Roots in service			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								166		Heavy Root ball blocking pipe			5		Chemical Root Treatment (Included Above)							
								182		Fine Roots at Joint			2		Chemical Root Treatment (Included Above)							
								187		moderate longitudinal fractures			4		CIPP (Included Above)							
								194		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)							
															seal all laterals (6)		6	EA	$800.00		$4,800.00	
5/2/2014	Savoy Rd	S23-120	S23-121	8	148	Other	3							22								

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
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Appendix D
TV Inspection Summary Subarea 22

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/24/2014	Hillcrest Rd	S31-126	S31-125	8	293	VCP	3							22								$650.00
								195		Minor Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								223		Fine Roots at Joint			2									
5/2/2014	Colby St	S23-181	S23-180	8	138	VCP	3							22								$241.50
								49		Minor Longitudinal Fracture			2									
								98		Medium Roots at Joint			3		Chemical Root Treatment		138	LF	$1.75	$241.50		
								105		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								116		Medium Roots at Joint - START			3		Chemical Root Treatment (Included Above)							
								126		Medium Roots at Joint - FINISH			3		Chemical Root Treatment (Included Above)							
5/2/2014	Colby St	S23-180	S23-179	8	115	VCP	3							22								
5/2/2014	Colby St	S23-179	S23-178	8	198	PVC	12							22								
5/2/2014	Colby St	S23-178	S23-177	8	250	PVC	12							22								
12/18/2014	Washington Ave	S31-060	S31-061	8	48	VCP	3							22								
12/18/2014	Washington Ave	S31-060	S31-059	8	92	VCP	3							22								$2,750.00
								21		Longitudinal Fracture			2									
								80		Moderate Longitudinal Fracture			4		Point Repair up to 12 ft	1	1	EA	$2,750.00	$2,750.00		
								89		Moderate Longitudinal Fracture			3									
12/18/2014	Washington Ave	S31-059	S31-058	8	98	VCP	3							22								
								1		Fine Roots at Joint			2									
12/18/2014	Washington Ave	S31-058	S31-055	8	292	VCP	3							22								$2,050.00
								116		Fine Roots at Joint			2									
								185		Moderate Longitudinal Fracture	720	360	4		Point Repair up to 4 ft	3	1	EA	$2,050.00	$2,050.00		
								269		Moderate Longitudinal Fracture			2									
12/18/2014	Holmes St	S23-001	S31-029	8	275	other	13							22								$24,400.00
								85		Minor Circumferential Fracture			2		CIPP		275	LF	$40.00	$11,000.00		
								85		Leaking Service at Connection with Main	2,880	1,440	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
								151		Major Infiltration Gusher at Joint	2,880	1,440	5		CIPP (Included Above)							
								171		Moderate Longitudinal Fracture	1,440	720	4		CIPP (Included Above)							
								173		Leaking Service at Connection with Main	7,200	3,600	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
								182		Minor Circumferential Fracture			2		CIPP (Included Above)							
								182		Major Infiltration Runner at Joint	2,160	1,080	4		CIPP (Included Above)							
								183		Major Infiltration Runner at Joint	720	360	4		CIPP (Included Above)							
								198		Major Infiltration Runner at Joint	720	360	4		CIPP (Included Above)							
								214		Moderate Infiltration Runner at Joint	360	180	3		CIPP (Included Above)							
								243		Moderate Infiltration Dripper at Joint	180	90	3		CIPP (Included Above)							
															seal all laterals (3)		3	EA	$800.00		$2,400.00	
12/18/2014	Holmes St	S31-029	S31-052	8	193	VCP	3							22								$550.00
								0		Infiltration Runner at Pipe Connection with Manhole	720	360	4		Grout Pipe Connection		1	EA	$550.00	$550.00		
								168		Fine Roots at Joint			2									
12/18/2014	Holmes St	S31-052	S31-060	8	199	VCP	3							22								$12,510.00
								0		Major Infiltration Runner in Bench	1,080	540	4		Grout Bench and Invert		1	EA	$550.00		$550.00	
								43		Major Infiltration Runner in Service	1,440	720	4		CIPP		199	LF	$40.00	$7,960.00		
								66		Major Infiltration Runner at Joint	1,080	540	4		CIPP (Included Above)							
								96		Major Infiltration Runner at Service Joint	1,080	540	4		CIPP (Included Above)							
								114		Major Infiltration Runner at Service Joint	1,080	540	4		CIPP (Included Above)							
								130		Major Infiltration Runner at Joint	720	360	4		CIPP (Included Above)							
								131		Major Infiltration Runner at Service Joint	1,080	540	4		CIPP (Included Above)							
															seal all laterals (5)		5	EA	$800.00		$4,000.00	
12/18/2014	Dell Ave	S31-029	S23-126	8	33	VCP	3							22								$5,500.00
								0		Major Infiltration Gusher in Invert	7,200	3,600	5		Remove and Replace		1	EA	$5,500.00	$5,500.00		
12/18/2014	Dell Ave	S31-066	S31-065	8	225	VCP	3							22								
								121		Fine Roots at Joint			2									
								146		Fine Roots at Joint			2									
								149		Fine Roots at Joint			2									
								173		Fine Roots at Joint			2									
12/19/2014	Hawthorne Ave	S31-066	S31-067	8	149	PVC	11							22								
12/19/2014	Beaufort Ave	S31-083	S31-067	8	156	Unknown	12							22								
								62		Fine Roots at Joint			2									
12/19/2014	Hazelton Ave	S31-088	S31-089	8	66	VCP	3							22								
								66		Tap Break-In Intruding - active			2									
12/19/2014	Hazelton Ave	S31-088	S31-090	8	30	PVC	12							22								
12/19/2014	Hazelton Ave	S31-090	S31-093	8	163	PVC	12							22								
12/19/2014	Hazelton Ave	S31-089	S31-088	8	30	AC	11							22								
								30		Tap Break-In Intruding - active			2									
12/19/2014	Ellicott St	S31-035	S31-039	8	158	PVC	12							22								$4,550.00
								9		Moderate Infiltration Runner at Joint	720	360	4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								21		Tap Break-In Defective - Leaking at Joint			3									
								21		Major Infiltration Runner at Joint	1,440	720	4		lateral grout up to 5 ft		1	EA	$2,500.00	$2,500.00		
12/19/2014	Ellicott St	S31-039	S31-040	8	52	VCP	3							22								

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 22

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/24/2014	Hillcrest Rd	S31-126	S31-125	8	293	VCP	3							22								$650.00
								195		Minor Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00	
								223		Fine Roots at Joint			2									
12/19/2014	Ellicott St	S31-040	S31-041	8	168	VCP	3							22								$4,394.00
								9		Fine Roots at Joint			2									
								35		Medium Roots at Joint			4		Chemical Root Treatment		168	LF	$1.75	$294.00		
								35		Minor Infiltration Dripper at Joint	360	180	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								97		Fine Roots at Joint			2									
								101		Major Infiltration Gusher at Joint	2,160	1,080	5		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
12/19/2014	Ellicott St	S31-041	S31-042	8	187	VCP	3							22								
12/19/2014	Melrose Ave	S31-017	S31-018	8	190	VCP	3							22								
								0		Fine Roots at Joint			2									
								129		Fine Roots at Joint			2									
								133		Fine Roots at Joint			2									
								134		Fine Roots at Joint			2									
								139		Fine Roots at Joint - Start			2									
								190		Fine Roots at Joint - Finish			2									
12/19/2014	Melrose Ave	S31-017	S31-016	8	174	VCP	2							22								
								50		Fine Roots at Joint			2									
								131		Fine Roots at Joint			2									
12/19/2014	Melrose Ave	S31-016	S31-015	8	176	VCP	2							22								
								16		Fine Roots at Joint			2									
								79		Fine Roots at Joint			2									
								83		Fine Roots at Joint			2									
								114		Fine Roots at Joint			2									
										TOTAL	73,620	36,810							TOTAL	$160,949.50	$46,000.00	$206,512.00

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 24

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/14/2015	Fairfield St	S52-081	S42-100	8	184	VCP	3							24								$2,250.00
								78		Fine Roots at Joint			1									
								183		Moderate Multiple Fractures			3		Point Repair, up to 8ft		1	EA	$2,250.00	$2,250.00		
								183		Fine Root Barrel at fracture			1									
4/14/2015	Fairfield St	S52-081	S52-082	12	200	VCP	3							24								$5,500.00
								69		Defective Tap Leaking at joint	2,880	1,440	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
								173		minor incrustation			1									
4/14/2015	Fairfield St	S52-082	S52-083	12	244	VCP	3							24								$8,050.00
								72		Defective Tap leaking from joint	2,160	1,080	3		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
								174		Fine Roots at joint			1									
								174		Infiltration dripper	180	90	3		Point Repair up to 4 ft		1	EA	$2,550.00	$2,550.00		
4/14/2015	Fairfield St	S52-083	S52-084	12	256	VCP	3							24								$2,500.00
								17		Infiltration runner at tap connection to joint	1,440	720	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/14/2015	Fairfield St	S52-084	S52-085	12	246	VCP	3							24								
4/14/2015	Douglas Rd	S42-017	S42-018	8	174	VCP	3							24								$304.50
								86		Fine Roots at Joint			3		Chemical Root Treatment		174	LF	$1.75	$304.50		
								92		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								98		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								104		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								136		Fine Roots at Joint start			1		Chemical Root Treatment (Included Above)							
								174		Fine Roots at Joint end			1		Chemical Root Treatment (Included Above)							
4/14/2015	Douglas Rd	S42-018	S42-019	8	248	VCP	3							24								
								18		Lateral Roots												
								177		Minor Circumferential Fracture			1									
4/14/2015	Woodbury Rd	S42-057	S42-058	8	35	VCP	3							24								
4/14/2015	Woodbury Rd	S42-057	S32-002	8	275	VCP	3							24								
4/14/2015	Woodbury Rd	S32-002	S32-003	8	73	VCP	3							24								
4/14/2015	Richard Rd	S32-043	S32-044	8	31	VCP	3							24								
4/14/2015	Richard Rd	S32-043	S32-042	8	105	VCP	3							24								
4/14/2015	Richard Rd	S32-042	S32-041	8	207	VCP	3							24								$4,550.00
								39		Infiltration Runner at joint in service	720	360	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
								40		Infiltration Runner at joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								175		Fine Roots at Joint			1									
								180		Fine Roots at Joint			1									
								183		Fine Roots at Joint start			1									
								206		Fine Roots at Joint finish			1									
4/14/2015	Richard Rd	S32-041	S32-040	8	136	VCP	3							24								$4,100.00
								58		Infiltration Runner at joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								81		Infiltration Runner at joint	360	180	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								84		Fine Roots at Joint			1									
4/14/2015	Rockwood Ln	S32-039	S32-038	8	100	VCP	3							24								$10,050.00
								50		Infiltration Runner at Joint in service	720	360	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
								84		Infiltration Runner at service connection to pipe	2,880	1,440	4		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
								88		Infiltration Runner at Joint	1,440	720	3		Point Repair		1	EA	$2,050.00	$2,050.00		
								88		Minor Circumferential Fracture			1									
4/14/2015	Rockwood Ln	S32-038	S32-045	8	123	VCP	3							24								$7,385.25
								6		Infiltration Dripper at Joint	360	180	2									
								57		Moderate Multiple Fractures start			3		CIPP		123	LF	$40.00	$4,920.00		
								80		Moderate Multiple Fractures finish			3									
								83		Fine Roots at Joint start			2		Chemical Root Treatment		123	LF	$1.75	$215.25		
									94	Roots in Lateral			3		Lateral Root Removal		1	EA	$650.00		$650.00	
								103		Fine Roots at Joint finish					seal all laterals (2)		2	EA	$800.00		$1,600.00	
4/14/2015	Rockwood Ln	S32-045	S32-047	8	158	VCP	3							24								
4/14/2015	Richard Rd	S32-040	S32-039	8	200	VCP	3							24								$4,550.00
								95		Infiltration Runner at joint	1,440	720	3		Point Repair, up to 4 ft		1	EA	$2,050.00	$2,050.00		
								148		Infiltration Runner in service	2,160	1,080	4		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/14/2015	Richard Rd	S32-039	S32-038	8	173	VCP	3							24								$2,250.00
								1		Moderate Longitudinal Fracture			2									
								124		Moderate Multiple Fractures			3		Point Repair, up to 8ft		1	EA	$2,250.00	$2,250.00		
								127		Moderate Multiple Fractures			2									
4/14/2015	Rockwood Ln	S42-061	S32-037	8	134	VCP	3							24								
								25		Fine Roots at Joint start			1									
								28		Fine Roots at Joint finish			1									
								78		Fine Roots at Joint start			1									
								130		Fine Roots at Joint finish			1									
4/14/2015	Rockwood Ln	S32-037	S32-038	8	50	VCP	3							24								
4/14/2015	Woodbury Rd	S42-058	S42-060	8	97	VCP	3							24								
								87		Fine Roots at Joint			1									
								95		Minor Longitudinal Fracture			1									
								95		Fine Roots at Joint			1									
4/14/2015	Woodbury Rd	S42-059	S42-058	8	38	VCP	3							24								
								31		Minor Circumferential Fracture			1									
4/15/2015	Douglas Rd	S52-058	S42-019	8	246	VCP	3							24								

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Appendix D
TV Inspection Summary Subarea 24

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/15/2015	Douglas Rd	S52-058	S52-076	8	214	VCP	3							24								$374.50
								23		Fine Roots at Joint start			3		Chemical Root Treatment		214	LF	$1.75	$374.50		
								200		Fine Roots at Joint finish			3		Chemical Root Treatment (Included Above)							
								212		Minor Multiple Fractures			1									
4/15/2015	Douglas Rd	S52-058	S52-059	8	245	VCP	3							24								$2,500.00
								107		Fine Roots at Joint			1									
								126		Fine Roots at Joint			1									
								149		Fine Roots at Joint start			1									
								170		Fine Roots at Joint finish			1									
								180		Leaking Service	720	360	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
								189		Fine Roots at Joint start			1									
								240		Fine Roots at Joint finish			1									
4/15/2015	Douglas Rd	S52-059	S52-060	8	196	VCP	3							24								$608.00
								10		Fine Roots at Joint			3		Chemical Root Treatment		196	LF	$1.75	$343.00		
								44		Fine Roots at Joint			1									
								74		Fine Roots at Joint			1									
								138		Fine Roots at Joint			1									
								160		Obstruction			4		Heavy Cleaning		1	HR	$265.00	$265.00		
4/15/2015	Elmwood Rd	S42-021	S42-140	8	196	VCP	3							24								
								45		Fine Roots at Joint start			1									
								71		Fine Roots at Joint finish			1									
4/15/2015	Berkshire Rd	S42-140	S52-075	8	144	VCP	3							24								$2,050.00
								33		Minor Circumferential Fracture			1									
								58		Hole			5		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
4/15/2015	Berkshire Rd	S52-075	S52-076	8	244	VCP	3							24								
								75		Minor Circumferential Fracture			1									
								152		Fine Root at Joint			1									
4/15/2015	Berkshire Rd	S52-077	S52-078	8	146	VCP	3							24								
								51		Fine Roots at Joint			1									
								62		Fine Roots at Joint			1									
								96		Fine Roots at Joint			1									
4/15/2015	Berkshire Rd	S52-078	S52-079	8	80	VCP	3							24								
								61		Fine Roots at Joint			1									
								67		Fine Roots at Joint start			1									
								79		Fine Roots at Joint finish			1									
4/15/2015	Berkshire Rd	S52-079	S52-063	8	188	VCP	3							24								
4/15/2015	Berkshire Rd	S52-077	S52-076	8	127	VCP	3							24								
4/15/2015	Douglas Rd	S52-060	S52-059	8	36	VCP	3							24								
								30		Fine Roots at Joint			1									
4/15/2015	Elmwood Rd	S52-073	S52-074	8	90	VCP	3							24								
								26		Minor Deposits attached												
4/15/2015	Elmwood Rd	S52-023	S52-074	8	172	AC	13							24								
4/15/2015	Thornton Rd	S31-138	S31-132	8	332	VCP	3							24								$17,280.00
								12		Fine Roots at Joint			1		CIPP		332	LF	$40.00	$13,280.00		
								54		Minor Longitudinal Crack			1									
								78		Minor Spiral Fracture			1									
								119		Minor Spiral Crack			1									
								119		Fine Roots at Joint			1									
								128		Moderate Spiral Fracture			3									
								131		Fine Roots at Joint			1									
								131		Infiltration Dripper at Joint	360	180	2									
								142		Fine Roots at Joint			1									
								159		Fine Roots at Joint Start			1									
								218		Infiltration Dripper at joint	360	180	2									
								221		Defective tap - roots coming in from connection			2									
								221		Infiltration Dripper at Joint	360	180	2									
								237		Moderate Spiral Fracture			2									
								281		Minor Longitudinal Fracture			1									
								332		Fine Roots at Joint finish			1									
															seal all laterals (5)		5	EA	$800.00	$4,000.00		
4/15/2015	Thornton Rd	S31-132	S31-133	8	188	VCP	3							24								$2,050.00
								125		Broken			2		Point Repair		1	EA	$2,050.00	$2,050.00		
4/15/2015	Thornton Rd	S31-133	S32-001	8	281	VCP	3							24								$4,550.00
								62		Moderate Longitudinal Fracture			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
								113		Fine roots at joint			1									
								143		Fine roots at joint			1									
								187		Minor Longitudinal Crack			1									
								187		Fine Roots at Joint			1									
								203		Defective Tap			1									
								203		Infiltration Dripper at tap connection to pipe	360	180	3		Seal lateral		1	EA	$2,500.00		$2,500.00	
								273		Moderate Multiple Cracks			2									
4/15/2015	Birds Hill Ave	S31-131	S31-132	8	177	VCP	3							24								$2,050.00
								104		Infiltration runner at joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		

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Appendix D
TV Inspection Summary Subarea 24

																	EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/15/2015	Thornton Rd	S32-001	S 42-056	8	213	VCP	3							24								$2,050.00
								38		Moderate Multiple Cracks			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
								190		Moderate Multiple Cracks			2									
								207		Moderate Longitudinal Crack			1									
4/15/2015	Thornton Rd	S42-056	S42-055	8	148	VCP	3							24								$2,050.00
								0		Moderate Circumferential Crack			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
4/15/2015	Thornton Rd	S42-055	S42-054	8	193	VCP	3							24								
4/15/2015	Thornton Rd	S42-054	S42-053	8	278	VCP	3							24								
								69		Minor Multiple Cracks			2									
								215		Defective Tap Cracked Cap			1									
4/15/2015	Thornton Rd	S42-053	S42-052	8	157	VCP	3							24								
4/15/2015	Thornton Rd	S42-052	S42-051	8	307	VCP	3							24								$2,050.00
								1		Moderate Multiple Fracture			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
4/15/2015	Dunbarton Rd	S42-040	S42-041	8	153	VCP	3							24								
								48		Tap Intruding			1									
4/16/2015	Shady Ln	S41-091	S31-136	6	186	AC	11							24								
4/16/2015	Wendling Rd	S41-091	S41-092	8	106	AC	11							24								
4/16/2015	Shady Ln	S41-095	S41-093	8	25	AC	12							24								$325.00
								25		Intruding Tap			3		Cut protruding lateral		1	EA	$325.00		$325.00	
4/16/2015	Shady Lane Easement	S41-095	S41-094	8	99	AC	12							24								$11,000.00
								45		Defective Tap												
								45		Infiltration Runner at 2 taps	2,880	1,440	3		Replace Service Wye		2	EA	$5,500.00		$11,000.00	
4/16/2015	Shady Ln	S41-095	S42-096	8	140	AC	12							24								$2,500.00
								32		Defective Tap			2									
								32		Infiltration Runner at tap joint to pipe	360	180	3		Seal lateral		1	EA	$2,500.00		$2,500.00	
								33		Broken			3									
4/16/2015	Dawson Dr	S42-034	S42-096	8	140	AC	12							24								$2,825.00
								11		Intruding Tap			3		Cut protruding lateral		1	EA	$325.00		$325.00	
								11		Infiltration Runner at tap joint to pipe	360	180	3		Seal lateral		1	EA	$2,500.00		$2,500.00	
4/16/2015	Dawson Dr	S42-034	S42-035	8	226	AC	12							24								$15,000.00
								226		Infiltration Runner in bench	2,880	1,440	5		Replace Manhole		1	EA	$15,000.00	$15,000.00		
4/16/2015	Dawson Dr	S42-035	S42-036	8	196	AC	12							24								$2,500.00
								20		Defective Tap			2									
								20		Infiltration Runner at Tap connection to pipe	1,440	720	4		Seal lateral		1	EA	$2,500.00		$2,500.00	
								100		Intruding Tap			1									
4/16/2015	Dawson Dr	S42-036	S42-037	8	251	AC	12							24								$5,500.00
								68		Defective Tap			3									
								68		Infiltration Runner at Tap connection to pipe	2,880	1,440	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
4/16/2015	Dawson Dr	S42-037	S42-038	8	30	AC	12							24								
4/16/2015	Dawson Dr	S42-038	S42-039	8	146	PVC	12							24								$11,000.00
								89		Defective Tap			3									
								89		Infiltration Runner at Tap connection to pipe	2,880	1,440	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
								96		Defective Tap			3									
								96		Infiltration Runner at Tap connection to pipe	10,080	5,040	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00	
4/16/2015	Dawson Dr	S42-039	S42-041	8	73	AC	12							24								
4/16/2015	Dawson Dr	S42-041	S42-042	8	55	AC	12							24								
4/16/2015	Dawson Dr	S42-042	S42-044	8	223	AC	12							24								$2,050.00
								58		Moderate Multiple Fractures			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
								75		Intruding Tap			1									
4/17/2015	Kearney Rd	S05-077	S05-078	8	159	AC	13							24								
4/17/2015	Kearney Rd	S05-078	S05-079	8	196	AC	13							24								
4/17/2015	Kearney Rd	S05-079.1	S05-079	8	28	AC	13							24								
								23		Offset Joint			2									
4/17/2015	Hazel Ln	S17-094	128-16	8	290	AC	13							24								
4/17/2015	Hazel Ln	S17-093	S17-088	10	130	AC	13							24								
4/17/2015	Jayne Rd	S17-082	S17-084	8	147	AC	13							24								
4/17/2015	Jayne Rd	S17-083	S17-080	8	127	AC	13							24								
4/17/2015	Jayne Rd	S17-083	S17-084	8	144	AC	13							24								
4/17/2015	Jayne Rd	S17-084	S17-085	8	150	AC	13							24								$2,750.00
								64		Minor Circumferential Fracture			1									
								64		Infiltration Runner at joint	2,880	1,440	3		Point Repair, up to 12ft		1	EA	$2,750.00	$2,750.00		
								71		Hole			3									
4/17/2017	Jayne Rd	S17-085	S17-086	8	157	AC	13							24								
4/17/2017	Whitman Rd	S46-027	S46-028	8	180	AC	13							24								
4/17/2017	Whitman Rd	S55-001	S46-028	8	295	AC	13							24								
4/17/2017	Whitman Rd	S55-001	S55-002	8	299	AC	13							24								
4/17/2017	Dawson Dr	S41-098	S41-097	8	203	AC	12							24								$4,100.00
								13		Intruding Tap			1									
								99		Broken			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		
								102		Broken			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00		

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Appendix D
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EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/17/2015	Dawson Dr	S41-098	S42-033	8	206	AC	12							24								$2,500.00
								46		Defective tap			2									
								46		Infiltration at tap connection to pipe	1,440	720	4		Seal lateral		1	EA	$2,500.00		$2,500.00	
								128		Minor Deposits attached			1									
4/17/2015	Dawson Dr	S42-032	S42-033	8	118	AC	12							24								
4/17/2015	Dawson Dr	S42-032	S42-031	8	77	AC	12							24								
4/17/2015	Dawson Dr	S42-032	S42-030	8	130	AC	12							24								
4/17/2015	Dawson Dr	S42-030	S42-038	8	173	AC	12							24								
4/17/2015	Dawson Dr	S41-092	S41-094	8	142	AC	12							24								
										TOTAL	49,140	24,570							TOTAL	$79,252.25	$71,900.00	$151,152.25

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Appendix D
TV Inspection Summary Subarea 25

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/30/2015	Saint Mary St	S02-001	S05-097	8	137	AC	13							25								
3/30/2015	Saint Mary St	S05-097	S05-098	8	99	AC	13							25								
3/30/2015	Central Ave	S05-098	S05-099	8	129	VCP	3							25								
3/30/2015	Central Ave	S05-099	S05-100	8	244	VCP	3							25								
								212		Hole			2									
3/31/2015	Central Ave	S05-100	S02-046	8	253	VCP	3							25								
								230		Minor Circular Fracture			2									
3/31/2015	Central Ave	S02-047	S02-046	8	164	VCP	3							25								$2,050.00
								49		Hole			4		Point Repair 4ft		1	EA	$2,050.00	$2,050.00		
3/31/2015	Central Ave	S02-047	S02-048	8	46	VCP	3							25								
3/31/2015	Reservoir St	S02-050	S02-048	8	195	VCP	3							25								
4/1/2015	Reservoir St ROW	S02-087	S02-089	12	63	PVC	13							25								
4/1/2015	Reservoir St ROW	S02-089	S05-102	12	280	PVC	13							25								$5,500.00
								170		Broken			5		Remove and Replace		1	EA	$5,500	$5,500.00		
4/1/2015	Reservoir St ROW	S05-102	S05-103	12	121	PVC	3							25								$7,260.00
								61		Moderate Longitudinal Fracture			2		CIPP		121	LF	$60	$7,260.00		
								105		Broken			5									
								105		Infiltration Runner	1,440	720	4									
										Seal all Laterals (0)							0	EA	$800.00	$0.00		
4/1/2015	Reservoir St ROW	S05-103	S05-104	12	226	VCP	3							25								$17,560.00
								2		Minor deposits attached			1		CIPP		226	LF	$60	$13,560.00		
								36		Infiltration Runner	2,880	1,440	4									
								53		Infiltration Runner	2,880	1,440	4									
								53		Heavy Multiple Fractures			4									
								54		Defective Tap: Leaking	1,080	540	3									
								120		Holes			5			3						
								127		Minor Circumferential Fracture			1									
								150		Minor Deposits attached start			1									
								155		fine roots at joint			1									
								158		Moderate Multiple Fractures			3									
								169		Moderate Multiple Fractures start			3			11						
								170		Infiltration Runner	2,160	1,080	4									
								172		Infiltration Runner	2,160	1,080	4									
								175		Minor Deposits Attached end			2									
								180		Moderate Multiple Fractures end			4									
								193		Heavy Multiple Fractures			4									
								196		Moderate Multiple Fractures			3									
								210		Moderate Multiple Fractures			3									
										Seal all Laterals (5)							5	EA	$800.00	$4,000.00		
4/1/2015	Reservoir St ROW	S05-104	S05-105	12	141	VCP	3							25								$8,460.00
								15		Broken			5		CIPP		141	LF	$60	$8,460.00		
								15		Infiltration Runner	2,160	1,080	4									
								25		Fine Roots at Joint start			2									
								30		Infiltration Dripper	180	90	4									
								33		Infiltration Dripper	180	90	4									
								65		Infiltration Runner	720	360	4									
								68		Infiltration Dripper	360	180	3									
								77		Infiltration Dripper	360	180	3									
								104		Infiltration Dripper	180	90	3									
								113		Infiltration Runner	720	360	4									
								125		Infiltration Runner	720	360	4									
								140		Fine Roots at Joint end			2									
										Seal all Laterals (0)							0	EA	$800.00	$0.00		
4/1/2015	Reservoir St ROW	S05-105	S05-106	12	110	VCP	3							25								$6,600.00
								3		Fine Roots at Joint			2		CIPP		110	LF	$60	$6,600.00		
								3		Infiltration Runner at joint	180	90	4									
								9		Infiltration Dripper at joint	180	90	3									
								15		Infiltration Dripper at joint	180	90	3									
								21		Infiltration Runner at joint	720	360	4									
								50		Infiltration Runner at joint	1,080	540	4									
								65		Infiltration Runner at joint	2,160	1,080	4									
								68		Infiltration Runner at joint	360	180	3									
								72		Infiltration Dripper at joint	360	180	3									
								77		Infiltration Runner at joint	720	360	4									
								78		Infiltration Runner at joint	720	360	4									
								80		Infiltration Dripper at joint	360	180	3									
								82		Infiltration Runner at joint	720	360	4									
								85		Infiltration Dripper at joint	360	180	3									
								88		Infiltration Dripper at joint	360	180	3									
								91		Infiltration Runner at joint	720	360	4									
								100		Infiltration Dripper at joint	360	180	4									
								110		Fine Roots at Joint			2									
										Seal all Laterals (0)							0	EA	$800.00	$0.00		

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 25

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/25/2015	Reservoir Ave	S02-060	S02-061	8	134	AC	13							25								$5,500.00
								133		Infiltration Runner at joint	4,320	2,160	4		Remove and Replace		1	EA	$5,500.00	$5,500.00		
3/25/2015	Reservoir Ave	S02-060A	S02-059	8	173	AC	13							25								
3/25/2015	Reservoir Ave	S02-058	S02-060A	8	164	AC	13							25								
								120		Minor Circumferential Fracture			2									
3/25/2015	Reservoir Ave	S02-058	S02-058A	8	202	AC	13							25								
3/25/2015	Carter St	S02-059	S02-057	8	180	AC	13							25								$2,050.00
								54		hole middle of pipe			5		point repair 4 ft		1	EA	$2,050	$2,050.00		
3/25/2015	Reservoir St Ext	S02-075	S02-075A	8	37	AC	13							25								
3/25/2015	Reservoir St Ext	S02-075A	S02-058A	8	60	AC	13							25								
3/25/2015	Reservoir St	S02-052	S02-050	8	153	CI	13							25								
3/25/2015	Daley St	S02-003	S02-004	8	119	AC	13							25								
								35		Fine Roots at Joint			1									
3/25/2015	St Mary St	S02-011	S02-004	8	3	AC	13							25								
3/25/2015	St Mary St	S02-011	S02-012	8	160	AC	13							25								
								65		Moderate Longitudinal Fracture			2									
3/25/2015	St Mary St	S02-012	S02-013	8	88	AC	13							25								
3/25/2015	Seabeds Way	S02-027	S02-028	10	137	PVC	12							25								
3/25/2015	Seabeds Way	S02-027	S02-026	8	130	PVC	12							25								
								130		offset Joint Survey abandoned												
3/27/2015	Reservoir Street ROW	S02-088	S02-086	8	99	VCP	3							25								
								95		Fine Roots at Joint			2									
3/27/2015	Reservoir Street ROW	S02-086	S02-085	8	145	PVC	13							25								
3/27/2015	Reservoir Street ROW	S02-046	S05-101	8	164	VCP	3							25								
								108		Fine Roots at Joint			1									
3/27/2015	Reservoir Street ROW	S05-101	S02-088	8	62	VCP	3							25								
								21		Fine Roots at Joint			2									
3/24/2015	Bridge St	S02-070	S02-066	8	189	PVC	13							25								
3/24/2015	Reservoir Ave	S02-065	S02-104	8	194	PVC	13							25								
3/24/2015	Reservoir Ave	S02-060	S02-060A	8	12	AC	13							25								
3/24/2015	Reservoir Ave	S02-065	S02-063	8	188	AC	13							25								
3/24/2015	Reservoir Ave	S02-063	S02-060	8	120	AC	13							25								
								15		Minor Deposits attached			1									
3/24/2015	Reservoir Ave	S02-052	S02-050	8	153	CI	13							25								
4/13/2015	Captain Robert Cook Dr	S02-033	S02-034	8	83	AC	13							25								
4/13/2015	Captain Robert Cook Dr	S02-035	S02-034	8	107	AC	13							25								
								45		Fine Roots at Joint			1									
								49		Fine Roots at joint			2									
								49		Minor Longitudinal Fracture			1									
4/13/2015	Captain Robert Cook Dr	S02-036	S02-035	8	86	AC	13							25								
										TOTAL	32,040	16,020							TOTAL	$54,980	$0	$54,980

BETA

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 26

																	EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/9/2016	Laurel Cir	S50-070	S50-071	8	181	AC	13							26								
								110		Minor Hole			1									
4/9/2016	Laurel Cir	S50-070	S50-069	8	81	AC	13							26								
4/9/2016	Laurel Dr	S50-069	S50-072	8	142	VCP	3							26								
								34		Minor Longitudinal Fracture												
4/9/2016	Laurel Dr	S50-072	S50-073	8	72	VCP	3							26								
								49		Moderate Multiple Fractures			2									
4/9/2016	Laurel Dr	S50-073	S50-074	8	83	VCP	3							26								
								18		Fine Roots at Joint Start			2									
								40		Fine Roots at Joint Finish			2									
								51		Fine Roots at Joint			2									
4/9/2016	Laurel Dr	S50-069	S50-068	8	36	VCP	3							26								
4/9/2016	Laurel Dr	S50-067	S50-068	8	188	VCP	3							26								$2,050.00
								26		Moderate Multiple Fractures			3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								27		Moderate Hole			3									
4/9/2016	Laurel Dr	S50-067	S50-066	8	136	VCP	3							26								
								17		Fine Roots at Joint			1									
								31		Fine Roots at Joint			1									
									31	Minor Circumferential Fracture			1									
4/9/2016	Laurel Dr	S50-066	S50-065	8	124	VCP	3							26								
								28		Root Ball at Joint			2									
								44		Fine Roots at Joint Start			1									
								119		Fine Roots at Joint Finish			1									
								121		Minor Circumferential Fracture			1									
4/9/2016	Laurel Dr	S50-065	S50-064	8	89	VCP	3							26								
4/9/2016	Laurel Dr	S50-074	S50-075	8	401	VCP	3							26								$2,050.00
								81		Fine Roots at Joint Start			1									
								100		Fine Roots at Joint Finish			1									
								286		Minor Deposits attached			1									
								286		Minor Infiltration Dripper at joint	180	90	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								297		Minor Deposits attached			1									
4/9/2016	Laurel Dr	S50-075	S50-078	8	208	VCP	3							26								
4/9/2016	Laurel Dr	S50-065	S50-077	8	119	VCP	3							26								$3,031.75
								9		Minor Circumferential Fracture			2									
								18		Heavy Root Ball at Joint			5		Root treatment		119	LF	$1.75	$208.25		
								30		Heavy Root Ball at Joint			5				119	LF	$6.50	$773.50		
									30	Heavy Longitudinal Fracture			5		Point repair 4 ft (fracture may be longer than 4 ft, root ball in way)		1	EA	$2,050.00	$2,050.00		
								31		Heavy Multiple Fractures			4									
								34		Heavy Root Ball at Joint (survey abandoned)			5									
4/11/2016	Laurel Dr	S50-075	S50-076	8	144	VCP	3							26								$21,150.00
									6.6	Broken at Joint			3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								18		Minor Deposits Attached			1									
								18		Minor Infiltration Dripper at joint	180	90	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								115		Moderate Infiltration Runner	720	360	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								131		Fine Roots at Joint			1									
								144		Heavy Infiltration from service joint into Manhole	10,080	5,040	5		Replace manhole		1	EA	$15,000	$15,000.00		
4/11/2016	Laurel Dr Easement	S50-076	S50-077	8	84	VCP	3							26								$2,197.00
								2		Multiple Minor Fractures			1									
								14		Moderate Roots at Joint			3		Root treatment		84	LF	$1.75	$147.00		
								17		Moderate Infiltration Dripper	180	90	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								20		Root ball at joint can not pass (survey abandoned)			5									
4/11/2016	Laurel Dr Easement	S50-078	S50-079	8	175	VCP	3							26								
4/11/2016	Laurel Dr Easement	S50-079	S50-080	8	182	VCP	3							26								$2,500.00
								6		Minor Deposits Attached			1									
								150		Defective Break In tap with Infiltration at joint	2,880	1,440	3		Seal lateral		1	EA	$2,500		$2,500.00	
										TOTAL	14,220	7,110							TOTAL	$30,479	$2,500	$32,979

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 27

																	EST. REHAB COSTS			
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
5/16/2014	Windfield St	S29-010	S29-011	8	184	VCP	3							27								
								63		Minor Multiple Fractures			1									
								137		Minor Spiral Crack			1									
5/16/2014	Windfield St	S29-011	S29-012	8	73	VCP	3							27								
								47		Minor Circumferential Fracture			2									
5/16/2014	Windfield St	S29-012	S29-013	8	105	VCP	3							27								
5/16/2014	Windfield St	S29-013	S29-014	8	158	VCP	3							27								$2,050.00
								44		Moderate Multiple Fractures			3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								104		Minor Circumferential Fracture			1									
5/16/2014	Windfield St	S29-014	S29-015	8	66	VCP	3							27								
								0		Water Level 20%			1									
								25		Minor Spiral Fracture			1									
								25		Water Level 20%			2									
								46		Water Level 20%			1									
5/16/2014	Windfield St	S29-015	S29-016	8	164	VCP	3							27								$2,500.00
								22		Minor Leak at service connection to main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
5/16/2014	Ware Rd	S29-019	S29-018	8	322	VCP	3							27								$8,563.50
								65		Moderate Multiple Fractures - START			3		Replace Service Wye	3	1	EA	$5,500.00	$5,500.00		
								68		Moderate Multiple Fractures - FINISH			3									
								141		Leak at Service Connection to Main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
								198		Fine Roots at Joint			1		Chemical Root Treatment		322	LF	$1.75	$563.50		
								271		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								280		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)							
								304		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)							
								315		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)							
5/16/2014	Ware Rd	S29-018	S29-017	8	72	VCP	3							27								$2,500.00
								4		Leak at Service Connection to Main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
5/16/2014	Ware Rd	S29-017	S29-016	8	237	VCP	3							27								
5/16/2014	Abbott St	S29-021	S29-022	8	169	VCP	3							27								$2,500.00
								73		Minor Circumferential Fracture			1									
								147		Minor Leak at chimney service Joint to main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00	
								164		Minor Circumferential Fracture			1									
5/16/2014	Abbott St	S29-022	S29-016	8	269	VCP	3							27								$2,400.00
								25		Fine Roots at Joint			1									
								85		Moderate chimney leak at service joint to main	720	360	3		lateral grout up to 5 ft		1	EA	$800.00		$800.00	
								115		Fine Roots at Joint			1									
								118		Water Level 20%			1									
								124		Water Level 20%			1									
								203		Heavy Leak at service connection to main	2,660	1,330	4		lateral grout up to 5 ft		1	EA	$800.00		$800.00	
								215		Moderate chimney leak at service joint to main	1,880	940	3		lateral grout up to 5 ft		1	EA	$800.00		$800.00	
										TOTAL	5,980	2,990							TOTAL	$8,114	$12,400	$20,514

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 28

																		EST. REHAB COSTS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/11/2016	Rivard Rd	S39-075	S39-074	8	115	AC	13							28								
4/11/2016	Rivard Rd	S39-075	S39-076	8	179	AC	13							28								$2,050.00
								99		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050	$2,050		
4/11/2016	Rivard Rd	S39-076	S39-077	8	136	AC	13							28								$4,100.00
								72		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050	$2,050		
								107		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050	$2,050		
4/11/2016	Rivard Rd	S39-077	S39-078	8	42	AC	13							28								
4/11/2016	Rivard Rd	S39-078	S39-079	8	91	AC	13							28								$550.00
								89		Moderate Infiltration Runner	2,880	1,440	3		Grout & patch MH bench, invert, and connection		1	EA	$550	$550		
										TOTAL	2,880	1,440							TOTAL	$6,700	$0	$6,700

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 29

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/30/2016	Tillotson Rd Easement	S21-121	S21-122	8	257	AC	13							29								$2,050.00
								26		Minor Longitudinal Fractures			2									
								137		Moderate Multiple Fractures			4		Point repair 4 ft		1	EA	$2,050.00	$2,050.00		
								137		Moderate Infiltration Runner	720	360	4									
4/30/2016	Tillotson Rd Easement	S21-122	S21-123	8	301	AC	13							29								
4/30/2016	Tillotson Rd Easement	S21-123	S15-061	8	235	AC	13							29								$15,000.00
								235		Heavy Infiltration Gusher on bench	7200	3600	5		Replace manhole		1	EA	$15,000.00	$15,000.00		
										Heavy Root Infiltration at Pipe Connection to Bench			5									
4/30/2016	Tillotson Rd Easement	S15-061	S15-064	8	270	AC	13							29								
4/30/2016	Pershing Rd Easement	S21-124	S21-123	8	125	AC	13							29								
										TOTAL	7,920	3,960							TOTAL	$17,050	$0	$15,000

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 30

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
5/18/2015	Warren St	S50-022	S59-013	8	220	PVC	12							30								
5/18/2015	South Street Easement	S59-019	S59-017	8	114	PVC	11							30								$550.00
								114		Infiltration Runner at connection to MH s59-017	360	180	3		Grout pipe connection		1	EA	$550.00	$550.00		
5/18/2015	South Street Easement	S59-017	S59-017.1	8	60	AC	11							30								
5/18/2015	South Street Easement	S59-017.1	S59-015	8	28	AC	11							30								
5/18/2015	South Street Easement	S59-019	S59-019.1	8	27	AC	11							30								
5/18/2015	South Street Easement	S59-019.1	S59-020	8	133	AC	11							30								
5/18/2015	South Street Easement	S59-020	S59-021	8	316	AC	11							30								
										TOTAL	360	180							TOTAL	$550	$0	$550

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 31

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/17/2015	Webster St	S59-036	S59-034	8	261	AC	12							31								$2,050.00
								4		Broken			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
4/17/2015	Fox Hill Rd	S59-036	S59-035	8	207	AC	12							31								$2,050.00
								51		Broken			5		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
								51		Infiltration Runner from hole	360	180	3									
4/17/2015	Fox Hill Rd	S59-036	S59-037	8	231	AC	12							31								
4/17/2015	Fox Hill Rd	S59-037	S59-038	8	228	AC	12							31								$2,500.00
								52		Infiltration from inside service	360	180	2		Seal lateral		1	EA	$2,500.00		$2,500.00	
4/17/2015	Fox Hill Rd	S59-039	S59-040	8	95	AC	12							31								
4/18/2015	Fox Hill Rd	S59-039	S59-038	9	71	AC	13							31								
										TOTAL	720	360							TOTAL	$4,100	$2,500	$6,600

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 32

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
3/31/2015	First Ave	S11-022	S11-021	12	285	VCP	3							32								**$2,550.00**
								55		Minor Circumferential Fracture			2									
								141		Minor Deposits attached			2									
								141		Infiltration Runner	180	90	3		Point Repair up to 4 ft		1	EA	$2,550	$2,550		
3/31/2015	First Ave	S11-023	S11-022	12	83	VCP	3							32								
3/31/2015	First Ave	S11-024	S11-023	12	247	VCP	3							32								
								160		Minor Longitudinal Crack			2									
3/31/2015	First Ave	S11-025	S11-024	12	307	VCP	3							32								**$5,100.00**
								2		Multiple Moderate Fractures			4		Point Repair up to 4 ft		1	EA	$2,550	$2,550		
								47		Broken			4		Point Repair up to 4 ft		1	EA	$2,550	$2,550		
3/31/2015	First Ave	S11-026	S11-025	12	314	VCP	3							32								
3/31/2015	First Ave	S11-027	S11-026	12	325	VCP	3							32								**$19,500.00**
								16		Minor Deposits Attached			1		CIPP		325	LF	$60	$19,500		
								185		Infiltration Runner	7,200	3,600	4									
								287		Minor Spiral Fracture			2									
								291		Infiltration Runner	4,320	2,160	4									
								325		Infiltration Runner	2,880	1,440	4									
										seal all laterals ()							0	EA	$800	$0		
3/31/2015	First Ave	S11-028	S11-027	12	146	VCP	3							32								**$9,560.00**
								84		Fine Roots at Joint			1		CIPP		146	LF	$60	$8,760		
								87		Fine Roots at Joint			1									
								93		Fine Roots at Joint			1									
								96		Fine Roots at Joint			1									
								113		Minor Deposits Attached			1									
								125		Minor Deposits Attached			1									
								146		Minor Deposits Attached			1									
										seal all laterals (1)							1	EA	$800		$800	
3/31/2015	First Ave	S11-029	S11-028	12	177	VCP	3							32								**$11,420.00**
								101		Infiltration Runner	720	360	4		CIPP		177	LF	$60	$10,620		
								107		Moderate Spiral Fracture			3									
								110		Moderate Multiple Fractures			4									
								119		Infiltration Runner	2,880	1,440	4									
								122		Moderate Multiple Fractures			4									
								140		Minor Circumferential Fracture			2									
										seal all laterals (1)							1	EA	$800		$800	
3/31/2015	First Ave	S11-029	S17-095	12	242	VCP	3							32								**$15,320.00**
								93		Defective Tap, Leaking at joint	720	360	4		CIPP		242	LF	$60	$14,520		
								222		Moderate Longitudinal Fracture			3									
										seal all laterals (1)							1	EA	$800		$800	
3/26/2015	Highland Terrace	S11-58	S11-57	8	57	AC	13							32								
3/26/2015	Highland Terrace	S11-51	S11-50	8	143	AC	13							32								
								70		Moderate Spiral Fracture			2									
								87		Minor Joint Separation			2									
3/26/2015	Highland Terrace	S11-56	S11-49	8	103	AC	13							32								
										Medium Roots at Joint			2									
3/26/2015	Highland Terrace	S11-49	S11-48	8	145	AC	13							32								**$253.75**
								0		Medium Roots at Joint			2									
								16		Medium Roots at Joint			3		Chemical Root Treatment		145	LF	$1.75		$254	
								128		Minor Roots at Joint			2									
								131		Medium Roots at Joint			3									
3/26/2015	Highland Terrace	S11-48	S11-47	8	199	VCP	3							32								
3/26/2015	Highland Terrace	S11-47	S11-46	8	195	VCP	3							32								**$2,050.00**
								63		Broken			4		Point Repair up to 4 ft		1	EA	$2,050	$2,050		
								142		Minor Longitudinal Fracture			2									
3/26/2015	Riverside St	S06-053	S06-052	8	279	VCP	3							32								
								44		Minor Roots at Joint			2									
3/26/2015	Riverside St	S06-053	S06-052	8	92	VCP	3							32								
								79		Minor Roots at Joint			2									
3/26/2015	Riverside St	S06-051	S06-050	8	331	VCP	3							32								
								6		Minor Roots at Joint			1									
								105		Minor Roots at Joint			1									
								135		Minor Roots at Joint			1									
								180		Minor Roots at Joint			1									
								198		Minor Roots at Joint			1									
4/1/2015	First Ave	S11-021	S11-021.1	12	118	VCP	3							32								**$7,080.00**
								9		Moderate Multiple Fractures start			4		CIPP	9	118	LF	$60	$7,080		
								18		Moderate Multiple Fractures end			4									
								80		Minor Longitudinal Fracture			2									
								97		Infiltration runner at joint	720	360	4			1						
										seal all laterals (0)							0	EA	$800.00			
4/2/2015	Cabot St	S11-042	S11-041	6	33	AC	5							32								**$265.00**
								33		obstacle			4		Heavy Cleaning		1	EA	$265.00	$265.00		
4/2/2015	Cabot St	S11-041	S11-042	6	45	AC	5							32								
								45		obstacle			2									
4/2/2015	Cabot St	S11-042	S11-043	8	190	AC	5							32								**$2,050.00**
								150		Hole			5		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00		
4/2/2015	Cabot St	S11-043	S11-064	13	143	AC	5							32								
4/2/2015	Cabot St	S11-064	S11-044	8	147	AC	5							32								
4/2/2015	Cabot St	S11-045	S11-046	8	172	AC	5							32								
4/2/2015	Cabot St	S11-045	S11-044	8	111	AC	5							32								
4/2/2015	Cabot St	S11-045	S11-047	8	133	AC	5							32								
4/2/2015	Cabot St	S11-047	S11-048	8	142	AC	5							32								
								55		Moderate Multiple Fractures			2									
4/2/2015	Cabot St	S11-048	S11-023	8	97	AC	5							32								

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix D
TV Inspection Summary Subarea 32

EST. REHAB COSTS

DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/ INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/ OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST
4/8/2015	Wexford St	S06-021	S06-020	8	307	AC	10							32								**$2,500.00**
								123		Leaking Service	360	180	3		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/8/2015	Wexford St	S06-020	S06-018	8	50	AC	8							32								
4/8/2015	Brook Rd	S06-019	S06-018	8	162	AC	8							32								
4/8/2015	Wexford/Charles Easemer	S06-017	S06-024	8	270	AC	12							32								**$11,600.00**
								142		Broken			5		CIPP		270	LF	$40.00	$10,800.00		
										Seal all Laterals (1)							1	EA	$800.00		$800.00	
4/8/2015	Wexford St	S06-016	S06-017	8	57	AC	12							32								**$3,080.00**
								33		Hole			5		CIPP		57	LF	$40.00	$2,280.00		
								33		Infiltration Runner at hole	4320	2160	5									
								34		Hole			4									
								34		Infiltration Runner at hole	4320	2160	5									
										Seal all Laterals (1)							1	EA	$800.00		$800.00	
4/8/2015	Wexford St	S06-017	S06-018	8	216	AC	8							32								
								208		Moderate Multiple Cracks			2									
4/8/2015	Franklin St	S06-014	S06-016	8	139	AC	8							32								**$7,960.00**
								33		Break in tap Defective			5		CIPP		139	LF	$40.00	$5,560.00		
								33		Leaking at tap joint to pipe	5760	2880	5									
										Seal all Laterals (3)							3	EA	$800.00		$2,400.00	
4/8/2015	Wexford St	S06-015	S06-016	8	134	PVC	12							32								
4/8/2015	Charles St	S06-023	S06-024	8	298	AC	12							32								
4/8/2015	Charles St	S06-027	S06-026	8	292	AC	12							32								**$2,500.00**
								96		Leaking Service	2160	1080	4		Seal Lateral		1	EA	$2,500.00		$2,500.00	
4/8/2015	Charles St	S06-026	S06-025	8	78	AC	12							32								
4/8/2015	Charles St	S06-025	S06-024	8	200	AC	12							32								
6/9/2016	Charles St ROW	S06-011	S06-010	12	124	VCP	3							32								**$217.00**
								3		Minor roots at Joint			2		Chemical Root Treatment		124	LF	$1.75		$217.00	
								5		Moderate Longitudinal Fracture			3									
								10		Deposits Attached			2									
								23		Moderate Longitudinal Fracture			3									
								31		Heavy Roots at Joint			5									
								46		Minor roots at Joint			2									
								121		Deposits Attached			2									
6/9/2016	Charles St ROW	S06-010	S06-009	12	172	VCP	3							32								
								75		Moderate Longitudinal Fracture Start			2									
								95		Moderate Longitudinal Fracture End			2									
								102		Moderate Longitudinal Fracture Start			2									
								124		Moderate Longitudinal Fracture End			2									
6/9/2016	Charles St ROW	S06-009	S06-008	12	92	VCP	3							32								
								14		Moderate Longitudinal Fracture, Start			2									
								15		Minor Roots at Joint			2									
								50		Deposits Attached, Start			2									
								91		Moderate Longitudinal Fracture, End			2									
								91		Deposits Attached, End			2									
6/9/2016	Charles St ROW	S06-008	S06-007	12	89	VCP	3							32								**$2,550.00**
								5		Moderate Longitudinal Fracture			2									
								14		Deposits Attached, Start			2									
								21		Infiltration Runner	1,440	720	4		Point Repair		1	EA	$2,550.00		$2,550.00	
								23		Moderate Longitudinal Fracture			3									
								88		Deposits Attached, End			2									
6/10/2016	Charles St ROW	S06-007	S06-006	12	99	CIP	13							32								
								0		Deposits Attached, Start			2									
								99		Deposits Attached, End			2									
6/10/2016	Charles St ROW	S06-003	S06-004	10	69	VCP	3							32								
										TOTAL	37,980	18,990							TOTAL	$91,135	$14,421	$105,556

Appendix E
Previous TV Investigation and Rehabilitation Map

Town of Needham, MA
Sewer TV and Rehabilitation Map

N
W E
S

Legend

Most Recent TV Inspection and New Installation

- Not Inspected
- 1994-2000
- 2004
- 2005
- 2008
- 2010
- 2011
- 2012
- 2014
- 2015
- 2016

Rehabilitation Work

- Sewer Pipe
- Sewer Manhole

MWRA

- Sewer Pipe
- Sewer Manhole

Sewer Pump Station Locations

1. West Street Pump Station
2. Reservoir B Pump Station
3. Great Plain Avenue Pump Station
4. Kendrick Street Pump Station
5. Alden Road Pump Station
6. Milo Circle Pump Station
7. Reservoir A Pump Station
8. Lake Drive Pump Station
9. Warren Street Pump Station

970 485 0 970 Feet

BETA
ENGINEERING SUCCESS TOGETHER

October 27, 2016

Appendix F
Cost Effective Analysis

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/21/2015	Edgewater Dr	S60-020	S60-021	8		VCP	3							3								$2,050.00			
								13		Defective Tap, cracked cap			3		Point Repair, up to 4ft		1	EA	$2,050.00		$2,050.00		$0	$0.00	NO
4/21/2015	Edgewater Dr	S60-022	S60-023	8	205	VCP	3							3								$2,500.00			
								77		Infiltration Runner from inside service	180	90	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/21/2015	Edgewater Dr	S60-002	S60-003	8	146	VCP	3							4								$2,500.00			
								49		Infiltration Dripper at service connection to pipe	180	90	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/21/2015	Edgewater Dr	S60-007	S60-006	8	67	VCP	3							4								$2,500.00			
								3		Fine Roots at Joint			1												
								21		Fine Roots at Joint			1												
								36		Fine Roots at Joint start			1												
								40		Infiltration Dripper	180	90	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								62		Fine Roots at Joint finish			1												
4/22/2015	Whitman Rd	S55-007.1	S55-009	8	168	AC	13							5								$2,500.00			
								25		Infiltration Dripper at tap connection to pipe	180	90	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/22/2015	Whitman Rd	S55-010	S55-011	8	172	AC	13							5								$5,500.00			
								26		Infiltration Runner at tap connection to pipe	2,160	1,080	3		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
								40		Defective Tap			3												
4/11/2016	Oxbow Rd	S56-023	S56-004	8	233	AC	13							6								$4,100.00			
								107		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								110		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								222		Hole			2												
4/15/2014	Mayflower Rd.	S19-029	S19-030	8	284	VCP	3							11								$16,160.00			
								2	Moderate Multiple Fractures				1		CIPP	1	284	LF	$40.00	$11,360.00			$0	$0.00	NO
								63		Moderate Longitudinal Crack			3		CIPP (Included Above)	2									
								66		Moderate Multiple Cracks			3		CIPP (Included Above)	4									
								72		Moderate Multiple Fractures			3		CIPP (Included Above)	7									
								82		Moderate Multiple Cracks			3		CIPP (Included Above)	14									
								120		Moderate Multiple Fractures			3		CIPP (Included Above)	6									
								125		Moderate Multiple Fractures			3		CIPP (Included Above)	2									
								129	Moderate Multiple Fractures				2		CIPP (Included Above)	12									
								145		Moderate Multiple Fractures			2		CIPP (Included Above)	7									
								157		Moderate Multiple Fractures			2		CIPP (Included Above)	34									
								163		Moderate Multiple Fractures			2		CIPP (Included Above)	1									
								167		Moderate Multiple Fractures			2		CIPP (Included Above)	1									
								203	Moderate Multiple Fractures				2		CIPP (Included Above)	3									
								224	Moderate Multiple Fractures				2		CIPP (Included Above)	6									
								233		Light Roots at Joint			1												
								235		Light Roots at Joint			1												
								238		Light Roots at Joint			1												
								252	Moderate Multiple Fractures				1		seal all laterals (6)		6	EA	$800.00		$4,800.00				
4/15/2014	Mayflower Rd.	S19-030	S19-031	8	286	VCP	3							11								$500.50			
								62		Light Roots at Joint			3		Chemical Root Treatment		286	LF	$1.75	$500.50			$0	$0.00	NO
								65		Light Mineral Deposits Attached			1												
								67		Moderate Roots at Joint			1												
								181		Minor Longitudinal Fracture			2			20									
								220		Light Roots at Joint			1												
								224		Light Roots at Joint			1												
								230		Light Roots at Joint			1												
								242		Moderate Roots at Joint			1												
4/15/2014	Whiting Way	S19-033	S19-032	8	188	VCP	3							11								$2,050.00			
								158		Broken			3		Point Repair, up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/15/2014	Whiting Way	S19-032	S27-009	8	290	VCP	3							11								$2,557.50			
								21	Obstacle Blocking Flow 10%				3												
								28		Light Grease Deposits Attached			1												
								56		Light Grease Deposits Attached			1												
								170		Heavy Roots at Joint			3		Chemical Root Treatment		290	LF	$1.75	$507.50			$0	$0.00	NO
								176	Heavy Roots at Joint				3												
								196		Heavy Roots at Joint			3												
								200	Moderate Roots at Joint				2												
								202	Heavy Roots at Joint				3												
								208	Light Roots at Joint				1												
								215		Leaking at Joint	180	90	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								215	Light Roots at Joint				1												
								280		Light Roots at Joint			1												
4/16/2014	Alden Rd	S20-004	S27-005	8	224	VCP	3							11								$12,160.00			
								38		Leaking Joint	180	90	3		CIPP	1	224	LF	$40.00	$8,960.00			$10,085	$0.83	NO
								137		Leaking Joint	180	90	3		CIPP (Included Above)	1									
								137		Longitudinal Fracture			3		CIPP (Included Above)	3									
								181		Leaking Joint	180	90	3		CIPP (Included Above)	1									
								223		Minor Spiral Crack			1		CIPP (Included Above)	1									
								223		Leaking Joint	180	90	3		CIPP (Included Above)	1									
															seal all laterals (4)		4	EA	$800.00		$3,200.00				
4/16/2014	Canavan Cr	S27-017	S27-018	8	56	AC	12							11								$2,500.00			
								45		Service Lateral Leaking at Main	360	180	3		Seal lateral	1	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/16/2014	Canavan Cr	S27-018	S27-008	8	144	AC	12							11								$5,500.00			
								0		Leaking Joint	2160	1,080	3		Remove and Replace	1	1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
4/17/2014	Brewster Dr.	S28-011	S28-005	8	310	AC	13							11								$2,315.00			
								152	Obstacle Blocking Flow 10%				3		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
								308		Leaking Joint	1080	540	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$15,128	$7.38	
4/17/2014	Standish Rd	S27-019	S27-020	8	195	AC	13							11								$265.00			
								154	Light Roots through Barrell				2												
								154	Obstacle Blocking Flow				3		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																		EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/17/2014	Standish Rd	S27-021	S27-022	8	209	AC	13							11								$2,050.00			
								0		Leaking Joint	180	90	1		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								50		Light Grease Deposits Attached			1												
								54	Light Grease Deposits Attached				1												
4/18/2014	Canavan Cr	S28-014	S28-015	8	193	VCP	3							11								$915.00			
								59		Light Roots at Joint			1												
								99	Heavy Roots in Service				3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								107	Obstacle Blocking Flow				1		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
4/18/2014	Carol Rd	S28-015	S28-016	8	276	VCP	3							11								$14,240.00			
								27	Leak through Service Cap		1440	720	3		CIPP		276	LF	$40.00	$11,040.00			$45,384	$3.19	YES
								86	Service Lateral Leaking		720	360	3												
								88		Joint Leaking	720	360	3			1									
								276		Leaking at Pipe Connection to Bench	360	180	3			1									
										seal all laterals (4)							4	EA	$800.00	$3,200.00					
4/18/2014	Curtis Rd	S20-007	S20-006	8	180	VCP	3							11								$315.00			
								42		Minor Circumfrential Fracture			1			1									
								57	Minor Longitudinal Crack				1			3									
								66		Minor Spiral Crack			1			3									
								111		Light Roots at Joint			1												
								120		Light Roots at Joint			1												
								138		Light Roots at Joint			1												
								144		Light Roots at Joint			1												
								150		Medium Roots at Joint			2												
								168		Heavy Roots at Joint			3		Chemical Root Treatment		180	LF	$1.75	$315.00			$0	$0.00	NO
4/22/2014	Mackintosh Ave	S20-034	S20-033	8	287	PVC	13							11								$4,100.00			
								94		Leaking Joint	180	90	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								215	Light Mineral Deposits Attached				1												
								215	Hole				3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								260		Water Level 45%															
4/11/2014	Pilgrim Rd	S19-020	S19-021	8	247	VCP	3							11								$432.25			
								14		Medium Roots at Joint			3		Chemical Root Treatment		247	LF	$1.75	$432.25			$0	$0.00	NO
								36		Medium Roots at Joint			3												
								38		Fine Roots at Joint			1												
								40	Minor Multiple Fractures				1			3									
								47	Minor Multiple Fractures				1			5									
								50		Fine Roots at Joint			1												
								56		Fine Roots at Joint			1												
								60		Roots in Lateral Service			1												
								91		Minor Longitudinal Crack			1			1									
								119		Minor Longitudinal Crack			1			1									
								122		Roots in Lateral Service			1												
								138		Multiple Minor Cracks			2			1									
								169		Multiple Minor Cracks			2			1									
								177		Multiple Minor Cracks			2			1									
								196		Medium Roots at Joint			3												
								215		Multiple Minor Cracks			2			1									
								218		Multiple Minor Cracks			2			1									
								247		Fine Roots at Joint			1												
4/11/2014	Pilgrim Rd	S19-021	S19-001	8	198	VCP	3							11								$3,250.00			
								91		Minor Longitudinal Crack			1			1									
								109		Minor Longitudinal Crack			1			1									
								115		Fine Roots at Joint			1												
								126		Fine Roots at Joint			1												
								129		Fine Roots at Joint			1												
								159		Fine Roots at Joint			1												
								167		Minor Longitudinal Crack			1			1									
								177		Minor Longitudinal Crack			1			1									
								180		Minor Longitudinal Crack			1			1									
								186		Fine Roots at Joint			1												
								186		Moderate Multiple Cracks			3		Point Repair up to 16 ft	1	1	EA	$3,250.00	$3,250.00			$0	$0.00	NO
								192		Moderate Longitudinal Fracture			3			1									
								197		Moderate Circumferential Fracture			3			1									
								197		Fine Roots at Barrell			1												
								198		Fine Roots at Joint			1												
4/11/2014	Stockdale Rd	S19-023	S19-022	8	258	VCP	3							11								$15,120.00			
								23		Water Level 15%			1		CIPP		258	LF	$40.00	$10,320.00			$7,564	$0.50	NO
								41		Water Level 5%			1		CIPP (Included Above)										
								61		Moderate Longitudinal Crack			3		CIPP (Included Above)	1									
								92		Light Mineral Deposits Attached			1		CIPP (Included Above)										
								95		Light Mineral Deposits Attached			1		CIPP (Included Above)										
								100		Light Mineral Deposits Attached			1		CIPP (Included Above)										
								159		Light Mineral Deposits Attached			1		CIPP (Included Above)										
								164		Minor Longitudinal Crack			1		CIPP (Included Above)	1									
								171		Moderate Longitudinal Crack			2		CIPP (Included Above)	1									
								171		Leaking at Joint	180	90	3		CIPP (Included Above)	1									
								175		Leaking at service Connection			1		CIPP (Included Above)										
								175		Leaking Service	180	90	1		CIPP (Included Above)	1									
								182		Light Mineral Deposits Attached			1		CIPP (Included Above)										
								203		Light Mineral Deposits Attached			1		CIPP (Included Above)										
								239		Leaking at JOint	180	90	1		CIPP (Included Above)	1									
										seal all laterals (6)							6	EA	$800.00		$4,800.00				

CLIENT: TOWN OF NEEDHAM
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CONTRACT # 4623

Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/11/2014	Stockdale Rd	S19-022	S27-003	8	257	VCP	3							11								$2,500.00			
								31		Leak at service connection to main	1080	540	3		Seal lateral		1	EA	$2,500.00		$2,500.00		$15,128	$6.05	YES
								39		water level 15%			1												
								46		water level 5%			1												
								75		fine root at joint			1												
								78		Minor Multiple Cracks			1												
								81		fine root at joint			1												
								100		Minor Longitudinal fracture			1												
								123		minor circumfrential fracture			1												
								152		minor longitudinal crack			1												
								164		minor longitudinal crack			1												
								171		Minor Multiple Cracks			1												
								186		minor longitudinal crack			1												
								230		minor multiple cracks - START			1												
								233		Minor longitudinal fracture			1												
								257		minor multiple cracks - FINISH			1												
4/11/2014	Poweder House Cir	S19-014A	S19-012	8	125	AC	12							11								$218.75			
								3		Multiple Cracks			2			1									
								10		Fine Roots at Joint			1												
								21		Deposits Attached			1												
								50		Deposits Attached			1												
								76		Deposits Attached			1												
								125		Heavy Roots at Joint 55%			3		Chemical Root Treatment		125	LF	$1.75	$218.75			$0	$0.00	NO
4/16/2014	Stewart Rd	S20-002	S20-001	8	284	AC	12							11								$497.00			
								261		Roots in service lateral			1												
								261		Heavy Roots at Tap 55%			3		Chemical Root Treatment		284	LF	$1.75	$497.00			$0	$0.00	NO
4/16/2014	Stewart Rd	S27-026	S27-011	8	300	AC	12							11								$2,500.00			
								72		Fine Roots at Joint			1												
								89		Leaking at Service Connection to Main	180	90	1		Seal lateral	1	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/17/2014	Pond St	S28-070		8	131	VCP	3							11								$17,050.00			
								23		Leaking from Joint	1440	720	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
								122		Fine Roots at Joint			1												
								131		Install terminal manhole	720	360	3				1	EA	$15,000.00	$15,000.00			$10,085	$0.67	NO
4/17/2014	Pond St	S28-070	S28-071	8	113	VCP	3							11								$5,320.00			
								5		Moderate Longitudinal Fracture			3		CIPP	1	113	LF	$40.00	$4,520.00			$0	$0.00	NO
								8		Moderate Multiple Fractures			3			1									
								23		Minor Longitudinal Crack			1			1									
								79		Moderate Spiral Fracture			3			1									
								86		Minor Spiral Crack			1		seal all laterals (1)	1	1	EA	$800.00		$800.00			$0.00	NO
4/17/2014	Pond St	S28-066	S29-001	8	163	VCP	3							11								$2,050.00			
								10		Leaking from joint	360	180	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								11		Water Level 10%			1												
								25		Water Level 5%			1												
								84		Water Level 15%			1												
								94		Water Level 5%			1												
								130		Water Level 20%			1												
								136		Water Level 5%			1												
4/17/2014	Great Plain Ave	S20-017	S20-030	12	154	VCP	3							11								$10,040.00			
								8		Infiltration runner at joint	1440	720	3		CIPP	1	154	LF	$60.00	$9,240.00			$30,256	$3.27	YES
								70		Deposits Attached			1												
								76		Infiltration runner at joint	720	360	3			1	1								
								90		Water Level 15%			1												
								105		Water Level 5%			1												
								110		Longitudinal Crack			3			1	1								
								124		Longitudinal Crack			2			1	1								
								139		Water Level 30%			1												
								145		Water Level 5%			1												
															seal all laterals (1)		1	EA	$800.00		$800.00			$0.00	NO
4/17/2014	Great Plain Ave	S28-042	S28-041	8	180	VCP	3							11								$2,500.00			
								74		Lekaing from Service Lateral	180	90	3		Seal lateral	1	1	EA	$2,500.00	$2,500.00			$2,521	$1.01	YES
4/18/2014	Great Plain Ave	S28-038	S28-035	8	234	VCP	3							11								$10,960.00			
								76		Moderate Multiple Cracks			3		CIPP	1	234	LF	$40.00	$9,360.00			$0	$0.00	NO
								80		Moderate Multiple Cracks			3		CIPP (Included Above)	1									
								172		Minor Longitudinal Crack			1		CIPP (Included Above)	1									
								188		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1									
								191		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1									
								197		Minor Longitudinal Crack			1		CIPP (Included Above)	1									
								200		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1									
								226		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1									
								228		Minor Longitudinal Crack			1		seall all lateral (2)	1	2	EA	$800.00		$1,600.00			$0.00	NO

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/18/2014	Great Plain Ave	S28-020	S28-019	8	110	VCP	3							11								$4,400.00			
								4		Minor Longitudinal Crack			1		CIPP	1	110	LF	$40.00	$4,400.00			$0	$0.00	NO
								7		Minor Multiple Cracks - START			1			18									
								15		Water Level 20%			1												
								25		Minor Multiple Cracks - FINISH			1												
								46		Minor Longitudinal Crack			1			1									
								61		Water Level 5%			1												
								67		Minor Longitudinal Crack			1			1									
								73		Moderate Longitudinal Fracture - START			3			12									
								80		Water Level 20%			1												
								83		Water Level 5%			1												
								85		Moderate Longitudinal Fracture - FINISH			1												
								94		Moderate Longitudinal Fracture			3			1									
								100		Minor Longitudinal Crack			1			1									
								105		Water Level 25%			1												
								107		Moderate Multiple Fractures			3		seal all laterals (0)	1									
4/18/2014	High Rock St	S38-017		8	154	AC	12							11								$2,050.00			
								154		Leaking at Joint at end cap	1440	720	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
4/18/2014	Central Ave	S38-018	S38-019	8	275	AC	12							11								$2,500.00			
								205		Leakt at Service joint to main	360	180	3		Seal lateral	1	1	EA	$2,500.00	$2,500.00			$5,043	$2.02	YES
								215		Fine Roots at Joint			1												
								241		Fine Roots at Joint			1												
4/19/2014	Mason Rd	S20-016	S20-017	10	194	VCP	3							11								$11,300.00			
								29		Minor Multiple Cracks			1		CIPP	1	194	LF	$50.00	$9,700.00			$32,777	$2.90	YES
								36		Moderate Longitudinal Fractures			3			1									
								37		Service Lateral Leaking	2160	1,080	3												
								83		Light Mineral Deposits Attached			1												
								98		Light Mineral Deposits Attached			1												
								104		Light Mineral Deposits Attached			1												
								112		Minor Multiple Cracks			1			1									
								151		Minor Leak at Joint	180	90	3			1									
								170		Minor Multiple Cracks - START			1			3									
								173		Minor Multiple Cracks - FINISH			1			1									
															seall all laterals (2)		2	EA	$800.00		$1,600.00				
4/19/2014	Mason Rd	S20-023	S20-024	8	167	VCP	3							11								$9,880.00			
								1		Light Mineral Deposits Attached			1		CIPP		167	LF	$40.00	$6,680.00			$15,128	$1.53	YES
								4		Light Mineral Deposits Attached			1		CIPP (Included Above)										
								7		Light Mineral Deposits Attached			1		CIPP (Included Above)										
								7		Leak at Joint	180	90	3		CIPP (Included Above)	1									
								48		MinorLongitudinal Crack			1		CIPP (Included Above)	1									
								90		Leak at Joint	720	360	3		CIPP (Included Above)	1									
								120		Leak at service connection to main	180	90	3		CIPP (Included Above)	1									
								167		Light Mineral Deposits Attached			1		CIPP (Included Above)										
															seal all laterals (4)		4	EA	$800.00		$3,200.00				
4/19/2014	Fuller Brook Ave	S20-022	S20-020	8	221	VCP	3							11								$11,240.00			
								3		Longitudinal Crack			1		CIPP	1	221	LF	$40.00	$8,840.00			$7,564	$0.67	NO
								14		Deposits Attached			1		CIPP (Included Above)										
								17		Deposits Attached			1		CIPP (Included Above)										
								57		Infiltration dripper at joint	180	90	3		CIPP (Included Above)	1									
								69		Infiltration dripper at joint	180	90	3		CIPP (Included Above)	1									
								122		Deposits in service lateral			2		CIPP (Included Above)										
								122		Leak in service lateral connection to main	180	90	3		CIPP (Included Above)	1									
								178		Deposits Attached			1		CIPP (Included Above)										
															seal all laterals (3)		3	EA	$800.00		$2,400.00				
4/19/2014	Fuller Brook Ave	S20-027	S20-026	8	69	VCP	3							11								$2,050.00			
								11		Leaking Joint	180	90	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
4/19/2014	Fuller Brook Ave	S20-027	S20-020	8	302	VCP	3							11								$2,050.00			
								4		Water Level 15%			1												
								38		Water Level 5%			1												
								61		Water Level 15%			1												
								74		Water Level 5%			1												
								143		Water Level 10%			1												
								170		Water Level 5%			1												
								227		Leaking Joint	360	180	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								231		Fine Roots at Joint			1												
4/23/2014	Central Ave	S38-014	S38-015	8	264	AC	12							11								$3,250.00			
								9		Minor Circumfrential Fracture			2			1									
								9		Leaking Joint	1440	720	3		Point Repair up to 16 ft	1	1	EA	$3,250.00	$3,250.00			$20,170	$6.21	YES
								22		Leaking Joint	720	360	3		Point Repair up to 16 ft (Included Above)	1									
								104		Vermin Cockroach			1												
								145		Vermin Cockroach			1												
								211		Vermin Cockroach			1												
								250		Vermin Cockroach			1												
4/23/2014	Noyes St	S28-057	S28-045	8	240	AC	12							11								$325.00			
								94		Protruding Lateral			3		Cut Lateral Protrusion		1	EA	$325.00		$325.00		$0	$0.00	NO
4/23/2014	Central Ave	S38-004	S38-005	8	160	PVC	13							11								$2,050.00			
										Leaking Joint	720	360	3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
										Fine Roots at Joint			2												
4/23/2014	Central Ave	S38-005	S38-006	8	172	AC	12							11								$301.00			
								59		Medium Roots at Joint			3		Chemical Root Treatment		172	LF	$1.75	$301.00			$0	$0.00	NO
4/25/2014	Gay St	S39-023	S39-024	8	102	AC	13							11								$550.00			
								102		Leak at Connection to manhole	360	180	2		Grout Pipe Connection at Manhole		1	EA	$550.00	$550.00			$5,043	$9.17	YES

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/25/2014	Brackett St	S39-043	S39-026	8	127	VCP	3							11									$222.25			
								16		Fine Roots at Joint			1												
								22		Fine Roots at Joint			1												
								34		Fine Roots at Joint			1												
								39		Fine Roots at Joint			1												
								44		Fine Roots at Joint			1												
								87		Minor Longitudinal Crack			1			1									
								110		Medium Roots at Joint - START			3		Chemical Root Treatment	17	127	LF	$1.75	$222.25			$0	$0.00	NO
								127		Medium Roots at Joint - FINISH			3												
4/25/2014	Tolman St	S38-042	S28-064	8	263	VCP	3							11									$2,050.00			
								131		Fine Roots at Joint			1												
								227		Leak at Jiont	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
5/5/2016	Rolling Ln	S14-042	S14-043	8	248	AC	13							12									$2,500.00			
								203		Break in Tap Defective			1		Included Below										
								203		Minor Infiltration Dripper at joint to service	180	90	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/5/2016	Rolling Ln	S14-044	S15-002	8	93	AC	13							12									$550.00			
								92		Minor Infiltration Dripper on bench	180	90	3		Grout Manhole Bench		1	EA	$550.00	$550.00			$2,521	$4.58	YES
5/6/2016	Nardone Rd	S21-043	S21-026	8	260	AC	13							12									$4,050.00			
								222		Moderate Longitudinal Fracture in main and service			3		T-liner		1	EA	$2,000.00		$2,000.00		$0	$0.00	NO
								252		Moderate Circumferential Fracture			3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								252		Minor Deposits Attached at Fracture			2												
4/13/2016	Crescent Rd	S16-007	S16-008	8	172	AC	13							13									$5,000.00			
								100		Moderate Infiltration Runner at chimney connection to main	360	180	3		Grout service lateral		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								103		Moderate Infiltration Runner at chimney connection to main	360	180	3		Grout service lateral		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/16/2016	Lakin St	S09-036	S04-010	8	158	AC	13							13									$4,100.00			
								10		Minor Londitudinal Fracture			1												
								10		Minor Infiltration Dripper	180	90	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								33		Minor Obstacles			1												
								119		Moderate Hole			3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/16/2016	Lakin St	S04-009	S04-008	8	174	AC	13							13									$550.00			
								173		Infiltration Runner in Main connection to MH	2160	1080	3		Grout & patch bench, invert, and connection		1	EA	$550.00	$550.00			$30,256	$55.01	YES
5/13/2014	Wayne Road	S09-083	S09-084	8	110	AC	13							14									$2,500.00			
								52		Leak in Service lateral	180	90	3		Seal lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/14/2014	Central Ave	S09-094	S09-094A	8	134	AC	13							14									$2,500.00			
								177		Leak from service chimney	180	90	3		Seal lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/14/2014	Central Ave	S21-001	S20-052	8	3	AC	13							14									$265.00			
								3		Moderate Obstruction			3		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
5/14/2014	Central Ave	S20-055	S20-056	8	121	AC	13							14									$2,500.00			
								80		Moderate Leak in Service connection	720	360	3		Seal lateral		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
3/20/2015	Reservoir St	S05-104	S05-105	12	36	VCP	6?							14									$265.00			
								17		Moderate Multiple Cracks			3												
								36		Heavy Debris ABANDON survey			3		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
3/30/2015	Arnold St	S05-094	S05-069	8	283	AC	13							14									$2,050			
								14		Minor Circular Fracture at Joint			2												
								26		Minor Circular Fracture at Joint			2												
								166		Infiltration at Joint	360	180	3		Point Repair up to 4 ft		1	EA	$2,050	$2,050			$5,043	$2.46	YES
3/30/2015	Wellesley Ave	S04-022	S04-023	8	320	PVC	13							14									$2,500			
								104		Leak at connection to pipe	180	90	2		Seal lateral		1	EA	$2,500		$2,500		$2,521	$1.01	YES
3/27/2015	Sunnyside Rd	S10-020	S10-019	8	157	AC	13							14									$2,050			
								76		Hole			3		Point Repair up to 4 ft		1	EA	$2,050	$2,050			$0	$0.00	NO
6/13/2016	Elder Road	S05-28	S05-027	10	107	VCP	3							14									$5,500			
								10		Minor Roots at Joint			1												
								61		Minor Sag			1		Dig and replace 20ft		1	EA	$5,500	$5,500			$0	$0.00	NO
								70		Minor Longitudinal Fracture			2		Dig and replace 20ft										
								70		Moderate Joint Offset			3		Dig and replace 20ft										
								77		Minor Obstacles in Joint			1		Dig and replace 20ft										
								80		Moderate Circumferential Fracture			3		Dig and replace 20ft										
4/12/2016	Meadowbrook Rd	S29-065	S29-066	8	259	AC	13							15									$550			
								258		Moderate Infiltration Runner at main connection to MH	2880	1440	3		Grout & patch bench, invert, and connection		1	EA	$550.00	$550.00			$40,341	$73.35	YES
4/12/2016	Meadowbrook Rd	S29-082	S29-085	8	241	AC	13							15									$5,325			
								76		Break in Tap defective infiltration at joint	2880	1440	3		Grout lateral		1	EA	$2,500.00		$2,500.00		$40,341	$16.14	YES
								194		Break in Tap defective intruding			2		Cut lateral protrusion		1	EA	$325.00		$325.00		$0	$0.00	NO
								194		Infiltration runner at service connection to main	720	360	2		Grout lateral		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
5/2/2014	Henderson St	S39-086	S39-085	8	391	PVC	12							19.1									$2,050.00			
								88		Fine Roots at Joint			1												
								320		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
5/3/2014	Memorial Cir	S49-094	S49-093	8	124	VCP	3							19.1									$217.00			
								57		Fine Roots at Joint			1												
								72		Moderate Longitudinal Fracture - START			3		Chemical Root Treatment	21	124	LF	$1.75	$217.00			$0	$0.00	NO
								93		Moderate Longitudinal Fracture - FINISH			3												
5/3/2014	Henderson St	S39-037	S39-052	8	307	VCP	3							19.1									$2,050.00			
								62		Leak at Joint	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								97		Obstacle thru Connection 5%			1												
5/5/2014	Barrett St	S49-015	S49-017	8	216	PVC	12							19.1									$5,000.00			
								62		Moderate Leak in service connection to main	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
								202		Moderate Leak in service connection	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
5/5/2014	Barrett St	S49-015	S49-017	8	216	PVC	12							19.1									$2,500.00			
								26		Leak in Service Lateral	360	180	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								50		Minor Longitudinal Fracture			2												
5/6/2014	Barrett St	S39-001	S49-006	8	199	other	3							19.1									$2,500.00			
								156		Moderate Leak in service connection to main	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
5/6/2014	Francess St	S49-001	S49-003	8	66	PVC	12							19.1									$2,615.50			
								9		Moderate Roots at Joint - START			3		Chemical Root Treatment	27	66	LF	$1.75	$115.50			$0	$0.00	NO
								36		Moderate Roots at Joint - FINISH			3												
								49		Minor Leak at service connection to main	180	90	2		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								62		Fine Roots at Joint			1												
5/6/2014	Francess St	S49-003	S49-004	8	129	other	12							19.1									$5,000.00			
								4		Minor leak at connection to service	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								49		Minor leak at connection to service	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/6/2014	Deer Field Rd	S49-012	S49-011	8	104	PVC	12							19.1									$550.00			
								0		Minor leak in crack	180	90	3		Grout Pipe Connection at Manhole		1	EA	$550.00	$550.00			$2,521	$4.58	YES
								4		Minor Circumfrential Fracture in pipewall			1												
5/6/2014	Deer Field Rd	S49-010	S49-010A	8	139	PVC	12							19.1									$2,500.00			
								5		Minor Circumfrential Fracture			1												
								10		Minor leak at service connection to main	180	90	1		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/6/2014	Deer Field Rd	S49-010A	S49-009	8	188	PVC	12							19.1									$4,100.00			
								76		Moderate leak in service cap	360	180	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								155		Light Mineral Deposits Attached			1												
								169		Minor leak in service cap	180	90	2		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
5/6/2014	Gilbert Rd	S48-041	S48-040	8	150	PVC	12							19.1									$4,550.00			
								24		Minor Leak in capped service	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								105		Minor Leak at Chimney	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/6/2014	Gilbert Rd	S48-040	S49-003	8	158	AC	12							19.1									$276.50			
								129		Medium Roots at Joint			3		Chemical Root Treatment		158	LF	$1.75	$276.50			$0	$0.00	NO
5/7/2014	Gilbert Rd	S38-025	S38-026	8	123	AC	12							19.1									$265.00			
								79		Moderate Grease deposits			3		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
5/9/2014	High Rock St	S49-051	S49-034	8	170	VCP	12							19.1									$4,100.00			
								33		Multiple Moderate Fractures			3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								75		Chip at Joint			2												
								75		Joint Leaking	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
5/9/2014	High Rock St	S49-034	S49-036	8	336	VCP	12							19.1									$4,100.00			
								184		Leak at Capped service entrance	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								204		Leak at Capped service entrance	180	90	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								333		Minor Longitudinal Fracture			2												
5/12/2014	High Rock St	S38-038	S39-012	8	226	PVC	12							19.1									$395.50			
								102		Medium Roots at Joint			3		remove roots		226	LF	$1.75	$395.50			$0	$0.00	NO
5/12/2014	High Rock St	S39-006	S39-007	8	137	PVC	12							19.1									$239.75			
								21		Minor Offset Joint			2												
								57		Light Grease Deposits attached			2												
								81		Medium Roots at Joint - START			3		Chemical Root Treatment	53	137	LF	$1.75	$239.75			$0	$0.00	NO
								101		Minor Mineral deposits attached			1												
								134		Medium Roots at Joint - FINISH			3												
5/15/2014	Fairview Rd	S49-042	S39-029	8	235	other	3							19.1									$2,500.00			
								1		Leak at service connection to main	180	90	3		Lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								4		Water Level 20%			1												
5/15/2014	Noyes St	S28-052	S28-050	8	221	AC	12							19.1									$386.75			
								2		Medium Roots at Joint			3		Chemical Root Treatment		221	LF	$1.75	$386.75			$0	$0.00	NO
5/19/2014	Fairview Rd	S49-047	S49-048	8	85	VCP	3							19.1									$650.00			
								62		Fine Roots at Joint			1												
								72		Moderate Roots in Service			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
5/19/2014	Linden St	S49-077	S49-078	8	74	VCP	3							19.1									$2,050.00			
								4		Minor Circumfrential Crack			1												
								40		Leak at Joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
5/19/2014	Murphy Rd	S49-057	S49-058	8	303	VCP	3							19.1									$2,500.00			
								76		Chip at Joint			1												
								146		Moderate Leak in service	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
5/19/2014	Murphy Rd	S49-058	S49-065	8	175	VCP	3							19.1									$550.00			
								0		Minor Leak at joint	360	180	3		Grout Pipe Connection at Manhole		1	EA	$550.00	$550.00			$5,043	$9.17	YES
								63		Fine Roots at Joint			1												
								72		Fine Roots at Joint			1												
								77		Fine Roots at Joint			1												
5/20/2014	Yurick Rd	S49-062	S49-063	8	72	VCP	3							19.1									$126.00			
								0		Medium Roots at Joint			3		remove roots		72	LF	$1.75	$126.00			$0	$0.00	NO
5/20/2014	Yurick Rd	S49-063	S49-064	8	227	VCP	3							19.1									$2,447.25			
								1		Minor Circumfrential Fracture			1												
								42		Obstacle			1												
								60		Moderate Longitudinal Fracture			3		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								71		Fine roots at joint			1												
								80		minor multiple fractures			1												
								97		minor multiple cracks			2												
								118		minor multiple fractures			2												
								148		Medium roots out of service joint			3		Chemical Root Treatment		227	LF	$1.75	$397.25			$0	$0.00	NO
								171		Minor Circumfrential Fracture			1												

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
5/20/2014	Yurick Rd	S49-060	S49-059	8	145	VCP	3							19.1									$253.75			
								57		Minor Circumfrential Crack			1													
								59		Minor Circumfrential Crack			1													
								59		Fine roots at joint			1													
								66		Minor Circumfrential Crack			1													
								66		Fine roots at joint			1													
								71		Fine roots at joint - START			1													
								75		Minor Circumfrential Fracture			1													
								111		Medium root at joint - START			3		chemical root treatment		145	LF	$1.75	$253.75			$0	$0.00	NO
								145		Fine roots at joint - FINISH			1													
								145		Medium root at joint - FINISH			3													
5/20/2014	Marked Tree Rd	S38-028	S39-003	8	242	PVC	12							19.1									$2,500.00			
								67		Fine roots at joint			1													
								149		Moderate leak at service connection to main	720	360	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
5/21/2014	Marked Tree Rd	S39-044	S39-055	8	248	PVC	12							19.1									$4,100.00			
								114		Leak at Joint	360	180	3		Point repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								133		minor circumfrential fracture			1													
								167		Leak at Joinh	360	180	3		Point repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								194		Fine roots at joint			1													
								215		minor circumfrential fracture			1													
3/19/2014	Tower	S23-027	S23-024	8	250	VCP	3							20									$14,000.00			
								48		Leaking Joint	2440	1220	3		CIPP		250	LF	$40.00	$10,000.00			$34,178	$3.42	YES
															Seall all laterals (5)		5	EA	$800.00		$4,000.00				
3/19/2014	Lindbergh Ave	S23-031	S23-030	8	188	VCP	3							20									$5,500.00			
								183		Service Joint Connection Leaking	2440	1220	3		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$34,178	$6.21	YES
3/19/2014	Lindbergh Ave	S23-030	S23-024	8	223	VCP	3							20									$2,050.00			
								28		Light Mineral Deposits Attached			1													
								71	Mineral Deposits Attached				1													
								214		Minor Longitudinal Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
3/19/2014	Lindbergh Ave	S23-024	S23-022	8	200	VCP	3							20									$5,500.00			
								8		Service Connection Leaking	2160	1,080	3		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
3/20/2014	Lindbergh Ave	S23-022	S23-017	8	92	VCP	3							20									$2,500.00			
								31		Service Connection Leaking	720	360	3		Lateral Grout up to 5 ft		1	EA	$2,500.00	$2,500.00			$10,085	$4.03	YES
3/20/2014	Lindbergh Ave	S22-081	S22-080	8	72	VCP	3							20									$2,050.00			
								1		Moderate Circumferential Fracture			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
3/20/2014	Lindbergh Ave	S22-080	S22-079	8	112	VCP	3							20									$6,080.00			
								95		Leaking Joint	720	360	3		CIPP		112	LF	$40.00	$4,480.00			$10,085	$2.25	YES
															Seal all laterals (2)		2	EA	$800.00		$1,600.00				
3/20/2014	Lindbergh Ave	S22-079	S22-078	8	261	VCP	3							20									$2,500.00			
								170		Light Mineral Deposits Attached			1													
								194		Service Lateral Leaking	360	180	3		Lateral Grout up to 5 ft		1	EA	$2,500.00	$2,500.00			$5,043	$2.02	YES
3/19/2014	La Salle Road	S22-115	S22-082	8	262	VCP	3							20									$458.50			
								44		Fine Roots at Joint			1													
								77		Medium Roots at Joint			3		Chemical Root Treatment		262	LF	$1.75	$458.50			$0	$0.00	NO
								100		Fine Roots at Joint			1													
								104		Fine Roots at Joint			1													
								137		Minor Roots in Service Lateral			1													
								198		Fine Roots at Joint			1													
								203		Fine Roots at Joint			1													
								222		Medium Roots at Joint			3													
								225		Fine Roots at Joint			1													
								235		Water Level 10%			1													
								242		Water Level 5%			1													
								258		Minor Roots and Cracks in Service Lateral			1													
								262		Fine Roots at Joint			1													
3/19/2014	Mayo Avenue	S40-130	S40-129	8	322	VCP	3							20									$1,213.50			
								2		Multiple Minor Cracks			1			1										
								5		Multiple Minor Cracks			1			1										
								94		Minor Longitudinal Cracks			1			1										
								102		Multiple Minor Cracks			1			1										
								114		Multiple Minor Cracks			1			1										
								146		Minor Spiral Crack			1			1										
								149		Fine Roots at Joint			1													
								153		Fine Roots at Joint			1													
								156		Fine Roots at Joint START			1		Chemical Root Treatment		322	LF	$1.75	$563.50			$0	$0.00	NO
								160		Moderate Fractures around Service Lateral			2													
								215		Fine Roots at Joint FINISH			1													
								224		Modeate Fractures around Service Lateral			2													
								228		Minor Spiral Crack			1			1										
								231		Fine Roots at Joint			1													
								232		Moderate Roots in Service Lateral			3		remove lateral roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								236		Minor Longitudinal Cracks			1			1										
								245		Moderate Roots in Service Lateral			1													
								258		Fine Roots at Joint			1													
								264		Fine Roots at Joint			1													
								305		Fine Roots at Joint			1													
								308		Fine Roots at Joint			1													

CLIENT: TOWN OF NEEDHAM
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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
3/20/2014	Stevens Road	S41-015	S41-014	8	348	VCP	3							20									$1,300.00			
								3		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								4		Fine Roots at Joint			1												
								68		Minor Roots in Service Lateral			1												
								99		Minor Longitudinal Crack			1			1									
								150		Fine Roots at Joint			1												
								207		Water Level 10%			1												
								212		Minor Longitudinal Crack			1			1									
								213		Minor Roots in Service Lateral			2												
								220		Fine Roots at Joint			1												
								223		Fine Roots at Joint			1												
								241		Water Level 5%			1												
								307		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								346		Minor Roots in Service Lateral			2												
3/20/2014	Stevens Road	S41-014	S40-133	8	348	VCP	3							20									$2,700.00			
								19		Water Level 10%			1												
								28		Water Level 5%			1												
								41		Minor Longitudinal Crack			1			1									
								103		Fine Roots at Joint			1												
								106		Minor Roots in Service Lateral			1												
								119		Fine Roots at Joint			1												
								120		Fine Roots at Joint			1												
								123		Fine Roots at Joint			1												
								129		Fine Roots at Joint - START			1												
								135		Minor Circumfrential Fracture			1			1									
								139		Minor Roots in Service Lateral			1												
								159		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								161		Minor Roots in Service Lateral			1												
								200		Fine Roots at Joint - FINISH			1												
								235		Hole at Joint			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								300		Chip at Joint			1			1									
3/20/2014	Harris Ave	S40-133	S40-132	10	261	VCP	3							20									$2,700.00			
								8		Minor Longitudinal Crack			1			1									
								47		Fine Roots at Joint			1												
								52		Minor Multiple Fractures			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								52		Fine Roots at Joint			1												
								55		Fine Roots at Joint			1												
								57		Minor Multiple Cracks			1			1									
								59		Minor Multiple Cracks			1			1									
								75		Minor Multiple Cracks			1			5									
								95		Minor Longitudinal Crack			1			1									
								100		Minor Multiple Cracks			1			1									
								136		Minor Longitudinal Crack			1			1									
								138		Fine Roots at Joint			1												
								142		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								142		Fine Roots at Joint			1												
								145		Fine Roots at Joint			1												
								149		Fine Roots at Joint			1												
								197		Minor Multiple Cracks			1			1									
								238		Fine Roots at Joint			1												
3/20/2014	Harris Ave	S40-132	S40-120	10	319	VCP	3							20									$4,450.00			
								60		Leak in main connection to Service Lateral	180	90	3		Lateral Grout	1	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								61		Minor Multiple Cracks			1			1									
								83		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								127		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								146		Fine Roots at Joint			1												
								182		Fine Roots at Joint			1												
								192		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								289		Water Level 15%			1												
3/21/2014	Holland Ter	S30-097	S30-095	8	252	VCP	3							20									$1,091.00			
								107		Fine Roots at Joint			1												
								112		Fine Roots at Joint			1												
								115		Fine Roots at Joint			1												
								118		Fine Roots at Joint			1												
								118		Medium Roots at Joint			3		Chemical Root Treatment		252	LF	$1.75	$441.00			$0	$0.00	NO
								119		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								131		Minor Fractures around Service Lateral			1			1									
								131		Minor Longitudinal Crack			1			1									
								131		Fine Roots at Joint			1												
								152		Chips at Joint			2			1									

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
3/21/2014	Gibson St	S30-092	S30-093	8	323	VCP	3							20									$5,665.25			
								15		Minor Longitudinal Crack			1		Chemical Root Treatement		323	LF	$1.75	$565.25			$0	$0.00	NO
								27		Minor Longitudinal Crack			1												
								49		Minor Longitudinal Crack			1			1									
								81		Minor Longitudinal Crack			1			1									
								135		Minor Multiple Cracks			1			1									
								138		Minor Multiple Cracks			1			1									
								144		Minor Multiple Cracks			1			1									
								150		Minor Multiple Cracks			1			1									
								166		Minor Longitudinal Crack			1			1									
								168		Minor Circumfrential Crack			2			1									
								184		Minor Longitudinal Crack			1			1									
								201		Fine Roots at Joint			1												
								201		Minor Multiple Cracks			1			1									
								216		Fine Roots at Joint			1												
								216		Minor Multiple Cracks			1			1									
								219		Fine Roots at Joint			1												
								225		Fine Roots at Joint			1												
								226		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								226		Leaking Service Lateral	360	180	3		Lateral Grout		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								228		Moderate Roots in Service Lateral			2		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								231		Water Level 10%			1												
								241		Water Level 5%			1												
								247		Minor Longitudinal Crack			1			1									
								250		Minor Multiple Cracks			1			1									
								255		Moderate Roots in Service Lateral - START			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								257		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								284		Minor Multiple Cracks			1			1									
								313		Minor Multiple Cracks			1			1									
								323		Fine Roots at Joint - FINISH			1												
4/2/2014	Brookline St	S23-011	S23-010	8	295	VCP	3							20									$20,600.00			
								0		Minor Circumfrential Crack			2		CIPP	1	295	LF	$40.00	$11,800.00			$0	$0.00	NO
								9		Minor Circumfrential Fracture			1		CIPP (included above)	1									
								13		Minor Spiral Crack			1		CIPP (included above)	1									
								22		Minor Spiral Crack			1		CIPP (included above)	1									
								26		Moderate Multiple Fractures - START			3		CIPP (included above)	1									
								38		Fine Roots at Joint			1												
								41		Fine Roots at Joint			1												
								44		Fine Roots at Joint - START			1												
								47		Roots in Service Lateral			1												
								66		Moderate Multiple Fractures - FINISH			3		CIPP (included above)	1									
								113		Minor Circumfrential Fracture			1		CIPP (included above)	1									
								113		Roots in Service Lateral			1												
								126		Minor Circumfrential Crack			2		CIPP (included above)	1									
								133		Moderate Multiple Fractures - START			3		CIPP (included above)	1									
								144		Medium Roots at Joint			3												
								148		Moderate Multiple Fractures - FINISH			3		CIPP (included above)	1									
								182		Fine Roots at Joint - FINISH			1												
								196		Minor Longitudinal Crack			1		CIPP (included above)	1									
								249		Minor Longitudinal Crack			1		CIPP (included above)	1									
								257		Fine Roots at Joint			1												
								292		Moderate Multiple Cracks			3		seal all laterals (11)		11	EA	$800.00		$8,800.00				
4/2/2014	Brookline St	S22-074	S22-073	8	162	VCP	3							20									$4,100.00			
								12		Leaking at Joint	180	90	3		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								34		Fine Roots at Joint			1												
								37		Minor Multiple Crack			1												
								50		Fine Roots at Joint			1												
								59		Leaking at Joint	180	90	3		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								59		Fine Roots at Joint			1												
								89		Light Mineral Deposits Attached			1												
								95		Light Mineral Deposits Attached			1												
								98		Light Mineral Deposits Attached			1												
								116		Fine Roots at Joint			1												
								124		Water Level 5%			1												
								126		Light Mineral Deposits Attached			1												
								128		Water Level 5%			1												
								131		Light Mineral Deposits Attached			1												

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/2/2014	Brookline St	S22-073	S22-072	8	273	VCP	3							20									$6,600.00			
								7		Leaking at joint	180	90	3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								7		Light Mineral Deposits Attached			1												
								9		Light Mineral Deposits Attached			1												
								11		Light Mineral Deposits Attached			1												
								23		Leaking at Joint	180	90	3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								62		Water Level 15%			1												
								67		Water Level 5%			1												
								88		Light Mineral Deposits Attached			1												
								104		Cracks around service entrance			1												
								136		Leaking Service at entrance	360	180	3		Seal lateral		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								191		Fine Roots at Joint			1												
								197		Minor Circumfrential Fracture			1			1									
								197		Fine Roots at Joint			1												
								200		Fine Roots at Joint			1												
								204		Roots in Service Lateral			1												
								206		Roots in Service Lateral			1												
								225		Fine Roots at Joint			1												
								232		Roots in Service Lateral			1												
								234		Roots in Service Lateral			1												
								254		Water Level 25%			1												
								266		Camera Underwater			3												
								273		Camera Underwater			3												
4/2/2014	Powers St	S30-086	S30-087	8	209	VCP	3							20									$650.00			
								1		Fine Roots at Joint			1												
								4		Minor Longitudinal Crack			1			1									
								16		Moderate Roots in Service Lateral			3		remove lateral roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								20		Fine Roots at Joint			1												
								86		Minor Multiple Cracks			2			1									
								116		Minor Longitudinal Crack			1			1									
								139		Minor Longitudinal Crack			1			1									
								171		Minor Multiple Cracks			2			1									
								180		Minor Longitudinal Crack			1			1									
								192		Minor Longitudinal Crack			1			1									
4/2/2014	Powers St	S30-087	S30-088	8	209	VCP	3							20									$3,250.00			
								20		Minor Multiple Cracks			1			1									
								21		Fine Roots at Joint - START			1												
								32		Fine Roots at Joint			1												
								38		Fine Roots at Joint			1												
								42		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								44		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								46		Fine Roots at Joint			1												
								49		Fine Roots at Joint			1												
								89		Minor Longitudinal Crack			1			1									
								100		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								102		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								131		Roots at Service lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								159		Minor Longitudinal Crack			1			1									
								209		Fine Roots at Joint - FINISH			1												
4/3/2014	Parkinson St	S30-085	S30-084	8	72	VCP	3							20									$650.00			
								6		Minor Longitudinal Crack			1			1									
								12		Minor Multiple Cracks			1			1									
								21		Minor Longitudinal Crack			1			1									
								27		Minor Multiple Cracks			1			1									
								33		Fine Roots at Joint			1												
								41		Fine Roots at Joint			1												
								50		Fine Roots at Joint			1												
								72		Fine Roots at Joint			1												
								72		Moderate Roots in Lateral Service			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
4/9/2014	Rosemary St	S22-042	S22-043	6	147	VCP	3							20									$2,050.00			
								22		Light Mineral Deposits Attached			1												
								26		Fine Roots at Joint			1												
								30		Fine Roots at Joint			1												
								68		Light Mineral Deposits Attached			1												
								145		Minor Multiple Fractures			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/9/2014	Rosemary St	S22-044	S22-045	6	146	VCP	3							20									$2,050.00			
								54		Protruding Service			1												
								104		Cracks around service entrance			1												
								104		Spiral Fracture			3		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/9/2014	Webster St	S22-061	S22-060	10	219	VCP	3							20									$2,500.00			
								9		Minor Longitudinal Crack			1			1									
								154		Service Lateral Leaking at Connection	180	90	3		Sea lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								164	Minor Circumfrential Fracture				1			1									

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/2/2015	Cimino Rd	S16-121	S16-122	8	197	VCP	3							21								$11,080.00			
								26		Minor Longitudinal Cracks Start			1		CIPP	13	197	LF	$40.00	$7,880.00			$0	$0.00	NO
								39		Minor Longitudinal Cracks End			1												
								59		Moderate Multiple Cracks			1												
								71		Roots coming out of Tap			3												
								88		Broken			3												
								108		Broken			3												
								133		Moderate Multiple Cracks			3												
								158		Moderate Multiple Cracks			3												
										seal all laterals (4)							4	EA	$800.00	$3,200.00					
4/6/2015	Brookline St	S23-096	S23-097	8	252	AC	13							21								$2,600.00			
								0		Infiltration Runner in Manhole S23-096	720	360	3		Grout Manhole Bench	1	1	EA	$550.00	$550.00			$10,085	$18.34	YES
								58		Minor Circumferential Fracture			1												
								58		Infiltration Runner in crack	720	360	3		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
4/6/2015	Brookline St	S23-097	S23-098	8	200	AC	13							21								$2,050.00			
								198		Infiltration Runner at Joint	360	180	3		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
4/7/2015	Rosalie Rd	S17-061	S23-075	8	277	VCP	3							21								$5,684.75			
								1		Minor Circumferential Fracture			1												
								110		Infiltration Runner	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								111		Broken Tap leaking from connection	360	180	3		Grout service at connection with main		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								198		Fine Roots at Joint			1		Chemical Root Treatment		277	FT	$1.75	$484.75			$0	$0.00	NO
								200	Moderate Roots in Service Lateral				2		Chemical Root Treatment		1	EA	$650.00		$650.00		$0	$0.00	NO
								202		Fine Roots at Joint			1		Chemical Root Treatment (included above)										
								259		Fine Roots at Joint			1		Chemical Root Treatment (included above)										
								265		Fine Roots at Joint			1		Chemical Root Treatment (included above)										
								272		Medium Roots at Joint			3		Chemical Root Treatment (included above)										
4/7/2015	Rosalie Rd	S17-061	S17-060	8	151	VCP	3							21								$2,500.00			
								23		Defective tap Leaking from connection															
								23		Infiltration Runner	720	360	3		Grout service at connection with main	1	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
								24		Minor Multiple Fractures			2												
4/8/2015	Brookline St	S23-102	S23-109	8	135	AC	3							21								$236.25			
								15		Fine Roots at Joint			1		Chemical Root Treatment		135	FT	$1.75	$236.25			$0	$0.00	NO
								29		Fine Roots at Joint			1		Chemical Root Treatment (included above)										
								41		Medium Roots at Joint			2		Chemical Root Treatment (included above)										
								55		Fine Roots at Joint			1		Chemical Root Treatment (included above)										
								82		Fine Roots at Joint			1		Chemical Root Treatment (included above)										
4/8/2015	Paul Revere Rd	S23-061	S23-062	8	129	VCP	3							21								$2,500.00			
								29		Service Lateral leaking	360	180	3		Lateral Grout		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								29		Fine Roots at Joint			1												
4/8/2015	Paul Revere Rd	S23-062	S23-063	8	69	VCP	3							21								$2,500.00			
								4		Fine Roots at Joint			1												
								22		Service Lateral Leaking	720	360	3		Lateral Grout		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
4/8/2015	Paul Revere Rd	S23-063	S23-064	8	61	VCP	3							21								$3,240.00			
								14		Infiltration Runner at joint	1,440	720	3		CIPP		61	LF	$40.00	$2,440.00			$70,597	$28.93	YES
								35		Infiltration Runner at joint	720	360	3												
								41		Infiltration Runner at joint	2,880	1,440	3												
								55		Fine Roots at Joint			1												
										seal all laterals (1)							1	EA	$800.00	$800.00					
4/8/2015	Paul Revere Rd	S23-065	S23-067	8	101	VCP	3							21								$2,500.00			
								42		Fine Roots at Joint			1												
								50		Service Lateral Leaking	360	180	3		Lateral Grout		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/8/2015	Richdale Rd	S23-129	S23-130	8	131	AC	13							21								$650.00			
								41		Moderate Roots at service connection			3		Chemical Root Treatment		1	EA	$650.00		$650.00		$0	$0.00	NO
4/8/2015	Richdale Rd	S23-130	S23-131	8	82	AC	13							21								$2,500.00			
								61		Service Lateral Leaking	180	90	3		Lateral Grout		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/13/2015	Parker Rd	S23-134	S23-133	8	125	VCP	3							21								$7,400.00			
								8		Moderate Fracture Circumfrential			3		CIPP		125	LF	$40.00	$5,000.00			$0	$0.00	NO
								13		Fine Roots at Joint			1												
								15		Moderate Fracture Circumfrential			3												
								68		Minor Multiple Fractures			1												
								109		Minor Fracture Circumfrential			2		seal all laterals (3)		3	EA	$800.00		$2,400.00				
4/13/2015	Paul Revere Rd	S23-035	S23-034	8	259	AC	13							21								$2,500.00			
								40		Minor Circumfrential Fracture			1												
								64	Service Lateral Leaking		720	360	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
4/14/2015	Highgate St	S24-007	S24-008	8	96	AC	10							21								$4,550.00			
								20		Hole			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								85		Service Lateral Leaking	360	180	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/24/2014	Hillcrest Rd	S31-128	S31-129	6	195	VCP	3							22								$341.25			
								70		Medium Roots at Joint			3		Chemical Root Treatment		195	LF	$1.75	$341.25					
								75		Fine Roots at Joint			2												
								93		Fine Roots at Joint - START			2			102									
								195		Fine Roots at Joint - FINISH			2												
4/24/2014	Hillcrest Rd	S31-123	S31-124	8	145	VCP	3							22								$5,500.00			
								106		Moderate Multiple Fractures			3		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$0	$0.00	NO
4/25/2014	Wachusett Rd	S31-117	S31-118	8	36	VCP	3							22								$63.00			
								11		Fine Roots at Joint			1												
								13		Fine Roots at Joint			1												
								17		Fine Roots at Joint			1												
								19		Medium Roots at Joint			3		Chemical Root Treatment		36	LF	1.75	$63.00			$0	$0.00	NO
								25		Fine Roots at Joint			1												
								34		Medium Roots at Joint			3												
								36		Fine Roots at Joint			1												

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/25/2014	Wachusett Rd	S31-117	S31-116	8	169	VCP	3							22									$2,050.00			
								52		Minor Spiral Crack			1			1									
								61		Minor Longitudinal Crack			1			1									
								70		Minor Longitudinal Crack			1			1									
								73		Fine Roots at Joint			1			1									
								75		Fine Roots at Joint			1												
								99		Fine Roots at Joint			1												
								108		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								117		Fine Roots at Joint			1												
								142		Fine Roots at Joint			1												
								147		Fine Roots at Joint - START			1												
								168		Minor Circumfrential Crack			2												
								169		Fine Roots at Joint - FINISH			1												
4/25/2014	Wachusett Rd	S31-113	S31-114	8	246	VCP	3							22									$650.00			
								79		Fine Roots at Joint - START			1			167									
								82		Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								246		Fine Roots at Joint - FINISH			1												
4/25/2014	Wachusett Rd	S31-112	S31-113	8	229	VCP	3							22									$4,100.00			
								27		Water Level 10%			1												
								39		Water Level 5%			1												
								66		Minor Longitudinal Crack			1			1									
								72		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								146		Crack in entrance to service lateral			1												
								146		Minor Longitudinal Crack			1			1									
								151		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/25/2014	Wyoming Ave	S31-102	S31-103	6	156	VCP	3							22									$273.00			
								44		Fine Roots at Joint			1												
								54		Fine Roots at Joint			1												
								123		Fine Roots at Joint			1												
								137		Medium Roots at Joint			3		Chemical Root Treatment		156	LF	$1.75	$273.00			$0	$0.00	NO
								141		Fine Roots at Joint			1												
								146		Fine Roots at Joint - START			1			10									
								152		Medium Roots at Joint			3												
								156		Fine Roots at Joint - FINISH			1												
4/25/2014	Wyoming Ave	S31-103	S31-104	6	206	VCP	2							22									$360.50			
								18		Fine Roots at Joint			1												
								25		Hole at joint			1			1									
								25		Fine Roots at Joint			3		Chemical Root Treatment		206	LF	$1.75	$360.50			$0	$0.00	NO
								33		Fine Roots at Joint			1												
								34		Roots in service lateral			1												
								35		Medium Roots at Joint			3												
								41		Fine Roots at Joint - START			1												
								58		Minor Longitudinal Crack			1			1									
								64		Debris in service lateral			1												
								129		Fine Roots at Joint - FINISH			1												
								175		Water Level 15%			1												
4/25/2014	Wyoming Ave	S31-104	S31-105	8	61	VCP	3							22									$2,050.00			
								24		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								59		Minor Spiral Crack			1			1									
5/1/2014	Ina Rd	S31-157	S31-158	8	227	VCP	11							22									$5,500.00			
								85		Leaking Joint at Service Lateral Connection	1440	720	3		Replace Service Wye	1	1	EA	$5,500.00	$5,500.00			$20,170	$3.67	YES
4/28/2014	Tudor Rd	S32-014	S32-015	8	117	VCP	3							22									$2,250.00			
								77		Moderate Circumfrential Fracture			3		Point Repair up to 8 ft		1	EA	$2,250.00	$2,250.00			$0	$0.00	NO
								77		Moderate Longitudinal Crack			3		Point Repair up to 8 ft (Included Above)	5									
4/28/2014	Woodbury Rd	S32-008	S32-009	8	275	VCP	3							22									$1,131.25			
								55		Medium Roots at Joint			3		Chemical Root Treatment	275	275	LF	$1.75	$481.25			$0	$0.00	NO
								59		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)										
								66		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00	$650.00			$0	$0.00	NO
								76		Fine Roots at Joint			1												
								85		Fine Roots at Joint			1												
								118		Fine Roots at Joint			1												
4/29/2014	Highgate St	S31-161	S31-162	8	222	other	3							22									$5,000.00			
								136		Minor Leak at Joint	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								141		Minor Leak at Joint	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/1/2014	Edwardel Rd	S32-034	S32-035	8	249	VCP	3							22									$435.75			
								185		Medium Roots at Joint			3		Chemical Root Treatment		249	LF	$1.75	$435.75			$0	$0.00	NO
								188		Fine Roots at Joint			1												
								221		Fine Roots at Joint			1												
5/1/2014	Arch St	S32-035	S31-163	8	109	VCP	3							22									$190.75			
								20		Medium Roots at Joint			3		Chemical Root Treatment		109	LF	$1.75	$190.75			$0	$0.00	NO
								24		Fine Roots at Joint			1												
								29		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)										
								32		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)										
								38		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)										
								59		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)										
								65		Fine Roots at Joint			1												
								68		Fine Roots at Joint			1												
								71		Fine Roots at Joint			1												
								95		Fine Roots at Joint			1												
								105		Fine Roots at Joint			1												
								108		Fine Roots at Joint			1												

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
5/1/2014	Arch St	S31-164	S31-165	8	299	PVC	6							22								$4,100.00			
								9		Hole			3		Point repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								156		Moderate Leak at Joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
5/2/2014	Rae Ave	S23-092	S23-091	8	271	VCP	3							22								$474.25			
								2		Fine Roots at Joint			1												
								36		Fine Roots at Joint			1												
								39		Fine Roots at Joint			1												
								42		Fine Roots at Joint			1												
								66		Fine Roots at Joint			1												
								68		Fine Roots at Joint			1												
								71		Fine Roots at Joint			1												
								74		Fine Roots at Joint			1												
								80		Fine Roots at Joint			1												
								103		Medium Roots at Joint - START			3		Chemical Root Treatment	34	271	LF	$1.75	$474.25			$0	$0.00	NO
								137		Medium Roots at Joint - FINISH			3		Chemical Root Treatment										
								140		Medium Roots at Joint - START			3		Chemical Root Treatment	50									
								183		Minor Longitudinal Fracture - START			2			5									
								188		Minor Longitudinal Fracture - FINISH			2												
								190		Medium Roots at Joint - FINISH			3		Chemical Root Treatment										
								205		Fine Roots at Joint			1												
								208		Fine Roots at Joint			1												
5/2/2014	Rae Ave	S23-091	S31-168	8	223	VCP	3							22								$390.25			
								61		Medium Roots at Joint			3		Chemical Root Treatment	223	223	LF	$1.75	$390.25			$0	$0.00	NO
								66		Fine Roots at Joint			1												
								75		Fine Roots at Joint			1												
								80		Fine Roots at Joint			1												
								170		Fine Roots at Joint			1												
5/2/2014	Colby St	S23-181	S23-180	8	138	VCP	3							22								$241.50			
								49		Minor Longitudinal Fracture			2												
								98		Medium Roots at Joint			3		Chemical Root Treatment		138	LF	$1.75	$241.50			$0	$0.00	NO
								105		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								116		Medium Roots at Joint - START			3		Chemical Root Treatment (Included Above)										
								126		Medium Roots at Joint - FINISH			3		Chemical Root Treatment (Included Above)										
4/14/2015	Fairfield St	S52-081	S42-100	8	184	VCP	3							24								$2,250.00			
								78		Fine Roots at Joint			1												
								183		Moderate Multiple Fractures			3		Point Repair, up to 8ft		1	EA	$2,250.00	$2,250.00			$0	$0.00	NO
								183		Fine Root Barrell at fracture			1												
4/14/2015	Fairfield St	S52-082	S52-083	12	244	VCP	3							24								$8,050.00			
								72		Defective Tap leaking from joint	2,160	1,080	3		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
								174		Fine Roots at joint			1												
								174		Infiltration dripper	180	90	2		Point Repair up to 4 ft		1	EA	$2,550.00	$2,550.00			$2,521	$0.99	NO
4/14/2015	Fairfield St	S52-083	S52-084	12	256	VCP	3							24								$2,500.00			
								17		Infiltration runner at tap connection to joint	1,440	720	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
4/14/2015	Douglas Rd	S42-017	S42-018	8	174	VCP	3							24								$304.50			
								86		Fine Roots at Joint			1		Chemical Root Treatment		174	LF	$1.75	$304.50			$0	$0.00	NO
								92		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								98		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								104		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								136		Fine Roots at Joint start			1		Chemical Root Treatment (Included Above)										
								174		Fine Roots at Joint end			1		Chemical Root Treatment (Included Above)										
4/14/2015	Richard Rd	S32-042	S32-041	8	207	VCP	3							24								$4,550.00			
								39		Infiltration Runner at joint in service	720	360	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
								40		Infiltration Runner at joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								175		Fine Roots at Joint			1												
								180		Fine Roots at Joint			1												
								183		Fine Roots at Joint start			1												
								206		Fine Roots at Joint finish			1												
4/14/2015	Richard Rd	S32-041	S32-040	8	136	VCP	3							24								$4,100.00			
								58		Infiltration Runner at joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								81		Infiltration Runner at joint	360	180	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								84		Fine Roots at Joint			1												
4/14/2015	Rockwood Ln	S32-038	S32-045	8	123	VCP	3							24								$7,385.25			
								6		Infiltration Dripper at Joint	360	180	2										$5,043	$0.77	NO
								57		Moderate Multiple Fractures start			3		CIPP		123	LF	$40.00	$4,920.00					
								80		Moderate Multiple Fractures finish			3												
								83		Fine Roots at Joint start			2		Chemical Root Treatement		123	LF	$1.75	$215.25			$0	$0.00	NO
								94	Roots in Lateral				3		Lateral Root Removal		1	EA	$650.00		$650.00		$0	$0.00	NO
								103		Fine Roots at Joint finish					seal all laterals (2)		2	EA	$800.00		$1,600.00				
4/14/2015	Richard Rd	S32-039	S32-038	8	173	VCP	3							24								$2,250.00			
								1		Moderate Longitudinal Fracture			2												
								124		Moderate Multiple Fractures			3		Point Repair, up to 8ft		1	EA	$2,250.00	$2,250.00			$0	$0.00	NO
								127		Moderate Multiple Fractures			2												
4/15/2015	Douglas Rd	S52-058	S52-076	8	214	VCP	3							24								$374.50			
								23		Fine Roots at Joint start			3		Chemical Root Treatment		214	LF	$1.75	$374.50			$0	$0.00	NO
								200		Fine Roots at Joint finish			3		Chemical Root Treatment (Included Above)										
								212		Minor Multiple Fractures			1												

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																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/15/2015	Douglas Rd	S52-058	S52-059	8	245	VCP	3							24								$2,500.00			
								107		Fine Roots at Joint			1												
								126		Fine Roots at Joint			1												
								149		Fine Roots at Joint start			1												
								170		Fine Roots at Joint finish			1												
								180		Leaking Service	720	360	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
								189		Fine Roots at Joint start			1												
								240		Fine Roots at Joint finish			1												
4/15/2015	Thornton Rd	S31-138	S31-132	8	332	VCP	3							24								$17,280.00			
								12		Fine Roots at Joint			1		CIPP		332	LF	$40.00	$13,280.00			$15,128	$0.88	NO
								54		Minor Longitudinal Crack			1												
								78		Minor Spiral Fracture			1												
								119		Minor Spiral Crack			1												
								119		Fine Roots at Joint			1												
								128		Moderate Spiral Fracture			3												
								131		Fine Roots at Joint			1												
								131		Infiltration Dripper at Joint	360	180	3												
								142		Fine Roots at Joint			1												
								159		Fine Roots at Joint Start			1												
								218		Infiltration Dripper at joint	360	180	3												
								221		Defective tap - roots coming in from connection			2												
								221		Infiltration Dripper at Joint	360	180	3												
								237		Moderate Spiral Fracture			2												
								281		Minor Longitudinal Fracture			1												
								332		Fine Roots at Joint finish			1												
															seal all laterals (5)		5	EA	$800.00	$4,000.00					
4/15/2015	Thornton Rd	S31-132	S31-133	8	188	VCP	3							24								$2,050.00			
								125		Broken			3		Point Repair		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/15/2015	Thornton Rd	S31-133	S32-001	8	281	VCP	3							24								$4,550.00			
								62		Moderate Longitudinal Fracture			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								113		Fine roots at joint			1												
								143		Fine roots at joint			1												
								187		Minor Longitudinal Crack			1												
								187		Fine Roots at Joint			1												
								203		Defective Tap			1												
								203		Infiltration Dripper at tap connection to pipe	360	180	2		Seal lateral		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								273		Moderate Multiple Cracks			2												
4/15/2015	Birds Hill Ave	S31-131	S31-132	8	177	VCP	3							24								$2,050.00			
								104		Infiltration runner at joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
4/15/2015	Thornton Rd	S32-001	S 42-056	8	213	VCP	3							24								$2,050.00			
								38		Moderate Multiple Cracks			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								190		Moderate Multiple Cracks			2												
								207		Moderate Longitudinal Crack			1												
4/15/2015	Thornton Rd	S42-052	S42-051	8	307	VCP	3							24								$2,050.00			
								1		Moderate Multiple Fracture			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/16/2015	Shady Lane Easement	S41-095	S41-094	8	99	AC	12							24								$11,000.00			
								45		Defective Tap															
								45		Infiltration Runner at 2 taps	2,880	1,440	3		Replace Service Wye		2	EA	$5,500.00		$11,000.00		$40,341	$3.67	YES
4/16/2015	Shady Ln	S41-095	S42-096	8	140	AC	12							24								$2,500.00			
								32		Defective Tap			2												
								32		Infiltration Runner at tap joint to pipe	360	180	3		Seal lateral		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								33		Broken			3												
4/16/2015	Dawson Dr	S42-034	S42-096	8	140	AC	12							24								$2,825.00			
								11		Intruding Tap			1		Cut protruding lateral		1	EA	$325.00		$325.00		$0	$0.00	NO
								11		Infiltration Runner at tap joint to pipe	360	180	3		Seal lateral		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/16/2015	Dawson Dr	S42-042	S42-044	8	223	AC	12							24								$2,050.00			
								58		Moderate Multiple Fractures			3		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								75		Intruding Tap			1												
4/17/2015	Jayne Rd	S17-084	S17-085	8	150	AC	13							24								$2,750.00			
								64		Minor Circumfrential Fracture			1												
								64		Infiltration Runner at joint	2,880	1,440	3		Point Repair, up to 12ft		1	EA	$2,750.00	$2,750.00			$40,341	$14.67	YES
								71		Hole			3												
4/9/2016	Laurel Dr	S50-067	S50-068	8	188	VCP	3							26								$2,050.00			
								26		Moderate Multiple Fractures			3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								27		Moderate Hole			3												
4/9/2016	Laurel Dr	S50-074	S50-075	8	401	VCP	3							26								$2,050.00			
								81		Fine Roots at Joint Start			1												
								100		Fine Roots at Joint Finish			1												
								286		Minor Deposits attached			1												
								286		Minor Infiltration Dripper at joint	180	90	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								297		Minor Deposits attached			1												
4/11/2016	Laurel Dr Easement	S50-079	S50-080	8	182	VCP	3							26								$2,500.00			
								6		Minor Deposits Attached			1												
								150		Defective Break In tap with Infiltration at joint	2,880	1,440	3		Seal lateral		1	EA	$2,500		$2,500.00		$40,341	$16.14	YES
5/16/2014	Windfield St	S29-013	S29-014	8	158	VCP	3							27								$2,050.00			
								44		Moderate Multiple Fractures			3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								104		Minor Circumfrential Fracture			1												
5/16/2014	Windfield St	S29-015	S29-016	8	164	VCP	3							27								$2,500.00			
								22		Minor Leak at service connection to main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 3

																		EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
5/16/2014	Ware Rd	S29-019	S29-018	8	322	VCP	3							27									$8,563.50			
								65		Moderate Multiple Fractures - START			3		Replace Service Wye	3	1	EA	$5,500.00	$5,500.00			$0	$0.00	NO
								68		Moderate Multiple Fractures - FINISH			3												
								141		Leak at Service Connection to Main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								198		Fine Roots at Joint			1		Chemical Root Treatment		322	LF	$1.75	$563.50			$0	$0.00	NO
								271		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								280		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)										
								304		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								315		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)										
5/16/2014	Ware Rd	S29-018	S29-017	8	72	VCP	3							27									$2,500.00			
								4		Leak at Service Connection to Main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/16/2014	Abbott St	S29-021	S29-022	8	169	VCP	3							27									$2,500.00			
								73		Minor Circumfrential Fracture			1												
								147		Minor Leak at chimney service Joint to main	180	90	3		lateral grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								164		Minor Circumfrential Fracture			1												
4/11/2016	Rivard Rd	S39-075	S39-076	8	179	AC	13							28									$2,050.00			
								99		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050	$2,050			$0	$0.00	NO
4/11/2016	Rivard Rd	S39-076	S39-077	8	136	AC	13							28									$4,100.00			
								72		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050	$2,050			$0	$0.00	NO
								107		Moderate Hole			3		Point Repair 4 ft		1	EA	$2,050	$2,050			$0	$0.00	NO
4/11/2016	Rivard Rd	S39-078	S39-079	8	91	AC	13							28									$550.00			
								89		Moderate Infiltration Runner	2,880	1,440	3		Grout & patch MH bench, invert, and connection		1	EA	$550	$550			$40,341	$73.35	YES
5/18/2015	South Street Easement	S59-019	S59-017	8	114	PVC	11							30									$550.00			
								114		Infiltration Runner at connection to MH s59-017	360	180	3		Grout pipe connection		1	EA	$550.00	$550.00			$5,043	$9.17	YES
4/17/2015	Webster St	S59-036	S59-034	8	261	AC	12							31									$2,050.00			
								4		Broken			3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/17/2015	Fox Hill Rd	S59-037	S59-038	8	228	AC	12							31									$2,500.00			
								52		Infiltration from inside service	360	180	3		Seal lateral		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
3/31/2015	First Ave	S11-022	S11-021	12	285	VCP	3							32									$2,550.00			
								55		Minor Circumfrential Fracture			2												
								141		Minor Deposits attached			2												
								141		Infiltration Runner	180	90	3		Point Repair up to 4 ft		1	EA	$2,550	$2,550			$2,521	$0.99	NO
4/2/2015	Cabot St	S11-042	S11-041	6	33	AC	5						3	32									$265.00			
								33		obstacle					Heavy Cleaning		1	EA	$265.00	$265.00			$0	$0.00	NO
4/8/2015	Wexford St	S06-021	S06-020	8	307	AC	10						3	32									$2,500.00			
								123		Leaking Service	360	180			Seal Lateral		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 4

																		EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/21/2015	Edgewater Dr	S60-009	S60-010	8	60	VCP	3							4								$5,605.00			
								5		Infiltration Runner	2,160	1,080	4		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
								5		Fine Roots at Joint start			1		Chemical Root Treatment		60	LF	$1.75	$105.00			$0	$0.00	NO
								53		Fine Roots at Joint finish			1												
4/15/2014	Whiting Way	S27-009	S27-007	8	289	VCP	3							11								$5,500.00			
								7	Service Lateral Leaking at Joint		2160	1080	4		Replace Service Wye	1	1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
								81	Minor Longitudinal Crack				1			4									
								86		Light Roots at Joint			1												
								92		Light Roots at Joint			1												
								207					1			2									
4/16/2014	Alden Rd	S27-005	S27-002	8	148	VCP	3							11								$5,500.00			
								79		Service Lateral Leaking at Joint	2440	1,220	4		Replace Service Wye	1	1	EA	$5,500.00		$5,500.00		$34,178	$6.21	YES
4/17/2014	Standish Rd	S27-022	S27-023	8	97	AC	13							11								$2,050.00			
								11		Hole in side of Pipline			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/11/2014	Alden Rd	S19-001	S27-002	8	231	AC	12							11								$530.00			
								1		Surface Roughness - START			2												
								1		Heavy Mineral Deposits Attached - START			4		Heavy Cleaning		2	HR	$265.00	$530.00			$0	$0.00	NO
								14		Surface Roughness - FINISH			2												
								14		Heavy Mineral Deposits Attached - FINISH			4		Heavy Cleaning										
4/11/2014	Stockdale Rd	S19-026	S19-025	8	183	AC	12							11								$2,700.00			
								50		Moderate Multiple Fractures			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								152		Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								152		Fine Roots at Joint			1												
4/11/2014	Stockdale Rd	S19-025	S19-024	8	155	VCP	3							11								$9,400.00			
								18		Moderate Longitudinal Fracture			4		CIPP	1	155	LF	$40.00	$6,200.00			$22,131	$2.35	YES
								21		Minor Multiple Cracks			1		CIPP (Included Above)	1									
								28		Moderate Multiple Fractures			3		CIPP (Included Above)	1									
								40		Minor Longitudinal Crack			1		CIPP (Included Above)	1									
								47		Leaking from connection to main	180	90	3		CIPP (Included Above)										
								52		Leaking from connection to main	180	90	3		CIPP (Included Above)										
								72		Fine Roots at Joint			1		CIPP (Included Above)										
								83		Fine Roots at Joint			1		CIPP (Included Above)										
								95		Minor Longitudinal Crack			1		CIPP (Included Above)	1									
								108		Leaking from connection to main	1220	610	3		CIPP (Included Above)										
								151		Minor Longitudinal Crack			1		seal all laterals (4)		4	EA	$800.00		$3,200.00				NO
4/11/2014	Stockdale Rd	S19-024	S19-023	8	257	VCP	3							11								$15,880.00			
								1		Moderate Circumfrential Crack			2		CIPP	1	257	LF	$40.00	$10,280.00			$2,521	$0.16	NO
								13		Minor Circumfrential Crack			1		CIPP (Included Above)	1									
								19		Minor Multiple Cracks			2		CIPP (Included Above)	1									
								33		Leaking at Joint	180	90	3		CIPP (Included Above)	1									
								33		Minor Multiple Cracks			2		CIPP (Included Above)	1									
								49		Water Level 15%			1		CIPP (Included Above)										
								75		Water Level 5%			1		CIPP (Included Above)										
								79		Hole in side of pipe			4		CIPP (Included Above)	1									
								125		Fine Roots at Joint			1		CIPP (Included Above)										
								160		Minor Multiple Cracks			2		CIPP (Included Above)	1									
								172		Minor Longitudinal Crack			2		CIPP (Included Above)	1									
								178		Moderate Longitudinal Fracture			3		CIPP (Included Above)	1									
								205		Minor Longitudinal Crack			1		CIPP (Included Above)	1									
								226		Minor Longitudinal Crack			2		CIPP (Included Above)	1									
								232		Minor Longitudinal Crack			2		CIPP (Included Above)	1									
								240		Minor Longitudinal Crack			1		CIPP (Included Above)	1									
										seal all laterals (7)							7	EA	$800.00		$5,600.00				
4/11/2014	Powder House Cir	S19-014	S19-014A	8	119	PVC	13							11								$208.25			
								63		Heavy Roots at Joint			4		Chemical Root Treatment		119	LF	$1.75	$208.25			$0	$0.00	NO
								71		Fine Roots at Joint			1												
								73		Fine Roots at Joint			1												
4/17/2014	Pond St	S28-065	S28-066	8	197	VCP	3							11								$4,100.00			
								14		Light Mineral Deposits Attached			1												
								40		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								47		Moderate Multiple Cracks			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								141		Minor Longitudinal Cracks			1			1									
4/17/2014	Great Plain Ave	S20-030	S20-031	12	98	VCP	3							11								$7,480.00			
								7		Minor Longitudinal Crack			1		CIPP	1	98	LF	$60.00	$5,880.00			$42,862	$5.73	YES
								16		Minor Longitudinal Crack			1			1									
								28		Leaking Joint	1440	720	3			1	1								
								33		Leaking from connection to main	1440	720	4				1								
								86		Leaking at Joint	180	90	4			1	1								
								86		Minor Longitudinal Crack			1		seal all laterals (2)	1	2	EA	$800.00		$1,600.00				

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 4

																		EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/17/2014	Great Plain Ave	S20-031	S28-017	12	217	VCP	3							11								$17,820.00			
								2		Moderate Multiple Fractures			3		CIPP		217	LF	$60.00	$13,020.00			$10,085	$0.57	NO
								3		Leaking at Joint	720	360	3		CIPP (Included Above)	20								
								5		Minor Longitudinal Crack - START			1		CIPP (Included Above)									
								14		Moderate Multiple Cracks			4		CIPP (Included Above)									
								25		Minor Longitudinal Crack - FINISH			1		CIPP (Included Above)									
								43		Minor Longitudinal Crack			1		CIPP (Included Above)									
								44		Fine Roots at Joint			1		CIPP (Included Above)									
								98		Moderate Multiple Cracks			4		CIPP (Included Above)									
								141		Minor Longitudinal Crack			1		CIPP (Included Above)									
								170		Minor Longitudinal Crack			1		CIPP (Included Above)									
								183		Moderate Longitudinal Fracture			4		CIPP (Included Above)									
								185		Moderate Multiple Cracks			4		CIPP (Included Above)									
								189		Moderate Multiple Cracks			4		CIPP (Included Above)									
								214		Light Mineral Deposits Attached			1											
								215		Minor Circumfrential Fracture			2		seal all laterals (6)		6	EA	$800.00		$4,800.00			
4/19/2014	Howe Rd	S20-029	S20-028	8	257	VCP	3							11								$2,250.00			
								6		Minor Circumfrential Fracture			1			1									
								18		Fine Roots at Joint			1												
								57		Moderate Longitudinal Fracture - START			4		Point Repair up to 8 ft	1	1	EA	$2,250.00	$2,250.00			$0	$0.00	NO
								60		Moderate Longitudinal Fracture - FINISH			4												
								208		Minor Circumfrential Fracture			1			1									
4/19/2014	Howe Rd	S20-028	S20-027	8	268	VCP	3							11								$3,250.00			
								20		Minor Circumfrential Fracture			1												
								26		Minor Longitudinal Crack			1												
								36		Minor Longitudinal Crack			1												
								72		Water Level 15%			1												
								75		Moderate Longitudinal Fracture - START			4		Point Repair up to 12 ft	9	1	EA	$3,250.00	$3,250.00			$0	$0.00	NO
								84		Moderate Longitudinal Fracture - FINISH			4												
								97		Water Level 5%			1												
								105		Fine Roots at Joint			1												
4/23/2014	MacIntosh Ave	S20-033	S20-021	8	262	AC	3							11								$15,280.00			
								18		Light Mineral Deposits Attached			1		CIPP		262	LF	$40.00	$10,480.00			$17,649	$1.16	YES
								35		Leaking at Joint	180	90	4		CIPP (Included Above)	1								
								35		Leaking at Connection to main	180	90	4		CIPP (Included Above)									
								88		Leaking at Connection to main	180	90	2		CIPP (Included Above)									
								262		Leaking Joint	720	360	3		CIPP (Included Above)	1								
															seal all laterals (6)		6	EA	$800.00		$4,800.00			
4/23/2014	Central Ave	S28-062	S28-061	8	251	AC	12							11								$5,000.00			
								144		Service Leaking from connection to main	180	90	4		seal lateral	1	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								152		Water Level 10%			1												
								158		Service Leaking from connection to main	180	90	4		seal lateral	1	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								158		Water Level 5%			1												
4/23/2014	Central Ave	S38-014	S38-006	8	87	AC	12							11								$2,050.00			
								82		Moderate Multiple Cracks			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/25/2014	Tolman St	S38-041	S38-042	8	68	VCP	3							11								$2,169.00			
								3		Moderate Multiple Cracks			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								47		Medium Roots at Joint - START			3		Chemical Root Treatment	8	68	LF	$1.75	$119.00			$0	$0.00	NO
								65		Medium Roots at Joint - FINISH			3												
5/6/2016	Nardone Rd	S21-026	S21-044	8	173	AC	13							12								$2,050.00			
								95		Heavy Infiltration Runner	2880	1440	4		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$40,341	$19.68	YES
5/6/2016	Jarvis Cir	S21-062	S21-061	8	122	AC	13							12								$11,000.00			
								39		Heavy Infiltration Runner at joint to service	2880	1440	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
								39		Moderate Longitudinal Fracture			4			0.5									
								73		Heavy Infiltration Gusher at joint to service	5760	2880	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00			$80,682	$14.67	YES
5/6/2016	Jarvis Cir	S21-061	S21-060	8	72	AC	13							12								$5,500.00			
								25		Heavy Infiltration Gusher at joint to service	3600	1800	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00			$50,426	$9.17	YES
5/6/2016	Jarvis Cir	S21-060	S21-059	8	124	AC	13							12								$5,500.00			
								59		Heavy Infiltration Gusher at joint to service	4320	2160	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00			$60,511	$11.00	YES
5/6/2016	Jarvis Cir	S21-059	S21-058	8	122	AC	13							12								$600.00			
								122		Heavy Infiltration Runner at bench	4320	2160	4		Grout Manhole		1	EA	$600.00	$600.00			$60,511	$100.85	YES
3/20/2015	Lynn Rd	S10-034	S10-033	8	294	AC	3?							14								$18,710.00			
								0		Heavy Infiltration Runner	7,200	3,600	4		grout manhole		1	EA	$550.00	$550.00			$100,852	$183.37	YES
								54		Hole			4		CIPP		294	LF	$40	$11,760			$7,564	$0.42	NO
								55		Infiltration Dripper	180	90	1												
								56		Infiltration Weeper	180	90	1												
								56		Broken			4												
								153		Broken			4												
								214		Infiltration Dripper	180	90	2												
								214		Hole			2												
								235		Surface Aggregate			2												
										Seal all Laterals (8)							8	EA	$800.00	$6,400.00					
3/20/2015	Lynn Rd	S10-035	S10-036	8	98	AC	3?							14								$6,320.00			
								43		Infiltration Runner	1,440	720	4		CIPP		98	LF	$40	$3,920			$20,170	$3.19	YES
										Seal all Laterals (3)							3	EA	$800.00	$2,400.00					

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CONTRACT # 4623

Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 4

																		EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
6/13/2016	Elder Road	S05-29	S05-028	10	194	PVC	3							14									$340			
								33		Minor Roots at Joint			1												
								63		Minor Roots at Joint			1												
								66		Minor Roots at Joint			1												
								69		Minor Roots at Joint			1												
								77		Minor Roots at Joint			1												
								83		Minor Roots at Joint			1												
								92		Minor Roots at Joint			2												
								144		Heavy Roots at Joint			4		Root treatment		194	LF	$2	$340			$0	$0.00	NO
								147		Moderate Roots at Joint			3		Root treatment										
								148		Heavy Roots at Capped Service			4		Root treatment										
								149		Minor Roots at Joint			1												
								158		Heavy Roots at Joint			4		Root treatment										
								176		Minor Roots at Joint			1												
								182		Minor Roots at Joint			1												
4/12/2016	Meadowbrook Rd	S29-064	S29-065	8	261	AC	13							15									$2,000.00			
								116		Heavy Infiltration Runner at service connection	4320	2160	4		T-liner		1	EA	$2,000.00		$2,000.00		$60,511	$30.26	YES
								116		Break In Tap Defective			2												
4/12/2016	Meadowbrook Rd	S29-082	S29-083	8	119	AC	13							15									$550.00			
								118		Moderate Infiltration Runner at Main connection to MH	2880	1440	4		Grout & patch bench, invert, and connection		1	EA	$550.00	$550.00			$40,341	$73.35	YES
4/13/2016	Meadowbrook Rd	S29-059	S29-058	8	83	AC	13							15									$5,500.00			
								62		Heavy Infiltration Runner at service connection to main	4320	2160	4		Dig and Replace wye		1	EA	$5,500.00	$5,500.00			$60,511	$11.00	YES
4/13/2016	Meadowbrook Rd	S29-058	S29-057	8	54	AC	13							15									$550.00			
								53		Moderate Infiltration in MH invert	3600	1800	4		Grout & patch bench, invert, and connection		1	EA	$550.00	$550.00			$50,426	$91.68	YES
4/13/2016	Blacksmith Dr	S29-100	S29-99	8	225	AC	13							15									$4,050.00			
								88		Heavy Infiltration Runner at chimney connection to main	7200	3600	4		T-liner		1	EA	$2,000.00		$2,000.00		$100,852	$50.43	YES
								185		Moderate Infiltration Runner at chimney connection to main	1440	720	2		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
3/26/2015	Sachem St	S10-096	S10-098	8	243	VCP	3							17									$2,050.00			
								14		Moderate Longitudinal Fracture			1												
								129		Broken			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								158		Fine Roots at Joint			1												
								169		Fine Roots at Joint			1												
								184		Fine Roots at Joint			1												
								193		Fine Roots at Joint			1												
								196		Fine Roots at Joint			1												
								201		Fine Roots at Joint			1												
								204		Fine Roots at Joint			1												
								210		Fine Roots at Joint			1												
								218		Fine Roots at Joint			1												
								222		Fine Roots at Joint			1												
								225		Fine Roots at Joint			1												
5/3/2014	Blake St	S39-047	S39-048	8	198	PVC	12							19.1									$2,050.00			
								2		Water Level 20%			1												
								5		Offset Joint Medium			1												
								5		Joint Leaking	180	90	4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								24		Water Level 5%			1												
								81		Minor Circumfrential Fracture			1			1									
								84		Water Level 20%			1												
								90		Water Level 5%			1												
5/3/2014	Blake St	S39-048	S39-049	8	221	PVC	12							19.1									$2,825.00			
								31		Protruding Service Lateral			1												
								110		Protruding Service Lateral			4		Cut protruding lateral		1	EA	$325.00		$325.00		$0	$0.00	NO
								110		Service Connection at Main Leaking	180	90	4		Lateral Grout	1	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/6/2014	Barrett St	S39-002	S39-001	8	198	other	3							19.1									$265.00			
								150		Heavy Mineral Buildup in service			4		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
5/7/2014	Gilbert Rd	S38-024	S38-025	8	152	AC	12							19.1									$265.00			
								57		Heavy Grease deposits			4		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
5/7/2014	Robinwood Ave Easement	S49-024	S49-023	8	141	AC	12							19.1									$7,550.00			
								0		Heavy Leak at joint	2160	1,080	4		Remove and Replace		1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
								93		Chip at Joint			3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
5/9/2014	High Rock St	S49-052	S49-051	8	128	VCP	12							19.1									$2,050.00			
								37		Minor Longitudinal Crack			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00					
								38		Leak at Longitudinal Crack	720	360	3		Point Repair up to 4 ft (Included Above)								$10,085	$4.92	YES
5/12/2014	High Rock St	S39-009	S39-008	8	203	VCP	12							19.1									$9,720.00			
								53		Moderate Multiple Fractures			3		CIPP		203	LF	$40.00	$8,120.00			$10,085	$1.04	YES
								56		Light Grease Deposits attached			1		CIPP (Included Above)										
								121		Moderate Spiral Fracture	720	360	4		CIPP (Included Above)										
								177		Water Level 10%			1		CIPP (Included Above)										
								180		Water Level 10%			1		CIPP (Included Above)										
								198		Light Mineral Deposits Attached			1		CIPP (Included Above)										
															seal all laterals (2)		2	EA	$800.00		$1,600.00				

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 4

																		EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
3/18/2014	Dartmouth Ave	S23-019	S23-127	8	298	VCP	3							20									$8,000.00			
								70		Service Lateral Leaking	4320	2160	4		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$60,511	$11.00	YES
								90	Minor Longitudinal Cracks				1			2.5									
								73	Minor Longitudinal Cracks				1			2.7									
								108	Minor Longitudinal Cracks				1			2.5									
								114	Minor Longitudinal Cracks				1			2.8									
								119	Minor Longitudinal Cracks				1			3									
								156		Service Lateral Leaking	180	90	1		Lateral Grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								222	Minor Longitudinal Cracks				1			1.2									
								297	Minor Longitudinal Cracks				1			1.5									
3/20/2014	James Ave	S22-105	S22-104	8	295	VCP	3							20									$15,000.00			
								156		Leaking Joint	2160	1,080	4		CIPP		295	LF	$40.00	$11,800.00			$30,256	$2.02	YES
								293		Minor longitudinal crack			1			1									
															Seal all laterals (4)		4	EA	$800.00		$3,200.00				
3/20/2014	Lindbergh Ave	S23-015	S23-014	8	217	VCP	3							20									$11,880.00			
								38		Leaking Joint	720	360	1		CIPP		217	LF	$40.00	$8,680.00			$10,085	$0.85	NO
								66		Light Mineral Deposits Attached			1												
								125		Minor Longitudinal Crack			1			4									
								127		Moderate Spiral Fracture			2			1									
								138		Moderate Circumferential Fracture			4			1	1								
								147		Light Roots at Joint			1												
								211		Moderate Circumferential Crack			2			1									
								214		Moderate Circumferential Fracture			4			1	1								
								215		Multiple Moderate Fractures			4			2									
															Seal all laterals (4)		4	EA	$800.00		$3,200.00				
3/20/2014	Lindbergh Ave	S23-014	S23-013	8	143	VCP	3							20									$2,050.00			
								2		Multiple Major Fractures			4		point repair up to 4 ft	3	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								53		Light Roots at Joint			1												
3/21/2014	Manning Street	S22-083	S22-078	8	320	VCP	3							20									$14,150.00			
								120	Heavy Roots at Service Entrance				3		Remove Lateral Roots		1	EA	$650.00	$650.00			$0	$0.00	NO
								120		Service Lateral Leaking	360	180	3		Lateral Grout up to 5 ft		1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								124		Leaking Joint in Service	2160	1,080	4		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
								124	Heavy Roots at Service Entrance				3												
								229		Service Lateral Leaking	1080	540	3		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$15,128	$2.75	YES
3/19/2014	La Salle Road	S22-082	S22-083	8	272	VCP	3							20									$5,768.00			
								6		Fine Roots at Joint			1												
								45		Protruding Service Lateral			1												
								57		Fine Roots at Joint			1												
								60		Fine Roots at Joint			1												
								73		Fine Roots at Joint			1												
								92		Minor Roots in Service Lateral			1												
								127	Moderate Longitudinal Cracks				4			2									
								139		Service Connection Cracked			4		CIPP		272	LF	$6.50	$1,768.00			$0	$0.00	NO
								139		Moderate Longitudinal Fractures			4		CIPP (Included Above)										
								151		Multiple Moderate Fractures			4		CIPP (Included Above)	1									
								170		Multiple Moderate Fractures			4		CIPP (Included Above)	1									
								183		Multiple Cracks			4		CIPP (Included Above)	1									
								183		Service Connection at Main Cracked			4		CIPP (Included Above)										
								190		Fine Roots at Joint			1												
								232		Minor Spiral Crack			1		CIPP (Included Above)	2									
															seal all laterals (5)		5	EA	$800.00		$4,000.00				
3/20/2014	Stevens Road	S41-016	S41-015	8	348	VCP	3							20									$2,600.00			
								15		Fine Roots at Joint			1												
								19		Fine Roots at Joint			1												
								28		Fine Roots at Joint			1												
								29		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								29		Fine Roots at Joint			1												
								67		Minor Longitudinal Crack			1			1									
								68		Defective Tap - Cracked Cap			1												
								83		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								92		Minor Longitudinal Cracks			1			1									
								147		Moderate Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								167		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								183		Fine Roots at Joint			1												
								222		Fine Roots at Joint			1												
								236		Fine Roots at Joint			1												
								242		Fine Roots at Joint			1												
								247		Fine Roots at Joint			1												
								259		Fine Roots at Joint			1												
								265		Fine Roots at Joint			1												
								334		Water Level 10%			1												
								334		Fine Roots at Joint			1												
								340		Fine Roots at Joint			1												

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 4

																		EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
3/20/2014	Mayo Ave	S40-131	S40-132	8	346	VCP	3							20								$22,490.00			
								19		Fine Roots at Joint			1		CIPP		346	LF	$40.00	$13,840.00			$0	$0.00	NO
								26		Fine Roots at Joint			1												
								45		Fine Roots at Joint			1												
								64		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00				
								65		Fine Roots at Joint			1												
								82		Multiple Cracks			4			1									
								85		Fine Roots at Joint			1												
								102		Fine Roots at Joint			1												
								113		Multiple Cracks			4			1									
								131		Fine Roots at Joint			1												
								140		Moderate Roots in Service Lateral			2												
								153		Fine Roots at Joint			1												
								210		Multiple Cracks			4			1									
								234		Fine Roots at Joint			1												
								253		Fine Roots at Joint			1												
								323		Spiral Crack			1			1									
								332		Multiple Cracks			4		seal all laterals (10)	1	10	EA	$800.00		$8,000.00				
3/21/2014	Holland Street	S30-094	S30-095	8	254	VCP	3							20								$3,209.50			
								81		Cracks around Service Lateral			3		Seal Lateral	1	1	EA	$2,500.00	$2,500.00			$0	$0.00	NO
								81		Minor Longitudinal Crack			1												
								140		Fine Roots at Joint			1												
								140		Minor Multiple Cracks			1												
								146		Fine Roots at Joint			1												
								152		Fine Roots at Joint			1												
								162		Minor Roots in Service Lateral			2												
								193		Mineral Deposits around Lateral Service			4		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
								196		Fine Roots at Joint			1												
								196		Medium Roots at Joint			3		Chemical Root Treatment		254	LF	$1.75	$444.50			$0	$0.00	NO
4/2/2014	Brookline St	S23-010	S23-009	8	245	VCP	3							20								$13,800.00			
								3		Fine Roots at Joint			1		CIPP		245	LF	$40.00	$9,800.00			$7,564	$0.55	NO
								11		Fine Roots at Joint			1		CIPP (included above)										
								15		Fine Roots at Joint			1		CIPP (included above)										
								17		Roots in Service Lateral			1		CIPP (included above)										
								25		Minor Multiple Cracks			1		CIPP (included above)	3									
								33		Minor Longitudinal Crack			1		CIPP (included above)	2									
								150		Multiple Fractures			3		CIPP (included above)	6									
								188		Defective Tap - Leaking	360	180	1		CIPP (included above)	1									
								214		Minor Multiple Fractures			2		CIPP (included above)	1									
								245		Leaking at Joint	180	90	4		CIPP (included above)	1									
															seal all laterals (5)		5	EA	$800.00		$4,000.00				
4/3/2014	Parkinson St	S30-005	S30-004	8	348	VCP	3							20								$1,259.00			
								40		Minor Multiple Cracks			1			1									
								43		Minor Longitudinal Cracks			1			1									
								62		Minor Multiple Cracks			2			1									
								81		Minor Multiple Cracks			1			1									
								99		Minor Multiple Cracks			1			1									
								106		Fine Roots at Joint			1												
								121		Minor Longitudinal Cracks			1			1									
								141		Minor Multiple Cracks			2			1									
								151		Minor Longitudinal Cracks			1			1									
								165		Minor Multiple Cracks			1			1									
								179		Minor Longitudinal Cracks			1			1									
								182		Minor Multiple Cracks			1			1									
								231		Minor Longitudinal Cracks			1			1									
								260		Minor Multiple Cracks			1			1									
								326		Minor Circumfrential Fracture			1			1									
								332		Fine Roots at Joint			1												
								335		Medium Roots at Joint			3		Chemical Root Treatment		348	LF	$1.75	$609.00			$0	$0.00	NO
								338		Medium Roots at Joint			3												
								341		Fine Roots at Joint			1												
								344		Medium Roots at Joint - START			3												
								348		Heavy Roots in service lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								348		Medium Roots at Joint - FINISH			3												

CLIENT: TOWN OF NEEDHAM
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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 4

																		EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/3/2014	Parkinson St	S30-083	S30-084	8	311	VCP	3							20									$3,894.25			
								3	Minor Longitudinal Cracks				1			1										
								12		Minor Multiple Cracks			1			1										
								22		Minor Longitudinal Cracks			1			1										
								25	Minor Longitudinal Cracks				1			1										
								28	Minor Longitudinal Cracks				1			1										
								35		Minor Longitudinal Cracks			1			1										
								50	Minor Longitudinal Cracks				1			1										
								63		Minor Spirl Fracture			1			1										
								78	Minor Longitudinal Cracks				1			1										
								82	Minor Longitudinal Cracks				1			1										
								91	Deposits Attached				1													
								94		Fine Roots at Joint			1													
								95		Minor Roots in from Service			1													
								98		Fine Roots at Joint			1													
								102		Fine Roots at Joint			1													
								109		Moderate Roots in Service			1		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								141		Medium Roots at Joint			3		Chemical Root Treatment		311	LF	$1.75	$544.25			$0	$0.00	NO
								142		Defective Tap - Roots			1													
								161		Medium Roots at Joint			3													
								170	Minor Longitudinal Cracks				1			1										
								178		Moderate Roots in Service			1													
								200	Minor Longitudinal Cracks				1			1										
								224		Fine Roots at Joint			1													
								248		Moderate Spirl Fracture			4		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								306		Minor Longitudinal Cracks			1			1										
								310		Service Filled with debris and roots			2													
								311		Moderate Roots in Service			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
4/3/2014	Parkinson St	S30-083	S30-084	8	133	VCP	3							20									$232.75			
								8	Minor Circumfrential Fracture				1			1										
								27		Fine Roots at Joint			1													
								37		Minor Longitudinal Crack			1			1										
								64		Fine Roots at Joint			1													
								65		Minor Roots in Lateral Service			1													
								66		Fine Roots at Joint			1													
								67		Minor Roots in Lateral Service			1													
								71		Fine Roots at Joint			1													
								109		Minor Longitudinal Crack			1			1										
								121		Medium Roots at Joint			3		Chemical Root Treatment		133	LF	$1.75	$232.75			$0	$0.00	NO
								127		Medium Roots at Joint			3													
								133		Fine Roots at Joint			1													
								133		Heavy Roots at Joint			4													
4/9/2014	Webster St	S22-060	S22-059	10	245	VCP	3							20									$2,050.00			
								23		Water Level 10%			1													
								80		Minor Longitudinal Crack			1			1										
								87		Minor Longitudinal Crack			1			1										
								90		Moderate Spiral Fracture			4		point repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								102		Minor Spiral Crack			1			1										
								162		Water Level 15%			1													
								166		WIRE in Pipe?			1													
								214		Camera Underwater			3													
								245		Camera Underwater			3													
4/6/2015	Greendale Ave	S42-117	S42-116	8	201	AC	13							21									$2,050.00			
								129		Hole			4		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/6/2015	Brookline St	S23-100	S23-101	8	65	AC	13							21									$2,050.00			
								39		Infiltration Runner at Joint	4320	2160	4		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00			$60,511	$29.52	YES
4/7/2015	Oak Hill St	S23-140	S23-141	8	273	AC	13							21									$7,550.00			
								173		Defective Break in Tap leaking	2160	1080	4		Replace Service Wye	1	1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
								249		Hole			3		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/7/2015	Oak Hill St	S23-104	S23-105	8	247	AC	13							21									$2,050.00			
								107		Broken			4		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/9/2015	Cimino Rd	S16-122	S16-123	8	137	VCP	3							21									$4,550.00			
								76		Infiltration Runner at Joint	1,440	720	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
								84		Infiltration Runner at Joint IN SERVICE	2,880	1,440	4		Lateral Grout		1	EA	$2,500.00		$2,500.00		$40,341	$16.14	YES
4/9/2015	Richdale Rd	S17-005	S17-008	8	316	AC	12							21									$2,050.00			
								16		Broken			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/9/2015	Richdale Rd	S17-012	S23-041	8	347	AC	12							21									$13,500.00			
								26		Service Lateral Leaking	180	90	3		Lateral Grout		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								27		Minor Deposits Attached			1													
								51		Broken			2		Remove and Replace Pipe		1	EA	$5,500.00	$5,500.00			$5,043	$0.92	NO
								51		Infiltration Runner at break	360	180	2													
								52		Infiltration Runner at joint connection to service	2,160	1,080	4		Remove and Replace Service Wye		1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
4/14/2015	Highgate St	S32-036	S24-005	8	167	AC	10							21									$2,050.00			
								25		Minor Circumfrential Fracture			1													
								163		Infiltration Runner ar Joint	1,440	720	4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
4/14/2015	Highgate St	S24-005	S24-006	8	229	AC	10							21									$2,050.00			
								82		Broken			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 4

																		EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/24/2014	Hillcrest Rd	S31-126	S31-127	8	230	VCP	3							22									$11,000.00			
								1		Minor Longitudinal Crack			1			1									
								42		Moderate Multiple Fractures			3		Replace Service Wye	1	1	EA	$5,500.00	$5,500.00			$2,521	$0.46	NO
								44		Fractures around Service Lateral Conneciton			1		Replace Service Wye (Included Above)										
								44		Leaking at Joint to service	180	90	4		Replace Service Wye (Included Above)	1									
								53		Fine Roots at Joint			1												
								65		Fine Roots at Joint			1												
								115		Fine Roots at Joint			1												
								123		Fine Roots at Joint			1												
								174		Minor Longitudinal Crack			1			1									
								183		Moderate Multiple Fractures			3		Replace Service Wye	1	1	EA	$5,500.00	$5,500.00			$0	$0.00	NO
								184		Fractures around Service Lateral Conneciton			3		Replace Service Wye (Included Above)										
								199		Fine Roots at Joint			1												
								203		Fine Roots at Joint			1												
								207		Fine Roots at Joint			1												
								223		Fine Roots at Joint			1												
								225		Fine Roots at Joint - START			1			5									
								230		Fine Roots at Joint - FINISH			1												
4/24/2014	Hillcrest Rd	S31-123	S31-121	8	300	VCP	3							22									$3,025.00			
								8		Leaking at Joint to service	180	90	4		Grout Lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								77		Fine Roots at Joint			1												
								83		Medium Roots at Joint			3		Chemical Root Treatment		300	LF	$1.75	$525.00			$0	$0.00	NO
								84		Medium Roots at Joint			3												
5/1/2014	Helen Rd	S31-149	S31-150	8	73	PVC	11							22									$2,050.00			
								9		Minor Longitudinal Crack			1			1									
								11		Minor Longitudinal Crack			1			1									
								21		Minor Circumfrential Fracture			1			1									
								26		Minor Circumfrential Fracture			1			1									
								61		Minor Longitudinal Crack			1			1									
								71		Moderate Multiple Cracks			4		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
5/1/2014	Arch St	S31-161	S31-163	8	187	VCP	3							22									$325.00			
								107		Minor Multiple Cracks			2												
								187		Protruding service lateral			4		cut protruding lateral		1	EA	$325.00	$325.00			$0	$0.00	NO
5/1/2014	Savoy Rd	S31-164	S23-121	8	204	PVC	6							22									$2,050.00			
								3		Moderate Leak at Joint	1440	720	4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
5/2/2014	Woodledge Rd	S31-166	S31-165	8	242	VCP	3							22									$7,223.50			
								71		Medium Roots at Joint			3		Chemical Root Treatment		242	LF	$1.75	$423.50			$0	$0.00	NO
								74		Fine Roots at Joint			2												
								79		Medium Roots at Joint			3												
								183		Heavy Leaking at service connection to main	1440	720	4		Seal lateral		1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
								187		Light Mineral Deposits Attached			1												
								196		Moderate Longitudinal Crack - START			4		Point Repair up to 8 ft	7	1	EA	$2,250.00	$2,250.00			$0	$0.00	NO
								203		Moderate Longitudinal Crack - FINISH			4												
								230		minor leaking at joint	360	180	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
12/18/2014	Washington Ave	S31-060	S31-059	8	92	VCP	3							22									$2,750.00			
								21		Longitudinal Fracture			2												
								80		Moderate Longitudinal Fracture			4		Point Repair up to 12 ft	1	1	EA	$2,750.00	$2,750.00			$0	$0.00	NO
								89		Moderate Longitudinal Fracture			3												
12/18/2014	Washington Ave	S31-058	S31-055	8	292	VCP	3							22									$2,050.00			
								116		Fine Roots at Joint			2												
								185		Moderate Longitudinal Fracture	720	360	4		Point Repair up to 4 ft	3	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								269		Moderate Longitudinal Fracture			2												
12/18/2014	Holmes St	S31-029	S31-052	8	193	VCP	3							22									$550.00			
								0		Infiltration Runner at Pipe Connection with Manhole	720	360	4		Grout Pipe Connection		1	EA	$550.00	$550.00			$10,085	$18.34	YES
								168		Fine Roots at Joint			2												
12/18/2014	Holmes St	S31-052	S31-060	8	199	VCP	3							22									$12,510.00			
								0		Major Infiltration Runner in Bench	1,080	540	4		Grout Bench and Invert		1	EA	$550.00		$550.00		$15,128	$27.51	YES
								43		Major Infiltration Runner in Service	1,440	720	4		CIPP		199	LF	$40.00	$7,960.00			$90,767	$7.59	YES
								66		Major Infiltration Runner at Joint	1,080	540	4		CIPP (Included Above)										
								96		Major Infiltration Runner at Service Joint	1,080	540	4		CIPP (Included Above)										
								114		Major Infiltration Runner at Service Joint	1,080	540	4		CIPP (Included Above)										
								130		Major Infiltration Runner at Joint	720	360	4		CIPP (Included Above)										
								131		Major Infiltration Runner at Service Joint	1,080	540	4		CIPP (Included Above)										
															seal all laterals (5)		5	EA	$800.00		$4,000.00				
12/19/2014	Ellicott St	S31-035	S31-039	8	158	PVC	12							22									$4,550.00			
								9		Moderate Infiltration Runner at Joint	720	360	4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								21		Tap Break-In Defective - Leaking at Joint			3												
								21		Major Infiltration Runner at Joint	1,440	720	4		lateral grout up to 5 ft		1	EA	$2,500.00	$2,500.00			$20,170	$8.07	YES
4/14/2015	Rockwood Ln	S32-039	S32-038	8	100	VCP	3							24									$10,050.00			
								50		Infiltration Runner at Joint in service	720	360	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
								84		Infiltration Runner at service connection to pipe	2,880	1,440	4		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$40,341	$7.33	YES
								88		Infiltration Runner at Joint	1,440	720	3		Point Repair		1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
								88		Minor Circumfrential Fracture			1												
4/14/2015	Richard Rd	S32-040	S32-039	8	200	VCP	3							24									$4,550.00			
								95		Infiltration Runner at joint	1,440	720	3		Point Repair, up to 4 ft		1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
								148		Infiltration Runner in service	2,160	1,080	4		Seal Lateral		1	EA	$2,500.00		$2,500.00		$30,256	$12.10	YES

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Appendix F
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DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/15/2015	Douglas Rd	S52-059	S52-060	8	196	VCP	3							24								$608.00			
								10		Fine Roots at Joint					Chemical Root Treatment		196	LF	$1.75	$343.00			$0	$0.00	NO
								44		Fine Roots at Joint			1												
								74		Fine Roots at Joint			1												
								138		Fine Roots at Joint			1												
								160		Obstruction			4		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
4/15/2015	Thornton Rd	S42-056	S42-055	8	148	VCP	3							24								$2,050.00			
								0		Moderate Circumfrential Crack			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/16/2015	Dawson Dr	S42-035	S42-036	8	196	AC	12							24								$2,500.00			
								20		Defective Tap			2												
								20		Infiltration Runner at Tap connection to pipe	1,440	720	4		Seal lateral		1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
								100		Intruding Tap			1												
4/17/2017	Dawson Dr	S41-098	S41-097	8	203	AC	12							24								$4,100.00			
								13		Intruding Tap			1												
								99		Broken			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								102		Broken			4		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/17/2015	Dawson Dr	S41-098	S42-033	8	206	AC	12							24								$2,500.00			
								46		Defective tap			2												
								46		Infiltration at tap connection to pipe	1,440	720	4		Seal lateral		1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
								128		Minor Deposits attached			1												
3/31/2015	Central Ave	S02-047	S02-046	8	164	VCP	3							25								$2,050.00			
								49		Hole			4		Point Repair 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
3/25/2015	Reservoir Ave	S02-060	S02-061	8	134	AC	13							25								$5,500.00			
								133		Infiltration Runner at joint	4,320	2,160	4		Remove and Replace		1	EA	$5,500.00	$5,500.00			$60,511	$11.00	YES
5/16/2014	Abbott St	S29-022	S29-016	8	269	VCP	3							27								$2,400.00			
								25		Fine Roots at Joint			1												
								85		Moderate chimney leak at service joint to main	720	360	3		lateral grout up to 5 ft		1	EA	$800.00		$800.00		$10,085	$12.61	YES
								115		Fine Roots at Joint			1												
								118		Water Level 20%			1												
								124		Water Level 20%			1												
								203		Heavy Leak at service connection to main	2,660	1,330	4		lateral grout up to 5 ft		1	EA	$800.00		$800.00		$37,259	$46.57	YES
								215		Moderate chimney leak at service joint to main	1,880	940	3		lateral grout up to 5 ft		1	EA	$800.00		$800.00		$26,334	$32.92	YES
4/30/2016	Tillotson Rd Easement	S21-121	S21-122	8	257	AC	13							29								$2,050.00			
								26		Minor Longitudinal Fractures			2												
								137		Moderate Muliple Fractures			4		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								137		Moderate Infiltration Runner	720	360	4												
3/31/2015	First Ave	S11-025	S11-024	12	307	VCP	3							32								$5,100.00			
								2		Multiple Moderate Fractures			4		Point Repair up to 4 ft		1	EA	$2,550	$2,550			$0	$0.00	NO
								47		Broken			4		Point Repair up to 4 ft		1	EA	$2,550	$2,550			$0	$0.00	NO
3/26/2015	Highland Terrace	S11-47	S11-46	8	195	VCP	3							32								$2,050.00			
								63		Broken			4		Point Repair up to 4 ft		1	EA	$2,050	$2,050			$0	$0.00	NO
								142		Minor Longitudinal Fracture			2												
4/1/2015	First Ave	S11-021	S11-021.1	12	118	VCP	3							32								$7,080.00			
								9		Moderate Multiple Fractures start			4		CIPP	9	118	LF	$60	$7,080			$10,085	$1.42	YES
								18		Moderate Multiple Fractures end			4												
								80		Minor Longitudinal Fracture			2												
								97		Infiltration runner at joint	720	360	4			1									
										seal all laterals (0)							0	EA	$800.00						
4/8/2015	Charles St	S06-027	S06-026	8	292	AC	12							32								$2,500.00			
								96		Leaking Service	2160	1080	4		Seal Lateral		1	EA	$2,500.00		$2,500.00		$30,256	$12.10	YES
6/9/2016	Charles St ROW	S06-008	S06-007	12	89	VCP	3							32								$2,550.00			
								5		Moderate Longitudinal Fracture			3												
								14		Deposits Attached, Start			2												
								21		Infiltration Runner	1,440	720	4		Point Repair		1	EA	$2,550.00	$2,550.00			$20,170	$7.91	YES
								23		Moderate Longitudinal Fracture			3												
								88		Deposits Attached, End			2												

CLIENT: TOWN OF NEEDHAM
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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 5

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/21/2015	Edgewater Dr	S60-019	S60-020	8	225	VCP	3							3									$15,000.00			
								224		Infiltration Gusher in bench	4,320	2,160	5		Replace Manhole		1	EA	$15,000.00	$15,000.00			$60,511	$4.03	YES
4/21/2015	Edgewater Dr	S60-021	S60-022	8	197	VCP	3							3									$8,000.00			
								29		Infiltration Dripper at service connection to pipe	180	90	2		Seal Lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								49		Infiltration Gusher at service connection to pipe	5,760	2,880	5		Remove and Replace		1	EA	$5,500.00	$5,500.00			$80,682	$14.67	YES
4/21/2015	Edgewater Dr	S60-002	S60-001	8	317	VCP	3							4									$17,500.00			
								171		Infiltration Dripper at tap connection to pipe	1,080	540	3		Seal Lateral		1	EA	$2,500.00		$2,500.00		$15,128	$6.05	YES
								317		Major Leaking through Bench	4,320	2,160	5		Replace Manhole		1	EA	$15,000.00	$15,000.00			$60,511	$4.03	YES
4/17/2014	Standish Rd	S27-025	S28-009A	8	18	AC	13							11									$325.00			
								18	Protruding Lateral				5		Cut lateral Protrusion		1	EA	$325.00		$325.00		$0	$0.00	NO
4/17/2014	Standish Rd	S28-009A	S27-025	8	316	AC	13							11									$325.00			
								143		Light Mineral Deposits Attached			1												
								316		Protruding Lateral			5		Cut lateral Protrusion		1	EA	$325.00		$325.00		$0	$0.00	NO
4/18/2014	Canavan Cr	S27-014	S27-013	8	93	AC	13							11									$325.00			
								92		Protruding Lateral			5		Cut lateral Protrusion		1	EA	$325.00		$325.00		$0	$0.00	NO
4/18/2014	Canavan Cr	S27-013	S27-014	8	321	AC	13							11									$2,375.00			
								195		Circumfrential Fracture			1			1									
								284	Light Grease Deposits Attached				2												
								287	Hole				3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								321	Protruding Lateral				5		Cut lateral Protrusion		1	EA	$325.00		$325.00		$0	$0.00	NO
4/24/2014	Mackintosh Ave	S20-008	S20-009	8	105	PVC	13							11									$8,265.00			
								36		Surface Roughness			2		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
								42	Service Lateral Leaking		1080	540	2		Lateral Grout	1	1	EA	$2,500.00		$2,500.00		$15,128	$6.05	YES
								62		Leaking at Chimney	4320	2,160	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$60,511	$11.00	YES
								90	Water Level 50%																
4/10/2014	Mary Chilton Rd	S19-008	S19-007	8	147	AC	12							11									$4,100.00			
								48		Multiple Cracks			3		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								103		Hole in side of pipe			5		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/18/2014	Central Ave	S38-019	S38-020	8	167	AC	12							11									$2,050.00			
								59		Heavy Leak at Joint	2160	1,080	5		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$30,256	$14.76	YES
4/19/2014	Mason Rd	S20-020	S20-015	10	101	VCP	3							11									$5,850.00			
								22		Deposits Attached			1		CIPP		101	LF	$50.00	$5,050.00			$35,298	$6.03	YES
								48		Infiltration runner at joint	720	360	1		CIPP (Included Above)	1									
								60		Multiple Fractures			1		CIPP (Included Above)	1									
								61		Defective Tap - Fractures and Leaking			1		CIPP (Included Above)										
								61		Infiltration gusher at joint	1440	720	5		CIPP (Included Above)	1									
								68		Infiltration runner at joint	360	180	1		CIPP (Included Above)	1									
								84		Water Level 10%			1		CIPP (Included Above)										
								89		Longitudinal Crack			1		CIPP (Included Above)	1									
								101		Spiral Fracture			2		CIPP (Included Above)	1									
															seall all laterals (1)		1	EA	$800.00		$800.00				
4/19/2014	Mason Rd	S20-015	S20-016	10	93	VCP	3							11									$7,050.00			
								11		Light Mineral Deposits Attached			1		CIPP		93	LF	$50.00	$4,650.00			$40,341	$5.72	YES
								26		Heavy Leak at Joint	2880	1,440	5		CIPP (Included Above)	1									
								27		Service entrance fractured			1		CIPP (Included Above)	1									
								27		Moderate Multiple Fractures			3		CIPP (Included Above)	1									
								28		Moderate Longitudinal Fractures			4		CIPP (Included Above)	1									
								50		Moderate Longitudinal Fractures			4		CIPP (Included Above)	1									
								58		Moderate Longitudinal Fractures			4		seal all laterals (3)	1	3	EA	$800.00		$2,400.00				
4/25/2014	Gay st	S39-023	S39-022	8	90	AC	13							11									$157.50			
								37		Root Ball at Joint 50%			5		Chemical Root Treatement		90	LF	$1.75	$157.50			$0	$0.00	NO
5/6/2016	Nardone Rd	S21-045	S21-062	8	107	AC	13							12									$5,500.00			
								79		Heavy Infiltration Gusher	14,400	7200	5		Dig and Replace wye		1	EA	$5,500.00	$5,500.00			$201,705	$36.67	YES
4/16/2016	Grasmere Rd	S04-007	S09-026	8	203	AC	13							13									$6,150.00			
								85		Sag in pipe			1												
								177		Infiltration at Joint in Pipe	1440	720	5		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
4/16/2016	Briarwood Cir	S09-023	S09-025	8	156	AC	13							13									$3,100.00			
								52		Break in Tap defective, minor infiltration	180	90	2		Grout service lateral		1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								155		Infiltration runner at main connection to MH	5760	2880	5		Grout manhole		1	EA	$600.00	$600.00			$80,682	$134.47	YES
3/20/2015	William St	S10-027	S10-028	8	387	AC	3?							14									$22,680.00			
								16		Hole			5		CIPP		387	LF	$40	$15,480			$0	$0.00	NO
								182		Broken			5												
								186		Longitudinal Crack			2												
								187		Hole			5												
								356		Obstruction			3												
										Seal all Laterals (9)							9	EA	$800.00	$7,200.00					
3/20/2015	William St	S10-028	S10-030	8	365	AC	3?							14									$21,000.00			
								2		Heavy Infiltration Runner	8640	4,320	5		CIPP	365	365	LF	$40	$14,600			$123,544	$5.88	YES
								2		Moderate Circumferential Fracture			2												
								48		infiltration weeper	180	90	1												
								48		Broken			5												
								185		Broken			5												
								304		Broken			5												
										Seal all Laterals (8)							8	EA	$800.00	$6,400.00					
3/20/2015	Lynn Rd	S10-034	S10-035	8	307	AC	3?							14									$17,880.00			
								239		Surface Aggregate			2		CIPP		307	LF	$40	$12,280			$40,341	$2.26	YES
								266		Infiltration Runner	2,880	1,440	5												
								266		Broken			4												
										Seal all Laterals (7)							7	EA	$800.00	$5,600.00					
3/30/2015	Webster St/Hillside St	S10-044	S10-018	8	226	PVC	13							14									$15,000			
								226		Major Infiltration in Bench s10-018	7,200	3,600	5		replace MH 210-018		1	EA	$15,000	$15,000			$100,852	$6.72	YES

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 5

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
3/27/2015	Sunnyside Rd	S10-019	S10-018	8	244	AC	13							14									$4,550			
								145		Infiltration dripper at tap joint to pipe	360	180	2		Seal lateral		1	EA	$2,500		$2,500		$5,043	$2.02	YES
								242		Infiltration Runner at joint	7,200	3,600	5		Point Repair up to 4 ft		1	EA	$2,050	$2,050			$100,852	$49.20	YES
6/10/2016	Elder Road	S10-031	S10-030	10	163	VCP	3							14									$2,050			
								6		Infiltration Runner at joint	4,320	2,160	5		Point Repair up to 4 ft		1	EA	$2,050	$2,050			$100,852	$49.20	YES
								9		Infiltration Runner at joint	2,880	1,440	4		Point Repair up to 4 ft (included above)										
								134																	
								161																	
4/13/2016	Blacksmith Dr	S29-99	S29-98	8	277	AC	13							15									$10,050.00			
								67		Moderate Infiltration Dripper at chimney connection to main	1440	720	2		Grout lateral		1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
								161		Heavy Infiltration Runner at chimney connection to service	10080	5040	5		Dig and Replace wye		1	EA	$5,500.00	$5,500.00			$141,193	$25.67	YES
								183		Minor Infiltration Dripper at joint	180	90	2		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								183		Minor Deposits attached			1												
								201		Minor Deposits attached			1												
5/3/2014	Overlook Rd	S39-034	S39-036	8	140	PVC	12							19.1									$550.00			
								140		Heavy Leak at pipeline connection to manhole	1440	720	5		Grout Pipe Connection at Manhole		1	EA	$550.00	$550.00			$20,170	$36.67	YES
5/7/2014	Robinwood Ave	S49-026	S49-027	8	83	AC	12							19.1									$2,050.00			
								6		Heavy Leak at joint to sealed Chimney Service	2880	1,440	5		Point Repair up to 4 ft		1	EA	$2,050.00		$2,050.00		$40,341	$19.68	YES
								6		Fine Roots at joint to chimney service			1												
5/9/2014	High Rock St	S49-038	S49-039	8	143	VCP	12							19.1									$5,500.00			
								19		Multiple Fractures			2												
								67		Water Level 20%			1												
								88		Heavy Leak at service connection to main	5760	2,880	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$80,682	$14.67	YES
								88		Minor Longitudinal Crack			1												
5/9/2014	High Rock St	S49-039	S49-041	10	197	VCP	12							19.1									$7,800.00			
								27		Leak at Joint	720	360	3		Point Repair up to 4 ft		1	EA	$2,300.00	$2,300.00			$10,085	$4.38	YES
								56		Minor Longitudinal Crack			1												
								87		Minor Mineral deposits attached			1												
								96		Minor Longitudinal Crack			1												
								171		Heavy Leak in service connection	2880	1,440	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
5/12/2014	High Rock St	S39-011	S39-010	8	309	VCP	12							19.1									$15,100.00			
								6		Minor Circumfrential Crack			2												
								136		Moderate Longitudinal Fracture			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								138		Moderate Circumfrential Fracture			3		Point Repair up to 4 ft (Included Above)										
								195		Moderate Leak at Service Connection to Main	720	360	3		Lateral grout up to 5 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								245		Moderate Longitudinal Fracture			3												
								245		Heavy Leak at Service connection to main	2880	1,440	5		Repalce Service Wye		1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
								257		Moderate Circumfrential Fracture at Service			3		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$0	$0.00	NO
5/19/2014	Linden St	S49-072	S49-073	8	122	VCP	3							19.1									$5,500.00			
								19		Heavy Leak at service connection to Chimney	2880	1,440	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
3/20/2014	Mayo Ave	S40-130	S40-131	8	144	VCP	3							20									$4,152.00			
								1		Medium Roots at Joint			2												
								2		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00	$650.00			$0	$0.00	NO
								6		Minor Longitudinal Crack			1			1									
								9		Minor Longitudinal Crack			1			1									
								11		Fine Roots at Joint			1												
								23		Fine Roots at Joint			1												
								29		Fine Roots at Joint			1												
								35		Fine Roots at Joint			1												
								36		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								47		Moderate Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								47	Minor Spiral Fracture				1			1									
								48	Minor Longitudinal Crack				1			1									
								49		Water Level 15%			1												
								55		Water Level 5%			1												
								80		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								82		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								83		Fine Roots at Joint			1												
								93		Minor Longitudinal Crack			1			1									
								111		Minor Roots in Service Lateral			2												
								116		Fine Roots at Joint			1												
								122		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								123		Fine Rotos at Joint			1												
								129		Fine Roots at Joint			1												
								131		Medium Roots at Joint			3		Chemical Root Treatment		144	LF	$1.75	$252.00			$0	$0.00	NO
								135		Minor Multiple Cracks			1			1									
								138		Medium Roots at Joint			3												
								144		Heavy Roots at Joint			5												
								144		Fine Roots at Joint			1												

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Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 5

																	EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/2/2014	Powers St	S30-089	S30-088	8	349	VCP	3							20								$29,270.75			
								3		Fine Roots at Joint			1		Chemical Root Treatment		349	LF	$1.75	$610.75			$0	$0.00	NO
								10		Minor Roots in Service Lateral			1												
								12		Moderate Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								13		Minor Longitudinal Crack			1		CIPP	1	349	LF	$40.00	$13,960.00			$60,511	$2.57	YES
								19		Fine Roots at Joint			1		Chemical Root Treatment (included above)										
								22		Fine Roots at Joint			1		Chemical Root Treatment (included above)										
								29		Fine Roots at Joint - START			1		Chemical Root Treatment (included above)										
								45		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								63		Minor Longitudinal Crack			1		CIPP (included above)	1									
								73		Minor Longitudinal Crack			1		CIPP (included above)	1									
								86		Minor Longitudinal Crack			1		CIPP (included above)	1									
								148		Moderate Roots in Service Lateral			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								158		Minor Longitudinal Crack			1		CIPP (included above)	1									
								174		Minor Multiple Fractures			1		CIPP (included above)	1									
								180		Minor Longitudinal Crack			1		CIPP (included above)	1									
								209		Roots in Service Lateral and Leak	180	90	1												
								211		Moderate Roots in Service Lateral			4		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								212		Leaking at Joint	180	90	1		CIPP (included above)										
								231		Minor Longitudinal Crack			1		CIPP (included above)	1									
								238		Fine Roots at Joint - FINISH			1		Chemical Root Treatment (included above)										
								247		Leaking at Service Lateral Connection	180	90	1												
								251		Minor Longitudinal Crack			1		CIPP (included above)	1									
								251		Leaking at Joint	360	180	3		CIPP (included above)	1									
								253		Leaking at Joint	1440	720	5		CIPP (included above)	1									NO
								276		Water Level 25%			1			1									
								282		Leaking at Service Lateral Connection	180	90	1												
								297		Minor Multiple Fractures			1		CIPP (included above)	1									
								345		Leaking at Joint	360	180	3		CIPP (included above)	1									
								349		Leaking at Joint	1440	720	3		CIPP (included above)	1									
								349		Light Grease Deposits Attached			1												
															seal all laterals (12)		12	EA	$800.00		$9,600.00				
4/9/2014	Webster St	S22-059	S22-058	10	299	VCP	3							20								$265.00			
								20		Minor Multiple Fractures			1			1									
								28		Minor Longitudinal Crack			1			1									
								53		Minor Multiple Fractures			1			1									
								79		Minor Multiple Fractures			1			1									
								111		Minor Longitudinal Crack			1			1									
								114		Minor Multiple Fractures			1			1									
								120		Minor Multiple Fractures			1			1									
								151		Minor Longitudinal Crack			1			1									
								163		Minor Multiple Fractures			1			1									
								176		Chip at joint			1			1									
								200		Minor Circumfrential Fractures			1			1									
								244		Minor Multiple Fractures			1			1									
								299		Obstacles 85%			5		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
4/6/2015	Greendale Ave	S52-095	S42-117	8	265	AC	13							21								$2,050.00			
								24		Hole			5		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/6/2015	Brookline St	S23-096	S23-095	8	116	AC	13							21								$2,050.00			
								30		Hole			5		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								108		Minor Circumferential Fracture			1												
4/7/2015	Falcon St	S23-140	S23-139	8	36	AC	13							21								$15,000.00			
								36		Manhole S23-139 Leaking	7200	3600	5		Replace Manhole	1	1	EA	$15,000.00	$15,000.00			$100,852	$6.72	YES
4/7/2015	Oak Hill St	S23-141	S23-142	8	150	AC	13							21								$2,050.00			
								23		Hole			5		Point Repair, up to 4ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/7/2015	Oak Hill St	S23-142	S23-143	8	109	AC	13							21								$11,000.00			
								41		Break in Leaking Tap at joint 12 o'clock															
								41		Infiltration Gusher	11520	5760	5		Replace Service Wye	1	1	EA	$5,500.00		$5,500.00		$161,364	$29.34	YES
								43		Break in Leaking Tap at joint 9 o'clock					Replace Wye	1	1	EA	$5,500.00		$5,500.00				
								43		Infiltration Gusher	4320	2160	5		Replace Service Wye (Included Above)								$60,511	$11.00	YES
4/7/2015	Brookline St	S23-101	S23-102	8	166	VCP	3							21								$5,500.00			
								157	Hole	Joint Offset			5		Remove and Replace		1	EA	$5,500.00	$5,500.00			$0	$0.00	NO
4/8/2015	Paul Revere Rd	S23-071	S23-072	8	85	VCP	3							21								$5,500.00			
								85		Infiltration Runner Pipe connection to manhole	3,600	1,800	5		Remove and Replace		1	EA	$5,500.00	$5,500.00			$50,426	$9.17	YES
4/8/2015	Richdale Rd	S23-132	S23-071	8	242	AC	13							21								$2,500.00			
								101		Fine Roots at Joint			1												
								104		Defective Tap - Leaking			4												
								104		Infiltration Runner at breaking connection	3,600	1,800	5		Grout Service at Connection with Main		1	EA	$2,500.00		$2,500.00		$50,426	$20.17	YES
4/13/2015	Paul Revere Rd	S23-065	S23-066	8	139	AC	13							21								$243.25			
								135		Heavy Roots Blocking pipe			5		Chemical Root Treatment		139	LF	$1.75	$243.25			$0	$0.00	NO
4/25/2014	Wachusett Rd	S31-115	S31-116	8	269	VCP	3							22								$2,785.75			
								1		Fine Roots at Joint			1												
								14		Fine Roots at Joint			1												
								15		Cracks along entrance to service			1												
								16		Fine Roots at Joint - START			1												
								99		Minor Longitudinal Crack			1			1									
								113		Moderate Grease Deposits			4		Heavy Cleaning		1	HR	$265.00	$265.00			$0	$0.00	NO
								120		Root Ball Connection			3		Chemical Root Treatment		269	LF	$1.75	$470.75			$0	$0.00	NO
								164		Minor Longitudinal Crack			1			1									
								232		Hole in side of pipe			5		Point Repair up to 4 ft	1	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								268		Minor Circumfrential Fracture			1			1									
								269		Fine Roots at Joint - FINISH			1												
								269		Heavy Grease Deposits Attached			4												
4/28/2014	Tudor Rd	S32-005	S32-006	8	172	VCP	3							22								$301.00			
								14		Minor Longitudinal Crack			1												
								119		Root Ball at Joint 50%			5		Chemical Root Treatment		172	LF	$1.75	$301.00			$0	$0.00	NO
								147		Fine Roots at Joint			1												

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 5

																	EST. REHAB COSTS				COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/29/2014	Audrey Ave	S32-010	S32-024	8	238	VCP	3							22								$7,550.00			
								57		Fine Roots at Joint			1												
								65		Fine Roots at Joint			1												
								78		Fine Roots at Joint			1												
								150		Moderate Longitudinal Crack			4		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								170		Heavy Leak at Joint	2160	1,080	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
5/1/2014	Arch St	S31-167	S31-165	8	274	PVC	6							22								$7,550.00			
								81		Heavy Leak at Joint	2880	1,440	5		Replace Service Wye		1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
								98		Leak from service lateral cap	1440	720	4		Point Repair		1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
								203		Light Mineral Deposits Attached			1												
								242		Light Mineral Deposits Attached			1												
5/2/2014	Savoy Rd	S23-119	S23-120	8	235	VCP	3							22								$15,261.25			
								6		Fine Roots at Joint			1		Chemical Root Treatment		235	LF	$1.75	$411.25			$0	$0.00	NO
								9		Fine Roots at Joint - START			1		Chemical Root Treatment (Included Above)										
								40		Fine Roots at Joint - FINISH			1		Chemical Root Treatment (Included Above)										
								53		Moderate Multiple Fractures			3		CIPP		235	LF	$40.00	$9,400.00			$0	$0.00	NO
								101		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								101		moderate longitudinal fractures			4		CIPP (Included Above)										
								107		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								110		Minor Circumfrential Crack			1		CIPP (Included Above)										
								152		Medium Roots at Joint			3		point repair up to 4 ft										
								155		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								161		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)										
								165		Moderate Roots in service			3		Remove Lateral Roots		1	EA	$650.00		$650.00		$0	$0.00	NO
								166		Heavy Rootball blocking pipe			5		Chemical Root Treatment (Included Above)										
								182		Fine Roots at Joint			2		Chemical Root Treatment (Included Above)										
								187		moderate longitudinal fractures			4		CIPP (Included Above)										
								194		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)										
															seall all laterals (6)		6	EA	$800.00		$4,800.00				
5/5/2014	Hillcrest Rd	S23-084	S23-083	8	123	other	12							22								$17,050.00			
								0		Leak in Bench	2880	1,440	5		Replace Manhole		1	EA	$15,000.00	$15,000.00			$40,341	$2.69	YES
								14		Fine Roots at Joint			1												
								36		Minor Multiple Fractures			2												
								52		Minor Longitudinal Crack			1												
								60		Moderate Longitudinal Fracture - START			3		Point Repair up to 4 ft	2	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								62		Moderate Longitudinal Fracture - FINISH			3												
								73		Minor Circumfrential Fracture			2												
12/18/2014	Dell Ave	S31-029	S23-126	8	33	VCP	3							22								$5,500.00			
								0		Major Infiltration Gusher in Invert	7,200	3,600	5		Remove and Replace		1	EA	$5,500.00	$5,500.00			$100,852	$18.34	YES
12/19/2014	Ellicott St	S31-040	S31-041	8	168	VCP	3							22								$4,394.00			
								9		Fine Roots at Joint			2												
								35		Medium Roots at Joint			4		Chemical Root Treatment		168	LF	$1.75	$294.00			$0	$0.00	NO
								35		Minor Infiltration Dripper at Joint	360	180	3		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								97		Fine Roots at Joint			2												
								101		Major Infiltration Gusher at Joint	2,160	1,080	5		Point Repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$30,256	$14.76	YES
12/18/2014	Holmes St	S23-001	S31-029	8	275	other	13							22								$24,400.00			
								85		Minor Circumfrential Fracture			2		CIPP		275	LF	$40.00	$11,000.00			$259,695	$10.64	YES
								85		Leaking Service at Connection with Main	2,880	1,440	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00				
								151		Major Infiltration Gusher at Joint	2,880	1,440	5		CIPP (Included Above)										
								171		Moderate Longitudinal Fracture	1,440	720	4		CIPP (Included Above)										
								173		Leaking Service at Connection with Main	7,200	3,600	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00				
								182		Minor Circumfrential Fracture			2		CIPP (Included Above)										
								182		Major Infiltration Runner at Joint	2,160	1,080	4		CIPP (Included Above)										
								183		Major Infiltration Runner at Joint	720	360	4		CIPP (Included Above)										
								198		Major Infiltration Runner at Joint	720	360	4		CIPP (Included Above)										
								214		Moderate Infiltration Runner at Joint	360	180	3		CIPP (Included Above)										
								243		Moderate Infiltration Dripper at Joint	180	90	3		CIPP (Included Above)										
															seal all laterals (3)		3	EA	$800.00		$2,400.00				
4/14/2015	Fairfield St	S52-081	S52-082	12	200	VCP	3							24								$5,500.00			
								69		Defective Tap Leaking at joint	2,880	1,440	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$40,341	$7.33	YES
								173		minor incrustation			1												
4/15/2015	Berkshire Rd	S42-140	S52-075	8	144	VCP	3							24								$2,050.00			
								33		Minor Circumfrential Fracture			1												
								58		Hole			5		Point Repair, up to 4ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/16/2015	Dawson Dr	S42-034	S42-035	8	226	AC	12							24								$15,000.00			
								226		Infiltration Runner in bench	2,880	1,440	5		Replace Manhole		1	EA	$15,000.00	$15,000.00			$40,341	$2.69	YES
4/16/2015	Dawson Dr	S42-036	S42-037	8	251	AC	12							24								$5,500.00			
								68		Defective Tap			3		Included Below										
								68		Infiltration Runner at Tap connection to pipe	2,880	1,440	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$40,341	$7.33	YES
4/16/2015	Dawson Dr	S42-038	S42-039	8	146	PVC	12							24								$11,000.00			
								89		Defective Tap			3												
								89		Infiltration Runner at Tap connection to pipe	2,880	1,440	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$40,341	$7.33	YES
								96		Defective Tap			3												
								96		Infiltration Runner at Tap connection to pipe	10,080	5,040	5		Replace Service Wye		1	EA	$5,500.00		$5,500.00		$141,193	$25.67	YES
4/1/2015	Reservoir St ROW	S02-089	S05-102	12	280	PVC	13							25								$5,500.00			
								170		Broken			5		Remove and Replace		1	EA	$5,500	$5,500.00			$0	$0.00	NO
3/25/2015	Carter St	S02-059	S02-057	8	180	AC	13							25								$2,050.00			
								54		hole middle of pipe			5		point repair 4 ft		1	EA	$2,050	$2,050.00			$0	$0.00	NO

CLIENT: TOWN OF NEEDHAM
PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix F
Sewer Segments Requiring Rehabilitation - PACP Rating 5

																	EST. REHAB COSTS			COST EFFECTIVE ANALYSIS		
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	ESTIMATED LENGTH (FT)/OCCURRENCE	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/9/2016	Laurel Dr	S50-065	S50-077	8	119	VCP	3							26								$3,031.75			
								9		Minor Circumfrential Fracture			2												
								18		Heavy Root Ball at Joint			5		Root treatment		119	LF	$1.75	$208.25			$0	$0.00	NO
								30		Heavy Root Ball at Joint			5												
									30	Heavy Longitudinal Fracture			5		Point repair 4 ft (fracture may be longer than 4 ft, root ball in way)		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								31		Heavy Multiple Fractures			4												
								34		Heavy Root Ball at Joint (survey abandoned)			5												
4/11/2016	Laurel Dr	S50-075	S50-076	8	144	VCP	3							26								$21,150.00			
									6.6	Broken at Joint			3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								18		Minor Deposits Attached			1												
								18		Minor Infiltration Dripper at joint	180	90	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								115		Moderate Infiltration Runner	720	360	3		Point repair 4 ft		1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								131		Fine Roots at Joint			1												
								144		Heavy Infiltration from service joint into Manhole	10,080	5,040	5		Replace manhole		1	EA	$15,000	$15,000.00			$141,193	$9.41	YES
4/11/2016	Laurel Dr Easement	S50-076	S50-077	8	84	VCP	3							26								$693.00			
								2		Multiple Minor Fractures			1												
								14		Moderate Roots at Joint			3		Root treatment		84	LF	$1.75	$147.00			$0	$0.00	NO
								17		Moderate Infiltration Dripper	180	90	3												
								20		Rootball at joint can not pass (survey abandoned)			5												
4/30/2016	Tillotson Rd Easement	S21-123	S15-061	8	235	AC	13							29								$15,000.00			
								235		Heavy Infiltration Gusher on bench	7200	3600	5		Replace manhole		1	EA	$15,000.00	$15,000.00			$100,852	$6.72	YES
										Heavy Root Infiltration at Pipe Connection to Bench			5												
4/17/2015	Fox Hill Rd	S59-036	S59-035	8	207	AC	12							31								$5,500.00			
								51		Broken			5		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								51		Infiltration Runner from hole	360	180	3												
4/2/2015	Cabot St	S11-042	S11-043	8	190	AC	5							32								$2,050.00			
								150		Hole			5		point repair up to 4 ft		1	EA	$2,050.00	$2,050.00			$0	$0.00	NO

Appendix G
Final Sewer Rehabilitation Recommendations

PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix G
Final CEA Recommendations

																	EST. REHAB COSTS				CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/21/2015	Edgewater Dr	S60-019	S60-020	8	225	VCP	3							3							$15,000.00			
								224		Infiltration Gusher in bench	4,320	2,160	5		Replace Manhole	1	EA	$15,000.00	$15,000.00			$60,511	$4.03	YES
4/21/2015	Edgewater Dr	S60-021	S60-022	8	197	VCP	3							3							$8,000.00			
								29		Infiltration Dripper at service connection to pipe	180	90	2		Seal Lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								49		Infiltration Gusher at service connection to pipe	5,760	2,880	5		Remove and Replace	1	EA	$5,500.00	$5,500.00			$80,682	$14.67	YES
4/21/2015	Edgewater Dr	S60-022	S60-023	8	205	VCP	3							3							$2,500.00			
								77		Infiltration Runner from inside service	180	90	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/21/2015	Edgewater Dr	S60-002	S60-001	8	317	VCP	3							4							$17,500.00			
								171		Infiltration Dripper at tap connection to pipe	1,080	540	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$15,128	$6.05	YES
								317		Major Leaking through Bench	4,320	2,160	5		Replace Manhole	1	EA	$15,000.00	$15,000.00			$60,511	$4.03	YES
4/21/2015	Edgewater Dr	S60-009	S60-010	8	60	VCP	3							4							$5,500.00			
								5		Infiltration Runner	2,160	1,080	4		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
4/21/2015	Edgewater Dr	S60-002	S60-003	8	146	VCP	3							4							$2,500.00			
								49		Infiltration Dripper at service connection to pipe	180	90	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/21/2015	Edgewater Dr	S60-007	S60-006	8	67	VCP	3							4							$2,500.00			
								40		Infiltration Dripper	180	90	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/22/2015	Whitman Rd	S55-007.1	S55-009	8	168	AC	13							5							$2,500.00			
								25		Infiltration Dripper at tap connection to pipe	180	90	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/22/2015	Whitman Rd	S55-010	S55-011	8	172	AC	13							5							$5,500.00			
								26		Infiltration Runner at tap connection to pipe	2,160	1,080	3		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
4/10/2014	Mary Chilton Rd	S19-008	S19-007	8	147	AC	12							11							$2,050.00			
								103		Hole in side of pipe			5		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/11/2014	Stockdale Rd	S19-026	S19-025	8	183	AC	12							11							$650.00			
								152		Roots in Service Lateral			4		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
4/11/2014	Stockdale Rd	S19-025	S19-024	8	155	VCP	3							11							$9,400.00			
								18		Moderate Longitudinal Fracture			4		CIPP	155	LF	$40.00	$6,200.00			$22,131	$2.35	YES
								21		Minor Multiple Cracks			1		CIPP (Included Above)									
								28		Moderate Multiple Fractures			3		CIPP (Included Above)									
								40		Minor Longitudinal Crack			1		CIPP (Included Above)									
								47		Leaking from connection to main	180	90	3		CIPP (Included Above)									
								52		Leaking from connection to main	180	90	3		CIPP (Included Above)									
								72		Fine Roots at Joint			1		CIPP (Included Above)									
								83		Fine Roots at Joint			1		CIPP (Included Above)									
								95		Minor Longitudinal Crack			1		CIPP (Included Above)									
								108		Leaking from connection to main	1220	610	3		CIPP (Included Above)									
								151		Minor Longitudinal Crack			1		seal all laterals (4)	4	EA	$800.00		$3,200.00				NO
4/11/2014	Stockdale Rd	S19-024	S19-023	8	257	VCP	3							11							$15,880.00			
								1		Moderate Circumfrential Crack			2		CIPP	257	LF	$40.00	$10,280.00			$2,521	$0.16	NO
								13		Minor Circumfrential Crack			1		CIPP (Included Above)									
								19		Minor Multiple Cracks			2		CIPP (Included Above)									
								33		Leaking at Joint	180	90	3		CIPP (Included Above)									
								33		Minor Multiple Cracks			2		CIPP (Included Above)									
								49		Water Level 15%			1		CIPP (Included Above)									
								75		Water Level 5%			1		CIPP (Included Above)									
								79		Hole in side of pipe			4		CIPP (Included Above)									
								125		Fine Roots at Joint			1		CIPP (Included Above)									
								160		Minor Multiple Cracks			2		CIPP (Included Above)									
								172		Minor Longitudinal Crack			2		CIPP (Included Above)									
								178		Moderate Longitudinal Fracture			3		CIPP (Included Above)									
								205		Minor Longitudinal Crack			1		CIPP (Included Above)									
								226		Minor Longitudinal Crack			2		CIPP (Included Above)									
								232		Minor Longitudinal Crack			2		CIPP (Included Above)									
								240		Minor Longitudinal Crack			1		CIPP (Included Above)									
															seal all laterals (7)	7	EA	$800.00		$5,600.00				
4/11/2014	Powder House Cir	S19-014	S19-014A	8	119	PVC	13							11							$208.25			
								63		Heavy Roots at Joint			4		Chemical Root Treatment	119	LF	$1.75	$208.25			$0	$0.00	NO
								71		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)									
								73		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)									
4/11/2014	Stockdale Rd	S19-022	S27-003	8	257	VCP	3							11							$2,500.00			
								31		Leak at service connection to main	1080	540	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$15,128	$6.05	YES
4/11/2014	Poweder House Cir	S19-014A	S19-012	8	125	AC	12							11							$218.75			
								125		Heavy Roots at Joint 55%			3		Chemical Root Treatment	125	LF	$1.75	$218.75			$0	$0.00	NO
4/15/2014	Whiting Way	S27-009	S27-007	8	289	VCP	3							11							$5,500.00			
								7		Service Lateral Leaking at Joint	2160	1080	4		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
4/15/2014	Whiting Way	S19-033	S19-032	8	188	VCP	3							11							$2,050.00			
								158		Broken			3		Point Repair, up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/15/2014	Whiting Way	S19-032	S27-009	8	290	VCP	3							11							$2,557.50			
								170		Heavy Roots at Joint			3		Chemical Root Treatment	290	LF	$1.75	$507.50			$0	$0.00	NO
								176	Heavy Roots at Joint				3		Chemical Root Treatment (Included Above)									
								196		Heavy Roots at Joint			3		Chemical Root Treatment (Included Above)									
								200	Moderate Roots at Joint				2		Chemical Root Treatment (Included Above)									
								202	Heavy Roots at Joint				3		Chemical Root Treatment (Included Above)									
								208	Light Roots at Joint				1		Chemical Root Treatment (Included Above)									
								215		Leaking at Joint	180	90	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								215	Light Roots at Joint				1		Chemical Root Treatment (Included Above)									
								280		Light Roots at Joint			1		Chemical Root Treatment (Included Above)									
4/16/2014	Alden Rd	S27-005	S27-002	8	148	VCP	3							11							$5,500.00			
								79		Service Lateral Leaking at Joint	2440	1,220	4		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$34,178	$6.21	YES
4/16/2014	Alden Rd	S20-004	S27-005	8	224	VCP	3							11							$12,160.00			
								38		Leaking Joint	180	90	3		CIPP	224	LF	$40.00	$8,960.00			$10,085	$0.83	NO
								137		Leaking Joint	180	90	3		CIPP (Included Above)									
								137		Longitudinal Fracture			3		CIPP (Included Above)									
								181		Leaking Joint	180	90	3		CIPP (Included Above)									
								223		Minor Spiral Crack			1		CIPP (Included Above)									
								223		Leaking Joint	180	90	3		CIPP (Included Above)									
															seal all laterals (4)	4	EA	$800.00		$3,200.00				
4/16/2014	Canavan Cr	S27-017	S27-018	8	56	AC	12							11							$2,500.00			
								45		Service Lateral Leaking at Main	360	180	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES

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Appendix G
Final CEA Recommendations

																		EST. REHAB COSTS				CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/16/2014	Canavan Cr	S27-018	S27-008	8	144	AC	12							11							$5,500.00			
								0		Leaking Joint	2160	1,080	3		Remove and Replace	1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
4/16/2014	Stewart Rd	S20-002	S20-001	8	284	AC	12							11							$497.00			
								261		Roots in service lateral			1											
								261		Heavy Roots at Tap 55%			3		Chemical Root Treatment	284	LF	$1.75	$497.00			$0	$0.00	NO
4/16/2014	Stewart Rd	S27-026	S27-011	8	300	AC	12							11							$2,500.00			
								89		Leaking at Service Connection to Main	180	90	1		Seal lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/17/2014	Pond St	S28-070		8	131	VCP	3							11							$17,050.00			
								23		Leaking from Joint	1440	720	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
								131			720	360	3		Install terminal manhole	1	EA	$15,000.00	$15,000.00			$10,085	$0.67	NO
4/17/2014	Pond St	S28-070	S28-071	8	113	VCP	3							11							$5,320.00			
								5		Moderate Longitudinal Fracture			3		CIPP	113	LF	$40.00	$4,520.00			$0	$0.00	NO
								8		Moderate Multiple Fractures			3		CIPP (Included Above)									
								23		Minor Longitudinal Crack			1		CIPP (Included Above)									
								79		Moderate Spiral Fracture			3		CIPP (Included Above)									
								86		Minor Spiral Crack			1		seal all laterals (1)	1	EA	$800.00		$800.00			$0.00	NO
4/17/2014	Pond St	S28-066	S29-001	8	163	VCP	3							11							$2,050.00			
								10		Leaking from joint	360	180	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
4/17/2014	Great Plain Ave	S20-017	S20-030	12	154	VCP	3							11							$10,040.00			
								8		Infiltration runner at joint	1440	720	3		CIPP	154	LF	$60.00	$9,240.00			$30,256	$3.01	YES
								76		Infiltration runner at joint	720	360	3		CIPP (Included Above)	1								
								110		Longitudinal Crack			3		CIPP (Included Above)	1								
								124		Longitudinal Crack			2		CIPP (Included Above)	1								
															seal all laterals (1)	1	EA	$800.00		$800.00				
4/17/2014	Great Plain Ave	S28-042	S28-041	8	180	VCP	3							11							$2,500.00			
								74		Lekaing from Service Lateral	180	90	3		Seal lateral	1	EA	$2,500.00	$2,500.00			$2,521	$1.01	YES
4/17/2014	Standish Rd	S27-022	S27-023	8	97	AC	13							11							$2,050.00			
								11		Hole in side of Pipline			4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/17/2014	Great Plain Ave	S20-030	S20-031	12	98	VCP	3							11							$7,480.00			
								7		Minor Longitudinal Crack			1		CIPP	98	LF	$60.00	$5,880.00			$42,862	$5.73	YES
								16		Minor Longitudinal Crack			1		CIPP (Included Above)									
								28		Leaking Joint	1440	720	3		CIPP (Included Above)	1								
								33		Leaking from connection to main	1440	720	4		CIPP (Included Above)	1								
								86		Leaking at Joint	180	90	4		CIPP (Included Above)	1								
								86		Minor Longitudinal Crack			1		seal all laterals (2)	2	EA	$800.00		$1,600.00				
4/17/2014	Great Plain Ave	S20-031	S28-017	12	217	VCP	3							11							$17,820.00			
								2		Moderate Multiple Fractures			3		CIPP	217	LF	$60.00	$13,020.00			$10,085	$0.57	NO
								3		Leaking at Joint	720	360	3		CIPP (Included Above)									
								5		Minor Longitudinal Crack - START			1		CIPP (Included Above)									
								14		Moderate Multiple Cracks			4		CIPP (Included Above)									
								25		Minor Longitudinal Crack - FINISH			1		CIPP (Included Above)									
								43		Minor Longitudinal Crack			1		CIPP (Included Above)									
								44		Fine Roots at Joint			1		CIPP (Included Above)									
								98		Moderate Multiple Cracks			4		CIPP (Included Above)									
								141		Minor Longitudinal Crack			1		CIPP (Included Above)									
								170		Minor Longitudinal Crack			1		CIPP (Included Above)									
								183		Moderate Longitudinal Fracture			4		CIPP (Included Above)									
								185		Moderate Multiple Cracks			4		CIPP (Included Above)									
								189		Moderate Multiple Cracks			4		CIPP (Included Above)									
								214		Light Mineral Deposits Attached			1		CIPP (Included Above)									
								215		Minor Circumfrential Fracture			2		seal all laterals (6)	6	EA	$800.00		$4,800.00				
4/17/2014	Brewster Dr.	S28-011	S28-005	8	310	AC	13							11							$2,050.00			
								308		Leaking Joint	1080	540	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$15,128	$7.38	YES
4/17/2014	Standish Rd	S27-021	S27-022	8	209	AC	13							11							$2,050.00			
								0		Leaking Joint	180	90	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
4/18/2014	Carol Rd	S28-015	S28-016	8	276	VCP	3							11							$14,240.00			
								27	Leak through Service Cap		1440	720	3		CIPP	276	LF	$40.00	$11,040.00			$45,384	$3.19	YES
								86	Service Lateral Leaking		720	360	3		CIPP (Included Above)									
								88		Joint Leaking	720	360	3		CIPP (Included Above)									
								276		Leaking at Pipe Connection to Bench	360	180	3		CIPP (Included Above)									
															seal all laterals (4)	4	EA	$800.00	$3,200.00					
4/18/2014	Central Ave	S38-019	S38-020	8	167	AC	12							11							$2,050.00			
								59		Heavy Leak at Joint	2160	1,080	5		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$30,256	$14.76	YES
4/18/2014	Great Plain Ave	S28-038	S28-035	8	234	VCP	3							11							$10,960.00			
								76		Moderate Multiple Cracks			3		CIPP	234	LF	$40.00	$9,360.00			$0	$0.00	NO
								80		Moderate Multiple Cracks			3		CIPP (Included Above)									
								172		Minor Longitudinal Crack			1		CIPP (Included Above)									
								188		Moderate Longitudinal Fracture			3		CIPP (Included Above)									
								191		Moderate Longitudinal Fracture			3		CIPP (Included Above)									
								197		Minor Longitudinal Crack			1		CIPP (Included Above)									
								200		Moderate Longitudinal Fracture			3		CIPP (Included Above)									
								226		Moderate Longitudinal Fracture			3		CIPP (Included Above)									
								228		Minor Longitudinal Crack			1		seall all lateral (2)	2	EA	$800.00		$1,600.00				
4/18/2014	High Rock St	S38-017		8	154	AC	12							11							$2,050.00			
								154		Leaking at Joint at end cap	1440	720	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
4/18/2014	Central Ave	S38-018	S38-019	8	275	AC	12							11							$2,500.00			
								205		Leakt at Service joint to main	360	180	3		Seal lateral	1	EA	$2,500.00	$2,500.00			$5,043	$2.02	YES
4/19/2014	Mason Rd	S20-016	S20-017	10	194	VCP	3							11							$11,300.00			
								29		Minor Multiple Cracks			1		CIPP	194	LF	$50.00	$9,700.00			$32,777	$2.90	YES
								36		Moderate Longitudinal Fractures			3		CIPP (Included Above)									
								37		Service Lateral Leaking	2160	1,080	3		CIPP (Included Above)									
								112		Minor Multiple Cracks			1		CIPP (Included Above)									
								151		Minor Leak at Joint	180	90	3		CIPP (Included Above)									
								170		Minor Multiple Cracks - START			1		CIPP (Included Above)									
								173		Minor Multiple Cracks - FINISH			1		CIPP (Included Above)									
															seall all laterals (2)	2	EA	$800.00		$1,600.00				

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Appendix G
Final CEA Recommendations

																	EST. REHAB COSTS				CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/19/2014	Mason Rd	S20-023	S20-024	8	167	VCP	3							11							$9,880.00			
								1		Light Mineral Deposits Attached			1		CIPP	167	LF	$40.00	$6,680.00			$15,128	$1.53	YES
								4		Light Mineral Deposits Attached			1		CIPP (Included Above)									
								7		Light Mineral Deposits Attached			1		CIPP (Included Above)									
								7		Leak at Joint	180	90	3		CIPP (Included Above)									
								48		MinorLongitudinal Crack			1		CIPP (Included Above)									
								90		Leak at Joint	720	360	3		CIPP (Included Above)									
								120		Leak at service connection to main	180	90	3		CIPP (Included Above)									
								167		Light Mineral Deposits Attached			1		CIPP (Included Above)									
															seal all laterals (4)	4	EA	$800.00		$3,200.00				
4/19/2014	Fuller Brook Ave	S20-027	S20-026	8	69	VCP	3							11							$2,050.00			
								11		Leaking Joint	180	90	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
4/19/2014	Fuller Brook Ave	S20-027	S20-020	8	302	VCP	3							11							$2,050.00			
								227		Leaking Joint	360	180	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
4/19/2014	Mason Rd	S20-020	S20-015	10	101	VCP	3							11							$5,850.00			
								22		Deposits Attached			1		CIPP	101	LF	$50.00	$5,050.00			$35,298	$6.03	YES
								48		Infiltration runner at joint	720	360	3		CIPP (Included Above)									
								60		Multiple Fractures			1		CIPP (Included Above)									
								61		Defective Tap - Fractures and Leaking			1		CIPP (Included Above)									
								61		Infiltration gusher at joint	1440	720	5		CIPP (Included Above)									
								68		Infiltration runner at joint	360	180	3		CIPP (Included Above)									
								84		Water Level 10%			1		CIPP (Included Above)									
								89		Longitudinal Crack			1		CIPP (Included Above)									
								101		Spiral Fracture			2		CIPP (Included Above)									
															seall all laterals (1)	1	EA	$800.00		$800.00				
4/19/2014	Mason Rd	S20-015	S20-016	10	93	VCP	3							11							$7,050.00			
								11		Light Mineral Deposits Attached			1		CIPP	93	LF	$50.00	$4,650.00			$40,341	$5.72	YES
								26		Heavy Leak at Joint	2880	1,440	5		CIPP (Included Above)									
								27		Service entrance fractured			1		CIPP (Included Above)									
								27		Moderate Multiple Fractures			3		CIPP (Included Above)									
								28		Moderate Longitudinal Fractures			4		CIPP (Included Above)									
								50		Moderate Longitudinal Fractures			4		CIPP (Included Above)									
								58		Moderate Longitudinal Fractures			4		seal all laterals (3)	3	EA	$800.00		$2,400.00				
4/19/2014	Howe Rd	S20-029	S20-028	8	257	VCP	3							11							$2,250.00			
								57		Moderate Longitudinal Fracture - START			4		Point Repair up to 8 ft	1	EA	$2,250.00	$2,250.00			$0	$0.00	NO
								60		Moderate Longitudinal Fracture - FINISH			4											
4/19/2014	Howe Rd	S20-028	S20-027	8	268	VCP	3							11							$3,250.00			
								75		Moderate Longitudinal Fracture - START			4		Point Repair up to 12 ft	1	EA	$3,250.00	$3,250.00			$0	$0.00	NO
								84		Moderate Longitudinal Fracture - FINISH			4											
4/22/2014	Mackintosh Ave	S20-034	S20-033	8	287	PVC	13							11							$2,050.00			
								94		Leaking Joint	180	90	1		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
4/23/2014	MacIntosh Ave	S20-033	S20-021	8	262	AC	3							11							$15,280.00			
								18		Light Mineral Deposits Attached			1		CIPP	262	LF	$40.00	$10,480.00			$17,649	$1.16	YES
								35		Leaking at Joint	180	90	4		CIPP (Included Above)									
								35		Leaking at Connection to main	180	90	4		CIPP (Included Above)									
								88		Leaking at Connection to main	180	90	2		CIPP (Included Above)									
								262		Leaking Joint	720	360	3		CIPP (Included Above)									
															seal all laterals (6)	6	EA	$800.00		$4,800.00				
4/23/2014	Central Ave	S28-062	S28-061	8	251	AC	12							11							$5,000.00			
								144		Service Leaking from connection to main	180	90	4		seal lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								158		Service Leaking from connection to main	180	90	4		seal lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/23/2014	Central Ave	S38-014	S38-015	8	264	AC	12							11							$3,250.00			
								9		Leaking Joint	1440	720	3		Point Repair up to 16 ft	1	EA	$3,250.00	$3,250.00			$20,170	$6.21	YES
								22		Leaking Joint	720	360	3		Point Repair up to 16 ft (Included Above)									
4/23/2014	Central Ave	S38-004	S38-005	8	160	PVC	13							11							$2,050.00			
										Leaking Joint	720	360	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
4/24/2014	Mackintosh Ave	S20-008	S20-009	8	105	PVC	13							11							$8,265.00			
								36		Surface Roughness			3		Heavy Cleaning	1	HR	$265.00	$265.00			$0	$0.00	NO
								42	Service Lateral Leaking		1080	540	3		Lateral Grout	1	EA	$2,500.00		$2,500.00		$15,128	$6.05	YES
								62		Leaking at Chimney	4320	2,160	5		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$60,511	$11.00	YES
								90	Water Level 50%															
4/25/2014	Gay st	S39-023	S39-022	8	90	AC	13							11							$157.50			
								37		Root Ball at Joint 50%			5		Chemical Root Treatement	90	LF	$1.75	$157.50			$0	$0.00	NO
4/25/2014	Gay St	S39-023	S39-024	8	102	AC	13							11							$550.00			
								102		Leak at Connection to manhole	360	180	2		Grout Pipe Connection at Manhole	1	EA	$550.00	$550.00			$5,043	$9.17	YES
4/25/2014	Tolman St	S38-042	S28-064	8	263	VCP	3							11							$2,050.00			
								227		Leak at Jiont	180	90	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
5/5/2016	Rolling Ln	S14-042	S14-043	8	248	AC	13							12							$2,500.00			
								203		Break in Tap Defective			1		Included Below									
								203		Minor Infiltration Dripper at joint to service	180	90	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/5/2016	Rolling Ln	S14-044	S15-002	8	93	AC	13							12							$550.00			
								92		Minor Infiltration Dripper on bench	180	90	3		Grout Manhole Bench	1	EA	$550.00	$550.00			$2,521	$4.58	YES
5/6/2016	Nardone Rd	S21-045	S21-062	8	107	AC	13							12							$5,500.00			
								79		Heavy Infiltration Gusher	14,400	7200	5		Dig and Replace wye	1	EA	$5,500.00	$5,500.00			$201,705	$36.67	YES
5/6/2016	Nardone Rd	S21-026	S21-044	8	173	AC	13							12							$2,050.00			
								95		Heavy Infiltration Runner	2880	1440	4		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$40,341	$19.68	YES
5/6/2016	Jarvis Cir	S21-062	S21-061	8	122	AC	13							12							$11,000.00			
								39		Heavy Infiltration Runner at joint to service	2880	1440	4		Dig and Replace wye	1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
								39		Moderate Longitudinal Fracture			4		Dig and Replace wye (included above)									
								73		Heavy Infiltration Gusher at joint to service	5760	2880	4		Dig and Replace wye	1	EA	$5,500.00	$5,500.00			$80,682	$14.67	YES
5/6/2016	Jarvis Cir	S21-061	S21-060	8	72	AC	13							12							$5,500.00			
								25		Heavy Infiltration Gusher at joint to service	3600	1800	4		Dig and Replace wye	1	EA	$5,500.00	$5,500.00			$50,426	$9.17	YES
5/6/2016	Jarvis Cir	S21-060	S21-059	8	124	AC	13							12							$5,500.00			
								59		Heavy Infiltration Gusher at joint to service	4320	2160	4		Dig and Replace wye	1	EA	$5,500.00	$5,500.00			$60,511	$11.00	YES
5/6/2016	Jarvis Cir	S21-059	S21-058	8	122	AC	13							12							$600.00			
								122		Heavy Infiltration Runner at bench	4320	2160	4		Grout Manhole	1	EA	$600.00	$600.00			$60,511	$100.85	YES

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Appendix G
Final CEA Recommendations

																	EST. REHAB COSTS				CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/13/2016	Crescent Rd	S16-007	S16-008	8	172	AC	13							13							$5,000.00			
								100		Moderate Infiltration Runner at chimney connection to main	360	180	3		Grout service lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								103		Moderate Infiltration Runner at chimney connection to main	360	180	3		Grout service lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/16/2016	Lakin St	S09-036	S04-010	8	158	AC	13							13							$2,050.00			
								10		Minor Infiltration Dripper	180	90	3		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
4/16/2016	Lakin St	S04-009	S04-008	8	174	AC	13							13							$550.00			
								173		Infiltration Runner in Main connection to MH	2160	1080	3		Grout & patch bench, invert, and connection	1	EA	$550.00	$550.00			$30,256	$55.01	YES
4/16/2016	Grasmere Rd	S04-007	S09-026	8	203	AC	13							13							$2,050.00			
								177		Infiltration at Joint in Pipe	1440	720	5		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
4/16/2016	Briarwood Cir	S09-023	S09-025	8	156	AC	13							13							$3,100.00			
								52		Break in Tap defective, minor infiltration	180	90	3		Grout service lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								155		Infiltration runner at main connection to MH	5760	2880	5		Grout manhole	1	EA	$600.00	$600.00			$80,682	$134.47	YES
3/20/2015	Lynn Rd	S10-034	S10-033	8	294	AC	3?							14							$18,710.00			
								0		Heavy Infiltration Runner	7,200	3,600	4		grout manhole	1	EA	$550.00	$550.00			$100,852	$14.51	YES
								54		Hole			4		CIPP	294	LF	$40.00	$11,760.00			$7,564	$0.42	NO
								55		Infiltration Dripper	180	90	1		CIPP (Included Above)									
								56		Infiltration Weeper	180	90	1		CIPP (Included Above)									
								56		Broken			4		CIPP (Included Above)									
								153		Broken			4		CIPP (Included Above)									
								214		Infiltration Dripper	180	90	2		CIPP (Included Above)									
								214		Hole			2		CIPP (Included Above)									
								235		Surface Aggregate			2		CIPP (Included Above)									
															Seal all Laterals (8)	8	EA	$800.00	$6,400.00					
3/20/2015	Lynn Rd	S10-035	S10-036	8	98	AC	3?							14							$6,320.00			
								43		Infiltration Runner	1,440	720	4		CIPP	98	LF	$40.00	$3,920.00			$20,170	$3.19	YES
															seal all laterals (3)	3	EA	$800.00		$2,400.00				
3/20/2015	Reservoir St	S05-104	S05-105	12	36	VCP	6?							14							$265.00			
								36		Heavy Debris ABANDON survey			3		Heavy Cleaning	1	HR	$265.00	$265.00			$0	$0.00	NO
3/20/2015	William St	S10-027	S10-028	8	387	AC	3?							14							$22,680.00			
								16		Hole			5		CIPP	387	LF	$40.00	$15,480.00			$0	$0.00	NO
								182		Broken			5		CIPP (Included Above)									
								186		Longitudinal Crack			2		CIPP (Included Above)									
								187		Hole			5		CIPP (Included Above)									
								356		Obstruction			3											
															Seal all Laterals (9)	9	EA	$800.00	$7,200.00					
3/20/2015	William St	S10-028	S10-030	8	365	AC	3?							14							$21,000.00			
								2		Heavy Infiltration Runner	8640	4,320	5		CIPP	365	LF	$40.00	$14,600.00			$123,544	$5.88	YES
								2		Moderate Circumferential Fracture			2		CIPP (Included Above)									
								48		infiltration weeper	180	90	3		CIPP (Included Above)									
								48		Broken			5		CIPP (Included Above)									
								185		Broken			5		CIPP (Included Above)									
								304		Broken			5		CIPP (Included Above)									
															Seal all Laterals (8)	8	EA	$800.00	$6,400.00					
3/20/2015	Lynn Rd	S10-034	S10-035	8	307	AC	3?							14							$17,880.00			
								239		Surface Aggregate			2		CIPP	307	LF	$40.00	$12,280.00			$40,341	$2.26	YES
								266		Infiltration Runner	2,880	1,440	5		CIPP (Included Above)									
								266		Broken			4		CIPP (Included Above)									
															Seal all Laterals (7)	7	EA	$800.00	$5,600.00					
3/27/2015	Sunnyside Rd	S10-019	S10-018	8	244	AC	13							14							$4,550.00			
								145		Infiltration dripper at tap joint to pipe	360	180	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								242		Infiltration Runner at joint	7,200	3,600	5		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$100,852	$49.20	YES
3/30/2015	Arnold St	S05-094	S05-069	8	283	AC	13							14							$2,050.00			
								166		Infiltration at Joint	360	180	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
3/30/2015	Wellesley Ave	S04-022	S04-023	8	320	PVC	13							14							$2,500.00			
								104		Leak at connection to pipe	180	90	2		Seal lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
3/30/2015	Webster St/Hillside St	S10-044	S10-018	8	226	PVC	13							14							$15,000.00			
								226		Major Infiltration in Bench s10-018	7,200	3,600	5		replace MH 210-018	1	EA	$15,000.00	$15,000.00			$100,852	$6.72	YES
5/13/2014	Wayne Road	S09-083	S09-084	8	110	AC	13							14							$2,500.00			
								52		Leak in Service lateral	180	90	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/14/2014	Central Ave	S09-094	S09-094A	8	134	AC	13							14							$2,500.00			
								177		Leak from service chimney	180	90	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/14/2014	Central Ave	S20-055	S20-056	8	121	AC	13							14							$2,500.00			
								80		Moderate Leak in Service connection	720	360	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
6/10/2016	Elder Road	S10-031	S10-030	10	163	VCP	3							14							$2,050.00			
								6		Infiltration Runner at joint	4,320	2,160	5		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$100,852	$49.20	YES
								9		Infiltration Runner at joint	2,880	1,440	4		Point Repair up to 4 ft (Included Above)									
6/13/2016	Elder Road	S05-29	S05-028	10	194	PVC	3							14							$339.50			
								33		Minor Roots at Joint			1		Chemical Root Treatment	194	LF	$1.75	$339.50			$0	$0.00	NO
								63		Minor Roots at Joint			1		Chemical Root Treatment (Included Above)									
								66		Minor Roots at Joint			1		Chemical Root Treatment (Included Above)									
								69		Minor Roots at Joint			1		Chemical Root Treatment (Included Above)									
								77		Minor Roots at Joint			1		Chemical Root Treatment (Included Above)									
								83		Minor Roots at Joint			1		Chemical Root Treatment (Included Above)									
								92		Minor Roots at Joint			2		Chemical Root Treatment (Included Above)									
								144		Heavy Roots at Joint			4		Chemical Root Treatment (Included Above)									
								147		Moderate Roots at Joint			3		Chemical Root Treatment (Included Above)									
								148		Heavy Roots at Capped Service			4		Chemical Root Treatment (Included Above)									
								149		Minor Roots at Joint			1		Chemical Root Treatment (Included Above)									
								158		Heavy Roots at Joint			4		Chemical Root Treatment (Included Above)									
								176		Minor Roots at Joint			1		Chemical Root Treatment (Included Above)									
								182		Minor Roots at Joint			1		Chemical Root Treatment (Included Above)									
4/12/2016	Meadowbrook Rd	S29-064	S29-065	8	261	AC	13							15							$2,000.00			
								116		Heavy Infiltration Runner at service connection	4320	2160	4		T-liner	1	EA	$2,000.00		$2,000.00		$60,511	$30.26	YES
								116		Break In Tap Defective			2		T-liner (included above)									
4/12/2016	Meadowbrook Rd	S29-082	S29-083	8	119	AC	13							15							$550.00			
								118		Moderate Infiltration Runner at Main connection to MH	2880	1440	4		Grout & patch bench, invert, and connection	1	EA	$550.00	$550.00			$40,341	$73.35	YES
4/12/2016	Meadowbrook Rd	S29-065	S29-066	8	259	AC	13							15							$550.00			
								258		Moderate Infiltration Runner at main connection to MH	2880	1440	3		Grout & patch bench, invert, and connection	1	EA	$550.00	$550.00			$40,341	$73.35	YES

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Appendix G
Final CEA Recommendations

																		EST. REHAB COSTS				CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/12/2016	Meadowbrook Rd	S29-082	S29-085	8	241	AC	13							15							$5,325.00			
								76		Break in Tap defective infiltration at joint	2880	1440	3		Grout lateral	1	EA	$2,500.00		$2,500.00		$40,341	$16.14	YES
								194		Break in Tap defective intruding			2		Cut lateral protrusion	1	EA	$325.00		$325.00		$0	$0.00	NO
								194		Infiltration runner at service connection to main	720	360	3		Grout lateral	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
4/13/2016	Meadowbrook Rd	S29-059	S29-058	8	83	AC	13							15							$5,500.00			
								62		Heavy Infiltration Runner at service connection to main	4320	2160	4		Dig and Replace wye	1	EA	$5,500.00	$5,500.00			$60,511	$11.00	YES
4/13/2016	Meadowbrook Rd	S29-058	S29-057	8	54	AC	13							15							$550.00			
								53		Moderate Infiltration in MH invert	3600	1800	4		Grout & patch bench, invert, and connection	1	EA	$550.00	$550.00			$50,426	$91.68	YES
4/13/2016	Blacksmith Dr	S29-100	S29-99	8	225	AC	13							15							$4,050.00			
								88		Heavy Infiltration Runner at chimney connection to main	7200	3600	4		T-liner	1	EA	$2,000.00		$2,000.00		$100,852	$50.43	YES
								185		Moderate Infiltration Runner at chimney connection to main	1440	720	2		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
4/13/2016	Blacksmith Dr	S29-99	S29-98	8	277	AC	13							15							$10,050.00			
								67		Moderate Infiltration Dripper at chimney connection to main	1440	720	3		Grout lateral	1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
								161		Heavy Infiltration Runner at chimney connection to service	10080	5040	5		Dig and Replace wye	1	EA	$5,500.00	$5,500.00			$141,193	$25.67	YES
								183		Minor Infiltration Dripper at joint	180	90	3		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
3/26/2015	Sachem St	S10-096	S10-098	8	243	VCP	3							17							$2,050.00			
								129		Broken			4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
5/3/2014	Blake St	S39-047	S39-048	8	198	PVC	12							19.1							$2,050.00			
								5		Joint Leaking	180	90	4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
5/3/2014	Blake St	S39-048	S39-049	8	221	PVC	12							19.1							$2,825.00			
								110		Protruding Service Lateral			4		Cut protruding lateral	1	EA	$325.00		$325.00		$0	$0.00	NO
								110		Service Connection at Main Leaking	180	90	4		Lateral Grout	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/3/2014	Henderson St	S39-037	S39-052	8	307	VCP	3							19.1							$2,050.00			
								62		Leak at Joint	180	90	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
5/3/2014	Overlook Rd	S39-034	S39-036	8	140	PVC	12							19.1							$550.00			
								140		Heavy Leak at pipeline connection to manhole	1440	720	5		Grout Pipe Connection at Manhole	1	EA	$550.00	$550.00			$20,170	$36.67	YES
5/5/2014	Barrett St	S49-015	S49-017	8	216	PVC	12							19.1							$5,000.00			
								62		Moderate Leak in service connection to main	720	360	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
								202		Moderate Leak in service connection	720	360	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
5/5/2014	Barrett St	S49-015	S49-017	8	216	PVC	12							19.1							$2,500.00			
								26		Leak in Service Lateral	360	180	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
5/6/2014	Barrett St	S39-001	S49-006	8	199	other	3							19.1							$2,500.00			
								156		Moderate Leak in service connection to main	720	360	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
5/6/2014	Francess St	S49-001	S49-003	8	66	PVC	12							19.1							$2,500.00			
								49		Minor Leak at service connection to main	180	90	2		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/6/2014	Francess St	S49-003	S49-004	8	129	other	12							19.1							$5,000.00			
								4		Minor leak at connection to service	180	90	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								49		Minor leak at connection to service	180	90	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/6/2014	Deer Field Rd	S49-012	S49-011	8	104	PVC	12							19.1							$550.00			
								0		Minor leak in crack	180	90	3		Grout Pipe Connection at Manhole	1	EA	$550.00	$550.00			$2,521	$4.58	YES
5/6/2014	Deer Field Rd	S49-010	S49-010A	8	139	PVC	12							19.1							$2,500.00			
								10		Minor leak at service connection to main	180	90	1		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/6/2014	Deer Field Rd	S49-010A	S49-009	8	188	PVC	12							19.1							$4,100.00			
								76		Moderate leak in service cap	360	180	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								169		Minor leak in service cap	180	90	2		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
5/6/2014	Gilbert Rd	S48-041	S48-040	8	150	PVC	12							19.1							$4,550.00			
								24		Minor Leak in capped service	180	90	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								105		Minor Leak at Chimney	180	90	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/7/2014	Robinwood Ave Easement	S49-024	S49-023	8	141	AC	12							19.1							$5,500.00			
								0		Heavy Leak at joint	2160	1,080	4		Remove and Replace	1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
5/7/2014	Robinwood Ave	S49-026	S49-027	8	83	AC	12							19.1							$2,050.00			
								6		Heavy Leak at joint to sealed Chimney Service	2880	1,440	5		Point Repair up to 4 ft	1	EA	$2,050.00		$2,050.00		$40,341	$19.68	YES
5/9/2014	High Rock St	S49-052	S49-051	8	128	VCP	12							19.1							$2,050.00			
								37		Minor Longitudinal Crack			4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00					
								38		Leak at Longitudinal Crack	720	360	3		Point Repair up to 4 ft (Included Above)							$10,085	$4.92	YES
5/9/2014	High Rock St	S49-051	S49-034	8	170	VCP	12							19.1							$2,050.00			
								75		Joint Leaking	720	360	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
5/9/2014	High Rock St	S49-034	S49-036	8	336	VCP	12							19.1							$4,100.00			
								184		Leak at Capped service entrance	180	90	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								204		Leak at Capped service entrance	180	90	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
5/9/2014	High Rock St	S49-038	S49-039	8	143	VCP	12							19.1							$5,500.00			
								88		Heavy Leak at service connection to main	5760	2,880	5		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$80,682	$14.67	YES
5/9/2014	High Rock St	S49-039	S49-041	10	197	VCP	12							19.1							$7,800.00			
								27		Leak at Joint	720	360	3		Point Repair up to 4 ft	1	EA	$2,300.00	$2,300.00			$10,085	$4.38	YES
								171		Heavy Leak in service connection	2880	1,440	5		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
5/12/2014	High Rock St	S39-011	S39-010	8	309	VCP	12							19.1							$15,100.00			
								136		Moderate Longitudinal Fracture			4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								138		Moderate Circumfrential Fracture			3		Point Repair up to 4 ft (Included Above)									
								195		Moderate Leak at Service Connection to Main	720	360	3		Lateral grout up to 5 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								245		Heavy Leak at Service connection to main	2880	1,440	5		Repalce Service Wye	1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
								257		Moderate Circumfrential Fracture at Service			3		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$0	$0.00	NO
5/12/2014	High Rock St	S39-009	S39-008	8	203	VCP	12							19.1							$9,720.00			
								53		Moderate Multiple Fractures			3		CIPP	203	LF	$40.00	$8,120.00			$10,085	$1.04	YES
								56		Light Grease Deposits attached			1		CIPP (Included Above)									
								121		Moderate Spiral Fracture	720	360	4		CIPP (Included Above)									
								177		Water Level 10%			1		CIPP (Included Above)									
								180		Water Level 10%			1		CIPP (Included Above)									
								198		Light Mineral Deposits Attached			1		CIPP (Included Above)									
															seal all laterals (2)	2	EA	$800.00		$1,600.00				
5/15/2014	Fairview Rd	S49-042	S39-029	8	235	other	3							19.1							$2,500.00			
								1		Leak at service connection to main	180	90	3		Lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/19/2014	Linden St	S49-077	S49-078	8	74	VCP	3							19.1							$2,050.00			
								40		Leak at Joint	720	360	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
5/19/2014	Linden St	S49-072	S49-073	8	122	VCP	3							19.1							$5,500.00			
								19		Heavy Leak at service connection to Chimney	2880	1,440	5		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
5/19/2014	Murphy Rd	S49-057	S49-058	8	303	VCP	3							19.1							$2,500.00			
								146		Moderate Leak in service	720	360	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES

PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix G
Final CEA Recommendations

																	EST. REHAB COSTS				CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
5/19/2014	Murphy Rd	S49-058	S49-065	8	175	VCP	3							19.1							$550.00			
								0		Minor Leak at joint	360	180	3		Grout Pipe Connection at Manhole	1	EA	$550.00	$550.00			$5,043	$9.17	YES
5/20/2014	Marked Tree Rd	S38-028	S39-003	8	242	PVC	12							19.1							$2,500.00			
								149		Moderate leak at service connection to main	720	360	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
5/21/2014	Marked Tree Rd	S39-044	S39-055	8	248	PVC	12							19.1							$4,100.00			
								114		Leak at Joint	360	180	3		Point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								167		Leak at Joinh	360	180	3		Point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
3/18/2014	Dartmouth Ave	S23-019	S23-127	8	298	VCP	3							20							$8,000.00			
								70		Service Lateral Leaking	4320	2160	4		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$60,511	$11.00	YES
								156		Service Lateral Leaking	180	90	1		Lateral Grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
3/19/2014	La Salle Road	S22-082	S22-083	8	272	VCP	3							20							$5,768.00			
								139		Service Connection Cracked			4		CIPP	272	LF	$6.50	$1,768.00			$0	$0.00	NO
								139		Moderate Longitudinal Fractures			4		CIPP (Included Above)									
								151		Multiple Moderate Fractures			4		CIPP (Included Above)									
								170		Multiple Moderate Fractures			4		CIPP (Included Above)									
								183		Multiple Cracks			4		CIPP (Included Above)									
								183		Service Connection at Main Cracked			4		CIPP (Included Above)									
								190		Fine Roots at Joint			1											
								232		Minor Spiral Crack			1		CIPP (Included Above)									
															seal all laterals (5)	5	EA	$800.00		$4,000.00				
3/19/2014	Tower	S23-027	S23-024	8	250	VCP	3							20							$14,000.00			
								48		Leaking Joint	2440	1220	3		CIPP	250	LF	$40.00	$10,000.00			$34,178	$3.42	YES
															Seall all laterals (5)	5	EA	$800.00		$4,000.00				
3/19/2014	Lindbergh Ave	S23-031	S23-030	8	188	VCP	3							20							$5,500.00			
								183		Service Joint Connection Leaking	2440	1220	3		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$34,178	$6.21	YES
3/19/2014	Lindbergh Ave	S23-024	S23-022	8	200	VCP	3							20							$5,500.00			
								8		Service Connection Leaking	2160	1,080	3		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
3/20/2014	Lindbergh Ave	S23-022	S23-017	8	92	VCP	3							20							$2,500.00			
								31		Service Connection Leaking	720	360	3		Lateral Grout up to 5 ft	1	EA	$2,500.00	$2,500.00			$10,085	$4.03	YES
3/20/2014	Lindbergh Ave	S22-080	S22-079	8	112	VCP	3							20							$6,080.00			
								95		Leaking Joint	720	360	3		CIPP	112	LF	$40.00	$4,480.00			$10,085	$1.66	YES
															Seal all laterals (2)	2	EA	$800.00		$1,600.00				
3/20/2014	Lindbergh Ave	S22-079	S22-078	8	261	VCP	3							20							$2,500.00			
								194		Service Lateral Leaking	360	180	3		Lateral Grout up to 5 ft	1	EA	$2,500.00	$2,500.00			$5,043	$2.02	YES
3/20/2014	Harris Ave	S40-132	S40-120	10	319	VCP	3							20							$2,500.00			
								60		Leak in main connection to Service Lateral	180	90	3		Lateral Grout	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
3/20/2014	James Ave	S22-105	S22-104	8	295	VCP	3							20							$15,000.00			
								156		Leaking Joint	2160	1,080	4		CIPP	295	LF	$40.00	$11,800.00			$30,256	$2.02	YES
								293		Minor longitudinal crack			1		CIPP (Included Above)									
															Seal all laterals (4)	4	EA	$800.00		$3,200.00				
3/20/2014	Lindbergh Ave	S23-015	S23-014	8	217	VCP	3							20							$11,880.00			
								38		Leaking Joint	720	360	1		CIPP	217	LF	$40.00	$8,680.00			$10,085	$0.85	NO
								66		Light Mineral Deposits Attached			1		CIPP (Included Above)									
								125		Minor Longitudinal Crack			1		CIPP (Included Above)									
								127		Moderate Spiral Fracture			2		CIPP (Included Above)									
								138		Moderate Circumferential Fracture			4		CIPP (Included Above)	1								
								147		Light Roots at Joint			1		CIPP (Included Above)									
								211		Moderate Circumferential Crack			2		CIPP (Included Above)									
								214		Moderate Circumferential Fracture			4		CIPP (Included Above)	1								
								215		Multiple Moderate Fractures			4		CIPP (Included Above)									
															Seal all laterals (4)	4	EA	$800.00		$3,200.00				
3/20/2014	Lindbergh Ave	S23-014	S23-013	8	143	VCP	3							20							$2,050.00			
								2		Multiple Major Fractures			4		point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
3/20/2014	Mayo Ave	S40-130	S40-131	8	144	VCP	3							20							$4,152.00			
								1		Medium Roots at Joint			2		Chemical Root Treatment	144	LF	$1.75	$252.00			$0	$0.00	NO
								2		Moderate Roots in Service Lateral			3		Remove Lateral Roots	1	EA	$650.00	$650.00			$0	$0.00	NO
								11		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								23		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								29		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								35		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								36		Moderate Roots in Service Lateral			3		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								47		Moderate Roots in Service Lateral			4		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								80		Moderate Roots in Service Lateral			3		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								82		Moderate Roots in Service Lateral			3		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								83		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								116		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								122		Moderate Roots in Service Lateral			3		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								123		Fine Rotos at Joint			1		Chemical Root Treatment (included above)									
								129		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								131		Medium Roots at Joint			3		Chemical Root Treatment (included above)									
								138		Medium Roots at Joint			3		Chemical Root Treatment (included above)									
								144		Heavy Roots at Joint			5		Chemical Root Treatment (included above)									
								144		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
3/21/2014	Manning Street	S22-083	S22-078	8	320	VCP	3							20							$14,150.00			
								120	Heavy Roots at Service Entrance				3		Remove Lateral Roots	1	EA	$650.00	$650.00			$0	$0.00	NO
								120		Service Lateral Leaking	360	180	3		Lateral Grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
								124		Leaking Joint in Service	2160	1,080	4		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
								124	Heavy Roots at Service Entrance				3		Included Above									
								229		Service Lateral Leaking	1080	540	3		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$15,128	$2.75	YES
3/21/2014	Gibson St	S30-092	S30-093	8	323	VCP	3							20							$3,150.00			
								226		Moderate Roots in Service Lateral			3		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								226		Leaking Service Lateral	360	180	3		Lateral Grout	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES

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Appendix G
Final CEA Recommendations

																		EST. REHAB COSTS			CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/2/2014	Brookline St	S23-011	S23-010	8	295	VCP	3							20							$20,600.00			
								0		Minor Circumfrential Crack			2		CIPP	295	LF	$40.00	$11,800.00			$0	$0.00	NO
								9		Minor Circumfrential Fracture			1		CIPP (included above)									
								13		Minor Spiral Crack			1		CIPP (included above)									
								22		Minor Spiral Crack			1		CIPP (included above)									
								26		Moderate Multiple Fractures - START			3		CIPP (included above)									
								66		Moderate Multiple Fractures - FINISH			3		CIPP (included above)									
								113		Minor Circumfrential Fracture			1		CIPP (included above)									
								126		Minor Circumfrential Crack			2		CIPP (included above)									
								133		Moderate Multiple Fractures - START			3		CIPP (included above)									
								148		Moderate Multiple Fractures - FINISH			3		CIPP (included above)									
								196		Minor Longitudinal Crack			1		CIPP (included above)									
								249		Minor Longitudinal Crack			1		CIPP (included above)									
								292		Moderate Multiple Cracks			3		CIPP (included above)									
															seal all laterals (11)	11	EA	$800.00		$8,800.00				
4/2/2014	Brookline St	S22-074	S22-073	8	162	VCP	3							20							$4,100.00			
								12		Leaking at Joint	180	90	3		point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								59		Leaking at Joint	180	90	3		point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
4/2/2014	Brookline St	S22-073	S22-072	8	273	VCP	3							20							$6,600.00			
								7		Leaking at joint	180	90	3		point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								23		Leaking at Joint	180	90	3		point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								136		Leaking Service at entrance	360	180	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/2/2014	Powers St	S30-089	S30-088	8	349	VCP	3							20							$27,420.75			
								3		Fine Roots at Joint			1		Chemical Root Treatment	349	LF	$1.75	$610.75			$0	$0.00	NO
								12		Moderate Roots in Service Lateral			4		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								13		Minor Longitudinal Crack			1		CIPP	349	LF	$40.00	$13,960.00			$60,511	$2.57	YES
								19		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								22		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								29		Fine Roots at Joint - START			1		Chemical Root Treatment (included above)									
								45		Moderate Roots in Service Lateral			3		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								63		Minor Longitudinal Crack			1		CIPP (included above)									
								73		Minor Longitudinal Crack			1		CIPP (included above)									
								86		Minor Longitudinal Crack			1		CIPP (included above)									
								148		Moderate Roots in Service Lateral			3		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								158		Minor Longitudinal Crack			1		CIPP (included above)									
								174		Minor Multiple Fractures			1		CIPP (included above)									
								180		Minor Longitudinal Crack			1		CIPP (included above)									
								209		Roots in Service Lateral and Leak	180	90	1		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								211		Moderate Roots in Service Lateral			4		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								212		Leaking at Joint	180	90	1		CIPP (included above)									
								231		Minor Longitudinal Crack			1		CIPP (included above)									
								238		Fine Roots at Joint - FINISH			1		Chemical Root Treatment (included above)									
								247		Leaking at Service Lateral Connection	180	90	1											
								251		Minor Longitudinal Crack			1		CIPP (included above)									
								251		Leaking at Joint	360	180	3		CIPP (included above)									
								253		Leaking at Joint	1440	720	5		CIPP (included above)									NO
								282		Leaking at Service Lateral Connection	180	90	1											
								297		Minor Multiple Fractures			1		CIPP (included above)									
								345		Leaking at Joint	360	180	3		CIPP (included above)									
								349		Leaking at Joint	1440	720	3		CIPP (included above)									
															seal all laterals (12)	12	EA	$800.00		$9,600.00				
4/3/2014	Parkinson St	S30-083	S30-084	8	311	VCP	3							20							$2,050.00			
								248		Moderate Spiral Fracture			4		point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/9/2014	Webster St	S22-061	S22-060	10	219	VCP	3							20							$2,500.00			
								154		Service Lateral Leaking at Connection	180	90	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/9/2014	Webster St	S22-060	S22-059	10	245	VCP	3							20							$2,050.00			
								90		Moderate Spiral Fracture			4		point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/9/2014	Webster St	S22-059	S22-058	10	299	VCP	3							20							$265.00			
								299		Obstacles 85%			5		Heavy Cleaning	1	HR	$265.00	$265.00			$0	$0.00	NO
4/2/2015	Cimino Rd	S16-121	S16-122	8	197	VCP	3							21							$11,080.00			
								26		Minor Longitudinal Cracks Start			1		CIPP	197	LF	$40.00	$7,880.00			$0	$0.00	NO
								39		Minor Longitudinal Cracks End			1		CIPP (included above)									
								59		Moderate Multiple Cracks			1		CIPP (included above)									
								88		Broken			3		CIPP (included above)									
								108		Broken			3		CIPP (included above)									
								133		Moderate Multiple Cracks			3		CIPP (included above)									
								158		Moderate Multiple Cracks			3		CIPP (included above)									
															seal all laterals (4)	4	EA	$800.00	$3,200.00					
4/6/2015	Greendale Ave	S42-117	S42-116	8	201	AC	13							21							$2,050.00			
								129		Hole			4		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/6/2015	Greendale Ave	S52-095	S42-117	8	265	AC	13							21							$2,050.00			
								24		Hole			5		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/6/2015	Brookline St	S23-096	S23-095	8	116	AC	13							21							$2,050.00			
								30		Hole			5		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/6/2015	Brookline St	S23-100	S23-101	8	65	AC	13							21							$2,050.00			
								39		Infiltration Runner at Joint	4320	2160	4		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$60,511	$29.52	YES
4/6/2015	Brookline St	S23-096	S23-097	8	252	AC	13							21							$2,600.00			
								0		Infiltration Runner in Manhole S23-096	720	360	3		Grout Manhole Bench	1	EA	$550.00	$550.00			$10,085	$18.34	YES
								58		Infiltration Runner in crack	720	360	3		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
4/6/2015	Brookline St	S23-097	S23-098	8	200	AC	13							21							$2,050.00			
								198		Infiltration Runner at Joint	360	180	3		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
4/7/2015	Rosalie Rd	S17-061	S23-075	8	277	VCP	3							21							$4,550.00			
								110		Infiltration Runner	720	360	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								111		Broken Tap leaking from connection	360	180	3		Grout service at connection with main	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/7/2015	Rosalie Rd	S17-061	S17-060	8	151	VCP	3							21							$2,500.00			
								23		Defective tap Leaking from connection			3		Included Below									
								23		Infiltration Runner	720	360	3		Grout service at connection with main	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES

PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix G
Final CEA Recommendations

																		EST. REHAB COSTS			CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/7/2015	Oak Hill St	S23-140	S23-141	8	273	AC	13							21							$5,500.00			
								173		Defective Break in Tap leaking	2160	1080	4		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
4/7/2015	Oak Hill St	S23-104	S23-105	8	247	AC	13							21							$2,050.00			
								107		Broken			4		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/7/2015	Falcon St	S23-140	S23-139	8	36	AC	13							21							$15,000.00			
								36		Manhole S23-139 Leaking	7200	3600	5		Replace Manhole	1	EA	$15,000.00	$15,000.00			$100,852	$6.72	YES
4/7/2015	Oak Hill St	S23-141	S23-142	8	150	AC	13							21							$2,050.00			
								23		Hole			5		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/7/2015	Oak Hill St	S23-142	S23-143	8	109	AC	13							21							$11,000.00			
								41		Break in Leaking Tap at joint 12 o'clock					Replace Service Wye (Included Below)									
								41		Infiltration Gusher	11520	5760	5		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$161,364	$29.34	YES
								43		Break in Leaking Tap at joint 9 o'clock					Replace Service Wye	1	EA	$5,500.00		$5,500.00				
								43		Infiltration Gusher	4320	2160	5		Replace Service Wye (Included Above)							$60,511	$11.00	YES
4/7/2015	Brookline St	S23-101	S23-102	8	166	VCP	3							21							$5,500.00			
								157	Hole	Joint Offset			5		Remove and Replace	1	EA	$5,500.00	$5,500.00			$0	$0.00	NO
4/8/2015	Paul Revere Rd	S23-061	S23-062	8	129	VCP	3							21							$2,500.00			
								29		Service Lateral leaking	360	180	3		Lateral Grout	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/8/2015	Paul Revere Rd	S23-062	S23-063	8	69	VCP	3							21							$2,500.00			
								22		Service Lateral Leaking	720	360	3		Lateral Grout	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
4/8/2015	Paul Revere Rd	S23-063	S23-064	8	61	VCP	3							21							$3,240.00			
								14		Infiltration Runner at joint	1,440	720	3		CIPP	61	LF	$40.00	$2,440.00			$70,597	$21.79	YES
								35		Infiltration Runner at joint	720	360	3		CIPP (included above)									
								41		Infiltration Runner at joint	2,880	1,440	3		CIPP (included above)									
															seal all laterals (1)	1	EA	$800.00	$800.00					
4/8/2015	Paul Revere Rd	S23-065	S23-067	8	101	VCP	3							21							$2,500.00			
								50		Service Lateral Leaking	360	180	3		Lateral Grout	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/8/2015	Paul Revere Rd	S23-071	S23-072	8	85	VCP	3							21							$5,500.00			
								85		Infiltration Runner Pipe connection to manhole	3,600	1,800	5		Remove and Replace	1	EA	$5,500.00	$5,500.00			$50,426	$9.17	YES
4/8/2015	Richdale Rd	S23-132	S23-071	8	242	AC	13							21							$2,500.00			
								104		Defective Tap - Leaking			4		Grout Service Connection with Main (included below)									
								104		Infiltration Runner at breaking connection	3,600	1,800	5		Grout Service at Connection with Main	1	EA	$2,500.00		$2,500.00		$50,426	$20.17	YES
4/8/2015	Richdale Rd	S23-130	S23-131	8	82	AC	13							21							$2,500.00			
								61		Service Lateral Leaking	180	90	3		Lateral Grout	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/9/2015	Cimino Rd	S16-122	S16-123	8	137	VCP	3							21							$4,550.00			
								76		Infiltration Runner at Joint	1,440	720	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
								84		Infiltration Runner at Joint IN SERVICE	2,880	1,440	4		Lateral Grout	1	EA	$2,500.00		$2,500.00		$40,341	$16.14	YES
4/9/2015	Richdale Rd	S17-005	S17-008	8	316	AC	12							21							$2,050.00			
								16		Broken			4		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/9/2015	Richdale Rd	S17-012	S23-041	8	347	AC	12							21							$8,000.00			
								26		Service Lateral Leaking	180	90	3		Lateral Grout	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								51		Infiltration Runner at break	360	180	3		Included Below									
								52		Infiltration Runner at joint connection to service	2,160	1,080	4		Remove and Replace Service Wye	1	EA	$5,500.00		$5,500.00		$35,298	$6.42	YES
4/13/2015	Paul Revere Rd	S23-065	S23-066	8	139	AC	13							21							$243.25			
								135		Heavy Roots Blocking pipe			5		Chemical Root Treatment	139	LF	$1.75	$243.25			$0	$0.00	NO
4/13/2015	Paul Revere Rd	S23-035	S23-034	8	259	AC	13							21							$2,500.00			
								64	Service Lateral Leaking		720	360	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
4/14/2015	Highgate St	S32-036	S24-005	8	167	AC	10							21							$2,050.00			
								163		Infiltration Runner ar Joint	1,440	720	4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
4/14/2015	Highgate St	S24-005	S24-006	8	229	AC	10							21							$2,050.00			
								82		Broken			4		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/14/2015	Highgate St	S24-007	S24-008	8	96	AC	10							21							$2,500.00			
								85		Service Lateral Leaking	360	180	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/24/2014	Hillcrest Rd	S31-123	S31-121	8	300	VCP	3							22							$2,500.00			
								8		Leaking at Joint to service	180	90	4		Grout Lateral	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/25/2014	Wachusett Rd	S31-115	S31-116	8	269	VCP	3							22							$2,785.75			
								1		Fine Roots at Joint			1		Chemical Root Treatment	269	LF	$1.75	$470.75			$0	$0.00	NO
								14		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
								16		Fine Roots at Joint - START			1		Chemical Root Treatment (included above)									
								113		Moderate Grease Deposits			4		Heavy Cleaning	1	HR	$265.00	$265.00			$0	$0.00	NO
								120		Root Ball Connection			3		Chemical Root Treatment (included above)									
								232		Hole in side of pipe			5		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								269		Fine Roots at Joint - FINISH			1		Chemical Root Treatment (included above)									
								269		Heavy Grease Deposits Attached			4		Heavy Cleaning (included above)									
4/28/2014	Tudor Rd	S32-005	S32-006	8	172	VCP	3							22							$301.00			
								119		Root Ball at Joint 50%			5		Chemical Root Treatment	172	LF	$1.75	$301.00			$0	$0.00	NO
								147		Fine Roots at Joint			1		Chemical Root Treatment (included above)									
4/29/2014	Audrey Ave	S32-010	S32-024	8	238	VCP	3							22							$5,500.00			
								170		Heavy Leak at Joint	2160	1,080	5		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$30,256	$5.50	YES
4/29/2014	Highgate St	S31-161	S31-162	8	222	other	3							22							$5,000.00			
								136		Minor Leak at Joint	180	90	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
								141		Minor Leak at Joint	180	90	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/1/2014	Savoy Rd	S31-164	S23-121	8	204	PVC	6							22							$6,600.00			
								3		Moderate Leak at Joint	1440	720	4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
								183		Heavy Leaking at service connection to main	1440	720	4		Seal lateral	1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
								230		minor leaking at joint	360	180	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
5/1/2014	Ina Rd	S31-157	S31-158	8	227	VCP	11							22							$5,500.00			
								85		Leaking Joint at Service Lateral Connection	1440	720	3		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$20,170	$3.67	YES
5/1/2014	Arch St	S31-164	S31-165	8	299	PVC	6							22							$4,100.00			
								9		Hole			3		Point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								156		Moderate Leak at Joint	720	360	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
5/1/2014	Arch St	S31-167	S31-165	8	274	PVC	6							22							$7,550.00			
								81		Heavy Leak at Joint	2880	1,440	5		Replace Service Wye	1	EA	$5,500.00	$5,500.00			$40,341	$7.33	YES
								98		Leak from service lateral cap	1440	720	4		Point Repair	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES

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Appendix G
Final CEA Recommendations

																	EST. REHAB COSTS				CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
5/2/2014	Savoy Rd	S23-119	S23-120	8	235	VCP	3							22							$15,261.25			
								6		Fine Roots at Joint			1		Chemical Root Treatment	235	LF	$1.75	$411.25			$0	$0.00	NO
								9		Fine Roots at Joint - START			1		Chemical Root Treatment (Included Above)									
								40		Fine Roots at Joint - FINISH			1		Chemical Root Treatment (Included Above)									
								53		Moderate Multiple Fractures			3		CIPP	235	LF	$40.00	$9,400.00			$0	$0.00	NO
								101		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)									
								101		moderate longitudinal fractures			4		CIPP (Included Above)									
								107		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)									
								110		Minor Circumfrential Crack			1		CIPP (Included Above)									
								152		Medium Roots at Joint			3		point repair up to 4 ft									
								155		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)									
								161		Fine Roots at Joint			1		Chemical Root Treatment (Included Above)									
								165		Moderate Roots in service			3		Remove Lateral Roots	1	EA	$650.00		$650.00		$0	$0.00	NO
								166		Heavy Rootball blocking pipe			5		Chemical Root Treatment (Included Above)									
								182		Fine Roots at Joint			2		Chemical Root Treatment (Included Above)									
								187		moderate longitudinal fractures			4		CIPP (Included Above)									
								194		Medium Roots at Joint			3		Chemical Root Treatment (Included Above)									
															seall all laterals (6)	6	EA	$800.00		$4,800.00				
5/5/2014	Hillcrest Rd	S23-084	S23-083	8	123	other	12							22							$15,000.00			
								0		Leak in Bench	2880	1,440	5		Replace Manhole	1	EA	$15,000.00	$15,000.00			$40,341	$2.69	YES
12/18/2014	Washington Ave	S31-060	S31-059	8	92	VCP	3							22							$2,750.00			
								80		Moderate Longitudinal Fracture			4		Point Repair up to 12 ft	1	EA	$2,750.00	$2,750.00			$0	$0.00	NO
								89		Moderate Longitudinal Fracture			3											
12/18/2014	Washington Ave	S31-058	S31-055	8	292	VCP	3							22							$2,050.00			
								185		Moderate Longitudinal Fracture	720	360	4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
12/18/2014	Holmes St	S31-029	S31-052	8	193	VCP	3							22							$550.00			
								0		Infiltration Runner at Pipe Connection with Manhole	720	360	4		Grout Pipe Connection	1	EA	$550.00	$550.00			$10,085	$18.34	YES
12/18/2014	Holmes St	S31-052	S31-060	8	199	VCP	3							22							$12,510.00			
								0		Major Infiltration Runner in Bench	1,080	540	4		Grout Bench and Invert	1	EA	$550.00		$550.00		$15,128	$27.51	YES
								43		Major Infiltration Runner in Service	1,440	720	4		CIPP	199	LF	$40.00	$7,960.00			$90,767	$7.59	YES
								66		Major Infiltration Runner at Joint	1,080	540	4		CIPP (Included Above)									
								96		Major Infiltration Runner at Service Joint	1,080	540	4		CIPP (Included Above)									
								114		Major Infiltration Runner at Service Joint	1,080	540	4		CIPP (Included Above)									
								130		Major Infiltration Runner at Joint	720	360	4		CIPP (Included Above)									
								131		Major Infiltration Runner at Service Joint	1,080	540	4		CIPP (Included Above)									
															seal all laterals (5)	5	EA	$800.00		$4,000.00				
12/18/2014	Holmes St	S23-001	S31-029	8	275	other	13							22							$24,400.00			
								85		Minor Circumfrential Fracture			2		CIPP	275	LF	$40.00	$11,000.00			$219,354	#REF!	#REF!
								85		Leaking Service at Connection with Main	2,880	1,440	5		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$40,341	$7.33	YES
								151		Major Infiltration Gusher at Joint	2,880	1,440	5		CIPP (Included Above)									
								171		Moderate Longitudinal Fracture	1,440	720	4		CIPP (Included Above)									
								173		Leaking Service at Connection with Main	7,200	3,600	5		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$100,852	$18.34	YES
								182		Minor Circumfrential Fracture			2		CIPP (Included Above)									
								182		Major Infiltration Runner at Joint	2,160	1,080	4		CIPP (Included Above)									
								183		Major Infiltration Runner at Joint	720	360	4		CIPP (Included Above)									
								198		Major Infiltration Runner at Joint	720	360	4		CIPP (Included Above)									
								214		Moderate Infiltration Runner at Joint	360	180	3		CIPP (Included Above)									
								243		Moderate Infiltration Dripper at Joint	180	90	3		CIPP (Included Above)									
															seal all laterals (3)	3	EA	$800.00		$2,400.00				
12/18/2014	Dell Ave	S31-029	S23-126	8	33	VCP	3							22							$5,500.00			
								0		Major Infiltration Gusher in Invert	7,200	3,600	5		Remove and Replace	1	EA	$5,500.00	$5,500.00			$100,852	$18.34	YES
12/19/2014	Ellicott St	S31-035	S31-039	8	158	PVC	12							22							$4,550.00			
								9		Moderate Infiltration Runner at Joint	720	360	4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								21		Tap Break-In Defective - Leaking at Joint			3		Included Below									
								21		Major Infiltration Runner at Joint	1,440	720	4		lateral grout up to 5 ft	1	EA	$2,500.00	$2,500.00			$20,170	$8.07	YES
12/19/2014	Ellicott St	S31-040	S31-041	8	168	VCP	3							22							$4,394.00			
								35		Medium Roots at Joint			4		Chemical Root Treatment	168	LF	$1.75	$294.00			$0	$0.00	NO
								35		Minor Infiltration Dripper at Joint	360	180	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								97		Fine Roots at Joint			2		Chemical Root Treatment (Included Above)									
								101		Major Infiltration Gusher at Joint	2,160	1,080	5		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$30,256	$14.76	YES
4/14/2015	Rockwood Ln	S32-039	S32-038	8	100	VCP	3							24							$10,050.00			
								50		Infiltration Runner at Joint in service	720	360	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
								84		Infiltration Runner at service connection to pipe	2,880	1,440	4		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$40,341	$7.33	YES
								88		Infiltration Runner at Joint	1,440	720	3		Point Repair	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
4/14/2015	Richard Rd	S32-040	S32-039	8	200	VCP	3							24							$4,550.00			
								95		Infiltration Runner at joint	1,440	720	3		Point Repair, up to 4 ft	1	EA	$2,050.00	$2,050.00			$20,170	$9.84	YES
								148		Infiltration Runner in service	2,160	1,080	4		Seal Lateral	1	EA	$2,500.00		$2,500.00		$30,256	$12.10	YES
4/14/2015	Fairfield St	S52-081	S52-082	12	200	VCP	3							24							$5,500.00			
								69		Defective Tap Leaking at joint	2,880	1,440	5		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$40,341	$7.33	YES
4/14/2015	Fairfield St	S52-081	S42-100	8	184	VCP	3							24							$2,250.00			
								183		Moderate Multiple Fractures			3		Point Repair, up to 8ft	1	EA	$2,250.00	$2,250.00			$0	$0.00	NO
4/14/2015	Fairfield St	S52-082	S52-083	12	244	VCP	3							24							$8,050.00			
								72		Defective Tap leaking from joint	2,160	1,080	3		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$30,256	$5.50	YES
								174		Infiltration dripper	180	90	2		Point Repair up to 4 ft	1	EA	$2,550.00	$2,550.00			$2,521	$0.99	NO
4/14/2015	Fairfield St	S52-083	S52-084	12	256	VCP	3							24							$2,500.00			
								17		Infiltration runner at tap connection to joint	1,440	720	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
4/14/2015	Richard Rd	S32-042	S32-041	8	207	VCP	3							24							$4,550.00			
								39		Infiltration Runner at joint in service	720	360	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
								40		Infiltration Runner at joint	720	360	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
4/14/2015	Richard Rd	S32-041	S32-040	8	136	VCP	3							24							$4,100.00			
								58		Infiltration Runner at joint	720	360	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								81		Infiltration Runner at joint	360	180	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
4/14/2015	Rockwood Ln	S32-038	S32-045	8	123	VCP	3							24							$6,520.00			
								6		Infiltration Dripper at Joint	360	180	2		CIPP	123	LF	$40.00	$4,920.00			$5,043	$0.77	NO
								57		Moderate Multiple Fractures start			3		CIPP (included above)									
								80		Moderate Multiple Fractures finish			3		CIPP (included above)									
															seal all laterals (2)	2	EA	$800.00		$1,600.00				

PROJECT NAME: INFILTRATION-INVESTIGATION
CONTRACT # 4623

Appendix G
Final CEA Recommendations

																		EST. REHAB COSTS				CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
4/14/2015	Richard Rd	S32-039	S32-038	8	173	VCP	3							24							$2,250.00			
								124		Moderate Multiple Fractures			3		Point Repair, up to 8ft	1	EA	$2,250.00	$2,250.00			$0	$0.00	NO
								127		Moderate Multiple Fractures			2											
4/15/2015	Douglas Rd	S52-058	S52-059	8	245	VCP	3							24							$2,500.00			
								180		Leaking Service	720	360	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$10,085	$4.03	YES
4/15/2015	Thornton Rd	S31-138	S31-132	8	332	VCP	3							24							$17,280.00			
								54		Minor Longitudinal Crack			3		CIPP	332	LF	$40.00	$13,280.00			$15,128	$0.88	NO
								78		Minor Spiral Fracture			3		CIPP (included above)									
								119		Minor Spiral Crack			3		CIPP (included above)									
								128		Moderate Spiral Fracture			3		CIPP (included above)									
								131		Infiltration Dripper at Joint	360	180	3		CIPP (included above)									
								218		Infiltration Dripper at joint	360	180	3		CIPP (included above)									
								221		Infiltration Dripper at Joint	360	180	3		CIPP (included above)									
								237		Moderate Spiral Fracture			3		CIPP (included above)									
								281		Minor Longitudinal Fracture			3		CIPP (included above)									
															seal all laterals (5)	5	EA	$800.00	$4,000.00					
4/15/2015	Thornton Rd	S31-132	S31-133	8	188	VCP	3							24							$2,050.00			
								125		Broken			3		Point Repair	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/15/2015	Thornton Rd	S31-133	S32-001	8	281	VCP	3							24							$2,500.00			
								203		Infiltration Dripper at tap connection to pipe	360	180	2		Seal lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/15/2015	Birds Hill Ave	S31-131	S31-132	8	177	VCP	3							24							$2,050.00			
								104		Infiltration runner at joint	720	360	3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
4/15/2015	Thornton Rd	S42-052	S42-051	8	307	VCP	3							24							$2,050.00			
								1		Moderate Multiple Fracture			3		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/15/2015	Douglas Rd	S52-059	S52-060	8	196	VCP	3							24							$265.00			
								160		Obstruction			4		Heavy Cleaning	1	HR	$265.00	$265.00			$0	$0.00	NO
4/15/2015	Berkshire Rd	S42-140	S52-075	8	144	VCP	3							24							$2,050.00			
								58		Hole			5		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/16/2015	Shady Lane Easement	S41-095	S41-094	8	99	AC	12							24							$11,000.00			
								45		Infiltration Runner at 2 taps	2,880	1,440	3		Replace Service Wye	2	EA	$5,500.00		$11,000.00		$40,341	$3.67	YES
4/16/2015	Shady Ln	S41-095	S42-096	8	140	AC	12							24							$2,500.00			
								32		Infiltration Runner at tap joint to pipe	360	180	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/16/2015	Dawson Dr	S42-034	S42-035	8	226	AC	12							24							$15,000.00			
								226		Infiltration Runner in bench	2,880	1,440	5		Replace Manhole	1	EA	$15,000.00	$15,000.00			$40,341	$2.69	YES
4/16/2015	Dawson Dr	S42-036	S42-037	8	251	AC	12							24							$5,500.00			
								68		Defective Tap			3		Included Below									
								68		Infiltration Runner at Tap connection to pipe	2,880	1,440	5		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$40,341	$7.33	YES
4/16/2015	Dawson Dr	S42-038	S42-039	8	146	PVC	12							24							$11,000.00			
								89		Defective Tap			3		Replace Service Wye (Included Below)									
								89		Infiltration Runner at Tap connection to pipe	2,880	1,440	5		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$40,341	$7.33	YES
								96		Defective Tap			3		Replace Service Wye (Included Below)									
								96		Infiltration Runner at Tap connection to pipe	10,080	5,040	5		Replace Service Wye	1	EA	$5,500.00		$5,500.00		$141,193	$25.67	YES
4/16/2015	Dawson Dr	S42-034	S42-096	8	140	AC	12							24							$2,500.00			
								11		Infiltration Runner at tap joint to pipe	360	180	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/16/2015	Dawson Dr	S42-042	S42-044	8	223	AC	12							24							$2,050.00			
								58		Moderate Multiple Fractures			3		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/16/2015	Dawson Dr	S42-035	S42-036	8	196	AC	12							24							$2,500.00			
								20		Defective Tap			2		Included Below									
								20		Infiltration Runner at Tap connection to pipe	1,440	720	4		Seal lateral	1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
4/17/2017	Dawson Dr	S41-098	S41-097	8	203	AC	12							24							$4,100.00			
								99		Broken			4		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								102		Broken			4		Point Repair, up to 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/17/2015	Dawson Dr	S41-098	S42-033	8	206	AC	12							24							$2,500.00			
								46		Defective tap			2		Included Below									
								46		Infiltration at tap connection to pipe	1,440	720	4		Seal lateral	1	EA	$2,500.00		$2,500.00		$20,170	$8.07	YES
4/17/2015	Jayne Rd	S17-084	S17-085	8	150	AC	13							24							$2,750.00			
								64		Infiltration Runner at joint	2,880	1,440	3		Point Repair, up to 12ft	1	EA	$2,750.00	$2,750.00			$40,341	$14.67	YES
								71		Hole			3		Included Above									
3/25/2015	Carter St	S02-059	S02-057	8	180	AC	13							25							$2,050.00			
								54		hole middle of pipe			5		point repair 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
3/25/2015	Reservoir Ave	S02-060	S02-061	8	134	AC	13							25							$5,500.00			
								133		Infiltration Runner at joint	4,320	2,160	4		Remove and Replace	1	EA	$5,500.00	$5,500.00			$60,511	$11.00	YES
3/31/2015	Central Ave	S02-047	S02-046	8	164	VCP	3							25							$2,050.00			
								49		Hole			4		Point Repair 4ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/1/2015	Reservoir St ROW	S02-089	S05-102	12	280	PVC	13							25							$5,500.00			
								170		Broken			5		Remove and Replace	1	EA	$5,500.00	$5,500.00			$0	$0.00	NO
4/9/2016	Laurel Dr	S50-067	S50-068	8	188	VCP	3							26							$2,050.00			
								26		Moderate Multiple Fractures			3		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								27		Moderate Hole			3		Included Above									
4/9/2016	Laurel Dr	S50-074	S50-075	8	401	VCP	3							26							$2,050.00			
								286		Minor Infiltration Dripper at joint	180	90	3		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
4/9/2016	Laurel Dr	S50-065	S50-077	8	119	VCP	3							26							$2,258.25			
								18		Heavy Root Ball at Joint			5		Chemical Root Treatment	119	LF	$1.75	$208.25			$0	$0.00	NO
								30		Heavy Root Ball at Joint			5		Chemical Root Treatment (Included Above)									
								30		Heavy Longitudinal Fracture			5		Point repair 4 ft (fracture may be longer than 4 ft, root ball in way)	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
								31		Heavy Multiple Fractures			4		Point repair 4 ft (fracture may be longer than 4 ft, root ball in way)									
								34		Heavy Root Ball at Joint (survey abandoned)			5		Chemical Root Treatment (Included Above)									
4/11/2016	Laurel Dr	S50-075	S50-076	8	144	VCP	3							26							$19,100.00			
								18		Minor Infiltration Dripper at joint	180	90	3		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								115		Moderate Infiltration Runner	720	360	3		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								144		Heavy Infiltration from service joint into Manhole	10,080	5,040	5		Replace manhole	1	EA	$15,000.00	$15,000.00			$141,193	$9.41	YES
4/11/2016	Laurel Dr Easement	S50-079	S50-080	8	182	VCP	3							26							$2,500.00			
								150		Defective Break In tap with Infiltration at joint	2,880	1,440	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$40,341	$16.14	YES
4/11/2016	Laurel Dr Easement	S50-076	S50-077	8	84	VCP	3							26							$2,197.00			
								14		Moderate Roots at Joint			3		Chemical Root Treatment	84	LF	$1.75	$147.00			$0	$0.00	NO
								17		Moderate Infiltration Dripper	180	90	3		Point Repair	1	EA	$2,050.00	$2,050.00			$2,521	$1.23	YES
								20		Rootball at joint can not pass (survey abandoned)			5		Chemical Root Treatment (Included Above)									

PROJECT NAME: INFILTRATION-INVESTIGATION
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Appendix G
Final CEA Recommendations

																	EST. REHAB COSTS				CEA	
DATE INSPECTED	LOCATION	FROM MANHOLE	TO MANHOLE	MAIN SIZE (IN)	PIPE LENGTH (FEET)	SEWER PIPE MATERIAL	JOINT SPACING (FEET)	DISTANCE TO DEFECT (FEET)	Found by BETA	DEFECT DESCRIPTION	OBSERVED Infiltration at Joint (GPD)	REMOVABLE I/I (GPD)	SCORING PTS/INCIDENT	SUB-AREA	RECOMMENDED REHAB METHOD	QUANTITY	UNITS	COST PER UNIT	SEWER REHAB COST	LATERAL REHAB COST	TOTAL REHAB COST	T&T COST	COST EFFECTIVE (T&T/REHAB $)	COST EFFECTIVE
5/16/2014	Abbott St	S29-022	S29-016	8	269	VCP	3							27							$2,400.00			
								85		Moderate chimney leak at service joint to main	720	360	3		lateral grout up to 5 ft	1	EA	$800.00		$800.00		$10,085	$12.61	YES
								203		Heavy Leak at service connection to main	2,660	1,330	4		lateral grout up to 5 ft	1	EA	$800.00		$800.00		$37,259	$46.57	YES
								215		Moderate chimney leak at service joint to main	1,880	940	3		lateral grout up to 5 ft	1	EA	$800.00		$800.00		$26,334	$32.92	YES
5/16/2014	Windfield St	S29-013	S29-014	8	158	VCP	3							27							$2,050.00			
								44		Moderate Multiple Fractures			3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
5/16/2014	Windfield St	S29-015	S29-016	8	164	VCP	3							27							$2,500.00			
								22		Minor Leak at service connection to main	180	90	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/16/2014	Ware Rd	S29-019	S29-018	8	322	VCP	3							27							$2,500.00			
								141		Leak at Service Connection to Main	180	90	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/16/2014	Ware Rd	S29-018	S29-017	8	72	VCP	3							27							$2,500.00			
								4		Leak at Service Connection to Main	180	90	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
5/16/2014	Abbott St	S29-021	S29-022	8	169	VCP	3							27							$2,500.00			
								147		Minor Leak at chimney service Joint to main	180	90	3		lateral grout up to 5 ft	1	EA	$2,500.00		$2,500.00		$2,521	$1.01	YES
4/11/2016	Rivard Rd	S39-078	S39-079	8	91	AC	13							28							$550.00			
								89		Moderate Infiltration Runner	2,880	1,440	3		Grout & patch MH bench, invert, and connection	1	EA	$550.00	$550.00			$40,341	$73.35	YES
4/30/2016	Tillotson Rd Easement	S21-121	S21-122	8	257	AC	13							29							$2,050.00			
								137		Moderate Muliple Fractures			4		Point repair 4 ft	1	EA	$2,050.00	$2,050.00			$10,085	$4.92	YES
								137		Moderate Infiltration Runner	720	360	4		Point repair (Included Above)									
4/30/2016	Tillotson Rd Easement	S21-123	S15-061	8	235	AC	13							29							$15,000.00			
								235		Heavy Infiltration Gusher on bench	7200	3600	5		Replace manhole	1	EA	$15,000.00	$15,000.00			$100,852	$6.72	YES
										Heavy Root Infiltration at Pipe Connection to Bench			5											
5/18/2015	South Street Easement	S59-019	S59-017	8	114	PVC	11							30							$550.00			
								114		Infiltration Runner at connection to MH s59-017	360	180	3		Grout pipe connection	1	EA	$550.00	$550.00			$5,043	$9.17	YES
4/17/2015	Webster St	S59-036	S59-034	8	261	AC	12							31							$2,050.00			
								4		Broken			3		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/17/2015	Fox Hill Rd	S59-037	S59-038	8	228	AC	12							31							$2,500.00			
								52		Infiltration from inside service	360	180	3		Seal lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
4/17/2015	Fox Hill Rd	S59-036	S59-035	8	207	AC	12							31							$2,050.00			
								51		Broken			5		Point Repair	1	EA	$2,050.00	$2,050.00			$5,043	$2.46	YES
								51		Infiltration Runner from hole	360	180	3		Point Repair (included above)									
3/26/2015	Highland Terrace	S11-47	S11-46	8	195	VCP	3							32							$2,050.00			
								63		Broken			4		Point Repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
3/31/2015	First Ave	S11-025	S11-024	12	307	VCP	3							32							$5,100.00			
								2		Multiple Moderate Fractures			4		Point Repair up to 4 ft	1	EA	$2,550.00	$2,550.00			$0	$0.00	NO
								47		Broken			4		Point Repair up to 4 ft	1	EA	$2,550.00	$2,550.00			$0	$0.00	NO
3/31/2015	First Ave	S11-022	S11-021	12	285	VCP	3							32							$2,550.00			
								141		Infiltration Runner	180	90	3		Point Repair up to 4 ft	1	EA	$2,550.00	$2,550.00			$2,521	$0.99	NO
4/1/2015	First Ave	S11-021	S11-021.1	12	118	VCP	3							32							$7,080.00			
								9		Moderate Multiple Fractures start			4		CIPP	118	LF	$60.00	$7,080.00			$10,085	$1.42	YES
								18		Moderate Multiple Fractures end			4		CIPP (Included Above)									
								80		Minor Longitudinal Fracture			2		CIPP (Included Above)									
								97		Infiltration runner at joint	720	360	4		CIPP (Included Above)									
															seal all laterals (0)	0	EA	$800.00						
4/2/2015	Cabot St	S11-042	S11-043	8	190	AC	5							32							$2,050.00			
								150		Hole			5		point repair up to 4 ft	1	EA	$2,050.00	$2,050.00			$0	$0.00	NO
4/8/2015	Charles St	S06-027	S06-026	8	292	AC	12							32							$2,500.00			
								96		Leaking Service	2160	1080	4		Seal Lateral	1	EA	$2,500.00		$2,500.00		$30,256	$12.10	YES
4/8/2015	Wexford St	S06-021	S06-020	8	307	AC	10							32							$2,500.00			
								123		Leaking Service	360	180	3		Seal Lateral	1	EA	$2,500.00		$2,500.00		$5,043	$2.02	YES
6/9/2016	Charles St ROW	S06-008	S06-007	12	89	VCP	3							32							$2,550.00			
								21		Infiltration Runner	1,440	720	4		Point Repair	1	EA	$2,550.00	$2,550.00			$20,170	$7.91	YES