

Sewer System Evaluation Survey (SSES) Infiltration Study



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EXECUTIVE SUMMARY

INTRODUCTION

The City of Portsmouth, New Hampshire (City) is a community of 16.8 square miles located along the Piscataqua River that was originally settled in 1623. Consequently, portions of the approximately 94 miles of the gravity sewer collection system are over 100 years old and have deteriorated over time. As a result of the City's aging infrastructure, the sanitary sewer collection system has areas that are structurally deficient and subject to high infiltration/inflow (I/I) rates due to condition and high groundwater. The City's wastewater needs are serviced by a combined (16 miles) and separated sanitary sewer (78 miles) collection system that flows to two separate facilities: the Peirce Island and Pease Wastewater Treatment Facilities (WWTF). The Pease WWTF serves the area known as Pease International Tradeport, while the Peirce Island WWTF serves the residents, businesses, and industrial areas of Portsmouth and Newcastle, NH. The Peirce Island WWTF currently has an average design flow of 4.8 million gallons per day (MGD) with plans to upgrade to 6.1 MGD average design flow.

In addition to the cost of treating clean groundwater and stormwater entering the collection system, the increased volume is contributing to operational problems such as surcharged pipes and manholes and more frequent discharges from combined sewer overflows (CSOs) in the collection system.

During the Spring of 2015, Woodard & Curran completed a wastewater metering study of the separated sanitary system that delineated sewer basins and measured each basin's wastewater flows. The results of this metering study were compiled into the City of Portsmouth Infiltration/Inflow Analysis dated 30 June 2016. As a result of the metering study, sewer basins were characterized as having excessive infiltration, inflow, or both. A total of 14 sewer basins accounting for 187,125 LF of sanitary sewer pipe were found to experience excessive infiltration. The purpose of this study is to investigate each sewer basin using standard Sewer System Evaluation Survey (SSES) techniques with the goal of locating sources of infiltration. The investigative techniques utilized were manhole inspections, flow isolation, and closed-circuit television (CCTV) sewer pipe inspection. This report will present recommended rehabilitation methods and associated construction costs to eliminate/reduce the amount of infiltration entering the City's collection system. During the course of the investigation structural defects (fractured or broken structures) were located and when severe enough, these defects were recommended for rehabilitation as well, even if infiltration was not observed at the time of CCTV inspection. Although, it may not be fiscally feasible to address all defects or remove all the I/I from the system, addressing the major structural defects and removing a significant volume of I/I can be achieved over the course of the phased plan and will reduce risk associated with the City's collection system. It should be noted that the plan to address active defects in the system may take several years and we recommend that the City continue to conduct a regular SSES/asset management/maintenance plan in parallel to keep the system operating effectively.

A total of nine sewer basins accounting for approximately 202,510 LF of sanitary sewer pipe were found to experience excessive inflow. To further determine the sources of inflow entering the wastewater collection system, the City of Portsmouth is conducting a Phase 2 I/I Study, Sewer System Evaluation Survey (SSES) Inflow Program. The program includes smoke testing of the sewer system to identify inflow sources, and home inspections to attempt to identify I/I sources from private property such as sump pumps. This memo discusses the field investigations and recommendations resulting from the smoke testing program, including a summary of pipe segments smoke tested, a summary of suspected sources, field sketches and photos of suspected sources, and the estimated inflow contribution from each identified source. The other task (house inspections) associated with the SSES Inflow Program has been presented in a separate document (Underwood Engineers Report dated June 2019).



FINDINGS FROM INVESTIGATIONS

From April-July of 2017, Woodard & Curran in conjunction with sub-consultants (Flow Assessment Services and Ted Berry Company) performed flow isolation, CCTV inspection, manhole inspections in the areas experiencing excessive infiltration. Woodard & Curran also partnered with Underwood Engineers (UE) to complete a detailed "Pilot Area" study in defined locations in the City that share public and private infrastructure. The result of this study showed that 90% of the I/I visually observed and estimated in these pilot areas originates from private laterals and therefore private infrastructure rehabilitation should be addressed. UE also completed a feasibility assessment that concluded that Woodlands Avenue Pump Stations and West Road Pump Station flow data could be used as an estimate for future I/I reduction in the area. Figure ES-1 – 2017 Field Investigation Summary illustrates fieldwork conducted by Woodard & Curran and sub-consultants in the City during the calendar year. Investigations revealed a varying degree of both structural and operational and maintenance (O&M) related defects throughout the collection system consistent with older New England municipalities. Table ES-1 – Summary of Sewer Infrastructure Investigations Findings shows the quantity of work completed and percentage of investigations resulting in rehabilitation recommendations. Measurements taken during springtime flow isolation of the City's sanitary sewer pipe showed that approximately 30% of the sanitary sewer investigated experienced high rates of infiltration (> 1,750 gallons per day per inch-diameter mile) and yielding as much as 913,000 gallons per day of groundwater entering the collection system. CCTV inspection of 46,066 linear feet (LF) of pipe located an estimated 140,400 gallons per day of infiltration entering the sewer system. Of the 428 manholes successfully inspected, approximately 143,136 gallons per day of infiltration was located.

As part of the scope of services, Woodard & Curran performed a review of existing CCTV data collected by City crews. The data consisted of manhole to manhole segments of at least 1,000 linear feet that had been investigated during high groundwater conditions. The results of this analysis were transmitted to the City in July 2017. A copy of this report is included as an Appendix to this report.

Investigation Activity	Type of I/I Sources and Defects Identified	Work Completed	% Defective or Additional Investigation
Flow Isolation	Infiltration	174,070 LF	30%
CCTV Inspection	Infiltration, Structural, and O&M Defects	33,359 LF	74%
Manhole Inspections	Infiltration, Structural, and O&M Defects	403 Manholes	40%
City Existing CCTV Review	Infiltration, Structural, and O&M Defects	14,500 LF	27%
Pilot Area Study	Infiltration, Structural, and O&M Defects	25 Manholes & 12,707 LF CCTV	0% & 9%
Smoke Testing	Inflow and Structural	186,570 LF	20% House Inspections
House Inspections	Private I/I	345 Buildings	8%

Table ES-1: Summary of Sewer Infrastructure Investigations Findings

RECOMMENDATIONS FOR FUTURE INVESTIGATION

During the SSES program, various potential I/I and structural/O&M defects could not be inspected for reasons including but not limited to: buried manhole covers, inability to locate a manhole, or intruding laterals in a pipeline. It is recommended that the City continue their infiltration study by completing the asset investigations outlined in Appendices A and B.



RECOMMENDATIONS FOR FUTURE REHABILITATION

The City's collection system is aging and requires rehabilitation and maintenance to reduce blockages or sanitary sewer overflows (SSOs) and maintain service to residents and businesses. As part of the 2017 SSES investigation, Woodard & Curran identified approximately \$1,890,000 in recommended collection system rehabilitation and improvements work. Of the total recommended rehabilitation, approximately \$1,240,000 is aimed at removal of infiltration. Woodard & Curran recommends that a 20% engineering fee and 30% contingency be included, resulting in a total estimated Program cost of \$2,957,000. A summary of estimated costs to rehabilitate all collection system defects identified during the 2017 SSES investigation is included in Table ES-2 – *Collection System Rehabilitation Summary of Costs*.

Investigation Type	Work Completed	Rehabilitation Recommendations	Infiltration Rehabilitation	Structural and O&M Rehabilitation	Total Estimated Cost
CCTV	32,329 ¹ LF	Infiltration, Structural, and O&M	\$880,000	\$300,000	\$1,180,000
Manhole Inspection	393 ¹ Manholes	Infiltration, Structural, and O&M	\$310,000	\$290,000	\$600,000
Pilot Area Study	24 Manholes & 12,000 LF CCTV	Infiltration, Structural, and O&M	\$10,000	\$20,000	\$30,000
City CCTV Review	14,500 LF CCTV	Infiltration, Structural, and O&M	\$35,000	\$40,000	\$75,000
Smoke Testing	37,871 LF	Inflow and Structural	\$312,000	\$0	\$312,000
Total Rehabilitation Cost:			\$1,550,000	\$650,000	\$2,200,000
Contingency (30%):			\$465,000	\$195,000	\$660,000
Engineering Cost (20%):			\$403,000	\$170,000	\$572,000
		Total Estimated Cost:	\$2,420,000	\$1,015,000	\$3,432,000

Table ES-2.	Collection System	m Rehabilitation	Summary of Co	sts
	CONCENION SYSTEM	II IXCHADIIItation	Summary of CO.	313

A prioritized database of each manhole and pipeline rehabilitation recommendation has been developed as part of this report and can be found in Section 4, as well as Appendices A and B. While it would be ideal to rehabilitate every collection system defect or infiltration source uncovered during the 2017 SSES investigations, the cost to perform this operation may be uneconomical, with reducing returns (in terms of infiltration removed from the system) for lower priority rehabilitation items. In order to mitigate the risk of future conveyance failures in the collection system, we recommend a phased sewer system rehabilitation program focused on addressing sources with the highest infiltration rate and most severe defects encountered during the SSES investigations while maintaining a database of the remaining defects for future rehabilitation consideration.

Table ES-3 summarizes the costs associated with the recommended plan, termed the Collection System Infiltration Removal Plan.

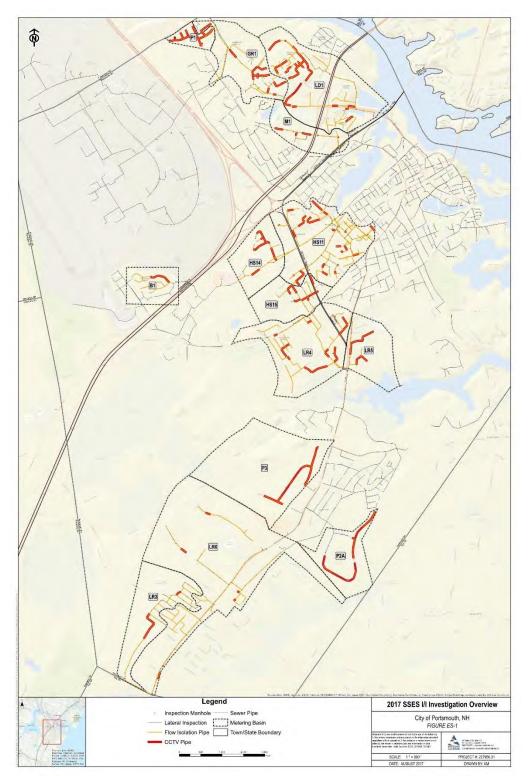


Phase	Contract #1	Contract #2	Contract #3	Contract #4	
Basins Included	LR3, LR4, LR6, GR1	HS11, LR5	LD1, B1, LR1, LR2	HS14, HS15, M1	Totals
Total Infiltration Observed	174,460	31,400	28,300	27,580	261,740
Infiltration Rehabilitation Cost	\$323,000	\$242,000	\$225,000	\$307,000	\$1,097,000
Inflow Rehabilitation Costs	\$35,000	\$165,000	\$97,000	\$15,000	\$312,000
Structural/O&M Rehabilitation Costs	\$63,000	\$163,000	\$63,000	\$105,000	\$394,000
Contingency Cost (30%)	\$127,000	\$171,000	\$116,000	\$129,000	\$543,000
Total Construction Cost	\$548,000	\$741,000	\$501,000	\$556,000	\$2,346,000
Engineering Costs (20%)	\$110,000	\$149,000	\$101,000	\$112,000	\$472,000
Total Estimated Contract Cost	\$658,000	\$890,000	\$602,000	\$668,000	\$2,818,000

Table ES-3: Collection System I/I Removal Plan Summary of Costs

The data from this report is incorporated in the City's existing GIS database. The database includes spatial and attribute data for both public and private wastewater infrastructure located within the City's jurisdiction. Through the field investigations completed as part of this study a few spatial updates can be incorporated into the database, allowing for an even more accurate representation. Much of the field data collected by Woodard & Curran and sub-consultants is digital and has been incorporated into ESRI accepted data (shapefiles, feature classes, etc.) that the City can use to inform and update their asset management programs.









1. PROJECT UNDERSTANDING

1.1 BACKGROUND

The City of Portsmouth, New Hampshire (City) is a community of 16.8 square miles located along the Piscataqua River that was originally settled in 1623. The gravity sewer collection system includes approximately 104 miles of pipe, and portions of the system are over 100 years old. As a result, portions of the collection system are structurally deficient and subject to high infiltration/inflow (I/I) rates due to age, condition, and location of the sewer system. The City's wastewater needs are serviced by a combined and separated sanitary sewer collection system that flows to two separate facilities: the Peirce Island and Pease Wastewater Treatment Facilities (WWTF). The Pease WWTF serves the area known as "Pease International Tradeport" while the Peirce Island WWTF serves the residents and businesses of Portsmouth and Newcastle, NH.

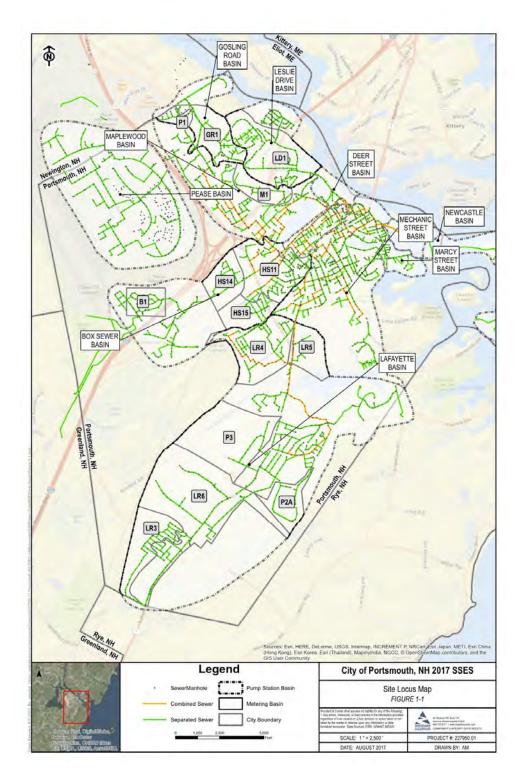
The collection system in the City utilizes an arrangement of combined (sanitary and stormwater) and separate sanitary pipe. Materials currently used in the systems to convey flow are vitrified clay (VC), brick, polyvinyl chloride (PVC), ductile iron (DI), cast iron (CI), high-density polyethylene (HDPE) pipe, reinforced concrete pipe (RCP), non-reinforced concrete pipe (Concrete), and asbestos cement (AC). Manholes in the City are typically mortared brick or precast concrete. The City's collection system consists of approximately 104 miles of sewer, siphon, and force main. Of this amount, approximately 86 miles is sanitary sewer and 18 miles is combined sewer. Within the City's limits, there is approximately 13 miles of private gravity and pressurized sewers. This study focuses only on the gravity sanitary sewer collection system. The combined system comprises is located mostly in the densely populated downtown region as shown in Figure 1-1 – *Site Locus Map*.

Treatment of sanitary wastewater occurs at the Peirce Island and Pease WWTF's. The Pease WWTF is located in the northwest part of the city and treats flows from Pease International Tradeport, an area comprised largely of industrial and commercial buildings. This facility has an average daily design flow of 1.2 MGD of wastewater and discharges effluent to the Piscataqua River. The Peirce Island WWTF is located on Peirce Island adjacent to Prescott Park and Downtown Portsmouth. This facility has an average daily design flow of 4.8 MGD of wastewater from the residential, commercial, and industrial properties of Portsmouth and Newcastle, NH outside of the Pease International Tradeport. The Peirce Island WWTF discharges to the Piscataqua River downstream Pease WWTF outfall. High volume or intense storm events, may cause wet weather flows to exceed the capacity of the collection system and/or treatment plant leading to the activation of the City's combined sewer overflows (CSOs). The City maintains a total of three CSOs, two of which are located on South Mill Pond adjacent to City Hall and the third is located adjacent to Granite State Minerals and discharges to the Piscataqua River.

In accordance with the City's Consent Decree, the City must provide secondary treatment at the Peirce Island WWTF and eliminate its remaining CSOs. As part of the EPA's Nine Minimum Controls Compliance Plan, it is recommended that the City eliminate inflow and infiltration when possible as part of their regular collection system repair and replacement procedures. The purpose of this study is to identify locations that contribute I/I to the City's collection sewer collection system. Once these areas are identified and evaluated, a systematic plan to address significant structural deficiencies and remove major infiltration and inflow (I/I) sources from the system will be developed. It is not fiscally feasible to address all defects and remove all I/I from the system, but addressing the major structural defects and removing a significant volume of I/I can be achieved over the course of the phased plan. It should be noted that the plan to address active defects in the system may take many years and we recommend that the City conduct a regular SSES/asset management/maintenance plan in parallel to keep the system operating effectively.









1.2 PROJECT FOCUS

Throughout this report, extraneous sewer flow from groundwater and stormwater, will be referred to as Infiltration and Inflow (I/I). Infiltration is generally defined as groundwater that enters the collection system through leaking pipes or manholes. Infiltration occurs when existing sewer lines experience material and/or joint degradation and deterioration. Infiltration also can occur when sewer lines are poorly designed and constructed.

Inflow is generally defined as stormwater or river water that enters the collection system directly through open manholes, manhole covers, frame seals or indirect connections with storm sewers.

As described in the *City of Portsmouth Infiltration/Inflow Analysis* (Woodard & Curran, 2016), pump station basins (i.e. areas of the City's sewer infrastructure that drain to a particular sewer pump station) were delineated into smaller "metering basins" that would allow for more precise investigation areas. In each basin, continuous depth-velocity flow meters were installed for a period of twelve weeks to estimate levels of I/I entering the sewer system. The metering program measured sanitary flow, infiltration, and inflow at the discharge manhole of each of these metering basins. Of the metering basins studied, 14 were identified for further infiltration study due to high infiltration rates. Table 1-1 shows the results from the *City of Portsmouth Infiltration/Inflow Analysis*. Sewer basins with high infiltration rates (>1,750 gallons per day per inch-diameter mile, gpd/idm) were studied during the Spring of 2017 (Study Period) and the resulting analysis and recommendations are described in this report. Figure 1-2 – Sewer System Metering Basins displays the metering basins investigated as part of the 2017 Infiltration Study.

Pump Station Basin	Metering Basin	High Inflow, High Infiltration, or Both	Estimated Infiltration Rate (based on 2015 metering), gpd/idm
Box	B1	Both	2,717
	HS14	High Infiltration	13,969
	HS15	Both	7,557
	HS11	Both	5,198
Maplewood	M1	High Infiltration	3,777
Gosling Road	P1	Both	5,612
	GR1	High Infiltration	4,308
Leslie Drive	LD1	Both	5,194
Lafayette Road	LR4	Both	4,106
	LR5	High Infiltration	7,524
	LR3	High Infiltration	3,842
	LR6	Both	5,806
	P2A ¹	High Infiltration	4,773 ¹
	P3	High Infiltration	6,573
Lafayette Road	LR1	High Inflow	N/A
	LR2	High Inflow	N/A
Box	HS12	N/A	Combined Area - Not Studied
Maplewood	HS13	N/A	Combined Area – Not Studied
Leslie Drive	P2	N/A	1,172

Table 1-1:	2015 Metering Results
	ZUTS MOLUTING RUSUILS

1. Private inflow area P2A was studied as part of this report and falls within metering basin LR2



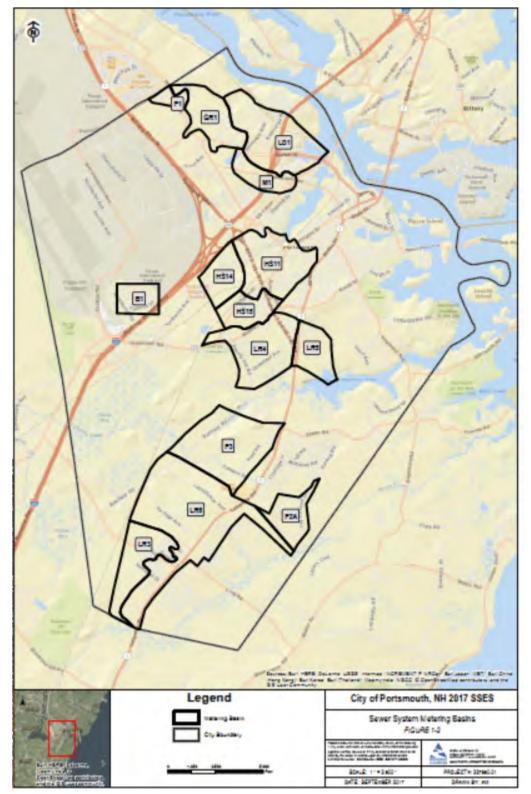
The purpose of this Sewer System Evaluation Survey (SSES) is to perform a comprehensive and systematic investigation of the City's sewer basins that were identified to experience excessive infiltration. Through this investigation structural and O&M related defects are located, prioritized, and recommended for rehabilitation to address specific deficiencies. At the conclusion of this report, each manhole and pipe segment will have its most significant defects listed with associated rehabilitation methods and estimated budgetary construction cost.

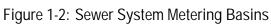
Through the successful removal of infiltration and inflow, peak flows (via high groundwater and rainfall-induced infiltration) to the City's pump stations and wastewater treatment facilities will be reduced. This will lead to decreased wear and tear of the City's mechanical equipment, chemical and energy usage, and SSOs and CSOs. The removal of infiltration an inflow may also lower the WWTF's 12-month rolling average flow. As shown in Table 1-2 – *SSES Investigations Techniques*, the field investigative procedures utilized to identify infiltration are flow isolation, Closed Circuit Television (CCTV) inspection, and manhole inspections. Figure 1-2 – *Sewer System Metering Basins* shows the locations in the City where the SSES was conducted, based on the results of the 2015 metering.

Investigation Activity	Type of I/I Sources and Defects Identified
Flow Isolation	Infiltration
CCTV Inspection	Infiltration, Structural, and O&M Defects
Manhole Inspections	Infiltration, Structural, and O&M Defects
Smoke Testing	Inflow, Structural
House Inspections	Private I/I

Table 1-2: SSES Investigation Techniques









1.3 CITY GEOGRAPHIC INFORMATION SYSTEM (GIS) COORDINATION

Woodard & Curran utilized the City's geographic information system (GIS) wastewater system database current as of April 26th, 2017, as a basis for this report. Field maps were created to guide investigation activities. Field data collected during the investigation phases as well recommendations for rehabilitation was successfully linked to the City's existing GIS and a geodatabase/shapefile were ultimately produced that spatially show findings. Many of the figures show the resulting data analysis performed by Woodard & Curran through the field work completed by Flow Assessment Services and Ted Berry Company. Variances between the City's GIS database and the sewer observed in the field (pipe diameter, locations, flow directions, etc.) were noted during field investigations and are provided in Appendix H: Sewer Map Revisions.



2. SEWER INFRASTRUCTURE INVESTIGATIONS

In addition to assessing infiltration in the areas of the City identified to experience excessive infiltration, field investigations were conducted to evaluate the structural integrity of the City's sewer infrastructure, and create an infrastructure database that allows the City to prioritize rehabilitation efforts in the immediate and long-term future. The following tasks were completed to locate structural and O&M related defects and quantify infiltration within the City's sewer system:

- Review of existing CCTV data
- Flow isolation
- CCTV inspection
- Manhole inspections

Table 2-1: Summary of Sewer Infrastructure Investigations

Investigation Activity	Type of I/I Sources and Defects Identified	Work Completed
Review of City's Existing CCTV data	Infiltration, Structural, and O&M Defects	14,500 LF
Flow Isolation	Infiltration	174,070 LF
CCTV Inspection	Infiltration, Structural, and O&M Defects	46,066 LF
Manhole Inspections	Infiltration, Structural, and O&M Defects	428 Manholes
Smoke Testing	Inflow, Structural	186,570 LF
House Inspections	Private I/I	345 Buildings

2.1 REVIEW OF EXISTING CCTV DATA

As part of the City's Infiltration and Inflow (I/I) program, the City of Portsmouth performs Closed Circuit Television (CCTV) inspection of gravity sewers throughout the City. A portion of these inspection videos were provided to Woodard & Curran for review as part of the Phase 2 Sanitary Sewer Evaluation Survey (SSES) program. Approximately 14,500 linear feet of sanitary sewer pipeline inspection was reviewed to determine the presence of I/I as well as structural defects within the sanitary sewage collection system. The *Sanitary Sewer Collection System DPW CCTV Inspection Results Technical Memorandum* dated 17 July 2017 is included in Appendix E of this report and summarizes the results of the review.

2.2 FLOW ISOLATION

2.2.1 DEVELOPMENT OF FLOW ISOLATION PROGRAM

Based on the flow metering program in the *City of Portsmouth Infiltration/Inflow Analysis*, the flow isolation program described herein was developed and implemented to further define sources of excessive infiltration within the City's separated sewer system. Flow isolation was conducted by Flow Assessment Services was conducted on sewer pipes during high groundwater periods from May 1st to July 26, 2017 to identify segments in the system that allow infiltration to enter the sewer and should be inspected in detail via sewer pipe CCTV inspection and surface manhole inspection. These sources can include cracked pipe, leaking joints, and service connections incorrectly connected to the sewer



pipe and manholes. Areas to be tested were scheduled with public safety officials and residents in advance to maximize awareness of the investigation.

Flow isolation was conducted on each scheduled manhole-to-manhole segment between the hours of 12:00 A.M. and 6:00 A.M on dry days during high groundwater levels. It is assumed that between these hours, sanitary flow from residential buildings is negligible and the majority of flow in the sewer system is infiltration. For each flow-isolated segment, a pre-calibrated weir was placed in the downstream end of the pipe segment to measure the depth and velocity of flow. The resulting flow rate is then mathematically compared against measured flows from sewer system upstream to calculate the "Net Line Flow" or the measured rate of infiltration for each flow isolation segment.

The flow rates calculated for each flow-isolated segment were normalized into units of gallons per day per inch-diameter mile (gpd/idm), allowing for the comparison of relative infiltration severity between different lengths and diameters of sewer pipe. The measured infiltration rates were compared to a benchmark value for excessive infiltration of 4,000 gpd/idm. Studies define this value as the infiltration rate at which the cost to transport and treat infiltration is greater than the cost to remove it from the system (i.e. the point at which rehabilitation is cost-effective). The recommended threshold of 4,000 gpd/idm was used as the benchmark to recommend pipe segments for CCTV inspection. As approved by the City the threshold was lowered to 1,750 gpd/idm to increase the quantity of sewer line segments to undergo CCTV inspection to locate additional infiltration sources.

All observations from flow isolation are entered into a Microsoft Excel and GIS database for review and analysis. This database is then used to develop recommendations for additional investigation such as CCTV, manhole inspections, or building inspections. This data can be imported into the City's GIS database.

2.2.2 FLOW ISOLATION FINDINGS

A total of 174,070 LF of sewer pipe was investigated, which is approximately 42% of the City's separated sewer system. The study successfully flow isolated 93% of the sanitary sewer system located in the basins identified for excessive infiltration during the *City of Portsmouth Infiltration/Inflow Analysis*. The flow isolation program identified approximately 913,000 gallons per day of possible infiltration entering the sewer system in the investigated areas that is the result of infiltration measured at three locations in the sanitary sewer system:

- Pipe Infiltration Infiltration originating from sewer pipes and service connections, as measured by precalibrated weirs. A total of 174,070 LF of sewer pipe was flow isolated during this phase of work.
- Manhole Defect Infiltration Infiltration originating from defects in the manhole structures, as estimated by visual observation.
- Manhole Service Infiltration Infiltration originating from direct service connections to manholes that are not considered to be city-owned mainline sewers, as measured by pre-calibrated weirs.

Based on the findings of the Flow Isolation work, 51,257 LF of sewer had measured infiltration rates greater than 1,750 gpd/idm or 30% of the sewer pipe flow isolated during this study. Sewer pipes that measured above 1,750 gpdidm accounted for approximately 630,000 gallons per day, while pipes experiencing less severe infiltration rates accounted for 56,000 gallons per day. Therefore, it can be reasoned that 90% of the infiltration due to sanitary sewer pipes is located in just 30% of the pipes. Visual observations of each manhole during flow isolation set up located a total of 37 manholes with active infiltration and 39 manholes with service connections that show active infiltration.

Figure 2-1: *Flow Isolation Results* illustrates sewer pipes investigated during the flow isolation program along with those pipe segments with infiltration rates in excess of 1,750, and 4,000 gpd/idm.



Table 2-2: *Flow Isolation Pipe Findings* summarizes observed infiltration rates associated with each sewer subarea. Raw data provided by Flow Assessment is included in Appendix C.

Table 2-3: *Flow Isolation Manhole Findings* summarizes observed infiltration rates located and measured during flow isolation. Although, typical flow isolation measurements only include infiltration located inside of the sewer pipe, Flow Assessment Services also separately documented infiltration occurring at the sanitary sewer manholes via field comments and photos.

Table 2-4: *Summary of Infiltration Measured during Flow Isolation* summarizes infiltration found at both the sewer pipes and sewer manholes during flow isolation per basin.

Meter Basin	Sewer System Flow Isolated (LF)	Sewer System Flow Isolated > 4000 gpd/idm (LF)	Sewer System Flow Isolated > 1750 gpd/idm (LF)	Total Observed Infiltration (gpd)
B1	4,800	111	951	6,120
GR1	14,558	2,910	4,330	65,909
HS11	28,298	3,494	7,984	88,488
HS14	6,139	2,209	3,167	39,240
HS15	7,306	1,923	3,820	35,712
LD1	26,214	7,447	12,011	129,067
LR3	12,143	1,626	1,626	54,072
LR4	19,510	3,692	5,894	80,208
LR5	5,186	1,857	2,902	23,184
LR6	27,334	982	1,415	64,224
M1	5,568	1,239	1,740	32,112
P1	6,926	3,146	4,649	59,198
P2A	5,134	134	767	8,568
P3	4,954	-	-	360
Total	174,070	30,769	51,257	686,462

Table 2.2.	Flow Isolation Pine Findings
Table Z-Z.	Flow Isolation Pipe Findings



				-	
Meter	Number of	Estimated	Number of	Estimated	Total Manhole
Basin	Manholes with	Manhole Defect	Manholes with	Service Flow	Infiltration
Dasiii	Infiltration	Infiltration (gpd)	Service Flow	Infiltration (gpd)	(gpd)
B1	1	720	-	-	720
GR1	4	34,704	5	11,376	46,080
HS11	5	11,088	7	24,192	35,280
HS14	-	-	2	504	504
HS15	3	2,592	2	2,160	4,752
LD1	7	9,000	9	11,016	20,016
LR3	-	-	-	-	-
LR4	10	23,328	4	9,720	33,048
LR5	-	-	1	2,880	2,880
LR6	2	7,560	8	70,920	78,480
M1	-	-	-	-	-
P1	4	2,520	1	1,440	3,960
P2A	-	-	-	-	-
P3	1	1,080	-	-	1,080
Total	37	92,592	39	134,208	226,800

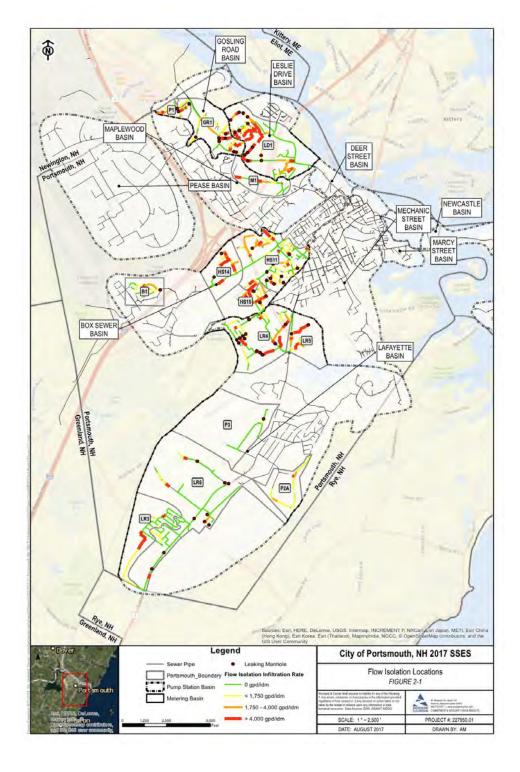
Table 2-3:	Flow Isolation Manhole Findings
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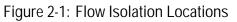
Table 2-4: Summary of Infiltration Measured During Flow Isolation

Meter	Pipe Infiltration	Manhole Defect	Manhole Service	Total Infiltration
Basin	(gpd)	Infiltration (gpd)	Infiltration (gpd)	(gpd)
B1	6,120	720	-	6,840
GR1	65,909	34,704	11,376	111,989
HS11	88,488	11,088	24,192	123,768
HS14	39,240	-	504	39,744
HS15	35,712	2,592	2,160	40,464
LD1	129,067	9,000	11,016	149,083
LR3	54,072	-	-	54,072
LR4	80,208	23,328	9,720	113,260
LR5	23,184	-	2,880	26,064
LR6	64,224	7,560	70,920	142,704
M1	32,112	-	-	32,112
P1	59,198	2,520	1,440	63,158
P2A	8,568	-	-	8,568
P3	360	1,080	-	1,440
Total	686,462	92,592	134,208	912,110

Flow isolation measurements and observations successfully located sewer pipes and manholes with excessive infiltration. The investigations following flow isolation, and described in the sections below, are aimed to locate, assess, and recommend rehabilitation for the specific defects that cause infiltration in the City's sanitary sewer system. Sewer pipe that was measured to have infiltration rates greater than 1,750 gpd/idm were recommended for CCTV inspection and manholes that were observed to have infiltration were recommended for surface manhole inspection.









2.3 SEWER PIPE CCTV INVESTIGATIONS

2.3.1 DEVELOPMENT OF CCTV INVESTIGATION PROGRAM

The CCTV investigation program described herein was developed and implemented to identify infiltration, assess structural condition, and locate defects causing operational issues in the City's sewer pipes.

CCTV inspections were concentrated in areas of the City with excessive infiltration as identified by the flow isolation program discussed in Section 2.2. The field CCTV investigation program was conducted by Ted Berry Company, Inc., under subcontract to Woodard & Curran, between March 30, 2017 and July 26, 2017 as well as September 12 & 13, 2017. Ted Berry inspected sewer pipes that were measured to have excessive infiltration (>1,750 gpd/idm). Therefore, of the 174,000 LF of sewer system flow isolation conducted, approximately 51,000 LF was scheduled for CCTV inspection.

All CCTV inspections were conducted in accordance with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP). Using NASSCO's pipeline assessment standards, sewer pipes are graded using a sum of the individual defects occurring within the manhole-to-manhole reach. Defects are ranked per NASSCO's standards on a scale of 1 through 5, with 1 defined as the most minor defect with no immediate action required and 5 defined as a major defect with immediate action required. For detailed information on the NASSCO grading system and guidelines, the NASSCO website can be accessed at https://www.nassco.org/.

2.3.2 CCTV INSPECTION FINDINGS

CCTV inspection revealed structural and O&M issues throughout the City's sewer system. A total of 46,066 LF of sewer pipe was successfully inspected, which is approximately 9% of the City's sewer system. Of the pipe investigated, CCTV inspection pinpointed infiltration defects as well as structural defects such as fractures and broken pipes as well as O&M issues such as grease and root intrusion. Structural damage such as collapsed pipes, or maintenance issues such as large root masses, can severely limit the hydraulic capacity of sewer pipes and cause backups or SSOs. Figure 2-2– *CCTV Inspection Locations* illustrates the locations of pipe segments that were inspected. All inspections were digitally recorded onto external hard drives and will be delivered to the Portsmouth Department of Public Works for incorporation into the City's GIS. CCTV inspection reports are included in Appendix D, and provide the following information for inspected pipe segments: unique pipe identification (ID) number, street name, inspection date, inspected length, pipe size and material, location of service connections, location and severity of defects, photos of pipe condition, and NASSCO ratings.

These reports, as well as the digital recordings of the inspections, were reviewed and analyzed by Woodard & Curran for accuracy regarding defects located during field inspection. Pipe defects were classified using the standard NASSCO coding system on a scale of 1 through 5 as described in Section 2.3.1. A summary of defects found throughout CCTV inspection can be found in Table 2-7 – *Summary of Pipeline Defects*. NASSCO pipe rankings are used as a tool to help prioritize pipe segments for future rehabilitation and can be incorporated into the City's risk analysis software VueWorks.

This report focuses on locating and quantifying infiltration in the City's sewer system and therefore, each pipe segment was evaluated for mainline and lateral infiltration. Table 2-5 – *Summary of Mainline and Lateral Infiltration* provides a breakdown of estimated infiltration observed during CCTV inspection per basin. Mainline infiltration is groundwater observed entering directly into the main sewer line via defects (e.g. fractures, holes, etc.) or leaking pipe joints; lateral infiltration is clear water observed flowing from laterals entering the main line. It is typical of lateral infiltration to appear at a constant flow rate, in contrast to the flush of a toilet or laundry system. Approximately 63,500 gpd of mainline



infiltration and 77,000 gpd of lateral infiltration were observed based on review of the CCTV inspections. CCTV inspection activities are summarized in Table 2-6 – *CCTV Investigation Summary by Pipe Diameter*.

Metering Basin	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Total Infiltration (gpd)
B1	-	2,016	2,016
GR1	15,120	4,320	19,440
HS11	3,024	20,160	23,184
HS14	1,728	4,032	5,760
HS15	5,328	4,608	9,936
LD1	5,184	15,984	21,168
LR3	5,760	-	5,760
LR4	12,528	7,344	19,872
LR5	720	-	720
LR6	12,240	720	12,960
M1	-	-	
P1	1,728	7,920	9,648
P2A	-	7,776	7,776
P3	-	1,872	1,872
Total:	63,360	77,040	140,112

 Table 2-5:
 Summary of Mainline and Lateral Infiltration

Table 2-6:	CCTV Investigation Summary by Pipe Diameter
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Metering Basin	6″	8"	10"	12"	>12"	Total
B1	0	759	0	0	0	759
GR1	1,140	942	460	0	0	2,542
HS11	203	4,031	930	1,007	0	6,171
HS14	0	1,480	213	575	393	2,661
HS15	0	2,478	677	290	0	3,445
LD1	1,195	4,672	893	0	0	6,760
LR3	0	234	1,417	0	0	1,650
LR4	0	4,349	1,303	0	0	5,652
LR5	0	495	804	0	0	1,299
LR6	0	1,458	0	0	0	1,458
M1	33	569	359	0	0	961
P1	108	2,643	683	217	0	3,651
P2A	0	5,047	0	0	0	5,047
P3	64	3,946	0	0	0	4,010
Total:	2,744	33,103	7,738	2,089	393	46,066



		Total
Category	Type of Defect	
		Count
Structural	Collapsed Pipe	2
Structural	Deformed Pipe	15
Structural	Broken Pipe	46
Structural	Hole	24
Structural	Fracture/Crack	219
Structural	Offset/Separated Joint	408
Structural	Other - STR	18
O&M	Infiltration	425
O&M	Grease	113
O&M	Roots	392
O&M	Debris	117
O&M	Protruding Lateral	92
O&M	Other - O&M	13
	Total	1884

Table 2.7.	Summary of Pipolino Defects
Table Z-7:	Summary of Pipeline Defects



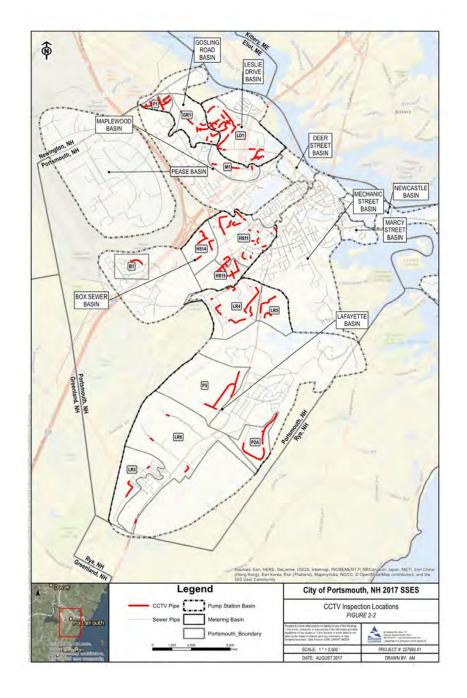


Figure 2-2: CCTV Inspection Locations



2.4 MANHOLE INSPECTIONS

2.4.1 DEVELOPMENT OF MANHOLE INSPECTION PROGRAM

Based on recommendations from the flow metering program included in the *City of Portsmouth Infiltration/Inflow* Analysis and the observations from the flow isolation study described above, the manhole inspection program described herein was developed and implemented to assess manhole condition, locate sources of infiltration and to identify structural defects and surcharged conditions in the City's sewer manholes. All manholes that were observed to have infiltration entering directly into the manhole during flow isolation were inspected via surface inspection during this phase.

Of the sewer basins that were metered during the spring of 2015, the following areas shown to have the highest I/I rates were selected for manhole investigation in 2017: GR1, LD1, HS11, LR3, LR6, LR5, HS14, HS15, M1, LR4, and B1. In these sewer basins, 96 manholes were inspected by Flow Assessment between May 22nd and May 26th of 2015 and consequently excluded from the 2017 field program that forms the basis of this report. Manhole Inspections were completed by Flow Assessment, under subcontract with Woodard & Curran, between June 20th and July 13th of 2017 as well as on September 8th, 2017.

During the inspection, Flow Assessment utilized the City's existing GIS database to identify sewer manholes as prescribed by Woodard & Curran. Each inspection consisted of a digital report, a surface photograph, and a "top-down" photograph looking into the manhole with the northern direction at the top of the photo. Manhole inspection data was compiled into a Microsoft Access database for reporting purposes. The data collected during each individual manhole inspections includes the following:

- Material and condition of manhole cover, frame, chimney, walls, invert and bench
- Inflow potential due to ponding or flooding
- Size, material, and location of pipe connections
- Evidence of surcharging
- Location of all observed leaks and defects
- Manhole depth

Material and condition of each manhole attribute (cover, frame, chimney, walls, invert, and bench) was graded on a 1-5 scale developed by Flow Assessment as presented in Table 2-8. The data collected during manhole inspections was organized into an electronic database to serve as a tool in prioritizing rehabilitation for each asset. Data collected during the manhole inspection process can be exported to the City's GIS database.

Grade	Description	Rehabilitation Recommendation
1	Good Condition	No Further Action Needed
2	Minor Defects Observed	No Immediate Action Needed No I/I Observed
3	Minor Defects or I/I Potential	Needs Attention or Rehabilitation
4	Significant Defects and or I/I	Corrective Action Should Be Scheduled in Near Future
5	Manhole or Connecting Pipes in Extremely Poor Condition	Failure Eminent, Needs Immediate Attention

	Table 2-8:	Manhole Condition Grading
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2.4.2 MANHOLE INSPECTION FINDINGS

Manhole inspections revealed structural and O&M issues throughout the City's sewer system access structures. Structural defects such as missing bricks, missing mortar, cracked walls, bench and invert defects can contribute to I/I and lead to manhole failure and create maintenance issues such as SSOs or roadway damage. A total of 490 manholes (or 13% of the City's sewer manholes) were scheduled for inspection and 428 were successfully inspected via surface inspection. Manholes that were not successfully inspected via surface inspection could either not be located (i.e. overgrown, buried, inaccessible) or could not be inspected (i.e. broken cover, manhole abandoned, cover too large to open per typical operation). Table 2-9 summarizes the manhole inspection program results by metering basin.

Metering Basin	Manholes Attempted	Surface Inspection Completed	Manhole Not Located	Manhole Cannot be Inspected
B1	5	5	0	0
GR1	64	52	11	1
HS11	88	66	16	6
HS14	26	26	0	0
HS15	30	25	5	0
LD1	33	25	5	3
LR3	55	52	3	0
LR4	22	21	1	0
LR5	29	23	6	0
LR6	73	72	0	1
M1	38	36	2	0
P1	0	0	0	0
P2A	27	25	2	0
P3	0	0	0	0
Total	490	428	51	11

			-
Table 2-9:	Manhole	Inspection	Summary
	marmore	inspection	Summary

Manholes that were successfully inspected via surface inspection were assessed for infiltration, structural defects, and operational and maintenance defects. During the inspection, as described above, each component of the manhole was assessed (on a scale of 1-5) in the field by Flow Assessment Services and confirmed by Woodard & Curran by desktop analysis for rehabilitation priority. Where desktop analysis identified defects not originally recorded during field inspection, rehabilitation is recommended. For example, if initial field inspection did not identify infiltration at a manhole joint, but review of the manhole photo located infiltration then the inspection database would be updated, and the manhole would be recommended for the necessary rehabilitation.

Infiltration at each manhole was estimated by Flow Assessment in the field during each surface inspection. Where manholes were identified to experience greater infiltration during flow isolation than during manhole inspection, the flow isolation observed infiltration rate is reported to represent worst case scenario.

Table 2-10 and 2-11 summarize manhole defects, the infiltration observed during manhole inspection as well as a count of manhole components that require rehabilitation based on field observation by Flow Assessment Services.



Table 2-10 provides a count of the defects located compared to the number of defects severe enough to require rehabilitation. For example, there were 105 manholes that were observed to have debris in the manhole, but only 71 manholes that are in imminent need of cleaning in order to reduce hydraulic restriction. The counts for the structural category reflect the logic described in Table 2-8. Rehabilitation was recommended for all observations of surcharge or infiltration.

Category	Type of Defect	# Defect Observations	# Observations Recommended for Rehabilitation
Structural	Cover	11	11
Structural	Frame	39	39
Structural	Corbel	129	129
Structural	Wall	108	108
Structural	Bench/Invert	147	86
O&M	Debris	105	71
O&M	Surcharge	11	11
O&M	Roots	27	14
1/1	Infiltration	74	74
Total:		651	541

Table 2-10: Summary of Manhole	Defects
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Table 2-11 provides a count of the manholes that showed infiltration in each meter basin. The total amount of manhole infiltration per metering basin is also summarized.

Metering Basin	Count of Manholes with Infiltration	Observed Infiltration Rate (gpd)
B1	1	720
GR1	18	53,496
HS11	16	14,904
HS14	5	4,248
HS15	6	4,320
LD1	4	5,760
LR3	3	6,048
LR4	7	40,680
LR5	3	864
LR6	8	11,088
M1	3	1,008
P1	0	-
P2A	0	-
P3	0	-
Total	74	143,136

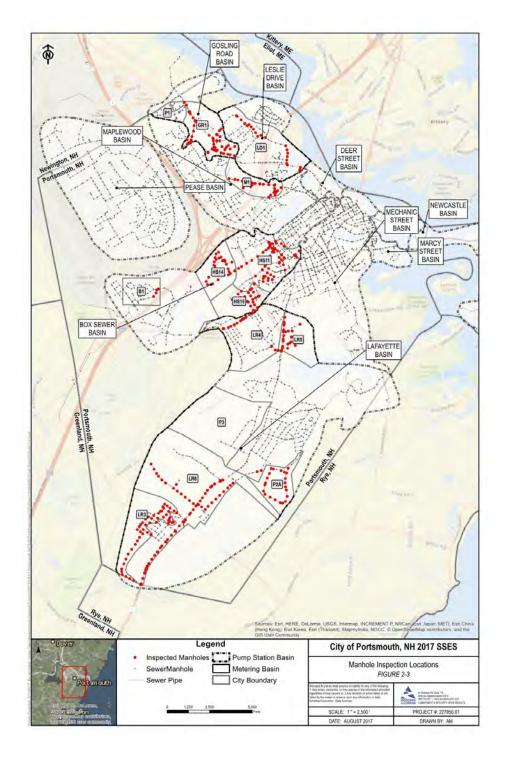
Table 2-11: Summary of Manhole Infiltration

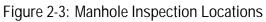


Manhole inspections identified 179 manholes with defects significant enough to warrant rehabilitation recommendations. Defects included broken manhole covers, missing mortar, missing bricks, infiltration, surcharge, settled debris, and root intrusion. A total of 249 manholes do not require rehabilitation.

Figure 2-3 – *Manhole Inspection Locations*. Of the 428 inspected manholes, approximately 74 manholes showed signs of infiltration during manhole inspection, totaling an estimated 143,136 gallons per day. Inspection reports are included in Appendix C.









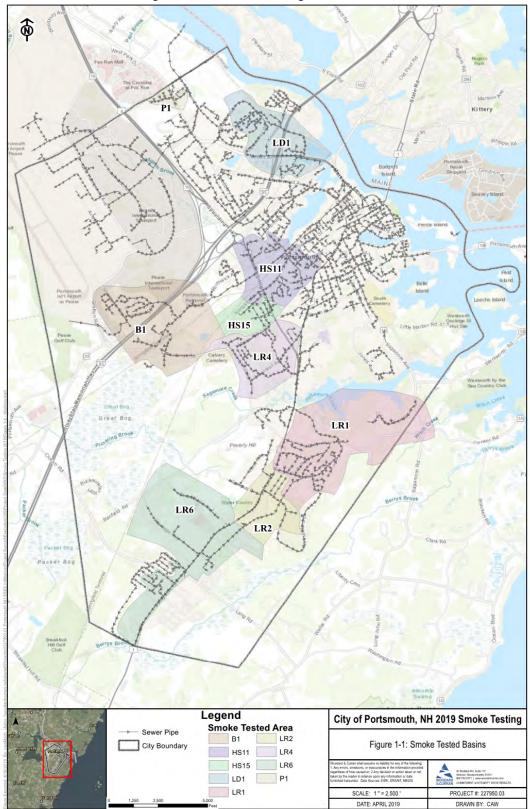
2.5 SMOKE TESTING

2.5.1 DEVELOPMENT OF THE SMOKE TESTING PROGRAM

As the first step in a comprehensive I/I – SSES Program, a flow metering program was conducted in the Spring of 2015 for the entire City of Portsmouth. The flow metering program identified subareas where infiltration and inflow are present in the system, prioritized the areas by the volume of infiltration and inflow identified, and recommended those subareas with excessive I/I for further study. Based on the recommendations from the flow metering program, the smoke testing program described herein was developed and implemented to address inflow sources within the sewer system.

The smoke testing program recommended in the 2015 I/I Report included the testing of approximately 202,510 linear feet of pipe in nine subareas of the wastewater collection system. These areas are shown in Figure 2-4. The field program was completed by Flow Assessment Services, LLC during the months of September and October 2018. Smoke testing is ideally conducted on sewer pipes during dry weather and low groundwater to identify points in the system that allow inflow to enter the sewer. These point sources can be cracked manhole covers, broken cleanouts, storm drains incorrectly connected to the sewer system, roof leaders, and yard drains.









A comprehensive public notification program was developed in conjunction with DPW, fire and police officials. Areas to be tested were scheduled with public safety officials and residents in advance to maximize awareness of the program. Residents were notified one week and 24-hours in advance of the work.

The smoke testing involved the introduction of a non-toxic smoke into the sewer system using a container of smokeproducing liquid and a blower. The smoke travels through the pipe and service connections, typically exiting through building vent stacks and from non-waterproof manhole covers. Where service cleanouts are broken; manholes have cover or corbel cracks; drains are directly connected to the sewer, etc. smoke will be observed exiting from them and these sources are easily identified as being potential contributors of inflow to the sewer system. In cases where smoke is emanating from drain structures, dye water testing and flooding of the suspect drain system can be used to verify the presence of an inflow-contributing source.

Table 2-12 presents a summary of the Smoke Testing Program showing the subareas recommended for smoke testing in the I/I Report, the actual length of sewers tested and the number of locations where smoke was observed. Observations are further broken down into those that were determined to be direct connections (heavy smoke indicating a direct link between the stormwater source and the wastewater collection system) or indirect connections (lighter smoke indicating a possible broken pipe or another path). Direct connections typically result in significantly higher volumes of inflow, and therefore are generally more cost effective to rehabilitate.

Area	Actual Footage of Smoke Testing Total (LF)	Footage of Smoke Testing with Defects	Number of Defects Identified	
		(LF)		
Subarea B1	25,413	4,363	3	
Subarea HS11	29,902	12,559	23	
Subarea HS15	6,814	2,594	1	
Subarea LD1	26,942	6,372	8	
Subarea LR1	34,050	4,541	9	
Subarea LR2	14,543	973	2	
Subarea LR4	19,506	2,433	4	
Subarea LR6	25,697	3,592	5	
Subarea P1	3,703	444	0	
Total	186,570	37,871	55	

2.5.2 ESTIMATED INFLOW VOLUME

Peak inflow was calculated for the flow metering program based on one inch of rain. This value is used to calculate the peak inflow quantity at each location identified as a potential source. The Rational Method is used to calculate peak inflow at each location in cubic feet per second, using the following formula:

Q = CiA

The values of C (runoff co-efficient) and A (in acres) were estimated in the field by Flow Assessment and are included in the attached Smoke Testing Report. The rainfall intensity (i) is the design storm intensity used to evaluate the metering results: 1 inch /hour for the storm's peak hour. Q (flow) is in cubic feet per second (cf/sec) and is converted to gallons per day (gpd). A summary of estimated inflow per subarea is presented in Table 1-2. Full details of each direct connection, such as location data, and pictures/sketches of the inflow source are included in Appendix B to this report.



2.5.3 FINDINGS OF THE SMOKE TESTING PROGRAM

The findings of the smoke testing program are summarized below by area. A full listing of all pipe segments and findings of the smoke testing program is included as Appendix A to this report.

2.5.3.1 Subarea B1

Smoke testing was conducted on 121 line sections in Subarea B1. Smoke was observed from three potential inflow sources in this subarea, all of which were on Greenland Road. One source was a direct connection to catch basin #2908 on Greenland Road. The second source is suspected to be a buried cleanout on Greenland Road, but the manhole could not be located. The third source was a broken cover, also located on Greenland Road. The catch basin is estimated to drain approximately 3,600 square feet (SF) resulting in approximately 2,000 gallons of inflow per inch of rain. The other sources are in unpaved areas and likely do not allow significant flows to enter the system It is recommended that the direct connection to catch basin #2908 be redirected. For the remaining direct connections, fixing the frames and covers is recommended. All inflow sources identified, regardless of the estimated drainage area, are recommended for repair.

2.5.3.2 Subarea HS11

Smoke testing was conducted on 171 line sections in Subarea HS11. Smoke was observed from 23 potential inflow sources in this subarea. Thirteen (13) of these sources were direct connections, including nine catch basins, two driveway drains, one roof leader, and a frame and cover which needs repairs. These sources are estimated to contribute approximately 53,000 gallons of inflow per inch of rain from the 7,300 SF drainage area. The remaining nine sources were classified as indirect sources. Recommended repairs for the direct connections include redirecting catch basin piping and repairing broken cleanout caps. It is recommended that indirect connections are monitored to track whether inflow problems increase.

2.5.3.3 Subarea HS15

Smoke testing was conducted on 29 line sections in Subarea HS15. Smoke was observed from one potential inflow source in this subarea. This source was a catch basin with a direct connection and is located on Middle Road. The catch basin is estimated to drain approximately 6,900 SF, resulting in approximately 2,200 gallons of inflow per inch of rain. This pipe segment is one of the largest drainage areas and highest flow contributors throughout the entire collection system that was evaluated and is recommended for repair.

2.5.3.4 Subarea LD1

Smoke testing was conducted on 152 line segments in Subarea LD1. Smoke was observed from eight potential inflow sources in this subarea. Six of these sources were direct connections, while two were indirect connections. Missing covers were observed on two of the seven potential direct inflow sources. Three of the direct connections were observed along Market Street, and showed smoke from the sidewalk, curb, and ground. The final direct connection was from a cracked, exposed chimney on an unmapped manhole located in the shoulder of Market Street. The flows contributed from these defects are minimal, contributing approximately 190 gallons of flow per inch of rain over a drainage area of approximately 1,000 SF. All direct connection inflow sources identified, regardless of the estimated drainage area, are recommended for repair.

2.5.3.5 Subarea LR1

Smoke testing was conducted on 153 line segments in the LR1 subarea. Smoke was observed from nine potential inflow sources. Seven of these sources were direct connections, while 2 were indirect connections. Five of the direct



connections are the result of broken infrastructure, such as corbels and covers, requiring the frames, covers and/or cleanouts of these connections to be repaired. The other two direct connections require redirecting a catch basin, and a yard drain. Combined, these two sources account for approximately 4,000 gallons of inflow from a drainage area of 11,200 SF. Redirecting the yard drain and catch basin at these locations is recommended. The indirection connections were attributed to catch basin connections, and monitoring is recommended for these areas. These sources do not have a large drainage area but do contribute significant flow. All inflow sources identified, regardless of the estimated drainage area, are recommended for repair.

2.5.3.6 Subarea LR2

Smoke testing was conducted on 63-line segments in the LR2 subarea. Smoke was observed from two potential inflow sources. The first potential source is a direct source, due to a missing cap from an at grade cleanout. The other source is an indirect connection between catch basins indicating the potential for a cracked pipe. The drainage areas and peak hourly inflow for the sources are minimal.

2.5.3.7 Subarea P1

Smoke testing was conducted for 21-line segments in the P1 subarea. No smoke was observed from any of these pipe segments

Area	Footage of Smoke Testing with Defects (LF)	Number of Locations with Direct Connections	Number of Locations with Indirect Connections	Estimated Inflow per Inch of Precipitation (gallons)
Subarea B1	4,363	3	0	2,000
Subarea HS11	12,559	13	10	53,300
Subarea HS15	2,594	1	0	2,200
Subarea LD1	6,372	6	2	200
Subarea LR1	4,541	7	2	4,100
Subarea LR2	973	1	1	<100
Subarea LR4	2,433	3	1	1,000
Subarea LR6	3,592	5	0	<100
Subarea P1	444	0	0	0
Total	37,871	39	16	62,000

Table 2-13: Estimated Inflow Summary



2.5.3.8 Conclusions and Recommendations

The results show that Subareas B1, HS11, LR1, and HS15 contribute the most amount of inflow to the overall collection system. In addition to contributing the most inflow, approximately 53,300 gallons per inch of precipitation, subarea HS11 also has the highest number of defects identified (22). This area accounts for approximately 85% of the total estimated inflow and should be prioritized for the repairs that were discussed previously in the report. The next highest contributor, LR1, contributes approximately as much flow as B1 and HS15 combined. Addressing these three areas, which account for approximately 92% of the remaining flow, should be completed once subarea HS11 has been addressed. Targeting all four of these areas first will address 98% of the total estimated inflow.

It is recommended that repairs be made to all direct sources identified herein, because addressing these direct sources is more cost-effective for the City than attempting to address every identified defect. The indirect sources identified during the smoke testing were all estimated to contribute minor volumes of inflow to the system compared to other sources identified. These sources did not warrant further testing by dye testing or flooding due to their limited impact. Instead, we recommend that the City continue to monitor these locations to confirm that conditions which contribute to inflow are not deteriorating and causing additional inflow and/or structural issues with the pipe or roadway.

The estimated cost to rehabilitate each of the inflow sources identified is based on typical efforts required to redirect an inflow source from the wastewater collection system to a storm drain. We have used the following estimated costs to calculate the costs listed in Table 1-3: Redirecting a catch basin was estimated to cost \$15,000. Redirecting a driveway drain, roof leader, or repairing a frame and cover was estimated to cost \$7,500. Repairing a cleanout cap was estimated to be \$1,000 and monitoring for indirect sources was estimated at \$0. All repair costs were calculated based on the type of repair, and then totaled for each subarea, resulting in a total estimated cost to redirect inflow. However, each inflow source will vary and the cost to rehabilitate is highly dependent on the proximity of the closest storm drain line. These cost estimates should be used for planning level purposes only. A more detailed analysis of the remediation required, and construction cost estimate to redirect flows can be developed on a case-by-case basis in the design phase.

A summary of the construction cost to redirect the direct inflow sources by subarea, and the cost-effectiveness of the work is included as Table 2-14. A summary of the types of defects found in each subarea is shown in Table 2-15.

Area	Number of Direct Connection Defects Identified	Number of CB redirections	Number of DD/RL relocations	Number of F&C repairs	Number of Cleanout repairs	Estimated Inflow per Inch of Precipitation (gallons)	Estimated Cost to Redirect Inflow	Cost per Gallon of Inflow Removed
Subarea B1	3	1	0	0	2	2,000	\$17,000	\$8.34
Subarea HS11	13	9	3	1	0	53,300	\$165,000	\$3.10
Subarea HS15	1	1	0	0	0	2,200	\$15,000	\$6.75
Subarea LD1	6	0	0	3	3	200	\$25,500	\$132.65
Subarea LR1	7	1	1	4	1	4,100	\$53,500	\$13.10
Subarea LR2	1	0	0	0	1	<100	\$1,000	\$118.85
Subarea LR4	3	1	0	1	1	1,000	\$17,000	\$17.85
Subarea LR6	5	0	1	1	3	<100	\$18,000	\$3208.55
Subarea P1	0	0	0	0	0	0	0	0
Total	39	13	5	10	11	63,000	\$312,000	\$5.00

Table 2-14: Estimated Rehabilitation Cost – Direct Sources



Area	Re-direct Catch Basin	Re-direct Roof Leader	Re-direct Driveway/ Yard Drain	Repair Cleanout Cap	Replace Frame & Cover	Monitor (indirect source)	Repair Manhole
Subarea B1	1	0	0	2	0	0	0
Subarea HS11	9	1	2	0	1	10	0
Subarea HS15	1	0	0	0	0	0	0
Subarea LD1	0	0	0	3	3	2	0
Subarea LR1	1	0	1	1	4	2	0
Subarea LR2	0	0	0	1	0	1	0
Subarea LR4	1	0	0	1	0	1	1
Subarea LR6	0	0	1	3	1	0	0
Subarea P1	0	0	0	0	0	0	0
Total	13	1	4	11	9	16	1

Table 2-15: Types of Defects Found by Subarea



2.6 BUILDING INSPECTIONS

Building Inspections were conducted in three "pilot areas" where previous investigations had concluded that significant volume of I/I was coming from private sources rather than defects in the City-owned infrastructure. Building inspections were conducted by Flow Assessment Services, Inc. in January and February 2019. The building inspections targeted 345 buildings. Flow Assessment's crews made up to three attempts to gain entry to each building in the study area. However, some residents did not respond to attempts to schedule an inspection or denied access to their property for the inspection. Field crews were successful in accessing 75% of the buildings. Of the completed inspections, approximately 8% of the buildings had a sump pump connected to the sanitary sewer. The results of these inspections are summarized below:

Area	Building Units	Inspections	Buildings with	Buildings with Sump Pump
		Completed	Sump Pump	Connected to Sewer
Wedgewood	134	127 (95%)	9 (7%)	6 (5%)
Woodlands	87	53 (61%)	35 (66%)	7 (13%)
Lincoln	124	80 (65%)	53 (66%)	9 (12%)

Infiltration and Inflow from private sources is the responsibility of the property owner and does not necessarily result in recommendations for capital improvements to be conducted by the City. Additional information related to the Building Inspections and recommendations for actions to address the findings is included in the Underwood Engineers Report dated August 2019, included as Appendix G.



2.7 SEWER INVESTIGATIONS SUMMARY

Sewer system investigations completed included flow isolation, CCTV pipe inspections, surface manhole inspections, smoke testing, and manhole inspections. Flow isolation investigations were conducted between April and June 2017, CCTV investigations were conducted between April and September of 2017, and surface manhole inspections were completed during the month of June and September of 2017. Smoke Testing was conducted in September and October 2018. House Inspections took place in January and February 2019.

The results of each type of investigation completed during 2017 are shown in Table 2-17 – *Summary of 2017 Sewer Infrastructure Investigations Findings*.

	5	•	e
Investigation Activity	Investigation Duration	Type of I/I Sources and Defects Identified	Work Completed
Flow Isolation	May 19 – June 9	Infiltration	174,070 LF
CCTV Inspection	May 22 – July 26, September 8	Infiltration, Structural, and O&M Defects	46,066 LF
Manhole Inspections	June 20 – July 13, September 12 & 13	Infiltration, Structural, and O&M Defects	428 Manholes
Smoke Testing	September & October 2018	Inflow & Structural	186,570 LF
Building Inspections	January & February 2019	Private I/I	345 Buildings

Table 2-17: Summary of Sewer Infrastructure Investigations Findings

Field inspections were related to structural and O&M defects rather than I/I, although both issues are intrinsically intertwined. Addressing structural and O&M issues will reduce infiltration and exfiltration from pipe segments and manholes; improve the hydraulic function of the collection system; and reduce the likelihood of emergencies such as pipe collapses, sinkholes, and SSOs.

It may not be feasible to remove all collection system defects or I/I from the system, but by utilizing best practices for rehabilitation, an appropriate level of infiltration removal can be achieved over the course of a phased plan. It should be noted that the plan to address active defects in the system may take several years and Woodard & Curran recommends that the City continue regular SSES/asset management/maintenance plan in parallel with future rehabilitation to keep the system operating effectively. Specific rehabilitation recommendations, along with discussions of prioritization and cost effectiveness, are included in Section 4.

2.8 ENVIRONMENTAL MONITORING

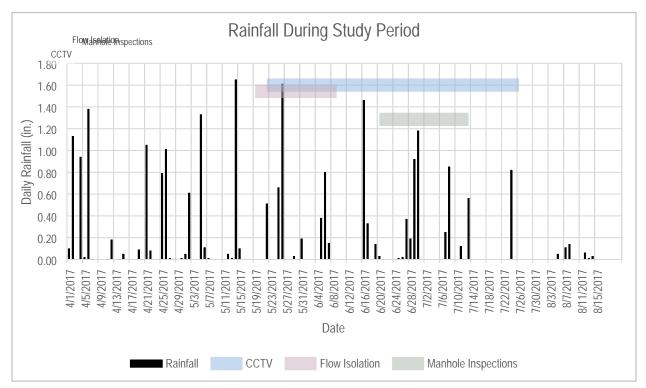
Throughout the duration of the field efforts completed during the Spring/Summer of 2017, various environmental factors were monitored. Groundwater gauging and rainfall data was monitored to provide context to the sewer investigations and to better understand or explain data trends or anomalies that may exist. For example, did the presence of rainfall increase flows during CCTV inspection? How did the groundwater elevation influence flow isolation results?

2.8.1 RAINFALL MONITORING

Woodard & Curran utilized the City's two permanent rain gauges to measure rainfall during the study period. The City's two rain gauges are located at Portsmouth City Hall and the Lafayette Road Pump Station. The City Hall rain gauge is a tipping bucket system by Nova Lynx and the Lafayette Road Pump Station gauge is similar by Hach Inc.



During the study period, a total of 23-inches of rainfall occurred over approximately 19 storm events. Figure 2-5 shows the measured rainfall over the course of the study period. All flow isolation activities were restricted to dry-weather, defined by at least 24 hours of dry weather following a rainfall of 0.5 inches or greater to mitigate any inflow impacts. For example, during the period of May 25-27, approximately 2.3 inches of rain fell, and flow isolation activities were halted until a dry period of 24 hours had passed. Where rainfall occurred in lesser intensities (<0.5-inches/event), flow isolation was completed under the standard operating procedure. No infiltration investigations were scheduled during rain events.





2.8.2 GROUNDWATER MONITORING WELL READINGS

Groundwater levels were monitored at several sites for the duration of the field investigations to gauge groundwater levels in the sewered areas. Groundwater elevations can fluctuate throughout the year and are estimated to be at the highest point during the springtime and gradually recede when temperatures rise during the summer. In order to measure peak infiltration rates, it is important to understand the elevation of the groundwater relative to the sewer system. In general, higher groundwater elevation leads to increased infiltration rates as the hydrostatic pressure surrounding the sewer system increases. Lower infiltration rates will be observed when the groundwater recedes below the level of the sewer system. Five groundwater monitoring wells were used for the study. The wells were located at the Woodlands 2 Pump Station, the Griffin Road Pump Station, and three wells located within the Peverly Hill Road DPW Yard.

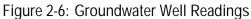
Table 2-18 presents information on each well, including location, well depth, and elevation at top of pipe. Wells were monitored on a weekly basis and the depth to groundwater recorded. The wells were located in several geographic locations in the City to approximate overall groundwater levels for the metered areas. Griffin Road PS is in the west central area, Woodlands PS is located in the southeast area of the City while DPW-1, 2, and 3 are located in the east central area at the DPW Facility on Peverly Hill Road.



Well ID	Location	Metering Basin	Depth of Well (ft.)	Top of Pipe Elevation (ft.)
Griffin Road	Griffin Road Pump Station	B1	14.8	39.99
Woodlands	Woodlands 2 Pump Station (F.W Hartford Drive)	P2A	11.0	39.42
DPW-1	Peverly Hill Road (new DPW site)	P3	30.4	59.47
DPW-2	Peverly Hill Road (new DPW site)	P3	25.4	57.79
DPW-3	Peverly Hill Road (new DPW site)	P3	32.8	55.86

Figure 2-6 shows a plot of the groundwater elevation for each well over the study period. Groundwater elevations at the Griffin Road PS well rose steadily from late April to mid-May to an elevation of 34.4-feet, then receded steadily through the remainder of the study period to an elevation of 33.2-feet. Woodlands PS remained fairly constant at near 36-feet throughout the study period. Levels at DPW-1, 2, and 3 peaked at 35.9-feet around May 8th then receded steadily throughout the study period to a level of 34.2-feet. Groundwater levels remained were highest near the beginning of the field investigations (for flow isolation) and receded during the end of the field investigations (for portions of the CCTV and manhole investigations). This corresponded to varying levels of infiltration rates observed – flow isolation measured more infiltration more than what was observed during the corresponding later-season CCTV investigation due to lower groundwater elevations and smaller inspected quantities. Although it would be optimal to perform CCTV inspection during the highest recorded groundwater elevation in order to maximum observed infiltration, it was not possible for the entirety of this study due to scheduling and warm-dry weather.







Flow isolation measured approximately 913,000 gpd, while CCTV inspection and MH inspection located 140,400 gpd and 143,000 gpd respectively). Woodard & Curran concludes that the disparity between infiltration measured during flow isolation and infiltration observed during CCTV pipe inspection and surface manhole inspections can be attributed to the following:

- Seasonal and yearly variation of the groundwater table
- Groundwater lowering during the study period
- Presence of sump pumps not identified during mainline CCTV inspection
- CCTV and MH inspections only comprising a partial record of all of the infrastructure within a sewer basin
- Areas near salt marshes may be tidally influenced in addition to typical groundwater fluctuations.

Lowering groundwater during flow isolation and CCTV inspections is expected as work progresses during the spring. Accordingly, it is likely that infiltration rates from sources identified later in the work period could be somewhat higher at times of high groundwater as compared with the observed rate during CCTV inspection. However, this is typical for these studies and should not significantly impact the findings of this report.



3. DESKTOP INVESTIGATIONS, PILOT STUDY, AND SEWER REPAIRS

3.1 REVIEW OF EXISTING CCTV DATA

The City has dedicated staff and resources to perform CCTV inspection of their sewer system. As part of the project scope, Woodard and Curran reviewed CCTV video of manhole-to-manhole segments of approximately 1,000 linear feet of sewer pipe that had been completed by City staff during estimated high groundwater conditions (March-May). A Technical Memorandum discussing recommended sewer rehabilitation based on the review of these CCTV videos was prepared and is attached as Appendix E. It is recommended that approximately 3,784 LF of sewer should be rehabilitated in order to remove the risk of structural failure, infiltration, and O&M related problems at an estimated construction cost of \$240,000. The total amount of infiltration identified was 14,000 gpd during observations.

3.2 PILOT AREAS STUDY

Underwood Engineers completed a detailed infiltration study of the pilot areas P1, P2A, and P3 as recommended in the 2016 I/I Study. Flow isolation, CCTV inspection of mainline and sewer laterals, and MH inspections were completed. Detailed findings and recommendations from these investigations can be found in Appendix F. The study found that infiltration in these areas is a result of leaking laterals. However, it is likely that excessive flow in these areas is from inflow and rain-induced infiltration rather than seasonal high groundwater. The study found that approximately 90% of the I/I in Pilot Areas 1, 2A and 3 originated from private laterals and concluded that private source I/I must be addressed for effective I/I reductions in these areas to be realized. Recommendations for further investigations in the Pilot Areas are summarized in Table 3-1.

Recommendation	Number	Pilot Area/Location	Comment
Pilot Area Building Inspections	300	1 [*] , 2A and Drainage Problem Areas	With public education mailer
Smoke Testing	6,926 LF	1	
Perform point repairs	5	1 and 3	
Clear main line blockage	1	1	
Monitor main line deformations	5	2A and 3	Repair if required
Evaluate/update Sewer Ordinance to address private I/I	NA	NA	
Develop private I/I mitigation	NA	NA	
program			

Table 3-1:	Summary of Pilot Area Recommendations
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*Excluding manufactured homes within Oriental Gardens

The building inspections; mailer; smoke testing; and sewer ordinance review and updating; and I/I mitigation program are included in the scope of work for the upcoming SSES Inflow Program.

Overall cost and recommendations have been added to the Summary of Recommendations table in Section 4.5.

3.3 SEWER ORDINANCE REVIEW

As part of the scope of work for this study, the City's existing Sewer Use Ordinances were reviewed and compared with current best practices and recommendations from the New Hampshire Department of Environmental Services (NHDES). This review resulted in several recommendations to update the ordinances, to address private I/I sources, facilitate enforcement of the ordinances by the City, and update the ordinances to comply with NHDES recommendations. These proposed modifications are summarized in the Underwood Engineers report dated August 2019, included as Appendix G to this report



3.4 SEWER CLEANING AND REPAIRS

Under subcontract to Woodard & Curran, Ted Berry Company was responsible for the CCTV inspection of sewer pipe. However, Ted Berry was not initially contracted to perform rehabilitation on sewer pipes that were deemed too full of debris to inspect or other blockages due to pipe condition (e.g. excessive root growth, protruding services, and highwater level.) Defects of this type may reduce the hydraulic capacity of pipes and do not allow for effective inspection. To facilitate the ongoing investigations and reduce future issues, coordination between the City and Ted Berry Company led to the cutting of protruding services under contract to the City. This coordination made the completion of CCTV inspection of pipes that were, at their existing condition, not possible to complete.

Segments that were previously inaccessible due to protruding laterals were repaired to facilitate CCTV investigation. Three pipe segments were repaired and are listed in Table 3-2.

Pipe SewerID	US MH	DS MH	Street	Quantity
327	1412	1413	Boyd Road	1
1327	2240	2239	Cottage Street	1
837	767	769	Maplewood Avenue	2
		4		

Six other locations were recommended by Woodard & Curran to Ted Berry for protruding service cutting, but could not be completed due to parked cars or heavy debris (Wedgewood Road, Boyd Street Off Ramp at US 1B, Bartlett Street, Easement off Woodbury Avenue, and Oriental Gardens).



4. RECOMMENDATIONS

The field investigations conducted revealed sewer infrastructure defects varying from minor roots and grease to severe fractures and broken pipe that requires short-term priority rehabilitation. Infiltration was located, quantified, and recommended for rehabilitation.

Utilizing CCTV pipeline inspection and surface manhole inspection, a prioritized database of each rehabilitation recommendation has been developed as part of this report. The recommendations are prioritized by infiltration removal, max defect score, and basin in Appendix A & B. I/I issues discovered during flow isolation, CCTV investigation, manhole inspections, and smoke testing were evaluated using a cost-effective analysis to determine the extent of infiltration removal per dollar spent on repair.

4.1 REHABILITATION PRIORITY

Identifying assets in the greatest need of rehabilitation is a challenging task that takes into consideration several factors including but not limited to: severity of defect, quantity of infiltration, and rehabilitation cost. The condition of Portsmouth's collection system will continue to deteriorate with time. The rate and extent of collection system degradation is dependent upon several factors including, age, pipe material, soundness of original construction, concentration of wastewater constituents, type and duration of external loading, surrounding soils and internal flow geometry. Addressing the defects found during CCTV inspection and manhole inspection will assist the City in both reducing I/I flows in the sewer system and removing risk of failure. Removing I/I from the collection system will benefit the City by improved collection system performance, reduced treatment and transport costs, assistance in maintaining wastewater discharge at the mandated limits, extending the service life of its sewer assets, and reducing operational costs.

Review of CCTV footage was performed using the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) condition scoring. The PACP scoring is a nationally recognized condition grading system utilized to rank structural and operational/maintenance defects. The assessment performed by Ted Berry was graded in PACP format. The overall scoring was used to reflect the highest of the peak scores and develop rehabilitation recommendations.

Using the PACP condition grade and type(s) of defects, recommendations for rehabilitation were made using the 0-5 scale where 0 typically indicates no action required and 5 indicates a priority repair should be made. Based on the review of the CCTV inspections, recommendations were developed to address any defects found in each pipe segment. The recommended repair method was selected based on the type of defect found and the severity of the defect, as well as the overall condition of the pipe segment.

In an effort to effectively reduce I/I flows to the sewer system, it is recommended that rehabilitation be completed in a systematic fashion where the highest intensity of infiltration is removed first. The movement of groundwater near the City's sewer assets is hard to predict, however it is recommended that sewer rehabilitation be completed in lengths of >1,000 LF in order to eliminate or reduce groundwater migration from a rehabilitated area to a non-rehabilitated area. With this taken into account, the rehabilitation recommendations described in Appendix A have been organized by metering basin first, street second, and defect score third, in order to consolidate assets in the greatest need of rehabilitation by location. Prioritizing rehabilitation in such a fashion typically reduces mobilization costs during construction and produces the best overall reduction in I/I.



4.2 COST EFFECTIVE ANALYSIS

To prioritize I/I rehabilitation, a cost-effective analysis was performed on each pipe segment to compare cost to rehabilitate a pipe segment to the I/I reduction achieved from the associated repairs. To create a relative comparison between amongst pipes of differing repair costs and infiltration severity, a ratio was developed which related the annual quantity of infiltration entering a pipe segment to the cost of rehabilitation and is expressed in dollars spent per gallon per day removed. For the purposes of this system, removal of the infiltration is estimated at 100%. This metric has been included on the rehabilitation recommendations found in Appendix A and B.

4.3 RECOMMENDATIONS FROM SEWER INVESTIGATIONS

4.3.1 CCTV INSPECTION RESULTS

Over 51% of sewer pipes inspected had issues warranting rehabilitation recommendations to prevent hydraulic failures, reduce I/I into the sewer system, or improve O&M activities. The City should also continue to monitor the remaining pipes that did not show defects requiring rehabilitation.

Observations from the CCTV inspection were entered into a database for review and analysis. This database was used to develop rehabilitation recommendations as described below:

Clean: High pressure water wash is recommended for pipe segments exhibiting significant debris and build-up for a pipe segment.

Complete CCTV: High pressure water wash is recommended for pipe segments exhibiting significant debris and build-up, and/or pipe segments that could not be fully inspected during the initial SSES fieldwork and a recommendation could not be recommended.

Locate Manhole: CCTV is recommended for pipe segments that could not be fully inspected during the initial SSES fieldwork. Segments recommended for cleaning are also to be CCTV inspected to identify potential deficiencies.

Inspect Lateral: Closed circuit television inspection of laterals is recommended for service laterals that display clear water flowing consistently and no visible source could be determined from mainline CCTV inspection. This recommendation also carries the cost to perform building inspections for each lateral to determine sump pump connectivity as well as the removal of lateral infiltration through lateral grouting as explained below. Laterals to be inspected are denoted in Appendix A by a comment that identifies the location of the lateral with an unknown source of infiltration.

Grout Lateral: Testing and sealing of laterals is recommended where infiltration is observed in the service lateral from leaking joints, holes, and/or other defects.

Test, and Seal Mainline Joints (T&S): Testing and sealing joints is recommended in pipe segments that are without observable structural deficiencies but exhibit active leaks, separated joints or circumferential cracks that could allow infiltration, and/or lie in areas of high groundwater influence. Does not include cleaning costs.

Cut Protruding Service: Protruding services not only reduce the cross-sectional area of the pipe and impede the hydraulic conditions at that location but limit the ability to inspect the pipe with a CCTV camera. Such a defect is recommended to be cut from within the pipe to rectify flow. Includes cleaning costs.

Root Treatment: Chemical root treatment is recommended in pipe segments that exhibit roots growing through joints and/or defects and often includes segments where the majority of the pipe cross section is restricted by root ball growths. Includes cleaning costs.



Short Liner (SL): A varying length cured-in-place-pipe (CIPP) liner is recommended in pipe reaches where identified leaks, cracks, or other defects occur sporadically in pipe segments that are otherwise in sound condition. Short liners include extra strength for pipe segments to provide structural support. The length of the short liner will be based on the size of the individual deficiency observed. Includes cleaning costs.

Cured-In-Place-Pipe (CIPP) Liner: A manhole-to-manhole structural CIPP liner is recommended in pipe segments where leaking joints, cracks, or other structural defects are recurring throughout the majority of the pipe segment. A CIPP liner creates a pipe within the existing pipe that reinstates the structural integrity of the pipe and removes infiltration. Includes cleaning costs.

Open Cut: An open cut repair is manhole to manhole excavation recommended in pipe segments that are damaged beyond repair by means of trenchless rehabilitation.

Point Repair: Refers to segments of pipe that must be rehabilitated by means of open cut excavation, yet do not require a full manhole to manhole pipe replacement. Point repairs include rehabilitation of defective service connections as well as defective mainline sewers.

Continue to Monitor: In pipe segments where defects are non-existent or minor in significance and no immediate rehabilitation is recommended, continued monitoring is the best practice.

Cleaning and CCTV inspection is recommended in several areas where protruding services and/or heavy debris buildup obstructed the initial inspection. Woodard & Curran recommends protruding services be cut flush with the wall of the pipe, using either a lateral cutter or grinder, to facilitate pipe cleaning and inspection. In addition to these targeted CCTV investigations, the City should also consider adopting a preventative inspection schedule to further their knowledge of the system and decrease reactive repairs.

Table 4-1 – *Pipeline Rehabilitation Unit Cost* lists the estimated cost per unit for the recommended rehabilitation method. The costs shown in this report are conservative and were developed from recent bid tabulations for projects designed by Woodard & Curran.

Table 4-2 through Table 4-4 summarize the estimated quantity and cost of each rehabilitation recommendation category based on CCTV inspection findings.

			Grout	CCTV		Cut	Complete		Open	Point	Root	
Method	Clean	CITS	Lateral	Lateral	CIPP	Service	CCTV	SL	Ċut	Repair	Treatment	Monitor
Pipe		(Per										
Size (in)	(LF)	Joint)	(EA)	(EA)	(LF)	(EA)	(LF)	(LF)	(LF)	(LF)	(LF)	(EA)
6	\$5.50	\$75	\$450	\$750	\$80	\$430	\$5.50	\$420	\$200	\$250	\$6	\$0
8	\$5.50	\$75	\$450	\$750	\$60	\$430	\$5.50	\$420	\$250	\$250	\$6	\$0
10	\$5.50	\$75	\$450	\$750	\$60	\$430	\$5.50	\$430	\$275	\$300	\$6	\$0
12	\$6.00	\$75	\$450	\$750	\$60	\$430	\$6.00	\$470	\$300	\$350	\$6	\$0
18	\$6.00	\$125	\$450	\$750	\$113	\$430	\$6.00	\$2,000	\$400	\$450	\$10	\$0

 Table 4-1:
 Pipeline Rehabilitation Unit Costs



Rehabilitation	Unit	Estimated
Recommendation	Unit	Quantity
T&S	Linear Foot	15,314
Grout Lateral	Each	44
CCTV Lateral	Each	63
CIPP	Linear Foot	9,183
Cut Service	Each	63
Cleaning	Linear Foot	7,739
CCTV	Linear Foot	8,909
SL	Linear Foot	58
Open Cut	Linear Foot	0
Spot Repair	Each	426
Root Treatment	Linear Foot	8,303
Monitor	Linear Foot	8,622

 Table 4-2:
 Summary of Pipe Rehabilitation Recommendations

Metering Basin	Cleaning	T&S	Grout Lateral	CCTV Lateral	CIPP	Cut Service	CCTV	SL	Open Cut	Spot Repair	Root Treatment	Monitor
B1	-	252	4	3	951	14	252	-	-	-	381	-
GR1	452	1,473	1	3	673	-	463	-	-	10	423	542
HS11	495	2,574	11	23	2,298	32	3,249	12	-	90	2,147	1,040
HS14	642	730	2	1	1,262	-	-	-	-	40	648	1,047
HS15	479	2,462	9	2	2,008	11	644	18	-	20	1,437	306
LD1	818	2,482	10	18	1,525	1	2,050	22	-	195	2,630	1,994
LR3	1,626	1,626	-	-	-	-	-	-	-	20	-	-
LR4	1,900	2,582	6	11	466	2	464	6	-	30	407	1,620
LR5	727	301	-	-	-	-	1,545	-	-	10	-	799
LR6	600	829	1	2	-	2	-	-	-	11	230	302
M1	-	-	-	-	-	1	242	-	-	-	-	971
Total	7,739	15,314	44	63	9,183	63	8,909	58	-	426	8,303	8,622



Metering Basin	Cleaning	T&S	Grout Lateral	CCTV Lateral	CIPP	Cut Service	CCTV	SL	Open Cut	Spot Repair	Root Treatment	Total
B1	\$0	\$6,314	\$1,800	\$2,250	\$57,076	\$6,020	\$1,389	\$0	\$0	\$0	\$2,285	\$77,134
GR1	\$2,487	\$20,421	\$450	\$2,250	\$40,359	\$0	\$2,549	\$0	\$0	\$2,500	\$2,540	\$73,557
HS11	\$3,072	\$53,680	\$4,950	\$17,250	\$142,263	\$13,760	\$18,139	\$5,040	\$0	\$23,500	\$12,884	\$294,539
HS14	\$3,736	\$7,494	\$900	\$750	\$75,746	\$0	\$0	\$0	\$0	\$10,000	\$3,889	\$102,515
HS15	\$2,633	\$61,588	\$4,050	\$1,500	\$120,453	\$4,730	\$3,688	\$7,620	\$0	\$5,000	\$8,620	\$219,881
LD1	\$4,497	\$51,099	\$4,500	\$13,500	\$91,519	\$430	\$11,278	\$9,240	\$0	\$48,750	\$15,783	\$250,596
LR3	\$8,945	\$11,612	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,000	\$0	\$25,557
LR4	\$10,451	\$22,196	\$2,700	\$8,250	\$27,954	\$860	\$2,550	\$2,580	\$0	\$8,000	\$2,440	\$87,981
LR5	\$3,999	\$2,261	\$0	\$0	\$0	\$0	\$8,496	\$0	\$0	\$3,000	\$0	\$17,756
LR6	\$3,298	\$6,223	\$450	\$1,500	\$0	\$860	\$0	\$0	\$0	\$2,750	\$1,379	\$16,460
M1	\$0	\$0	\$0	\$0	\$0	\$430	\$1,329	\$0	\$0	\$0	\$0	\$1,759
Total	\$43,119	\$242,889	\$19,800	\$47,250	\$555,370	\$27,090	\$49,416	\$24,480	\$0	\$108,500	\$49,820	\$1,167,735

Table 4-4: Pipe Rehabilitation Cost by Subarea

As described in Section 4.1, rehabilitation priority was organized based on infiltration rate, metering basin, street, and defect score to consolidate assets in the greatest need of rehabilitation by location. Detailed rehabilitation recommendations can be found for each pipe segment in Appendix A. Table 4-5 summarizes the cost of rehabilitation based on repair type. Infiltration costs include repairs to a pipe segment that are associated with removal of infiltration (e.g. CITS and CIPP of a pipe with leaking joints and fractures). Structural repairs include the costs associated with resolving significant structural deficiencies in the absence of infiltration (e.g. Point Repairs on a pipe with collapsed segments). O&M rehabilitation includes the costs to resolve any issues that reduce the hydraulic capacity of the pipe or are causing operational issues (e.g. roots intruding into a pipe segment).



Metering Basin	Total Infiltration Observed (gpd)	Infiltration Removal Cost	Structural and O&M Cost	Total Rehabilitation Cost	Average Cost Effectiveness (Infiltration Removal Cost / Gallon per Day Infiltration Removed
M1	0	\$0	\$1,759	\$1,759	\$0.00
LR3	5,760	\$6,011	\$19,546	\$25,557	\$1.04
LR6	12,960	\$16,460	\$0	\$16,460	\$1.27
GR1	19,440	\$59,378	\$14,179	\$73,557	\$3.05
LR4	19,872	\$78,456	\$9,525	\$87,981	\$3.95
HS11	23,184	\$204,505	\$90,034	\$294,539	\$8.82
LD1	21,168	\$192,083	\$58,513	\$250,596	\$9.07
LR5	720	\$6,918	\$10,837	\$17,756	\$9.61
HS14	5,760	\$68,845	\$33,670	\$102,515	\$11.95
HS15	9,936	\$186,940	\$32,941	\$219,881	\$18.81
B1	2,016	\$58,046	\$19,088	\$77,134	\$28.79
Total	120,816	\$877,642	\$290,092	\$1,167,734	\$7.26

Table 4-5: Summary of Pipeline Rehabilitation Costs

Note that the during the writing of this report, the City completed a dig and replace of MH767-MH769, located in Metering Basin M1, which is expected to remove 288 gallons per day of infiltration – therefore the cost of this replacement has been removed from this report.

Figures included in Appendix A illustrate the locations and recommendations developed during the CCTV inspection program. Pipeline rehabilitation is shown as either infiltration removal or related to structural and O&M rehabilitation. For pipeline rehabilitation, these two types of rehabilitation are mutually exclusive (i.e. rehabilitation associated with a given pipe will either aid in removal of infiltration or will not). For pipes where infiltration was observed during CCTV inspection, rehabilitation was for infiltration removal. Whereas pipes that did not show infiltration during CCTV inspection were recommended as part of a structural and O&M related rehabilitation. For this analysis, it is assumed that 100% of infiltration removal can be achieved Design for construction should consider both types of rehabilitation as well as economics of scale, sequencing, mobilization costs, and other construction related costs.



4.3.2 MANHOLE INSPECTION

Approximately 40% of the sewer manholes inspected had issues warranting rehabilitation to prevent hydraulic failures or improve O&M activities. The City should continue to monitor the remaining manholes that did not show defects requiring rehabilitation.

All observations from the manhole inspections were entered into a database for review and analysis. This database was then used to develop repair recommendations as described below:

Clean: Recommended for manholes where debris is present.

Cementitious Liner: Recommended for manholes with light to moderate infiltration present and/or structural damage such as loss of mortar, missing brick, or holes.

Corbel Repair: Recommended for manholes with missing/broken bricks and/or mortar from the corbel section.

Epoxy Liner: Recommended for manholes displaying evidence of degradation due to H₂S (Hydrogen Sulfide) corrosion and/or severe infiltration.

Curtain Grout Manhole: Recommended for manholes with infiltration present.

Locate Manhole: Manhole not inspected during the manhole inspection program due to unknown location. Manholes that are located along overgrown easements, buried under pavement, or in need of GIS spatial adjustment should be located.

Rebuild Bench and Invert: Recommended for manholes with damage to the bench and invert requiring repairs to increase hydraulic capacity.

Remove and Replace: Recommended for manholes with severe structural damage or extreme infiltration that cannot be repaired by means of trenchless rehabilitation.

New Frame and Cover: Recommended for manholes where frame and cover are damaged and may result in failure.

Raise Frame and Cover: Recommended for manholes buried or set below grade, which make the manhole more susceptible to inflow.

Continue to Monitor: Defects are not significant and do not need to be recommended for rehab, continued monitoring is best practice.

Table 4-6 – *Manhole Rehabilitation Unit Costs* provides detail into the estimated construction costs for reach of the rehabilitation methods. Note that the recommendation for continue to monitor is estimated as zero cost as no work is required for these manholes in the foreseeable future. Table 4-7 – *Manhole Rehabilitation Recommendations* provides a count of the number of manholes requiring a particular rehabilitation recommendation.



Recommended Rehabilitation	Unit	Unit Cost
Clean	EA	\$550
New Frame and Cover	EA	\$820
Chimney Repair	EA	\$1,000
Rebuild Bench and Invert	EA	\$2,200
Root Treatment	EA	\$2,200
Curtain Grout Manhole	Vertical Feet	\$200
Cementitious Liner	Vertical Feet	\$170
Epoxy Liner	Vertical Feet	\$500
Remove and Replace	EA	\$13,100
Raise Frame and Cover	EA	\$1,100
Locate Manhole	EA	\$100
Continue to Monitor	EA	\$0

 Table 4-6:
 Manhole Rehabilitation Unit Costs

Table 4-7:	Manhole Rehabilitation Recommendations

Recommended Rehabilitation	Rehabilitation Type	# Manhole Recommendations
Clean	O&M	71
New Frame and Cover	O&M	31
Chimney Repair	Structural	37
Rebuild Bench and Invert	O&M	45
Root Treatment	O&M	14
Curtain Grout Manhole	Infiltration	73
Cementitious Liner	Structural/Infiltration	73
Epoxy Liner	Structural	5
Remove and Replace	Structural	1
Raise Frame and Cover	O&M	8
Locate Manhole	O&M	50
Continue to Monitor	O&M	256
	Total:	664

As described in Section 4.1, rehabilitation priority was organized based on infiltration, metering basin, street, and defect score to consolidate assets in the greatest need of rehabilitation by location.

Detailed rehabilitation recommendations can be found for each manhole in Appendix B. Table 4-8 summarizes the cost of rehabilitation based on repair type. The total observed infiltration shown includes infiltration observed during manhole inspections and flow isolation. Infiltration rehabilitation costs include repairs to manholes in order to remove infiltration, including curtain grouting of manhole walls and cementitious liners for manholes that show infiltration. Structural repairs include the costs associated with resolving significant structural deficiencies in the absence of infiltration (e.g. Chimney Repair on a manhole with missing bricks from chimney or cementitious liner for defective manhole walls that do not show infiltration). O&M rehabilitation includes the costs to address any issues that reduce



the hydraulic capacity of the manhole or are causing operational issues (e.g. rebuild bench and invert on a manhole where debris has built up due to the lack of an invert).

Metering Basin	Total Observed Infiltration (gpd)	Infiltration Removal	Structural and O&M Repairs	Total Rehabilitation Cost	Average Cost Effectiveness (Infiltration Removal Cost / Gallon per Day Infiltration Removed
GR1	53,496	\$59,750	\$46,460	\$106,210	\$1.12
LR3	6,048	\$7,400	\$5,960	\$13,360	\$1.22
LR4	40,680	\$53,400	\$17,490	\$70,890	\$1.31
LR6	11,088	\$24,000	\$33,310	\$57,310	\$2.16
B1	720	\$1,800	\$10,030	\$11,830	\$2.50
HS11	14,904	\$58,540	\$54,010	\$112,550	\$3.93
HS14	4,248	\$17,760	\$20,700	\$38,460	\$4.18
LD1	5,760	\$34,410	\$21,770	\$56,180	\$5.97
M1	1,008	\$6,760	\$16,350	\$23,110	\$6.71
HS15	4,320	\$29,850	\$34,300	\$64,150	\$6.91
LR5	864	\$12,580	\$19,810	\$32,390	\$14.56
Total	143,136	\$306,250	\$280,190	\$586,440	\$2.14

Table 4-8: Summary of Manhole Rehabilitation Costs

Figures included in Appendix B illustrate the locations and recommendations developed during the manhole inspection program. Manhole rehabilitation is either related to infiltration removal, structural/O&M repairs, or both. For manhole rehabilitation, these two types of rehabilitation are not mutually exclusive (i.e. rehabilitation associated with a O&M may not aid in the removal of infiltration, e.g. new frame and cover will not reduce infiltration). Cost effectiveness of infiltration removal per basin is summarized below and is an estimate of the dollar value for infiltration rehabilitation compared to the volume of infiltration that could be removed. For this analysis, it is assumed that 100% of infiltration removal can be achieved. Design for construction should consider both types of rehabilitation as well as economics of scale, sequencing, mobilization costs, and other construction related costs.

4.3.3 SMOKE TEST RESULTS

The results show that Subareas B1, HS11, LR1, and HS15 contribute the most amount of inflow to the overall collection system. In addition to contributing the most inflow, approximately 53,300 gallons per inch of precipitation, subarea HS11 also has the highest number of defects identified (22). This area accounts for approximately 85% of the total estimated inflow and should be prioritized for the repairs that were discussed previously in the report. The next highest contributor, LR1, contributes approximately as much flow as B1 and HS15 combined. Addressing these three areas, which account for approximately 92% of the remaining flow, should be completed once subarea HS11 has been addressed. Targeting all four of these areas first will address 98% of the total estimated inflow.

It is recommended that repairs be made to all direct sources identified herein, because addressing these direct sources is more cost-effective for the City than attempting to address every identified defect. The indirect sources identified



during the smoke testing were all estimated to contribute minor volumes of inflow to the system compared to other sources identified. These sources did not warrant further testing by dye testing or flooding due to their limited impact. Instead, we recommend that the City continue to monitor these locations to confirm that conditions which contribute to inflow are not deteriorating and causing additional inflow and/or structural issues with the pipe or roadway.

The estimated cost to rehabilitate each of the inflow sources identified is based on typical efforts required to redirect an inflow source from the wastewater collection system to a storm drain. We have used the following estimated costs to calculate the costs listed in Table 4-9: Redirecting a catch basin was estimated to cost \$15,000. Redirecting a driveway drain, roof leader, or repairing a frame and cover was estimated to cost \$7,500. Repairing a cleanout cap was estimated to be \$1,000 and monitoring for indirect sources was estimated at \$0. All repair costs were calculated based on the type of repair, and then totaled for each subarea, resulting in a total estimated cost to redirect inflow.

However, each inflow source will vary and the cost to rehabilitate is highly dependent on the proximity of the closest storm drain line. These cost estimates should be used for planning level purposes only. A more detailed analysis of the remediation required, and construction cost estimate to redirect flows can be developed on a case-by-case basis in the design phase.

A summary of the construction cost to redirect the direct inflow sources by subarea, and the cost-effectiveness of the work is included as Table 4-9. A summary of the types of defects found in each subarea is shown in Table 4-10.

Area	Number Direct Connection Defects Identified	Number CB Redirections	Number DD/RL Relocations	Number F&C Repairs	Number Cleanout Repairs	Est Inflow per Inch of Precipitation (gallons)	Est Cost Redirect Inflow	Cost per Gallon of Inflow Removed
Subarea B1	3	1	0	0	2	2,000	\$17,000	\$8.34
Subarea HS11	13	9	3	1	0	53,300	\$165,000	\$3.10
Subarea HS15	1	1	0	0	0	2,200	\$15,000	\$6.75
Subarea LD1	6	0	0	3	3	200	\$25,500	\$132.65
Subarea LR1	7	1	1	4	1	4,100	\$53,500	\$13.10
Subarea LR2	1	0	0	0	1	<100	\$1,000	\$118.85
Subarea LR4	3	1	0	1	1	1,000	\$17,000	\$17.85
Subarea LR6	5	0	1	1	3	<100	\$18,000	\$3208.55
Subarea P1	0	0	0	0	0	0	0	0
Total	39	13	5	10	11	63,000	\$312,000	\$5.00

 Table 4-9:
 Estimated Rehabilitation Cost – Direct Sources



Area	Re-direct Catch Basin	Re-direct Roof Leader	Re-direct Driveway/ Yard Drain	Repair Cleanout Cap	Replace Frame & Cover	Monitor (indirect source)	Repair Manhole
Subarea B1	1	0	0	2	0	0	0
Subarea HS11	9	1	2	0	1	10	0
Subarea HS15	1	0	0	0	0	0	0
Subarea LD1	0	0	0	3	3	2	0
Subarea LR1	1	0	1	1	4	2	0
Subarea LR2	0	0	0	1	0	1	0
Subarea LR4	1	0	0	1	0	1	1
Subarea LR6	0	0	1	3	1	0	0
Subarea P1	0	0	0	0	0	0	0
Total	13	1	4	11	9	16	1

Table 4-10: Types of Defects Found by Subarea

4.3.4 GEOGRAPHIC INFORMATION SYSTEM UPDATES

Throughout the 2017 SSES investigation activities some asset locations were found to vary from those in the City's GIS database. Field notes and map changes from Flow Assessment have been provided in Appendix C to assist the City in making updates and/or changes to their asset database in GIS.

4.4 SUMMARY OF RECOMMENDATIONS AND ESTIMATED COSTS

The City's collection system is aging and requires an aggressive rehabilitation and maintenance schedule to reduce I/I and ensure uninterrupted wastewater flows and or SSOs. The tables below break down the overall costs to complete rehabilitation of infiltration and structural/O&M related defects located during this infiltration study.

Table 4-11 presents a summary of infiltration removal cost by metering basin. As can be seen, the cost per gallon for infiltration removal is under \$3.00/gpd for the first four basins. The cost then jumps to over \$6.00/gpd for the fifth basin.



Basin	Total Infiltration Observed in Pipeline (gpd)	Total Infiltration Observed Manhole (gpd)	Total Infiltration Observed Per Basin	Cost of Infiltration Removal Per Basin	Average Cost Effectiveness \$ Spent / Gallon per Day Infiltration Removed
LR3	5,760	6,048	11,808	\$13,411	\$1.14
GR1	19,440	53,496	72,936	\$119,128	\$1.63
LR6	12,960	11,088	24,048	\$40,460	\$1.68
LR4	19,872	40,680	60,552	\$131,856	\$2.18
M1	-	1,008	1,008	\$6,760	\$6.71
HS11	23,184	14,904	38,088	\$263,045	\$6.91
LD1	21,168	5,760	26,928	\$226,493	\$8.41
HS14	5,760	4,248	10,008	\$86,605	\$8.65
LR5	720	864	1,584	\$19,498	\$12.31
HS15	9,936	4,320	14,256	\$216,790	\$15.21
B1	2,016	720	2,736	\$59,846	\$21.87
Total:	120,816	143,136	263,952	\$1,183,832	\$4.77

Table 4-11: Summary of Infiltration Removal Costs Per Basin

Table 4-12 – *Collection System Rehabilitation Summary of Costs* summarizes the estimated cost to address identified collection system defects including engineering and contingencies. For convenience, all recommendations for sewer improvements located in the pilot areas has been separated by its own line item.

Investigation Type	Work Completed	Rehabilitation Recommendations	Infiltration/Inflow Rehabilitation	Structural and O&M Rehabilitation	Total Estimated Cost
CCTV	32,329 ¹ LF	Infiltration, Structural, and O&M	\$880,000	\$300,000	\$1,180,000
Manhole Inspection	393 ¹ Manholes	Infiltration, Structural, and O&M	\$310,000	\$290,000	\$600,000
Pilot Area Study	24 Manholes & 12,000 LF CCTV	Infiltration, Structural, and O&M	\$10,000	\$20,000	\$30,000
City CCTV Review	14,500 LF CCTV	Infiltration, Structural, and O&M	\$35,000	\$40,000	\$75,000
Smoke Testing	186,570 LF	Inflow & Structural	\$312,000	\$0	\$312,000
	Tot	al Rehabilitation Cost:	\$1,550,000	\$650,000	\$2,200,000
		Contingency (30%):	\$465,000	\$195,000	\$660,000
	E	Engineering Cost (20%):	\$403,000	\$170,000	\$572,000
		Total Estimated Cost:	\$2,420,000	\$1,015,000	\$3,432,000

Table 4-12: Collection System Rehabilitation Summary of Costs

As detailed above, Woodard & Curran identified approximately \$1,890,000 in collection system rehabilitation and improvements work. It is recommended that a 30% construction contingency and 20% engineering fee be added for a total design and construction cost of approximately \$3,000,000.

4.5 RECOMMENDED REHABILITATION PROGRAM

It is recommended that the City prioritize pipeline and manhole rehabilitation using infiltration removal costeffectiveness, structural integrity, and maintenance necessity. This approach provides the City with reduction of the risk of failure while removing costly infiltration that causes excess flow to pump stations and the treatment plant.

Woodard & Curran, in conjunction with input from the City's Department of Public Works staff, have recommended a phased approach to collection system rehabilitation based on the findings of this report. This phased approach is estimated to be completed in four projects that meet the needs of the City as explained above. The first phase will aim to remove infiltration in the City's metering basins that are estimated to be the most cost-effective as well as grouped together geographically. The basis of this plan is the pipe and manhole rehabilitation recommendations made in this report as well as the recommendations made in Task 4, which reviewed the City's recent CCTV inspection data and is attached in Appendix E. This will lead to decreased construction costs and ultimately cost savings for the City. The total infiltration observed accounts for infiltration located during pipe or manhole inspections, and does not account for infiltration measured during flow isolation. Lateral infiltration removal is considered only for pipes that have significant mainline infiltration or have significant structural or O&M related defects. Removal of specific lateral infiltration and rehabilitation should be approached during design phase of future construction projects for feasibility and cost-effectiveness and during the 2017 Inflow Study which will complete a sump pump inspection program. Per instruction from the City, where open-cut pipe replacement may be necessary it was noted in Table 4-14, however the estimated cost assumes cured-in-place pipe rehabilitation. Actual construction costs for each plan will be developed during final designs.



The phased Collection System Infiltration Removal Plan is outlined in Table 4-13. This purpose of this plan is to allow the City to understand budgetary requirements for both construction and engineering services as they build their wastewater capital improvement program. Continuing inspection during the 2017 Inflow Study and through ongoing inspectional/maintenance programs will inform the City's Department of Public Works of additional collection system needs that can be used to further develop the City's collection system rehabilitation improvement plans.

Phase	Contract #1	Contract #2	Contract #3	Contract #4	
Basins Included	LR3, LR4, LR6, GR1	HS11, LR5	LR1, LR2, LD1, B1	HS14, HS15, M1	Totals
Total Infiltration Observed	174,460	31,400	28,300	27,580	261,740
Infiltration Rehabilitation Cost	\$323,000	\$242,000	\$225,000	\$307,000	\$1,097,000
Structural/O&M Rehabilitation Costs	\$35,000	\$165,000	\$97,000	\$15,000	\$312,000
Smoke Testing Repairs	\$63,000	\$163,000	\$63,000	\$105,000	\$394,000
Contingency Cost (30%)	\$127,000	\$171,000	\$116,000	\$129,000	\$543,000
Total Construction Cost	\$548,000	\$741,000	\$501,000	\$556,000	\$2,346,000
Engineering Costs (20%)	\$110,000	\$149,000	\$101,000	\$112,000	\$472,000
Total Estimated Contract Cost	\$658,000	\$890,000	\$602,000	\$668,000	\$2,818,000

 Table 4-13:
 Phased Collection System Infiltration Removal Plan

All data and spreadsheets are in electronic format and included with this report. This allows the City to incorporate collection system data into future rehabilitation planning. Table 4-14 and Table 4-15 summarize the recommended improvements that form the basis of the City's Phased Collection System Infiltration Removal Plan. Figure 4-3 illustrates probable locations of future construction projects and the recommended rehabilitation work as summarized in the tables below. This figure was created using ESRI software and can be exported to the City via shapefiles or other GIS database formats.

Estimate Pipe Max Mainline Lateral Rehab Infiltratio Contract Meterina Sewer DS Diameter Street US MH Material Lenath Observations Defect Infiltration Infiltration Number Basin ID MH (in.) Recommendations from CC (LF) Score (gpd) (gpd) (gpd) Roots fine joint at 26' US. Roots fine joint at 63' US. Crack **CONTRACT 1** GR1 921 920 VCP spiral at 75' US. Roots ball joint at 120' US. Roots ball barrel at Root Treatment 4 Blue Heron Dr 3021 8 139 0 0 125' US. Rag in joint at 135' US. Clear water running from lateral at 131' DS. Roots ball joint and T&S, Grout Lateral, 913 914 720 **CONTRACT 1** GR1 3017 PVC 231 4 Blue heron Dr 6 0 fine joint throughout pipe. Root Treatment Fracture multiple and broken pipe with soil visible at 150.2' US. Complete CCTV, Spot Hole void visible at 152.2' US causing abandoned survey (no **CONTRACT 1** 3023 916 919 VCP 5 GR1 Blue Heron Dr 8 238 0 0 Repair reversal attempted) Piece of pipe from repair stuck in pipe @ 4' (approx.). Infiltration stains joint throughout, Roots fine joint & infiltration 821 CONTRACT 1 GR1 Osprey Drive 2994 819 8 VCP 55 3 0 joint light @ 69'. Roots medium joint from 70-90'. (MISLABELED PIPE NEED TO CONFIRM) T&S, Root Treatment 432 CONTRACT 1 EOP 821 VCP Fracture circumferential @ 0' w/infiltration high. 720 GR1 Osprey Drive 2992 6 218 Short Liner 5 0 Infiltration throughout with runners and gushers. Survey CONTRACT 1 5852 818 VCP 103 T&S, CIPP 5 9.072 GR1 Portsmouth Blvd 3210 8 0 abandoned due to debris (no reversal attempted) Fractures and infiltration throughout pipe, survey abandoned at CONTRACT 1 819 VCP T&S, CIPP 4 GR1 Portsmouth Blvd 3001 639 8 335 2.880 0 211' DS due to settled debris T&S, CIPP CONTRACT 1 GR1 3209 816 10 VCP 182 Fractures and infiltration throughout pipe 2,448 Portsmouth Blvd 5852 4 0 Infiltration in lateral @ 57', large debris in pipe @ 124' blocking Portsmouth **CONTRACT 1** 3008 2372 813 10 VCP 5 GR1 152 remaining survey. Infiltration joint light can be seen 0 Boulevard approximately 10' further ahead in pipe T&S 576 Crack longitudinal @ 27'. Crack spiral @ 30', infiltration stains Portsmouth CONTRACT 1 3009 813 814 10 VCP @ joints throughout, large deposit @ 30', infiltration stains in GR1 60 Clean, T&S, Short 3 0 Boulevard manhole 814 Liner 144 Infiltration gusher from hole at 15' US Clean, T&S, Spot 78 5 5,760 **CONTRACT 1** LR3 Suzanne Dr 1513 2595 2593 8 AC 0 Repair Infiltration stains throughout pipe with gusher and runner at Clean, T&S, Cut **CONTRACT 1** LR4 Greenleaf Ave 1881 394 392 10 AC 321 5 5.040 0 238 and 248' DS, respectively. Protruding lateral at 256.8' DS Service, Spot Repai Fractures and infiltration stains throughout pipe. Clear water T&S, Grout Lateral, **CONTRACT 1** LR4 Greenleaf Ave 555 1056 1047 8 AC 305 running from laterals at 24.5' and 138.5' US. Clear water 5 144 864 Inspect Lateral, CIPP coming from lateral at 217.2' US (unknown source). Clear water running from lateral at 13.4' US (Unknown 391 **CONTRACT 1** LR4 Greenleaf Ave 4753 392 8 AC 274 4 0 288 Inspect Lateral Source). Debris buildup at MH 392 Clear water dripping from lateral at 22.2' DS, Infiltration runner Clean, T&S, Grout **CONTRACT 1** LR4 Greenleaf Ave XC 1834 372 5872 10 AC 184 4 1.440 288 at DS MH connection Lateral Survey abandoned at 214' DS due to severe root ball. 1833 395 372 T&S, Root Treatment 5 **CONTRACT 1** LR4 Greenleaf Ave XC 10 AC 216 288 0 Infiltration dripper at MH372. T&S, Grout Lateral, Infiltration stains, roots, and fractures throughout pipe. Clear **CONTRACT 1** LR4 Middle Rd 4142 554 555 8 VCP water coming from protruding lateral at 96' DS. reversal CIPP, Cut Service, 4 432 161 0 complete Root Treatment Clear water coming from laterals at 59', 75', and 154.9' US (Unknown Source). Broken pipe void visible with infiltration Clean, T&S, Inspect Parking lot **CONTRACT 1** LR4 5120 5421 5422 5 1,296 8 AC 237 144 dripper at 65' US. Infiltration drippers and stains throughout Lateral, Spot Repair pipe Infiltration stains throughout pipe, Fractures at 120.5' DS. CONTRACT 1 5423 5421 Clean, T&S LR4 Parking lot 5122 8 AC 325 4 0 0 Clear water coming from lateral at 160.3' DS. Infiltration gusher Clean, T&S, Grout **CONTRACT 1** 640 562 565 AC 199 5 2,880 144 LR4 Sylvester St 8 from hole in pipe at 190' DS Lateral, Spot Repair Infiltration gusher at US MH Connection, roots at DS MH 420 195 5 CONTRACT 1 LR4 X-Country 1845 545 8 AC Clean, T&S 1.152 0 Connection Infiltration runner joint at 116' US. Roots at US MH Connection X-Country

Table 4-14: Pipeline Rehabilitation Recommendations

LR4

Greenleaf woods

Dr

1892

374

375

10

AC

231

CONTRACT 1

Clean, T&S

4

1.440

0



ration Infiltration Structural/ Estimated Total (\$ Spent per CCTV Removal Rehabilitation Gallon Per					
120 $133,167$ 150 $13,167$ $154,40$ 0 50 $53,809$ $53,809$ $53,809$ $50,00$ 432 $51,300$ 50 $53,000$ $51,300$ $53,010$ 720 $53,000$ 50 $53,000$ $54,17$ $9,072$ $58,720$ 50 $53,000$ $54,17$ $9,072$ $58,720$ 50 $53,200$ $54,17$ $2,880$ $52,8479$ 50 $52,8479$ $50,8720$ $2,448$ $515,462$ 50 $515,462$ $56,32$ 576 $52,600$ $515,600$ $54,511$ 144 $55,500$ $55,500$ $538,19$ 144 $55,500$ $57,509$ $51,517$ $5,760$ $56,011$ 50 $57,509$ $51,517$ $1,008$ $522,229$ 50 $57,509$ $51,517$ $1,008$ $522,229$ 50 $52,842$ $50,000$ $1,728$ $52,842$ 50 $52,842$ $51,537$ 288 5750 $50,000$ $57,537$ $50,000$ $1,440$ $57,837$ 50 $51,537$ $50,000$ $1,440$ $57,837$ 50 $57,837$ $50,000$ $3,024$ $55,533$ 50 $52,533$ $51,537$ $50,010$ $54,220$ $54,320$ $52,537$ $52,020$ $1,152$ $52,537$ 50 $52,533$ $51,537$ $50,010$ $52,533$ 50 $52,537$ $52,201$	mated ration CCTV pd)	Infiltration Removal	Structural/ O&M Rehab	Rehabilitation	Effectiveness (\$ Spent per Gallon Per Day
0S0 $$3,809$ $$3,809$ $$3,809$ $$0,00$ 432 $$1,300$ $$0$ $$1,300$ $$3,01$ 720 $$3,000$ $$0$ $$3,000$ $$4.17$ 9,072 $$8,720$ $$0$ $$8,720$ $$0,96$ 2,880 $$28,479$ $$0$ $$28,479$ $$9,89$ 2,448 $$15,462$ $$0$ $$15,462$ $$6,32$ $5,76$ $$2,600$ $$15,462$ $$6,32$ 144 $$5,500$ $$10$ $$2,601$ $$1.04$ $5,760$ $$6,011$ $$0$ $$6,011$ $$1.04$ $5,040$ $$7,599$ $$0$ $$7,599$ $$1.51$ $1,008$ $$22,229$ $$0$ $$2,242$ $$0,00$ $1,728$ $$2,921$ $$0$ $$2,2921$ $$10.14$ 432 $$15,537$ $$0$ $$1,537$ $$0,000$ $1,440$ $$7,837$ $$0$ $$2,2921$ $$0,000$ $1,440$ $$7,837$ $$0$ $$5,533$ $$0,000$ $1,152$ $$2,533$ $$0$ $$2,533$ $$0,000$ $1,152$ $$2,537$ $$0$ $$2,537$ $$2,202$	0	\$0	\$836	\$836	\$0.00
Image: second	720	\$3,167	\$0	\$3,167	\$4.40
432 $$1,300$ $≤0$ $$3,000$ $$4.17$ 720 $$3,000$ $$0$ $$3,000$ $$4.17$ $9,072$ $$8,720$ $$0$ $$8,720$ $$0.96$ $2,880$ $$28,479$ $$0$ $$28,479$ $$9.89$ $2,448$ $$15,462$ $$0$ $$15,462$ $$6.32$ $5,760$ $$2,600$ $$0$ $$2,600$ $$4.51$ 144 $$5,500$ $$0$ $$5,500$ $$38.19$ 144 $$5,500$ $$0$ $$6,011$ $$1.04$ $5,760$ $$6,011$ $$0$ $$6,011$ $$1.04$ $5,760$ $$6,011$ $$0$ $$7,599$ $$1.51$ $1,008$ $$22,229$ $$0$ $$22,229$ $$1,51$ $1,008$ $$22,842$ $$0$ $$2,842$ $$1,91$ $1,728$ $$2,842$ $$0$ $$2,842$ $$1,91$ $1,728$ $$2,842$ $$0$ $$2,842$ $$1,91$ $1,432$ $$15,537$ $$0$ $$2,842$ $$1,91$ $1,440$ $$7,837$ $$0$ $$1,537$ $$0,000$ $1,440$ $$7,837$ $$0$ $$4,220$ $$4,220$ $1,440$ $$7,837$ $$0$ $$4,220$ $$4,220$ $1,152$ $$2,533$ $$0$ $$2,55,533$ $$1,92$ $1,152$ $$2,537$ $$0$ $$2,537$ $$2,201$ $1,152$ $$2,537$ $$0$ $$2,55,533$ $$1,92$ $1,152$ $$2,537$ $$0$ $$2,537$ $$2,201$ $1,152$ $$2,537$ $$0$ $$2,55,533$ $$1,92$ <td>0</td> <td>\$0</td> <td>\$3,809</td> <td>\$3,809</td> <td>\$0.00</td>	0	\$0	\$3,809	\$3,809	\$0.00
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576 \$2,600 Image: Constraint of the state of the sta	2,448	\$15,462	\$0	\$15,462	\$6.32
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288 \$2,921 \$0 \$2,921 \$10.14 432 \$15,537 \$0 \$15,537 \$0.00 1,440 \$7,837 \$0 \$7,837 \$54.43 0 \$0 \$4,220 \$4,220 \$0.00 3,024 \$5,533 \$0 \$5,533 \$1.92 1,152 \$2,537 \$0 \$2,537 \$2.20	288	\$750	\$0	\$750	\$0.00
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1,440 \$7,837 \$0 \$7,837 \$54.43 0 \$0 \$4,220 \$4,220 \$0.00 3,024 \$5,533 \$0 \$5,533 \$1.92 1,152 \$2,537 \$0 \$2,537 \$2.20	288	\$2,921	\$0	\$2,921	\$10.14
0 \$0 \$4,220 \$4,220 \$0.00 3,024 \$5,533 \$0 \$5,533 \$1.92 1,152 \$2,537 \$0 \$2,537 \$2.20	432	\$15,537	\$0	\$15,537	\$0.00
3,024 \$5,533 \$0 \$5,533 \$1.92 1,152 \$2,537 \$0 \$2,537 \$2.20	1,440	\$7,837	\$0	\$7,837	\$54.43
1,152 \$2,537 \$0 \$2,537 \$2.20	0	\$0	\$4,220	\$4,220	\$0.00
	3,024	\$5,533	\$0	\$5,533	\$1.92
1,440 \$3,000 \$0 \$3,000 \$2.08	1,152	\$2,537	\$0	\$2,537	\$2.20
	1,440	\$3,000	\$0	\$3,000	\$2.08

Contract Number	Metering Basin	Street	Sewer ID	US MH	DS MH	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab Cost	Estimated Total Rehabilitation Cost	Cost Effectiveness (\$ Spent per Gallon Per Day Removed)
CONTRACT 1	LR4	X-Country Greenleaf Woods Dr	1893	375	376	10	AC	214	Broken pipe at 34.8' US	Short Liner	5	0	0	0	\$0	\$2,580	\$2,580	\$0.00
CONTRACT 1	LR6	Constitution Ave	1640	237	236	8	AC	230	Clear water coming from lateral at 97.1' US (Unknown Source). Roots medium barrel at 104' US. Infiltration gusher at 107' US. Roots fine joint at 118' US.	T&S, Inspect Lateral, Root Treatment	4	4,320	0	4,320	\$3,853	\$0	\$3,853	\$0.89
CONTRACT 1	LR6	Heritage Rd	1587	2641	136	8	AC	285	Heavy grease and debris buildup in pipe. Infiltration gusher at 9.6' DS from defective wye. Infiltration stains at 127' DS	Clean, T&S, Spot Repair	5	4,320	0	4,320	\$3,961	\$0	\$3,961	\$0.92
CONTRACT 1	LR6	Lafayette Rd	2000	2484	2479	8	AC	284	Clear water running from lateral at 96.3' DS (Unknown Source), Infiltration runner from broken pipe/fracture spiral at 265' DS.	Inspect Lateral, Spot Repair	5	2,880	720	3,600	\$3,250	\$0	\$3,250	\$1.13
CONTRACT 1	LR6	Lafayette Road	1613	2530	2629	8	AC	189	Deformed pipe (minor) @ 0', intruding lateral at 156'	Cut Service	4	0	0	0	\$0	\$600	\$600	\$0.00
CONTRACT 1	LR6	Lafayette Road	1617	2628	2627	12	AC	260	Infiltration joint @ 1' (first joint)	T&S, Short Liner	4	432	0	432	\$5,100	\$0	\$5,100	\$11.81
CONTRACT 1	LR6	Lafayette Road	1618	2627	118	12	AC	218	Infiltration stains throughout, Crack circumferential at 84' (infiltration light), eroding pipe surface @ 89' (5" piece broken off). Intruding lateral @ 94' (void visible around lateral), steady clear water running.	Cut Service	3	1440	0	1440	\$600	\$0	\$600	\$0.42
CONTRACT 1	LR6	Lafayette Road	1619	118	117	12	AC	314	Clear water coming from service @ 38' evidence of infiltration around service. Deterioration pipe surface throughout. Service @ 146' has steady clear water running with infiltration stains visible. Cavity in pipe @ 148' (infiltration stains visible), Unknown pipe at MH117 coming from East (potentially abandoned pipe)	Short Liner	2	1440	0	1440	\$3,000	\$0	\$3,000	\$2.08
CONTRACT 1	LR6	Lafayette Road	1528	2626	2625	12	AC	234	Crack longitudinal at joint 5', crack spiral @ 79', infiltration joint @ 143' (0.3 gpm)	T&S, Short Liner	4	432	0	432	\$7,900	\$0	\$7,900	\$18.29
CONTRACT 1	LR6	Ricci Ave	1988	2652	143	8	AC	314	Infiltration runner at intruding lateral 26.6' DS. Intruding lateral at 106' DS. Debris buildup at 307' DS	Clean, T&S, Grout Lateral, Cut Service	4	720	0	720	\$5,396	\$0	\$5,396	\$7.49
CONTRACT 2	HS11	Bartlett St	1329	1400	1399	8	VCP	20	Broken pipe soil visible at 13.2' US.	CIPP	5	0	0	0	\$0	\$1,216	\$1,216	\$0.00
CONTRACT 2	HS11	Bartlett St	343	1399	1398	8	VCP	219	Hole void visible at 4' DS. Hole void visible in lateral at 25.4' DS. Hole soil visible at 26.2' DS. Protruding laterals at 48.4' DS and 215.9' DS blocking complete survey (reversal unsuccessful)	CIPP, Cut Service, Complete CCTV	5	0	0	0	\$0	\$15,199	\$15,199	\$0.00
CONTRACT 2	HS11	Boyd Rd	328	1413	1414	8	VCP	271	Intruding taps at 59' and 90' DS. Clear water coming from tap break-ins at 59' and 90' DS. Roots and infiltration stains throughout pipe with infiltration runner at 192.3' DS. Fractures at 157.1' and 189.2' DS. Broken pipe void visible at 133.2' and 258' DS.	T&S, Grout Lateral, CIPP, Cut Service, Spot Repair, Root Treatment	5	144	864	1,008	\$28,968	\$0	\$28,968	\$201.17
CONTRACT 2	HS11	Boyd Rd	327	1412	1413	8	VCP	260	Hinge fracture 3 with void visible at 108' DS. Roots fine joint throughout. Intruding laterals at 123.7, 154.6, 199.6', and 233.2' DS.	Cut Service, Spot Repair, Root Treatment	5	0	0	0	\$0	\$5,781	\$5,781	\$0.00
CONTRACT 2	HS11	Cottage St	1327	2239A	2239	8	VCP	339	Roots medium and ball throughout pipe, clear water running from lateral at 125.5' US (Unknown Source).	Inspect Lateral, Root Treatment	4	0	288	288	\$2,783	\$0	\$2,783	\$0.00
CONTRACT 2	HS11	Cottage St	334	1419	1418	8	VCP	298	Roots and infiltration throughout pipe, Fracture spiral at 32.8' US. Broken lateral at 38' US (Fernco disconnected). Protruding lateral at 228.4' US. Clear water running from lateral at 228.4' US (Unknown Source)	T&S, Inspect Lateral, CIPP, Spot Repair, Root Treatment	4	0	720	720	\$30,355	\$0	\$30,355	\$0.00
CONTRACT 2	HS11	Fields Rd	210	1310	1311	12	FRP	176	Infiltration drippers and runners throughout pipe. Broken pipe with infiltration weeper at 51.2' DS. Clear water running from laterals at 32.2' DS, 81.7' DS, and 156.8' DS. Candidate for Dig & Replace.	CIPP	5	432	2,016	2,448	\$10,553	\$0	\$10,553	\$24.43
CONTRACT 2	HS11	Hannaford	239	1364	1363	6	AC	218	This is a 6" Pipe. Infiltration weeper at 19' US, infiltration stain at 36' US. Deformed vertically at 203.3' US. Survey abandoned due to large amounts of debris in pipe and vertical deformation (no reversal attempted)	T&S, CIPP	5	144	0	144	\$19,108	\$0	\$19,108	\$132.69
CONTRACT 2	HS11	Islington St	3243	EOP	1439	8	VCP	149	Clear water coming from lateral at 135.9' US. Clear water running from laterals at 63.2' and 122.8' US (unknown source). Hinge fracture 3 at 144' US.	Grout Lateral, Inspect Lateral, Short Liner	5	0	576	576	\$4,470	\$0	\$4,470	\$0.00



Contract Number	Metering Basin	Street	Sewer ID	US MH	DS MH	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab Cost	Estimated Total Rehabilitation Cost	Cost Effectiveness (\$ Spent per Gallon Per Day Removed)
CONTRACT 2	HS11	Islington St	3525	605	5400	8	VCP	217	Includes Pipe SewerID 3850, 3851 and 6429. Fractures and voids throughout pipe, intruding laterals at 103.2' DS, 115.5' DS, and 216.8' DS. Clear water coming from laterals at 20', 133.9', and 161.3' DS. Clear water coming from lateral at 115.5' DS (unknown source)	T&S, Grout Lateral, Inspect Lateral, CIPP, Cut Service	5	0	432	432	\$21,837	\$0	\$21,837	\$0.00
CONTRACT 2	HS11	Lovell St	237	1361	1360	8	AC	183	Infiltration weeper at 46.1' DS. Intruding lateral with clear water running at 53.1' DS (Unknown Source). Broken pipe void visible 1' US. Clear water running from laterals at 10 and 94' US. Broken pipe void visible at 123.1' US	T&S, Inspect Lateral, CIPP	5	576	2,880	3,456	\$13,077	\$0	\$13,077	\$22.70
CONTRACT 2	HS11	Melbourne St	201	589	590	10	VCP	456	Fracture multiple at 217' US. Roots and infiltration stains throughout pipe. Survey abandoned at 218' US due to sharp uphill bend (Reversal Complete)	CIPP, Spot Repair	5	0	0	0	\$0	\$33,377	\$33,377	\$0.00
CONTRACT 2	HS11	Melbourne St	5006	End of Pipe	589	10	VCP	242	Roots fine and ball throughout pipe, Intruding tap at 169.5' US causing abandoned survey.	Cut Service, Complete CCTV, Root Treatment	4	0	0	0	\$0	\$3,209	\$3,209	\$0.00
CONTRACT 2	HS11	Rutland St	204	590	End Of Pipe	8	VCP	240	Clear water dripping from laterals at 9.1' and 31' DS, intruding lateral at 10' DS. roots fine joint throughout pipe. Survey abandoned at 152' DS due to debris in pipe (reversal incomplete)	T&S, Grout Lateral, Cut Service, Complete CCTV, Root Treatment	5	0	1,584	1,584	\$10,076	\$0	\$10,076	\$0.00
CONTRACT 2	HS11	Sheffield Rd	200	583	589	8	VCP	240	Hole soil visible at 15.4' US from separated joint. Fracture longitudinal at 22' US. Hole soil visible at 49' US (Bell completely separated from pipe). Infiltration stain at 107' US. Hole soil visible at 132.7' US. Survey abandoned at 132.7' US due to separated joint (no reversal attempted)	T&S, CIPP, Complete CCTV, Spot Repair	5	0	0	0	\$0	\$26,689	\$26,689	\$0.00
CONTRACT 2	HS11	US 1B Off Ramp	329	1414	1415	8	VCP	258	Infiltration runner at 6' DS due to fracture. Infiltration stains and debris throughout pipe. Protruding lateral at 76' DS causing abandoned survey (reversal incomplete). Protruding lateral at 185.8' DS (found on reversal inspection)	T&S, Cut Service, Complete CCTV, Spot Repair	4	1,440	0	1,440	\$11,226	\$0	\$11,226	\$7.80
CONTRACT 2	HS11	US Rt 1 Bypass	195	1384	1383	12	VCP	358	Infiltration stains and drippers throughout. Roots fine joint at 22' US. Settled gravel at 187' US causing abandoned survey (no reversal attempted)	T&S, Complete CCTV	3	288	0	288	\$11,108	\$0	\$11,108	\$38.57
CONTRACT 2	LR5	Broad Street	3832	1092	1091	8	VCP	528	Solids deposit at joint 0', roots medium joint @ 3' (2), root ball @ 17'. Large object protruding from lateral at 42'. Fracture at 42' broken pipe around lateral. Infiltration stains at 53.5' originating from service. Patch repair at 59'. Broken pipe @ 63' hole with soil visible. Hole soil visible @ 74' from faulty lateral. Crack Longitudinal at 106'. Faulty lateral @ 143' void w/void visible. Diameter change 8-10'' @ 180' (EOS)	Root Treatment, CIPP	5	0	0	0	\$0	\$36,200	\$36,200	\$0.00
CONTRACT 2	LR5	Lafayette Rd XC	1916	1046	1069	10	AC	135	Infiltration runner at 30.3' DS, MH 1069 has infiltration at walls (1.5 gpm)	Clean, T&S	4	432	0	432	\$1,751	\$0	\$1,751	\$4.05
CONTRACT 2	LR5	Ledgewood Dr	1915	1045	1046	10	AC	167	Broken pipe at 17.4' US. Hole soil visible at 40' US. Infiltration stains throughout pipe, infiltration runner joint at 224' US. Survey abandoned due to high water level in pipe at 226' US (no reversal attempted)	T&S, Complete CCTV, Spot Repair	5	288	0	288	\$5,168	\$0	\$5,168	\$17.94
CONTRACT 2	LR5	Ledgewood Dr	1908	1040	1062	8	VCP	134	Deposits attached grease throughout pipe. Survey abandoned at 86.5' DS due to grease blockage (no reversal attempted)	Complete CCTV	5	0	0	0	\$0	\$735	\$735	\$0.00
CONTRACT 3	B1	Colonial Dr	173	468	467	8	VCP	318	Infiltration stains throughout pipe. Intruding laterals at 81.7, 110.2, 138.8, 202.2, 243.9', 252.6', 301.2', and 309' DS. Fracture spiral at 21' DS, Fracture multiple at 24.2 and 27.3' DS. Clear water running from lateral at 64.4' DS (Unknown Source).	Inspect Lateral, CIPP, Cut Service	4	0	144	144	\$23,266	\$0	\$23,266	\$0.00
CONTRACT 3	B1	Georges Ter	688	471	470	8	VCP	111	Roots ball and joint throughout. Infiltration dripper at 18.4' DS from intruding lateral. Intruding lateral with clear water running at 49' DS	Grout Lateral, CIPP, Cut Service, Root Treatment	5	0	432	432	\$9,099	\$0	\$9,099	\$0.00
CONTRACT 3	LD1	Blue Heron dr	2982	926	925	8	VCP	228	Roots throughout pipe. Infiltration weeper at joint 117' DS. Clear Water coming from laterals at 145' and 148' DS (Unknown source). Fracture spiral with infiltration runner at 147' DS.	T&S, Inspect Lateral, Spot Repair, Root Treatment	5	1,152	1,008	2,160	\$11,064	\$0	\$11,064	\$9.60



Contract Number	Metering Basin	Street	Sewer ID	US MH	DS MH	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab Cost	Estimated Total Rehabilitation Cost	Cost Effectiveness (\$ Spent per Gallon Per Day Removed)
CONTRACT 3	LD1	Blue Heron Dr	3102	828	829	8	VCP	242	Infiltration, fractures, and roots throughout pipe. Clear water coming from laterals at 88', 172', and 198' US (Unknown Source).	T&S, Inspect Lateral, CIPP, Complete CCTV, Root Treatment	4	288	1,152	1,440	\$25,631	\$0	\$25,631	\$89.00
CONTRACT 3	LD1	Blue Heron Dr	2981	927	926	8	VCP	195	Survey abandoned at 7' US due to roots (no reversal attempted)	Root Treatment	5	0	0	0	\$0	\$1,170	\$1,170	\$0.00
CONTRACT 3	LD1	Blue Heron Dr	2977	928	926	8	VCP	154	Roots throughout pipe. Broken pipe void visible at 146.2' DS. Fracture spiral at 0' US.	Short Liner, Root Treatment	5	0	0	0	\$0	\$3,442	\$3,442	\$0.00
CONTRACT 3	LD1	Blue Heron Dr	2976	930	928	6	PVC	243	Roots ball joint at 3' US. Clear Water running from lateral at 81' US (Unknown Source). Fracture spiral at 239.8' US (material changed to VCP at 232' US)	Inspect Lateral, Root Treatment	4	0	1,440	1,440	\$2,206	\$0	\$2,206	\$0.00
CONTRACT 3	LD1	Dunlin Way	2966	924	923	8	VCP	242	Fractures throughout pipe. Sag in pipe at 41' DS. Broken pipe no void visible at 95' DS. Pipe sag at 110' DS. Hinge fracture 3 from 135'-170' DS. Broken pipe with Hole soil visible at 160' DS (continuation of fracture).	CIPP, Spot Repair	5	0	0	0	\$0	\$21,995	\$21,995	\$0.00
CONTRACT 3	LD1	Market St	842	5565	2369	8	PVC	207	Light debris throughout pipe. Infiltration weeper and stain at 192' DS.	Clean, T&S	2	144	0	144	\$2,329	\$0	\$2,329	\$16.17
CONTRACT 3	LD1	Michael Succi Dr	3048	1015	1016	14	AC	200	Roots medium joint @ 79', hole with soil visible @ 79', difficult to determine where survey begins	Short Liner	5	0	0	0	\$0	\$3,000	\$3,000	\$0.00
CONTRACT 3	LD1	Michael Succi Dr	3049	1016	1017	14	AC	209	Offset joint small with void visible @ 36', infiltration stains at lateral 89' and 143', roots fine joint @ 207' (Manhole)	T&S	4	0	0	0	\$0	\$600	\$600	\$0.00
CONTRACT 3	LD1	Osprey Dr	2988	841	840	8	VCP	146	Fractures and infiltration stains throughout pipe. Roots ball joint at 111' DS	CIPP, Root Treatment	5	0	288	288	\$9,605	\$0	\$9,605	\$0.00
CONTRACT 3	LD1	Osprey Dr	2989	840	839	8	VCP	326	Roots and fractures throughout pipe. Hinge fracture 3 at 120.2' DS.	CIPP	4	0	0	0	\$0	\$19,533	\$19,533	\$0.00
CONTRACT 3	LD1	Spinnaker Way	2957	941	942	8	VCP	225	Surface spalling at 14' US. Clear water coming from laterals at 69', 106', 166', and 204' US. Clear water from lateral at 21' US (unknown source). Crack longitudinal at 22' US. Broken pipe at 30' (no void visible). Fracture spiral at 44' US. Roots in lateral at 69' US. Roots fine barrel at 100' US. Infiltration stains at 126' US. Fracture spiral at 217' US with infiltration runner	Grout Lateral, Inspect Lateral, Short Liner, Spot Repair	5	288	3,312	3,600	\$7,570	\$0	\$7,570	\$26.28
CONTRACT 3	LD1	Spinnaker Way	2955	939	940	8	VCP	246	Roots throughout pipe. Infiltration runner at 92' DS coming from crack longitudinal. Infiltration runner at 114' DS. Deposits attached grease and encrustation throughout pipe. Clear water running from lateral at 146' DS (Unknown source). Infiltration dripper joint at 174' DS. Infiltration runner joint at 180' DS. Infiltration dripper at 206' DS.	Clean, T&S, Inspect Lateral, Spot Repair	5	2,160	432	2,592	\$10,769	\$0	\$10,769	\$4.99
CONTRACT 3	LD1	Spinnaker Way	2963	935	934	8	VCP	206	Roots and debris throughout pipe. Broken pipe void visible at 62' US. Infiltration weeper joint at 98' US and 102' US. Collapsed pipe at 106' US. Hinge fracture 3 from 130' and 155' US.	T&S, Spot Repair, Root Treatment	5	720	0	720	\$22,653	\$0	\$22,653	\$31.46
CONTRACT 3	LD1	Spinnaker Way	2958	942	932	8	VCP	219	Crack longitudinal at 10' US With infiltration weeper. Crack circumferential and infiltration stains at 14' US. Pipe half full of debris at 28' (grass and toilet paper). Settled gravel deposits at 36' US. Infiltration stain joint at 40' US. Clear water leaking from lateral at 62' US. Roots joint fine and roots barrel fine at 100' US with Clear water running from lateral 100' US. Infiltration dripper at joint 112' US. Heavy debris and gravel blocking remaining survey. (Reversal complete)	T&S, Grout Lateral, CIPP, Short Liner	4	288	432	720	\$23,750	\$0	\$23,750	\$82.47
CONTRACT 3	LD1	Spinnaker Way	2961	937	936	8	VCP	212	Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at 79' US with Joint Offset Severe (sinking into ground)	Complete CCTV, Spot Repair	5	144	0	144	\$13,667	\$0	\$13,667	\$94.91
CONTRACT 3	LD1	Spinnaker Way	3027	943	2361	8	VCP	279	Infiltration runner in lateral at 207.6' DS. Infiltration stains and roots throughout pipe	T&S, Grout Lateral, Root Treatment	4	0	1,440	1,440	\$8,646	\$0	\$8,646	\$0.00
CONTRACT 3	LD1	Spinnaker Way	2956	940	941	8	VCP	186	Fractures, roots, and infiltration stains throughout pipe. Clear water running from lateral at 114.8' DS (Unknown Source)	T&S, Inspect Lateral, CIPP, Root Treatment	4	0	432	432	\$17,682	\$0	\$17,682	\$0.00



Contract Number	Metering Basin	Street	Sewer ID	US MH	DS MH	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab Cost	Estimated Total Rehabilitation Cost	Cost Effectiveness (\$ Spent per Gallon Per Day Removed)
CONTRACT 4	HS14	Coakley Rd	321	533	534	8	VCP	315	Fractures throughout pipe. Hole and broken pipe soil visible at 143' DS. Survey abandoned at 143' DS due to broken pipe (reversal incomplete)	CIPP, Spot Repair	5	0	0	0	\$0	\$21,381	\$21,381	\$0.00
CONTRACT 4	HS14	Coakley Rd	1334	541	5341	8	VCP	88	Roots, fractures, and infiltration throughout pipe. Hinge fracture 3 at 47' DS	T&S, CIPP, Spot Repair, Root Treatment	5	1,728	0	1,728	\$10,527	\$0	\$10,527	\$6.09
CONTRACT 4	HS14	Coakley Rd	187	538	540	8	VCP	560	Includes Pipe SewerID 1335. Roots throughout pipe. Broken pipe at 17.9' US. Fracture longitudinal at 61' US. Clear water running from laterals at 173' and 389' US (Unknown Source). Protruding lateral at 247' US. Fracture spiral at 288' US. Hole soil visible at 481' US.	Inspect Lateral, CIPP, Root Treatment	5	0	720	720	\$37,710	\$0	\$37,710	\$0.00
CONTRACT 4	HS14	Coakley Rd	320	532	533	8	VCP	178	Hinge fracture 4 at 34' DS, Clear water dripping from lateral at 48' DS, Hinge fracture 3 at 48-52' DS. Hinge fracture 3 from 149'-160' DS. Fractures throughout pipe. Candidate for Dig & Replace.	CIPP	4	0	144	144	\$10,685	\$0	\$10,685	\$0.00
CONTRACT 4	HS14	Coakley St	323	540	541	8	VCP	121	Fractures throughout pipe. Hinge fracture 3 at 35' DS. Hinge fracture 4 at 38' DS. Broken pipe void visible at 39' DS. Fracture spiral at 48' DS. Survey abandoned at large offset joint (52.4' DS) (no reversal attempted)	CIPP, Spot Repair	5	0	0	0	\$0	\$12,288	\$12,288	\$0.00
CONTRACT 4	HS15	Essex Ave	1389	596	598	8	VCP	390	Fractures and roots throughout pipe, clear water dripping from lateral at 165.8' US (Unknown Source). Collapsed pipe at 150.6 DS.	Inspect Lateral, CIPP, Spot Repair, Root Treatment	5	0	432	432	\$29,017	\$0	\$29,017	\$0.00
CONTRACT 4	HS15	Essex Ave	4156	593	580	8	VCP	318	Infiltration stains and roots throughout pipe. Fracture at 47.4.	T&S, Short Liner, Root Treatment	4	0	0	0	\$0	\$12,389	\$12,389	\$0.00
CONTRACT 4	HS15	Hampshire Rd	4172	587	1381	10	VCP	153	Infiltration and fractures throughout, broken pipe void visible at 35.2'.	T&S, CIPP	5	288	0	288	\$13,009	\$0	\$13,009	\$45.17
CONTRACT 4	HS15	Hampshire Rd	4165	2211	587	10	VCP	89	Infiltration stains at 11.1' US. Survey abandoned at 68.8' US due to high grease and water level (reversal incomplete)	T&S, Complete CCTV	4	0	0	0	\$0	\$2,717	\$2,717	\$0.00
CONTRACT 4	HS15	Melbourne St	5008	5401	2728	8	VCP	480	Fractures, holes, and roots throughout pipe. Intruding laterals at 21.6', 261', 301.4', 322.3', and 429.6' DS. Clear water running from laterals at 70.8', 261.7', 301.4, 350.7, and 364' DS.	T&S, Grout Lateral, CIPP, Cut Service, Root Treatment	5	0	2,592	2,592	\$48,069	\$0	\$48,069	\$0.00
CONTRACT 4	HS15	Melbourne St	202	2728	596	8	VCP	248	Roots and fractures throughout pipe, hole with soil visible at 210' DS, chipped bell at 233' DS.	CIPP, Root Treatment	5	0	0	0	\$0	\$16,377	\$16,377	\$0.00
CONTRACT 4	HS15	Sheffield Rd	4163	581	580	8	VCP	242	Hinge fracture 3 with broken pipe at 2' DS. Fractures throughout remainder of pipe. Intruding laterals at 58.6', 136', 145.4', and 167.5' DS. Clear water running from lateral at 167.5' DS (Unknown Source). Hole soil visible at 57.5' DS. Infiltration stains and mineral deposits throughout pipe with infiltration runner from joint at 156.1' DS.	T&S, Inspect Lateral, CIPP, Cut Service, Spot Repair	5	1,440	288	1,728	\$25,556	\$0	\$25,556	\$17.75
CONTRACT 4	HS15	Sheffield Rd	6468	597	5685	8	VCP	173	Fractures throughout pipe. Intruding laterals at 124.8' and 151.7' DS. Clear water dripping from lateral at 124.8' DS	T&S, Grout Lateral, CIPP, Cut Service	4	0	288	288	\$16,030	\$0	\$16,030	\$0.00
CONTRACT 4	HS15	Sims Ave	4153	599	600	8	VCP	80	Infiltration Runner at DS MH Connection Broken pipe at 69' DS. Infiltration Stains throughout pipe. Clear	Clean, T&S	4	720	0	720	\$2,440	\$0	\$2,440	\$3.39
CONTRACT 4	HS15	Sims Ave	4188	2728	598	8	VCP	238	Water coming from lateral at 131.4 DS. Protruding lateral at 135.6' DS causing abandoned survey (reversal incomplete)	T&S, Grout Lateral, CIPP, Short Liner	4	0	288	288	\$23,222	\$0	\$23,222	\$0.00
CONTRACT 4	HS15	US Rt 1 Byepass	547	1423	1382	8	VCP	83	Infiltration stains throughout pipe. Crack longitudinal at 21' US, Broken pipe void visible at 56.8' US, Large rock intruding into broken pipe at 79.9' US with infiltration runner around rock. Roots medium joint at 82.1' US. Candidate for Dig & Replace.	CIPP	5	720	0	720	\$4,956	\$0	\$4,956	\$6.88
CONTRACT 4	HS15	US Rt 1 Bypass	4554	1382	1383	12	VCP	290	Includes Pipe Sewer ID 4555. Infiltration stains and drippers throughout pipe. Clear water running from laterals at 190.7 and 191.3' DS. lateral intruding at 190.7' DS. Survey abandoned at 290' DS due to high water level (no reversal attempted)	T&S, Grout Lateral, Complete CCTV	4	432	720	1,152	\$9,893	\$0	\$9,893	\$22.90
CONTRACT 4	HS15	US Rt 1 Bypass N	194	1383	1384	10	VCP	399	Fracture spiral at 22' US. Infiltration drippers throughout pipe	Clean, T&S, Short Liner	3	1,728	0	1,728	\$14,747	\$0	\$14,747	\$8.53
CONTRACT 4	M1	Fairview Ave	834	111	110	8	PVC	28	Separated joint 1.5', lateral at 4.5' potential inflow source (steady clear water),	Grout Lateral	2	432	0	432	\$300	\$0	\$300	\$0.69



Contract Number	Metering Basin	Street	Sewer ID	US MH	DS MH	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab Cost	Estimated Total Rehabilitation Cost	Cost Effectiveness (\$ Spent per Gallon Per Day Removed)
CONTRACT 4	M1	Maplewood Ave	830	2129	2132	8	PVC	223	Light infiltration observed at lateral 160'	T&S	2	144	0	144	\$1,800	\$0	\$1,800	\$12.50
CONTRACT 4	M1	Maplewood Ave	841	105	104	8	PVC	261	Infiltration observed @ lateral (192'), grease deposits @ 250', lateral 1/2 full of grease @ 255'	Clean, Grout Lateral	3	432	0	432	\$1,800	\$0	\$1,800	\$4.17
CONTRACT 4	M1	Maplewood Ave	840	2359	105	8	PVC	169	Potential inflow observed @ 33' from lateral (steady clear water)	Grout Lateral	4	432	0	432	\$300	\$0	\$300	\$0.69
CONTRACT 4	M1	Maplewood St	837	767	769	8	VCP	213	Clear water running from lateral at 45.5' DS. Cracks and fractures throughout pipe. Survey abandoned at 110' DS due to turn in pipe (reversal incomplete) - City Currently Digging, Removed from Recommendation.	Monitor	4	0	0	0	\$0	\$0	\$0	\$0.00
CONTRACT 4	M1	Oleary Pl	833	759	111	6	AC	100	Rag wedged in joint at 29' DS. Survey abandoned at 33' DS due to offset joint (no reversal attempted)	Complete CCTV	5	0	0	0	\$0	\$553	\$553	\$0.00
							CONTRACT	1 TOTALS				51,264	4,032	55,296	\$178,085	\$12,045	\$190,130	-
							CONTRACT					3,744	9,360	13,104	\$170,480	\$122,406	\$292,885	-
	CONTRACT 3 TOTALS											5,184 8,496	10,512	15,696	\$187,938	\$49,739	\$237,677	-
		CONTRACT 4 TOTALS											5,472	13,968	\$250,062	\$65,705	\$315,767	-



Table 4-15: Manhole Rehabilitation Recommendations

													Infiltration
										E attac at a d	E attac at a d	Estimated	Removal
	Matarina		NALL.	MH	Manhala			Max	Estimated	Estimated	Estimated	Estimated	Cost
Contract	Metering	Street	MH	Depth	Manhole	Observations	Rehabilitation Recommendations	Defect	Infiltration	Infiltration	Structural / O&M	Total Rehab	Effectivenes
	Basin		Number	(ft)	Material			Score	(gpd)	Removal Cost	Rehab	Cost	s (\$ Spent per Gallon
										COSI	Reliab	COSI	Per Day
													Removed
CONTRACT 1	GR1	Blue Heron Dr Easement	916	8	BRICK	Roots and infiltration staining at wall	Root Treatment, Grout Manhole, Cementitious Liner	2	360	\$2,960	\$2,200	\$5,160	\$8.22
CONTRACT 1	GR1	Commerce Way	638	16	PRECAST	Infiltration staining	Grout Manhole	2	720	\$3,400	\$0	\$3,400	\$4.72
CONTRACT 1	GR1	Commerce Way	5332	13	PRECAST	Active infiltration at walls, cracked frame with broken pieces	New Frame and Cover, Grout Manhole, Cementitious Liner	3	720	\$4,810	\$820	\$5,630	\$6.68
CONTRACT 1	GR1	Commerce Way Easement	632	13	PRECAST	Mineral deposits	Grout Manhole	2	360	\$2,600	\$0	\$2,600	\$7.22
						Severe infiltration from corbel, surcharging (no bench or invert visible), ponding around							
CONTRACT 1	GR1	Commerce Way Easement	2385	8	BRICK	frame causing inflow. Located on Pease effluent line.	Corbel Repair, Rebuild Bench, Grout Manhole, Raise to Surface	4	2880	\$1,600	\$4,300	\$5,900	\$0.56
CONTRACT 1	GR1	Commerce Way Easement	2386	9	BRICK	Roots in corbel, Active infiltration with mineral deposits at wall, heavy debris in invert.	Root Treatment, Grout Manhole, Cementitious Liner	3	1440	\$3,330	\$2,200	\$5,530	\$2.31
		3		9		Located on Pease effluent line.		3	1440	\$3,330			
CONTRACT 1	GR1	Granite St R.O.W.	5729	6	PRECAST	Evidence of surcharge, bench and invert not visible due to high water.	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 1	GR1	Oriental Gardens R.O.W.	629	11	PRECAST	Heavy mineral deposits, aggregate visible at wall due to H2S	Grout Manhole, Epoxy Liner	3	1440	\$2,200	\$5,500	\$7,700	\$1.53
CONTRACT 1	GR1	Oriental Gardens R.O.W.	631	13	PRECAST	Mineral deposits	Grout Manhole	2	360	\$2,600	\$0	\$2,600	\$7.22
CONTRACT 1	GR1	Osprey Dr	821	9	BRICK	Manhole walls leaking at 11.6 gpm per flow isolation, no picture taken of infiltration. Also,	Grout Manhole, Cementitious Liner	4	16704	\$3,700	\$0	\$3,700	\$0.22
		1 5		,		possible industrial connection/service infiltration.							
CONTRACT 1	GR1	Osprey Dr Easement	5495	8	UNKNOWN	Cover broken	New Frame and Cover	4	0	\$0	\$820	\$820	\$0.00
CONTRACT 1	GR1	Portsmouth Boulevard	816	8	BRICK	Mineral deposits at wall. Pipe connection leak.	Grout Manhole, Cementitious Liner	3	7200	\$3,330	\$0	\$3,330	\$0.46
CONTRACT 1	GR1	Portsmouth Boulevard	818	10	BLOCK	Active infiltration and mineral deposits at wall, roots	Root Treatment, Grout Manhole, Cementitious Liner	4	7200	\$4,070	\$2,200	\$6,270	\$0.57
CONTRACT 1	GR1	Portsmouth Boulevard	5852	11	PRECAST	Mineral deposits at bench, broken bricks and missing mortar from corbel	Corbel Repair, Grout Manhole, Cementitious Liner	2	720	\$4,070	\$1,000	\$5,070	\$5.65
		Easement											· · · · · · · · · · · · · · · · · · ·
CONTRACT 1	GR1	Portsmouth Boulevard near Market St	813	11	BRICK	Active infiltration and mineral deposits at wall	Grout Manhole, Cementitious Liner	3	432	\$4,070	\$0	\$4,070	\$9.42
						Pipe connection leak from north and west pipes. Possible industrial connection/service	Grout Manhole, Cementitious Liner						<u> </u>
CONTRACT 1	GR1	Shearwater Dr	920	9	BRICK	infiltration.		4	10080	\$3,330	\$0	\$3,330	\$0.33
CONTRACT 1	GR1	Woodbury Ave	642	11	PRECAST	Missing bricks and mortar from corbel, Mineral deposits at wall, debris buildup in bench.	Corbel Repair, Grout Manhole, Cementitious Liner	3	1440	\$4,070	\$1,000	\$5,070	\$2.83
						Infiltration staining at wall, aggregate visible at wall due to H2S. Located on Pease effluent							
CONTRACT 1	GR1	Woodbury Ave	2387	12	PRECAST	line.	Grout Manhole, Epoxy Liner	2	360	\$2,400	\$6,000	\$8,400	\$6.67
CONTRACT 1	GR1	Woodbury Ave	2388	13	PRECAST	Mineral deposits, debris buildup in bench and channel. Bricks missing from bench.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	360	\$4,810	\$2,200	\$7,010	\$13.36
						Missing bricks in bench and invert. Light debris buildup in bench and channel. Infiltration				,	,		
CONTRACT 1	GR1	Woodbury Ave	5334	12	PRECAST	staining at wall. Possible industrial connection/service infiltration.	Rebuild Bench, Grout Manhole	4	720	\$2,400	\$2,200	\$4,600	\$3.33
CONTRACT 1	LR3	Nathaniel Dr R.O.W.	1646	5	PRECAST	Wall leaks, hole in wall at connection to bench	Grout Manhole, Cementitious Liner	3	2880	\$1,850	\$0	\$1,850	\$0.64
CONTRACT 1	LR3	Nathaniel Dr R.O.W.	2445	8	PRECAST	Light infiltration stains at walls, cracked cover	New Frame and Cover, Grout Manhole, Cementitious Liner	3	2880	\$2,960	\$820	\$3,780	\$1.03
CONTRACT 1	LR3	Nathaniel Dr R.O.W.	2455	7	PRECAST	Active infiltration at walls	Grout Manhole, Cementitious Liner	3	288	\$2,590	\$0	\$2,590	\$8.99
CONTRACT 1	LR3	Nathaniel Dr R.O.W.	2458	9	PRECAST	Rocks on bench	New Frame and Cover	4	0	\$0	\$820	\$820	\$0.00
CONTRACT 1	LR4	Greenleaf Ave	395	8	PRECAST	Possible industrial connection/service infiltration.	Grout Manhole, Cementitious Liner	3	720	\$2,960	\$0	\$2,960	\$4.11
CONTRACT 1	LR4	Greenleaf Ave	397	8	PRECAST	Corbel missing bricks and mortar, light debris on bench. 6 gpm leak observed during flow	Corbel Repair, Grout Manhole, Cementitious Liner	3	8640	\$2,960	\$1,000	\$3,960	\$0.34
				Ű		isolation.		L ů					
CONTRACT 1	LR4	Greenleaf Ave	1047	8	PRECAST	Possible industrial connection/service infiltration.	Grout Manhole, Cementitious Liner	3	1080	\$2,960	\$0	\$2,960	\$2.74
CONTRACT 1	LR4	Greenleaf Woods Dr	376	8	UNKNOWN	Incoming pipe connection leak	Grout Manhole, Cementitious Liner	3	288	\$2,960	\$0	\$2,960	\$10.28
CONTRACT 1	LR4	Greenleaf Woods Dr	377	14	PRECAST	Mineral deposits at pipe connections (primary in/out) with active infiltration	Grout Manhole, Cementitious Liner	4	17280	\$5,180	\$0	\$5,180	\$0.30
CONTRACT 1	LR4	Greenleaf Woods Dr	378	15	PRECAST	Active infiltration from wall	Grout Manhole, Cementitious Liner	4	1440	\$5,920	\$0	\$5,920	\$4.11
CONTRACT 1	LR4	Greenleaf Woods Dr	380	14	PRECAST	Chipped frame, Active infiltration with mineral deposits at wall	New Frame and Cover, Grout Manhole, Cementitious Liner	3	288	\$5,180	\$820	\$6,000	\$17.99
CONTRACT 1	LR4	Greenleaf Woods Dr	396	0	PRECAST	Incoming pipe connection leak, voids visible around inlet and outlet pipe connections.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	9360 1080	\$2,590	\$2,200	\$4,790	\$0.28
CONTRACT 1 CONTRACT 1	LR4 LR4	Greenleaf Woods Dr McClintock Ave	5872 544	8	UNKNOWN PRECAST	Incoming pipe connection leak Active Infiltration at walls	Grout Manhole, Cementitious Liner Grout Manhole, Cementitious Liner	3	1080	\$2,960 \$2,960	\$0 \$0	\$2,960 \$2,960	\$2.74 \$2.74
CONTRACT 1	LR4 LR4	McClintock Ave	545	8	PRECAST	Infiltration Gusher at Effluent Pipe Connection (to MH 420)	Grout Manhole, Cementitious Liner	3	2880	\$2,960	\$0	\$2,960	\$2.74
CONTRACT 1	LR4 LR4	McClintock Ave	2726	8	UNKNOWN	Incoming pipe connection leak	Grout Manhole, Cementitious Liner	3	72	\$2,960	\$0 \$0	\$2,900	\$41.11
CONTRACT 1	LR4 LR4	Middle Rd	961	6	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$2,700	\$2,200	\$2,700	\$0.00
CONTRACT 1	LR4 LR4	Middle Rd at Leavitt Ave	554	5	BLOCK	No bench and invert, heavy debris buildup, corbel blocks missing/deteriorating	Corbel Repair, Rebuild Bench	4	0	\$0 \$0	\$3,200	\$3,200	\$0.00
CONTRACT 1	LR4	Peverly Hill Rd	406	7	PRECAST	Incoming and outgoing pipe connection leaks.	Grout Manhole, Cementitious Liner	3	2232	\$2,960	\$0	\$2,960	\$1.33
		Peverly Hill Rd at McClintock											
CONTRACT 1	LR4	Ave	407	8	PRECAST	Outgoing pipe connection leak.	Grout Manhole, Cementitious Liner	3	1440	\$3,330	\$0	\$3,330	\$2.31
CONTRACT 1	LR4	Sweatt Ave	551	8	PRECAST	Pipe connection and invert leaking	Rebuild Bench, Grout Manhole, Cementitious Liner	3	360	\$2,960	\$2,200	\$5,160	\$8.22
CONTRACT 1	LR4	Woodworth Ave	546	8	UNKNOWN	Infiltration at pipe connection and invert	Grout Manhole	2	288	\$1,600	\$0	\$1,600	\$5.56
CONTRACT 1	LR6	Heritage Ave	2635	12	PRECAST	Active infiltration at wall	Grout Manhole, Cementitious Liner	3	288	\$4,440	\$0	\$4,440	\$15.42
CONTRACT 1	LR6	Heritage Ave	2642	9	PRECAST	Light Infiltration observed at walls, mineral deposits	Grout Manhole, Cementitious Liner	3	1440	\$3,700	\$0	\$3,700	\$2.57



Woodard & Curran, Inc. July 2020

Contract	Metering Basin	Street	MH Number	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectivenes s (\$ Spent per Gallon Per Day Removed
CONTRACT 1	LR6	Lafayette Rd	2471	6	PRECAST	Active infiltration at walls	Grout Manhole, Cementitious Liner	3	720 432	\$2,590	\$0 \$0	\$2,590	
CONTRACT 1	LR6	Lafayette Rd	2507	6	PRECAST	Infiltration at bench/wall connection	Grout Manhole, Cementitious Liner	2	432	\$2,590		\$2,590	\$6.00
CONTRACT 1	LR6	Lafayette Rd at Blue Fish Boulevard	2501	6	PRECAST	Moderate debris on bench, broken cover	New Frame and Cover, Rebuild Bench	4	0	\$0	\$3,020	\$3,020	\$0.00
CONTRACT 1	LR6	Lafayette Rd at Coach Rd	2483	8	PRECAST	Light infiltration at manhole wall	Grout Manhole	2	288	\$1,800	\$0	\$1,800	\$6.25
CONTRACT 1	LR6	Lafayette Rd at Coach Rd	2487	8	PRECAST	Light debris on bench and invert. Infiltration at bench/wall connection. Possible industrial connection/service infiltration.	Grout Manhole, Cementitious Liner	2	2520	\$3,330	\$0	\$3,330	\$1.32
CONTRACT 1	LR6	Lafayette Rd at Constitution Ave	2631	8	PRECAST	Broken frame, light debris on bench, bench missing bricks, corbel missing mortar	New Frame and Cover	4	0	\$0	\$820	\$820	\$0.00
CONTRACT 1	LR6	Lafayette Rd at Constitution Ave	2632	9	PRECAST	Broken frame, light debris on bench	New Frame and Cover	4	0	\$0	\$820	\$820	\$0.00
CONTRACT 1	LR6	Robert Ave	2646	6	PRECAST	Mineral deposits at wall and void visible at outgoing pipe connection	Grout Manhole, Cementitious Liner	3	5040	\$2,220	\$0	\$2,220	\$0.44
CONTRACT 1	LR6	White Cedar Boulevard R.O.W.	2657	8	PRECAST	Mineral deposits at wall	Grout Manhole, Cementitious Liner	3	360	\$3,330	\$0	\$3,330	\$9.25
CONTRACT 2	HS11	Aldrich Rd at Aldrich Court	5819	8	PRECAST	Incoming pipe connection leak (estimated at 2 gpm)	Rebuild Bench, Grout Manhole, Cementitious Liner	3	1800	\$2,960	\$2,200	\$5,160	\$1.64
CONTRACT 2	HS11	Bartlett St	1397	7	BRICK	Broken and loose bricks on corbel, missing mortar from corbel. No bench and invert, heavy debris buildup	Rebuild Bench, Cementitious Liner	4	0	\$0	\$3,390	\$3,390	\$0.00
CONTRACT 2	HS11	Brewery Lane	1329	14	PRECAST	No bench and invert	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
		4					New Frame and Cover, Rebuild Bench, Grout Manhole, Epoxy	-					
CONTRACT 2	HS11	Brewery Lane	1330	11	PRECAST BRICK AND	Bench and invert gone/broken/sinking, infiltration staining at walls, piece of frame missing No bench and invert, roots at wall. Large gaps in wall. Possible industrial	Liner	5	720	\$2,400	\$9,020	\$11,420	\$3.33
CONTRACT 2	HS11	Brewery Lane	1331	14	STONE	connection/service infiltration.	Rebuild Bench, Grout Manhole, Cementitious Liner	4	1440	\$5,550	\$2,200	\$7,750	\$3.85
CONTRACT 2	HS11	Cate St	1390	9	BLOCK	Active infiltration and mineral deposits at wall, corbel missing mortar	Grout Manhole, Cementitious Liner	3	288	\$3,330	\$0	\$3,330	\$11.56
CONTRACT 2 CONTRACT 2	HS11	Cate St Fells Rd	1392 1300	5	PRECAST BRICK	Mineral deposits at wall, corbel missing mortar Possible industrial connection/service infiltration.	Grout Manhole Grout Manhole, Cementitious Liner	2	360 720	\$1,200 \$2,960	\$0	\$1,200	\$3.33
CONTRACT 2	HS11 HS11	Fields Rd and Sewall Rd	1300	8	BLOCK	Moderate debris in bench and invert, active infiltration from wall	Grout Manhole, Cementitious Liner	3	1440	\$2,960 \$2,960	\$0 \$0	\$2,960 \$2,960	\$2.06
CONTRACT 2	HS11	Hampshire Rd	1311	8	BLOCK	Active infiltration and mineral deposits at wall	Grout Manhole, Cementitious Liner	3	288	\$2,960	\$0 \$0	\$2,900	\$10.28
CONTRACT 2	HS11	Islington St	2221	11	BRICK	Active infiltration at wall, bench and invert not visible, corbel missing mortar and cracked	Corbel Repair, Rebuild Bench, Grout Manhole, Cementitious	4	1080	\$4,440	\$3,200	\$7,640	\$4.11
CONTRACT 2	HS11	Islington St	2248	8	PRECAST	No bench and invert. Infiltration at manhole wall.	Rebuild Bench, Grout Manhole, Cementitious Liner	4	2880	\$2,960	\$2,200	\$5,160	\$1.03
CONTRACT 2	HS11	Lovell St R.O.W.	2741	10	BLOCK	Walls missing mortar, no bench and invert, mineral deposits in incoming line	Rebuild Bench, Grout Manhole, Cementitious Liner	4	720	\$4,070	\$2,200	\$6,270	\$5.65
CONTRACT 2	HS11	Madison St at Lovell St	1344	6	PRECAST	No bench and invert, heavy debris buildup	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 2	HS11	Sewall Rd	1307	6	PRECAST	Active infiltration at walls, hole in bench, corbel missing mortar, chipped frame	New Frame and Cover, Rebuild Bench, Grout Manhole, Cementitious Liner	3	288	\$2,590	\$3,020	\$5,610	\$8.99
CONTRACT 2	HS11	Sewall Rd	1314	8	PRECAST	Chipped cover, active infiltration coming from wall	New Frame and Cover, Grout Manhole, Cementitious Liner	3	288	\$2,960	\$820	\$3,780	\$10.28
				-		Faulty drop connection in manhole, light debris on bench and invert, walls weeping at							
CONTRACT 2	HS11	Sewall Rd at Spinney Rd	1315	9	PRECAST	joints Incoming pipe connection leak, broken and loose bricks in manhole. Possible industrial	Grout Manhole, Cementitious Liner	3	1728	\$3,330	\$0	\$3,330	\$1.93
CONTRACT 2 CONTRACT 2	HS11 HS11	Sheffield Rd Thaxter Rd at Fells Rd	583 1303	8	BRICK BLOCK	connection/service infiltration.	Grout Manhole, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	3	720 1080	\$2,960 \$4,070	\$0 \$2,200	\$2,960 \$6,270	
CONTRACT 2	HS11	US Bypass 1	1303	11	BLOCK	Roots, Active infiltration and mineral deposits at wall	Root Treatment, Grout Manhole, Cementitious Liner	3	1000	\$4,070	\$2,200	\$6,640	
CONTRACT 2	HS11	US Bypass 1 at rear	1388	12	PRECAST	Mineral deposits at wall, corbel missing mortar	Grout Manhole	2	360	\$2,400	\$2,200	\$0,040	
CONTRACT 2	LR5	Lafayette Rd	1064	11	PRECAST	Active infiltration with mineral deposits at wall	Grout Manhole, Cementitious Liner	3	288	\$4,070	\$0 \$0	\$4,070	
CONTRACT 2	LR5	Ledgewood Dr	1069	8	UNKNOWN	Incoming pipe connection leak	Grout Manhole, Cementitious Liner	3	1080	\$2,960	\$0	\$2,960	
CONTRACT 2	LR5	Ledgewood Dr R.O.W.	1044	5	PRECAST	No bench and invert, heavy debris buildup, active infiltration at wall, frame chipped	New Frame and Cover, Rebuild Bench, Grout Manhole, Cementitious Liner	4	288	\$2,220	\$3,020	\$5,240	\$7.71
CONTRACT 2	LR5	Ledgewood Dr R.O.W.	1045	8	PRECAST	Infiltration staining and mineral deposits at wall. Active infiltration from wall joints	Grout Manhole, Cementitious Liner	3	288	\$3,330	\$0	\$3,330	\$11.56
CONTRACT 3	B1	Victory Rd	460	8	BRICK	Roots at wall, corbel has broken bricks and missing mortar	Corbel Repair, Root Treatment, Grout Manhole	2	720	\$1,800	\$3,200	\$5,000	
CONTRACT 3	LD1	Albacore Museum Access Pump Station	2368	18	PRECAST	Light infiltration stains at walls	Grout Manhole, Cementitious Liner	3	720	\$6,660	\$0	\$6,660	\$9.25
CONTRACT 3	LD1	Dunlin Way	2454	14	PRECAST	No bench and invert, debris buildup	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 3	LD1	Kearsarge Rd at Market St	2362	10	PRECAST	Invert leak. Infiltration at manhole wall.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	1440	\$3,700	\$2,200	\$5,900	
CONTRACT 3	LD1	Kearsarge Way	946	8	PRECAST	Roots and Wall Leak	Root Treatment, Grout Manhole, Cementitious Liner	3	720	\$2,960	\$2,200	\$5,160	\$4.11
CONTRACT 3	LD1	Market St	5563	8	PRECAST	Wall leaks and the manhole does not have a bench/invert. Significant debris build up. Possible industrial connection/service infiltration.	Rebuild Bench, Grout Manhole, Cementitious Liner	4	1080	\$2,960	\$2,200	\$5,160	\$2.74
CONTRACT 3	LD1	Osprey Dr	838	8	BRICK	Active Infiltration at walls. Possible industrial connection/service infiltration.	Grout Manhole, Cementitious Liner	3	1440	\$2,960	\$0	\$2,960	
CONTRACT 3	LD1	Portsmouth Boulevard R.O.W.	17	7	PRECAST	Missing mortar from corbel with roots in corbel. Infiltration at pipe connection.	Corbel Repair, Grout Manhole, Cementitious Liner	2	720	\$2,960	\$1,000	\$3,960	\$4.11



Woodard & Curran, Inc. July 2020

Contract	Metering Basin	Street	MH Number	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectivenes s (\$ Spent per Gallon Per Day Removed
CONTRACT 3	LD1	Spinnaker Way	939	8	UNKNOWN	Infiltration at manhole walls	Grout Manhole, Cementitious Liner	3	720	\$2,960	\$0	\$2,960	\$4.11
CONTRACT 3	LD1	Spinnaker Way	940	8	UNKNOWN	Infiltration at manhole walls. Possible industrial connection/service infiltration.	Grout Manhole, Cementitious Liner	4	1440	\$2,960	\$0	\$2,960	\$2.06
CONTRACT 3	LD1	Spinnaker Way	942	9	BRICK	Mineral deposits at bench and invert, roots in corbel. Walls weaping during MH Inspection. Active infiltration during flow isolation.	Grout Manhole, Cementitious Liner	3	2880	\$3,330	\$0	\$3,330	\$1.16
CONTRACT 3	LD1	Spinnaker Way	943	8	UNKNOWN	Wall leaks. Possible industrial connection/service infiltration.	Grout Manhole, Cementitious Liner	2	720	\$2,960	\$0	\$2,960	\$4.11
CONTRACT 4	HS14	Barberry Lane Easement	5316	7	PRECAST	Active infiltration and mineral deposits at wall, corbel missing mortar	Corbel Repair, Grout Manhole, Cementitious Liner	3	2160	\$2,590	\$1,000	\$3,590	\$1.20
CONTRACT 4	HS14	Barberry Lane Easement	5412	17	PRECAST	Infiltration staining at wall	Grout Manhole, Cementitious Liner	3	360	\$6,660	\$0	\$6,660	\$18.50
CONTRACT 4	HS14	Borthwick Ave at Marriot Hotel	2219	6	PRECAST	Mineral deposits at outlet pipe with active infiltration	Grout Manhole, Cementitious Liner	3	288	\$2,220	\$0	\$2,220	\$7.71
CONTRACT 4	HS14	Coakley Rd	534	10	PARGED	No bench and invert, heavy debris buildup	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 4	HS14	Coakley Rd	540	8	BLOCK	Moderate debris on bench, broken frame, loose and broken bricks from corbel, missing mortar from walls	New Frame and Cover, Corbel Repair, Grout Manhole, Cementitious Liner	3	720	\$2,960	\$1,820	\$4,780	\$4.11
CONTRACT 4	HS14	Coakley Rd	541	7	BLOCK	Missing mortar in walls, No bench and invert, heavy debris buildup	Rebuild Bench, Cementitious Liner	4	0	\$0	\$3,560	\$3,560	\$0.00
CONTRACT 4	HS14	Coakley Rd	2727	8	BLOCK	Missing mortar in wall, no bench and invert, heavy debris buildup	Rebuild Bench, Grout Manhole, Cementitious Liner	4	720	\$3,330	\$2,200	\$5,530	\$4.63
CONTRACT 4	HS15	Essex Ave	593	12	BLOCK	Broken and missing bricks from wall, loose bricks in corbel, no bench or invert, heavy debris buildup	Corbel Repair, Rebuild Bench, Grout Manhole, Cementitious Liner	4	720	\$4,810	\$3,200	\$8,010	\$6.68
CONTRACT 4	HS15	Essex Ave and Middle Rd	591	6	BLOCK	No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup	Rebuild Bench, Grout Manhole, Cementitious Liner	4	288	\$2,590	\$2,200	\$4,790	\$8.99
CONTRACT 4	HS15	Hampshire Rd	584	7	BLOCK	No bench and invert, heavy debris buildup, corbel missing mortar	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 4	HS15	Hampshire Rd	586	7	BLOCK	No bench and invert, heavy debris	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 4	HS15	Hampshire Rd	587	10	BLOCK	Mineral deposits at wall, no bench and invert, heavy debris buildup	Rebuild Bench, Grout Manhole	4	720	\$2,000	\$2,200	\$4,200	\$2.78
CONTRACT 4	HS15	Marjorie St at Middle Rd	563	7	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 4	HS15	Middle Rd	577	8	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 4	HS15	Middle Rd	578	10	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 4	HS15	Sheffield Rd	5685	7	BLOCK	Mineral deposits at wall	Grout Manhole, Cementitious Liner	3	144	\$2,590	\$0	\$2,590	\$17.99
CONTRACT 4	HS15	Sims Ave	598	9	BRICK	Heavy debris in bench and invert	Rebuild Bench	4	0 2880	\$0	\$2,200	\$2,200	\$0.00
CONTRACT 4 CONTRACT 4	HS15 HS15	Sims Ave Sims Ave at Benson St	600 599	8	PRECAST PRECAST	Infiltration Gusher at Influent Pipe Connection (from MH 599)	Grout Manhole, Cementitious Liner Grout Manhole	3	2880	\$2,960 \$1,800	\$0 \$0	\$2,960 \$1,800	\$1.03 \$2.50
CONTRACT 4	HS15 HS15	US Rt 1 Bypass North	1382	8 11	BLOCK	Active infiltration at wall, roots in corbel, loose bricks and debris on bench. Collapsed pipe connection found during flow isolation. Possible industrial connection/service infiltration.	Remove and Replace Manhole	4	1720	\$1,800	\$0 \$0	\$1,800	\$2.50
CONTRACT 4	M1	860 Maplewood Ave	2129	8	UNKNOWN	MH Leaking via CCTV Inspection	Grout Manhole	3	1152	\$1,600	\$0	\$1,600	\$1.39
CONTRACT 4	M1	Cutts St at Rt 1 Bypass	93	7	PRECAST	Evidence of surcharge, heavy debris blocking flow, cracked cover	Clean, New Frame and Cover	4	0	\$1,000	\$1,370	\$1,000	\$0.00
CONTRACT 4	M1	Edmund Ave near Fairview	108	8	PRECAST	Cracked cover	New Frame and Cover, Grout Manhole	2	360	\$1,800	\$820	\$2,620	\$5.00
CONTRACT 4	M1	Fairview Ave	111	4	PRECAST	Cracked cover	New Frame and Cover	4	0	\$0	\$820	\$820	\$0.00
CONTRACT 4	M1	Maplewood Ave	767	6	BRICK	No bench and invert, corbel breaking	Corbel Repair, Rebuild Bench	4	0	\$0	\$3,200	\$3,200	\$0.00
CONTRACT 4	M1	US Rt 1 Bypass	116	9	PRECAST	Light infiltration at walls and light debris in invert	Grout Manhole	2	288	\$2,000	\$0	\$2,000	\$6.94
CONTRACT 4	M1	US Rt 1 Bypass at Cutts Ave	92	8	PRECAST	Broken bricks in corbel, Light infiltration at walls	Corbel Repair, Grout Manhole, Cementitious Liner	3	360	\$2,960	\$1,000	\$3,960	\$8.22
						CONTRACT 1 TOTALS			119,160	\$144,550	\$50,560	\$195,110	-
						CONTRACT 2 TOTALS			18,288	\$71,120	\$40,070	\$111,190	-
						CONTRACT 3 TOTALS			12,600	\$36,210	\$13,000	\$49,210	-
						CONTRACT 4 TOTALS			13,608	\$55,970	\$38,790	\$94,760	-





Area	Re-direct Catch Basin	Re-direct Roof Leader	Re-direct Driveway/ Yard Drain	Repair Cleanout Cap	Replace Frame & Cover	Monitor (indirect source)	Repair Manhole
Subarea B1	1	0	0	2	0	0	0
Subarea HS11	9	1	2	0	1	10	0
Subarea HS15	1	0	0	0	0	0	0
Subarea LD1	0	0	0	3	3	2	0
Subarea LR1	1	0	1	1	4	2	0
Subarea LR2	0	0	0	1	0	1	0
Subarea LR4	1	0	0	1	0	1	1
Subarea LR6	0	0	1	3	1	0	0
Subarea P1	0	0	0	0	0	0	0
Total	13	1	4	11	9	16	1

Table 4-16: Smoke Testing Rehabilitation Recommendations



5. REFERENCES

Flow Assessment Services, LLC, 2017. Portsmouth, NH Manhole Inspection Report July 2017; July 20.

Flow Assessment Services, LLC, 2017. Portsmouth, NH Flow Isolation Report April – June 2017; June 19.

Ted Berry Company, Inc., 2017. Portsmouth, NH CCTV Inspection Report April – July 2017; July 26.

Massachusetts Department of Environmental Protection, 2017. *Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey;* May 30.



6. LIST OF ABBREVIATIONS

AC	Asbestos Cement
CCTV	Closed Circuit Television
CI	Cast Iron
CIPP	Cured-in-Place-Pipe
CITS	Clean, Inspect, Test and Seal
City	City of Portsmouth, New Hampshire
CMOM	Capacity, Management, Operations and Maintenance
DI	Ductile Iron
DPW	Department of Public Works
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
Flow Assessment	Flow Assessment Services, LLC
FOG	Fats, Oils and Grease
GIS	Geographic Information System
GPD	Gallons per Day
GPM	Gallons per Minute
HDPE	High-Density Polyethylene
IDDE	Illicit Discharge Detection and Elimination
IDM	Inch Diameter Mile
I/I	Infiltration/Inflow
LF	Linear Feet
MACP	Manhole Assessment and Certification Program
MassDEP	Massachusetts Department of Environmental Protection
MGD	Million Gallons per Day
MH	Manhole
NASSCO	National Association of Sewer Service Companies
NPDES	National Pollutant Discharge Elimination System
NHDES	New Hampshire Department of Environmental Services
O&M	Operational and Maintenance
PACP	Pipeline Assessment and Certification Program
PVC	Polyvinyl Chloride



QMR	Quick Maintenance Pipe Rating
QOR	Quick Overall Pipe Rating
QSR	Quick Structural Pipe Rating
SRF	State Revolving Fund
SSES	Sewer System Evaluation Survey
SSOs	Sanitary Sewer Overflows
T&T Ted Berry	Transport and Treatment Ted Berry Company, Inc.
VC	Vitrified Clay
VCP	Vitrified Clay Pipe
WWTF	Wastewater Treatment Facility



APPENDIX A: CCTV FINDINGS AND RECOMMENDATIONS

			1			1	Append	tix A.1 - Pipeline Rehabilitation Recommendations - Infiltration Removal Cost	Effectiveness Prioritization	n			I			1	
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab	Defect Infi	ainline iltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab	Estimated Total Rehabilitation Cost	Cost Effectivenes s (\$ Spent per Gallon Per Day Removed)
3016	912	913	GR1	Blue Heron Dr	6	PolyVinyl Chloride	300	Clear water running from laterals at 174.6 and 289.1' US (Unknown Source).	Inspect Lateral	2	0	2,880	2,880	\$1,500	\$0	\$1,500	\$0.52
1640	237	236	LR6	Constitution Ave	8	Asbestos Cement	230	Clear water coming from lateral at 97.1' US (Unknown Source). Roots medium barrel at 104' US. Infiltration gusher at 107' US. Roots fine joint at 118' US.	T&S, Inspect Lateral, Root Treatment	4	4,320	0	4,320	\$3,853	\$0	\$3,853	\$0.89
2000	2484	2479	LR6	Lafayette Rd	8	Asbestos Cement	284	Clear water running from lateral at 96.3' DS (Unknown Source), Infiltration runner from broken pipe/fracture spiral at 265' DS.	Inspect Lateral, Spot Repair	5	2,880	720	3,600	\$3,250	\$0	\$3,250	\$0.90
1587	2641	136	LR6	Heritage Rd	8	Asbestos Cement	285	Heavy grease and debris buildup in pipe. Infiltration gusher at 9.6' DS from defective wye. Infiltration stains at 127' DS	Clean, T&S, Spot Repair	5	4,320	0	4,320	\$3,961	\$0	\$3,961	\$0.92
3210	5852	818	GR1	Portsmouth Blvd	8	Vitrified Clay Pipe	103	Infiltration throughout with runners and gushers. Survey abandoned due to debris (no reversal attempted)	T&S, CIPP	5	9,072	0	9,072	\$8,720	\$0	\$8,720	\$0.96
6610	5819	5818	HS11	Aldrich Rd	8	PolyVinyl Chloride	274	Clear water running from lateral at 189.8' DS (Unknown Source).	Inspect Lateral	2	0	720	720	\$750	\$0	\$750	\$1.04
556	1055	1056	LR4	Hillside Dr	8	PolyVinyl Chloride	397	Clear water running from laterals at 187.9' and 315.2' DS (Unknown Source)	Inspect Lateral	2	0	1,440	1,440	\$1,500	\$0	\$1,500	\$1.04
3408	5096	1340	HS11	Lovell St	12	PolyVinyl Chloride	76	Clear water running from lateral at 3' DS (Unknown Source).	Inspect Lateral	0	0	720	720	\$750	\$0	\$750	\$1.04
1513	2595	2593	LR3	Suzanne Dr	8	Asbestos Cement	78	Infiltration gusher from hole at 15' US	Clean, T&S, Spot Repair	5	5,760	0	5,760	\$6,011	\$0	\$6,011	\$1.04
563	1047	1631	LR4	Greenleaf Ave	8	Vitrified Clay Pipe	89	Clear water running from lateral at 80.5' DS (Unknown Source)	Inspect Lateral	2	0	576		\$750	\$0		
5121	5422	5394	LR4	Parking lot	8	Asbestos Cement	180	Clear water coming from laterals at 44.4' and 86.2' DS (Unknown Source)	Inspect Lateral	1	0	1,152	1,152	\$1,500	\$0	\$1,500	\$1.30
2979	932	920	LD1	Blue Heron Dr	6	PolyVinyl Chloride	208	Clear water running from lateral at 133' DS (Unknown Source). Survey abandoned at 160' DS due to hard left turn (no reversal attempted)	Inspect Lateral, Complete CCTV	2	0	1,440	1,440	\$1,894	\$0	\$1,894	\$1.32
5408	5494	817	GR1	Sanderling Way	6	PolyVinyl Chloride	115	Clear water running from lateral at 90.7' US (Unknown source). Heavy infiltration during flow isolation.	Clean, T&S, Inspect Lateral	2	0	1,440	1,440	\$2,050	\$0	\$2,050	\$1.42
1881	394	392	LR4	Greenleaf Ave	10	Asbestos Cement	321	Infiltration stains throughout pipe with gusher and runner at 238 and 248' DS, respectively. Protruding lateral at 256.8' DS	Clean, T&S, Cut Service, Spot Repair	5	5,040	0	5,040	\$7,599	\$0	\$7,599	\$1.51
220	1312	1311	HS11	Fields Rd	8	Unknown	264	Lining slightly detached at 27' US, clear water running from lateral at 81' US (Unknown Source), roots in lateral at 99' US. Survey abandoned at 170' US due to debris in pipe (no reversal attempted)	Inspect Lateral, Complete CCTV	3	0	1,440	1,440	\$2,199	\$0	\$2,199	\$1.53
2976	930	928	LD1	Blue Heron Dr	6	PolyVinyl Chloride	243	Roots ball joint at 3' US. Clear Water running from lateral at 81' US (Unknown Source). Fracture spiral at 239.8' US (material changed to VCP at 232' US)	Inspect Lateral, Root Treatment	4	0	1,440	1,440	\$2,206	\$0	\$2,206	\$1.53
2978	EOP	932	LD1	Blue Heron Dr	6	PolyVinyl Chloride	211	laterals at 37' and 58.4' US (unknown source)	Lateral, Inspect Lateral	0	0	3,024	3,024	\$4,774	\$0	\$4,774	\$1.58
1333	1402	1401	HS11	Bartlett St	8	Vitrified Clay Pipe	249	Infiltration stain joint at 11.5' DS. Protruding lateral at 42.1' DS with clear water running (Unknown Source)	Inspect Lateral, Cut Service	2	0	720	720	\$1,180	\$0	\$1,180	\$1.64
3511	1344	5844	HS11	Lovell St	10	PolyVinyl Chloride	312	Clear water running from laterals at 3', 126.6', 161.5', and 282.3' DS (Unknown Source). Intruding laterals at 157.6, 161.5, 168.2, and 170.1' DS.	Inspect Lateral, Cut Service	2	0	2,880	2,880	\$4,720	\$0	\$4,720	\$1.64
1834	372	5872	LR4	Greenleaf Ave XC	10	Asbestos Cement	184	Clear water dripping from lateral at 22.2' DS, Infiltration runner at DS MH connection	Clean, T&S, Grout Lateral	4	1,440	288	1,728	\$2,842	\$0	\$2,842	\$1.64
640	562	565	LR4	Sylvester St	8	Asbestos Cement	199	Clear water coming from lateral at 160.3' DS. Infiltration gusher from hole in pipe at 190' DS	Clean, T&S, Grout Lateral, Spot Repair	5	2,880	144	3,024	\$5,533	\$0	\$5,533	\$1.83
1892	374	375	LR4	X-Country Greenleaf woods Dr	10	Asbestos Cement	231	Infiltration runner joint at 116' US. Roots at US MH Connection	Clean, T&S	4	1,440	0	1,440	\$3,000	\$0	\$3,000	\$2.08
2957	941	942	LD1	Spinnaker Way	8	Vitrified Clay Pipe	225	Surface spalling at 14' US. Clear water coming from laterals at 69', 106', 166', and 204' US. Clear water from lateral at 21' US (unknown source). Crack longitudinal at 22' US. Broken pipe at 30' (no void visible). Fracture spiral at 44' US. Roots in lateral at 69' US. Roots fine barrel at 100' US. Infiltration stains at 126' US. Fracture spiral at 217' US with infiltration runner	Grout Lateral, Inspect Lateral, Short Liner, Spot Repair	5	288	3,312	3,600	\$7,570	\$0	\$7,570	\$2.10
1845	545	420	LR4	X-Country	8	Asbestos Cement	195	Infiltration gusher at US MH Connection, roots at DS MH Connection	Clean, T&S	5	1,152	0	1,152	\$2,537	\$0	\$2,537	\$2.20

GewerID	US MH	DS MH	Metering Basin	Street	Diamete (in.)	er Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab	Estimated Total Rehabilitation Cost	Cost Effectivenes s (\$ Spent per Gallon Per Day Removed)
5095	524	5411	HS14	X-Country	18	PolyVinyl Chloride	412		Clean, T&S, Grout Lateral	3	0	2,880	2,880	\$6,882	\$0	\$6,882	\$2.39
4753	392	391	LR4	Greenleaf Ave	8	Asbestos Cement	274	Clear water running from lateral at 13.4' US (Unknown Source). Debris buildup at MH 392	Inspect Lateral	4	0	288	288	\$750	\$0	\$750	\$2.60
3496	5109	5109A	HS11	Manor Dr	8	PolyVinyl Chloride	33	Clear water running from lateral at 24' DS (Unknown Source)	Inspect Lateral	0	0	288	288	\$750	\$0	\$750	\$2.6
236	1362	1361	HS11	Yoga Parking Lot	8	Asbestos Cement	109		Clean, T&S, Grout Lateral, Inspect Lateral, Cut Service	2	0	1,152	1,152	\$3,051	\$0	\$3,051	\$2.65
4153	599	600	HS15	Sims Ave	8	Vitrified Clay Pipe	80	Infiltration Runner at DS MH Connection	Clean, T&S	4	720	0	720	\$2,440	\$0	\$2,440	\$3.3
2975	931	5496	LD1	Blue Heron Dr	6	PolyVinyl Chloride	216	Clear water running from laterals at 56' DS and 187.6' DS (Unknown Source)	Inspect Lateral	2	0	432	432	\$1,500	\$0	\$1,500	\$3.47
237	1361	1360	HS11	Lovell St	8	Asbestos Cement	183	Infiltration weeper at 46.1' DS. Intruding lateral with clear water running at 53.1' DS (Unknown Source). Broken pipe void visible 1' US. Clear water running from laterals at 10 and 94' US. Broken pipe void visible at 123.1' US	T&S, Inspect Lateral, CIPP	5	576	2,880	3,456	\$13,077	\$0	\$13,077	\$3.78
1916	1046	1069	LR5	Lafayette Rd XC	10	Asbestos Cement	135	Infiltration runner at 30.3' DS, MH 1069 has infiltration at walls (1.5 gpm)	Clean, T&S	4	432	0	432	\$1,751	\$0	\$1,751	\$4.0
2955	939	940		Spinnaker Way	8	Vitrified Clay Pipe	246	longitudinal. Infiltration runner at 114' DS. Deposits attached grease and encrustation throughout pipe. Clear water running from lateral at 146' DS (Unknown source). Infiltration dripper joint at 174' DS. Infiltration runner joint at 180' DS. Infiltration dripper at 206' DS.	Clean, T&S, Inspect Lateral, Spot Repair	5	2,160	432	2,592	\$10,769	\$0	\$10,769	\$4.15
210	1310	1311	HS11	Fields Rd	12	Fiberglass Reinforced Pip	176	Infiltration drippers and runners throughout pipe. Broken pipe with infiltration weeper at 51.2' DS. Clear water running from laterals at 32.2' DS, 81.7' DS, and 156.8' DS. Candidate for Dig & Replace.	CIPP	5	432	2,016	2,448	\$10,553	\$0	\$10,553	\$4.3
3017	913	914	GR1	Blue heron Dr	6	PolyVinyl Chloride	231	Clear water running from lateral at 131' DS. Roots ball joint and fine joint throughout pipe.	T&S, Grout Lateral, Root Treatment	4	720	0	720	\$3,167	\$0	\$3,167	\$4.4
1883	390	389	LR4	Greenleaf Ave	8	Asbestos Cement	209	Clear water running from lateral at 94.4' DS	Clean, T&S, Grout Lateral	0	0	720	720	\$3,170	\$0	\$3,170	\$4.40
338	1401	1400	HS11	Bartlett St	8	Vitrified Clay Pipe	259	о 0	Inspect Lateral, Cut Service, Complete CCTV, Short Liner	2	0	1,440	1,440	\$6,844	\$0	\$6,844	\$4.75
2982	926	925		Blue Heron dr	8	Vitrified Clay Pipe		infiltration runner at 147' DS.	T&S, Inspect Lateral, Spot Repair, Root Treatment	5	1,152	1,008		\$11,064	\$0	\$11,064	\$5.12
1844	544	545	LR4	X-Country	8	Asbestos Cement	206	Clear water weeping from lateral at 91.4' DS (Unknown Source)	Inspect Lateral	2	0	144	144	\$750	\$0	\$750	\$5.2
5120	5421	5422	LR4	Parking lot	8	Asbestos Cement	237	Broken pipe void visible with infiltration dripper at 65' US. Infiltration drippers and stains throughout pipe		5	144	1,296	1,440	\$7,837	\$0	\$7,837	\$5.44
3416	1344A	1344	HS11	Madison St	12	PolyVinyl Chloride	180	122.7', 137.3', and 142.7' US (Unknown Source). Survey abandoned at 146.1' US due to size change (no reversal attempted)	Inspect Lateral, Cut Service, Complete CCTV	2	0	864	864	\$4,941	\$0	\$4,941	\$5.72
3027	943	2361	LD1	Spinnaker Way	8	Vitrified Clay Pipe	279	Infiltration runner in lateral at 207.6' DS. Infiltration stains and roots throughout pipe	T&S, Grout Lateral, Root Treatment	4	0	1,440	1,440	\$8,646	\$0	\$8,646	\$6.00
1334	541	5341	HS14	Coakley Rd	8	Vitrified Clay Pipe	88	° 11 °	T&S, CIPP, Spot Repair, Root Treatment	5	1,728	0	1,728	\$10,527	\$0	\$10,527	\$6.09
3209	816	5852	GR1	Portsmouth Blvd	10	Vitrified Clay Pipe	182	Fractures and infiltration throughout pipe	T&S, CIPP	4	2,448	0	2,448	\$15,462	\$0	\$15,462	\$6.3
204	590	End Of Pipe	HS11	Rutland St	8	Vitrified Clay Pipe	240	roots fine joint throughout pipe. Survey abandoned at 152' DS due to debris in	T&S, Grout Lateral, Cut Service, Complete CCTV, Root Treatment	5	0	1,584	1,584	\$10,076	\$0	\$10,076	\$6.36

						-	Append	lix A.1 - Pipeline Rehabilitation Recommendations - Infiltration Removal Cost	Effectiveness Prioritization	n							
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Recommendations	Defect Infi	ainline Itration gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab	Estimated Total Rehabilitation Cost	Cost Effectivenes s (\$ Spent per Gallon Per Day Removed)
547	1423	1382	HS15	US Rt 1 Byepass	8	Vitrified Clay Pipe	83	Infiltration stains throughout pipe. Crack longitudinal at 21' US, Broken pipe void visible at 56.8' US, Large rock intruding into broken pipe at 79.9' US with infiltration runner around rock. Roots medium joint at 82.1' US. Candidate for Dig & Replace.	CIPP	5	720	0	720	\$4,956	\$0	\$4,956	\$6.88
1988	2652	143	LR6	Ricci Ave	8	Asbestos Cement	314	Infiltration runner at intruding lateral 26.6' DS. Intruding lateral at 106' DS. Debris buildup at 307' DS	Clean, T&S, Grout Lateral, Cut Service	4	720	0	720	\$5,396	\$0	\$5,396	\$7.49
3243	EOP	1439	HS11	Islington St	8	Vitrified Clay Pipe	149			5	0	576	576	\$4,470	\$0	\$4,470	\$7.76
329	1414	1415	HS11	US 1B Off Ramp	8	Vitrified Clay Pipe	258	Infiltration runner at 6' DS due to fracture. Infiltration stains and debris throughout pipe. Protruding lateral at 76' DS causing abandoned survey (reversal incomplete). Protruding lateral at 185.8' DS (found on reversal inspection)	T&S, Cut Service, Complete CCTV, Spot Repair	4	1,440	0	1,440	\$11,226	\$0	\$11,226	\$7.80
2986	911	842	LD1	Osprey Dr	6	Vitrified Clay Pipe	270	Roots throughout pipe, clear water running from laterals at 84 and 87.4' US (Unknown Source). Survey abandoned at 91.5' US due to large offset joint (no reversal attempted)	Inspect Lateral, Complete CCTV, Root Treatment	3	0	576	576	\$4,601	\$0	\$4,601	\$7.99
194	1383	1384	HS15	US Rt 1 Bypass N	10	Vitrified Clay Pipe	399	Fracture spiral at 22' US. Infiltration drippers throughout pipe	Clean, T&S, Short Liner	3	1,728	0	1,728	\$14,747	\$0	\$14,747	\$8.53
4554	1382	1383	HS15	US Rt 1 Bypass	12	Vitrified Clay Pipe	290	Includes Pipe Sewer ID 4555. Infiltration stains and drippers throughout pipe. Clear water running from laterals at 190.7 and 191.3' DS. lateral intruding at 190.7' DS. Survey abandoned at 290' DS due to high water level (no reversal attempted)	T&S, Grout Lateral, Complete CCTV	4	432	720	1,152	\$9,893	\$0	\$9,893	\$8.59
1327	2239A	2239	HS11	Cottage St	8	Vitrified Clay Pipe	339	Roots medium and ball throughout pipe, clear water running from lateral at 125.5' US (Unknown Source).	Inspect Lateral, Root Treatment	4	0	288	288	\$2,783	\$0	\$2,783	\$9.66
3001	819	639	GR1	Portsmouth Blvd	8	Vitrified Clay Pipe	335	Fractures and infiltration throughout pipe, survey abandoned at 211' DS due to settled debris	T&S, CIPP	4	2,880	0	2,880	\$28,479	\$0	\$28,479	\$9.89
1833	395	372	LR4	Greenleaf Ave XC	10	Asbestos Cement	216	Survey abandoned at 214' DS due to severe root ball. Infiltration dripper at MH372.	T&S, Root Treatment	5	288	0	288	\$2,921	\$0	\$2,921	\$10.14
894	2133	78	LD1	Leslie Dr	8	PolyVinyl Chloride	78	Clear Water Weeping from laterals at 39.1' US and 42.4' US (Unknown Source)	Inspect Lateral	0	0	144	144	\$1,500	\$0	\$1,500	\$10.42
322	534	5342	HS14	Coakley St	8	PolyVinyl Chloride	230	Clear water running from lateral at 93.6' DS.	Clean, T&S, Grout Lateral	2	0	288	288	\$3,042	\$0	\$3,042	\$10.56
4163	581	580	HS15	Sheffield Rd	8	Vitrified Clay Pipe	242	Hinge fracture 3 with broken pipe at 2' DS. Fractures throughout remainder of pipe. Intruding laterals at 58.6', 136', 145.4', and 167.5' DS. Clear water running from lateral at 167.5' DS (Unknown Source). Hole soil visible at 57.5' DS. Infiltration stains and mineral deposits throughout pipe with infiltration runner from joint at 156.1' DS.	T&S, Inspect Lateral, CIPP, Cut Service, Spot Repair	5	1,440	288	1,728	\$25,556	\$0	\$25,556	\$14.79
896	78	73	LD1	Leslie Dr	8	PolyVinyl Chloride	154	Clear Water Weeping from lateral at 102' DS	Clean, T&S, Grout Lateral	2	0	144	144	\$2,186	\$0	\$2,186	\$15.18
212	1309	1308	HS11	Fields Rd	12	PolyVinyl Chloride	92	Intruding lateral at 47.5' DS with clear water weeping. Clear water running from lateral at 62.1' DS (Unknown Source)	Clean, T&S, Grout Lateral, Inspect Lateral	2	0	144	144	\$2,278	\$0	\$2,278	\$15.82
842	5565	2369	LD1	Market St	8	PolyVinyl Chloride	207	Light debris throughout pipe. Infiltration weeper and stain at 192' DS.	Clean, T&S	2	144	0	144	\$2,329	\$0	\$2,329	\$16.17
3102	828	829	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	242	Infiltration, fractures, and roots throughout pipe. Clear water coming from laterals at 88', 172', and 198' US (Unknown Source).	T&S, Inspect Lateral, CIPP, Complete CCTV, Root Treatment	4	288	1,152	1,440	\$25,631	\$0	\$25,631	\$17.80
689	470	469	B1	Odin St	8	Vitrified Clay Pipe	252	Clear water running from lateral at 70.9' US. Clear water running from laterals at 35.7' and 102.5' US (unknown source). Lateral at 70.9' US is intruding. Survey abandoned at 112.1' US due to offset joint and water level (reversal incomplete).	T&S, Grout Lateral, Inspect Lateral, CIPP, Cut Service, Complete CCTV	2	0	1,440	1,440	\$25,681	\$0	\$25,681	\$17.83
1915	1045	1046	LR5	Ledgewood Dr	10	Asbestos Cement	167	Broken pipe at 17.4' US. Hole soil visible at 40' US. Infiltration stains throughout pipe, infiltration runner joint at 224' US. Survey abandoned due to high water level in pipe at 226' US (no reversal attempted)	T&S, Complete CCTV, Spot Repair	5	288	0	288	\$5,168	\$0	\$5,168	\$17.94

							Appen	dix A.1 - Pipeline Rehabilitation Recommendations - Infiltration Removal Cost	Effectiveness Prioritizat	ion							
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab	Estimated Total Rehabilitation Cost	Cost Effectivenes s (\$ Spent per Gallon Per Day Removed)
5008	5401	2728	HS15	Melbourne St	8	Vitrified Clay Pipe	480	Fractures, holes, and roots throughout pipe. Intruding laterals at 21.6', 261', 301.4', 322.3', and 429.6' DS. Clear water running from laterals at 70.8', 261.7', 301.4, 350.7, and 364' DS.	T&S, Grout Lateral, CIPP, Cut Service, Root Treatment	5	0	2,592	2,592	\$48,069	\$0	\$48,069	\$18.55
326	1630	1402	HS11	Bartlett St	8	Vitrified Clay Pipe	91	Infiltration weeper at 52.9' US. Clear water running from lateral at 52.9' US. Defective short liner at 75' US	Clean, T&S, Grout Lateral, Spot Repair	3	0	288	288	\$5,713	\$0	\$5,713	\$19.84
688	471	470	B1	Georges Ter	8	Vitrified Clay Pipe	111	Roots ball and joint throughout. Infiltration dripper at 18.4' DS from intruding lateral. Intruding lateral with clear water running at 49' DS	Grout Lateral, CIPP, Cut Service, Root Treatment	5	0	432	432	\$9,099	\$0	\$9,099	\$21.06
555	1056	1047	LR4	Greenleaf Ave	8	Asbestos Cement	305	Fractures and infiltration stains throughout pipe. Clear water running from laterals at 24.5' and 138.5' US. Clear water coming from lateral at 217.2' US (unknown source).	T&S, Grout Lateral, Inspect Lateral, CIPP	5	144	864	1,008	\$22,229	\$0	\$22,229	\$22.05
328	1413	1414	HS11	Boyd Rd	8	Vitrified Clay Pipe	271	Intruding taps at 59' and 90' DS. Clear water coming from tap break-ins at 59' and 90' DS. Roots and infiltration stains throughout pipe with infiltration runner at 192.3' DS. Fractures at 157.1' and 189.2' DS. Broken pipe void visible at 133.2' and 258' DS.	T&S, Grout Lateral, CIPP, Cut Service, Spot Repair, Root Treatment	5	144	864	1,008	\$28,968	\$0	\$28,968	\$28.74
2963	935	934	LD1	Spinnaker Way	8	Vitrified Clay Pipe	206	Roots and debris throughout pipe. Broken pipe void visible at 62' US. Infiltration weeper joint at 98' US and 102' US. Collapsed pipe at 106' US. Hinge fracture 3 from 130' and 155' US.	T&S, Spot Repair, Root Treatment	5	720	0	720	\$22,653	\$0	\$22,653	\$31.46
2958	942	932	LD1	Spinnaker Way	8	Vitrified Clay Pipe	219	Crack longitudinal at 10' US With infiltration weeper. Crack circumferential and infiltration stains at 14' US. Pipe half full of debris at 28' (grass and toilet paper). Settled gravel deposits at 36' US. Infiltration stain joint at 40' US. Clear water leaking from lateral at 62' US. Roots joint fine and roots barrel fine at 100' US with Clear water running from lateral 100' US. Infiltration dripper at joint 112' US. Heavy debris and gravel blocking remaining survey. (Reversal complete)	T&S, Grout Lateral, CIPP, Short Liner	4	288	432	720	\$23,750	\$0	\$23,750	\$32.99
2988	841	840	LD1	Osprey Dr	8	Vitrified Clay Pipe	146	Fractures and infiltration stains throughout pipe. Roots ball joint at 111' DS	CIPP, Root Treatment	5	0	288	288	\$9,605	\$0	\$9,605	\$33.35
4142	554	555	LR4	Middle Rd	8	Vitrified Clay Pipe	161	Infiltration stains, roots, and fractures throughout pipe. Clear water coming from protruding lateral at 96' DS. reversal complete	T&S, Grout Lateral, CIPP, Cut Service, Root Treatment	4	0	432	432	\$15,537	\$0		
195	1384	1383	HS11	US Rt 1 Bypass	12	Vitrified Clay Pipe	358	Infiltration stains and drippers throughout. Roots fine joint at 22' US. Settled gravel at 187' US causing abandoned survey (no reversal attempted)	T&S, Complete CCTV	3	288	0	288	\$11,108	\$0	\$11,108	\$38.57
2956	940	941	LD1	Spinnaker Way	8	Vitrified Clay Pipe	186	Fractures, roots, and infiltration stains throughout pipe. Clear water running from lateral at 114.8' DS (Unknown Source)	T&S, Inspect Lateral, CIPP, Root Treatment	4	0	432	432	\$17,682	\$0	\$17,682	\$40.93
334	1419	1418	HS11	Cottage St	8	Vitrified Clay Pipe	298	Roots and infiltration throughout pipe, Fracture spiral at 32.8' US. Broken lateral at 38' US (Fernco disconnected). Protruding lateral at 228.4' US. Clear water running from lateral at 228.4' US (Unknown Source)	T&S, Inspect Lateral, CIPP, Spot Repair, Root Treatment	4	0	720	720	\$30,355	\$0	\$30,355	\$42.16
4172	587	1381	HS15	Hampshire Rd	10	Vitrified Clay Pipe	153	Infiltration and fractures throughout, broken pipe void visible at 35.2'.	T&S, CIPP	5	288	0	288	\$13,009	\$0	\$13,009	\$45.17
3525	605	5400	HS11	Islington St	8	Vitrified Clay Pipe	217	Includes Pipe SewerID 3850, 3851 and 6429. Fractures and voids throughout pipe, intruding laterals at 103.2' DS, 115.5' DS, and 216.8' DS. Clear water coming from laterals at 20', 133.9', and 161.3' DS. Clear water coming from lateral at 115.5' DS (unknown source)	T&S, Grout Lateral, Inspect Lateral, CIPP, Cut Service	5	0	432	432	\$21,837	\$0	\$21,837	\$50.55
187	538	540	HS14	Coakley Rd	8	Vitrified Clay Pipe	560	Includes Pipe SewerID 1335. Roots throughout pipe. Broken pipe at 17.9' US. Fracture longitudinal at 61' US. Clear water running from laterals at 173' and 389' US (Unknown Source). Protruding lateral at 247' US. Fracture spiral at 288' US. Hole soil visible at 481' US.	Inspect Lateral, CIPP, Root Treatment	5	0	720	720	\$37,710	\$0	\$37,710	\$52.38
3241	2239	2242	HS11	Cate St	8	Vitrified Clay Pipe	498	Roots throughout pipe. Intruding laterals at 13.2', 28.1' and 66.1' DS. Clear water dripping from lateral at 66.1' DS (Unknown Source). Survey abandoned at 66.1' DS (reversal incomplete)	Service, Complete CCTV, Root Treatment	3	0	144	144	\$7,767	\$0	\$7,767	\$53.94
6468	597	5685	HS15	Sheffield Rd	8	Vitrified Clay Pipe	173	Fractures throughout pipe. Intruding laterals at 124.8' and 151.7' DS. Clear water dripping from lateral at 124.8' DS	CIPP, Cut Service	4	0	288	288	\$16,030	\$0	\$16,030	\$55.66
1389	596	598	HS15	Essex Ave	8	Vitrified Clay Pipe	390	Fractures and roots throughout pipe, clear water dripping from lateral at 165.8' US (Unknown Source). Collapsed pipe at 150.6 DS.	Inspect Lateral, CIPP, Spot Repair, Root Treatment	5	0	432	432	\$29,017	\$0	\$29,017	\$67.17

							Append	dix A.1 - Pipeline Rehabilitation Recommendations - Infiltration Removal Cost	Effectiveness Prioritizati	on							
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab	Estimated Total Rehabilitation Cost	Cost Effectivenes s (\$ Spent per Gallon Per Day Removed)
2983	925	924	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	165	Fracture spiral at 1.6' DS. Clear water dripping from lateral at 42.3' DS (Unknown Source). Crack longitudinal at 105' DS. Broken pipe no void visible at 131' DS.	CIPP	3	0	144	144	\$9,899	\$0	\$9,899	\$68.74
1453	EOP	2140	LD1	Leslie Dr	8	Vitrified Clay Pipe	304	Clear water running from lateral at 24.3' US. Survey abandoned at 46.6' US due to offset joint (could not inspect by reversal)	T&S, Grout Lateral, Cut Service, Complete CCTV	1	0	144	144	\$10,156	\$0	\$10,156	\$70.53
320	532	533	HS14	Coakley Rd	8	Vitrified Clay Pipe	178	Hinge fracture 4 at 34' DS, Clear water dripping from lateral at 48' DS, Hinge fracture 3 at 48-52' DS. Hinge fracture 3 from 149'-160' DS. Fractures throughout pipe. Candidate for Dig & Replace.	CIPP	4	0	144	144	\$10,685	\$0	\$10,685	\$74.20
4188	2728	598	HS15	Sims Ave	8	Vitrified Clay Pipe	238	Broken pipe at 69' DS. Infiltration Stains throughout pipe. Clear Water coming from lateral at 131.4 DS. Protruding lateral at 135.6' DS causing abandoned survey (reversal incomplete)	T&S, Grout Lateral, CIPP, Short Liner	4	0	288	288	\$23,222	\$0	\$23,222	\$80.63
2961	937	936	LD1	Spinnaker Way	8	Vitrified Clay Pipe	212	Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at 79' US with Joint Offset Severe (sinking into ground)	Complete CCTV, Spot Repair	5	144	0	144	\$13,667	\$0	\$13,667	\$94.91
239	1364	1363	HS11	Hannaford	6	Asbestos Cement	218	This is a 6" Pipe. Infiltration weeper at 19' US, infiltration stain at 36' US. Deformed vertically at 203.3' US. Survey abandoned due to large amounts of debris in pipe and vertical deformation (no reversal attempted)	T&S, CIPP	5	144	0	144	\$19,108	\$0	\$19,108	\$132.69
173	468	467	B1	Colonial Dr	8	Vitrified Clay Pipe	318	Infiltration stains throughout pipe. Intruding laterals at 81.7, 110.2, 138.8, 202.2, 243.9', 252.6', 301.2', and 309' DS. Fracture spiral at 21' DS, Fracture multiple at 24.2 and 27.3' DS. Clear water running from lateral at 64.4' DS (Unknown Source).	Inspect Lateral, CIPP, Cut Service	4	0	144	144	\$23,266	\$0	\$23,266	\$161.57
837	767	769	M1	Maplewood St	8	Vitrified Clay Pipe	213	Clear water running from lateral at 45.5' DS. Cracks and fractures throughout pipe. Survey abandoned at 110' DS due to turn in pipe (reversal incomplete) - City Currently Digging, Removed from Recommendation.	Monitor	4	0	0	0	\$0	\$0	\$0	\$0.00
833	759	111	M1	Oleary Pl	6	Asbestos Cement	100	Rag wedged in joint at 29' DS. Survey abandoned at 33' DS due to offset joint (no reversal attempted)	Complete CCTV	5	0	0	0	\$0	\$553	\$553	\$0.00
1908	1040	1062	LR5	Ledgewood Dr	8	Vitrified Clay Pipe	134	Deposits attached grease throughout pipe. Survey abandoned at 86.5' DS due to grease blockage (no reversal attempted)	Complete CCTV	5	0	0	0	\$0	\$735	\$735	\$0.00
2981	927	926	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	195	Survey abandoned at 7' US due to roots (no reversal attempted)	Root Treatment	5	0	0	0	\$0	\$1,170	\$1,170	\$0.00
1329	1400	1399	HS11	Bartlett St	8	Vitrified Clay Pipe	20	Broken pipe soil visible at 13.2' US.	CIPP	5	0	0	0	\$0	\$1,216	\$1,216	\$0.00
1893	375	376	LR4	X-Country Greenleaf Woods Dr	10	Asbestos Cement	214	Broken pipe at 34.8' US	Short Liner	5	0	0	0	\$0	\$2,580	\$2,580	\$0.00
2977	928	926	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	154	Roots throughout pipe. Broken pipe void visible at 146.2' DS. Fracture spiral at 0' US.	Treatment	5	0	0	0	\$0	\$3,442	\$3,442	\$0.00
3023	916	919	GR1	Blue Heron Dr	8	Vitrified Clay Pipe	238	Fracture multiple and broken pipe with soil visible at 150.2' US. Hole void visible at 152.2' US causing abandoned survey (no reversal attempted)	Complete CCTV, Spot Repair	5	0	0	0	\$0	\$3,809	\$3,809	\$0.00
327	1412	1413	HS11	Boyd Rd	8	Vitrified Clay Pipe	260	Hinge fracture 3 with void visible at 108' DS. Roots fine joint throughout. Intruding laterals at 123.7, 154.6, 199.6', and 233.2' DS.	Cut Service, Spot Repair, Root Treatment	5	0	0	0	\$0	\$5,781	\$5,781	\$0.00
323	540	541	HS14	Coakley St	8	Vitrified Clay Pipe	121	Fractures throughout pipe. Hinge fracture 3 at 35' DS. Hinge fracture 4 at 38' DS. Broken pipe void visible at 39' DS. Fracture spiral at 48' DS. Survey abandoned at large offset joint (52.4' DS) (no reversal attempted)		5	0	0	0	\$0	\$12,288	\$12,288	\$0.00
343	1399	1398	HS11	Bartlett St	8	Vitrified Clay Pipe	219	Hole void visible at 4' DS. Hole void visible in lateral at 25.4' DS. Hole soil visible at 26.2' DS. Protruding laterals at 48.4' DS and 215.9' DS blocking complete survey (reversal unsuccessful)	CIPP, Cut Service, Complete CCTV	5	0	0	0	\$0	\$15,199	\$15,199	\$0.00
202	2728	596	HS15	Melbourne St	8	Vitrified Clay Pipe	248	Roots and fractures throughout pipe, hole with soil visible at 210' DS, chipped bell at 233' DS.	CIPP, Root Treatment	5	0	0	0	\$0	\$16,377	\$16,377	\$0.00
321	533	534	HS14	Coakley Rd	8	Vitrified Clay Pipe	315	Fractures throughout pipe. Hole and broken pipe soil visible at 143' DS. Survey abandoned at 143' DS due to broken pipe (reversal incomplete)	CIPP, Spot Repair	5	0	0	0	\$0	\$21,381	\$21,381	\$0.00

							Append	lix A.1 - Pipeline Rehabilitation Recommendations - Infiltration Removal Cost	Effectiveness Prioritizat	ion							
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab	Estimated Total Rehabilitation Cost	Cost Effectivenes s (\$ Spent per Gallon Per Day Removed)
2966	924	923	LD1	Dunlin Way	8	Vitrified Clay Pipe	242	Fractures throughout pipe. Sag in pipe at 41' DS. Broken pipe no void visible at 95' DS. Pipe sag at 110' DS. Hinge fracture 3 from 135'-170' DS. Broken pipe with Hole soil visible at 160' DS (continuation of fracture).	CIPP, Spot Repair	5	0	C	0	\$0	\$21,995	\$21,995	\$0.00
200	583	589	HS11	Sheffield Rd	8	Vitrified Clay Pipe	240	Hole soil visible at 15.4' US from separated joint. Fracture longitudinal at 22' US. Hole soil visible at 49' US (Bell completely separated from pipe). Infiltration stain at 107' US. Hole soil visible at 132.7' US. Survey abandoned at 132.7' US due to separated joint (no reversal attempted)		5	0	C	0	\$0	\$26,689	\$26,689	\$0.00
201	589	590	HS11	Melbourne St	10	Vitrified Clay Pipe	456	Fracture multiple at 217' US. Roots and infiltration stains throughout pipe. Survey abandoned at 218' US due to sharp uphill bend (Reversal Complete)	CIPP, Spot Repair	5	0	C	0	\$0	\$33,377	\$33,377	\$0.00
3021	921	920	GR1	Blue Heron Dr	8	Vitrified Clay Pipe	139	Roots fine joint at 26' US. Roots fine joint at 63' US. Crack spiral at 75' US. Roots ball joint at 120' US. Roots ball barrel at 125' US. Rag in joint at 135' US.	Root Treatment	4	0	C	0	\$0	\$836	\$836	\$0.00
4165	2211	587	HS15	Hampshire Rd	10	Vitrified Clay Pipe	89	Infiltration stains at 11.1' US. Survey abandoned at 68.8' US due to high grease and water level (reversal incomplete)	T&S, Complete CCTV	4	0	C	0	\$0	\$2,717	\$2,717	\$0.00
5006	End of Pipe	589	HS11	Melbourne St	10	Vitrified Clay Pipe	242	Roots fine and ball throughout pipe, Intruding tap at 169.5' US causing abandoned survey.	Cut Service, Complete CCTV, Root Treatment	4	0	C	0	\$0	\$3,209	\$3,209	\$0.00
5122	5423	5421	LR4	Parking lot	8	Asbestos Cement	325	Infiltration stains throughout pipe, Fractures at 120.5' DS.	Clean, T&S	4	0	(0	\$0	\$4,220	\$4,220	\$0.00
4156	593	580	HS15	Essex Ave	8	Vitrified Clay Pipe	318	Infiltration stains and roots throughout pipe. Fracture at 47.4.	T&S, Short Liner, Root Treatment	4	0	C	0	\$0	\$12,389	\$12,389	\$0.00
2989	840	839	LD1	Osprey Dr	8	Vitrified Clay Pipe	326	Roots and fractures throughout pipe. Hinge fracture 3 at 120.2' DS.	CIPP	4	0	(0	\$0	\$19,533	\$19,533	\$0.00
2994	820	819	GR1	Portsmouth Blvd	8	Vitrified Clay Pipe	55	Chipped bell at 42.3' DS, light debris throughout pipe	Clean	3	0	(0	\$0	\$300		
2964	934	933	LD1	Dunlin Way	8	Vitrified Clay Pipe	99	Debris and roots throughout pipe	Root Treatment	3	0	0	0	\$0	\$595		
2965	933	924	LD1	Dunlin Way	8	Vitrified Clay Pipe	126	Roots throughout pipe	Root Treatment	3	0	0	0	\$0	\$755	\$755	5 \$0.00
1919	1043	1044	LR5	Portsmouth High School Fields	10	Asbestos Cement	165	Survey abandoned at 75' DS due to debris (no reversal attempted)	Complete CCTV	3	0	C	0	\$0	\$909	\$909	\$0.00
1888	389	388	LR4	Holiday Dr	8	Asbestos Cement	256	Grease and debris throughout pipe, survey abandoned at 250' DS due to grease	Complete CCTV	3	0	C	0	\$0	\$1,408	\$1,408	\$0.00
331	1415	1416	HS11	US 1B Off Ramp	8	Vitrified Clay Pipe	296	Debris buildup throughout pipe, survey abandoned at 37.8' DS due to debris (no reversal attempted)	Complete CCTV	3	0	C	0	\$0	\$1,625	\$1,625	\$0.00
1343	469	468	B1	Odin St	8	Vitrified Clay Pipe	270	Roots medium and fine joint throughout pipe, intruding laterals at 9.5', 67.3', and 195.1' DS.	CIPP, Cut Service, Root Treatment	3	0	C	0	\$0	\$19,088	\$19,088	\$0.00
1483	2455	2452	LR3	Nathaniel Dr XC	10	Asbestos Cement	249	Fracture spiral at 76' DS. Heavy infiltration during flow isolation.	Clean, T&S	3	0	0	0	\$0	\$3,241		
6438	5398	916	GR1	Blue Heron Dr	8	Vitrified Clay Pipe	53	Fractures and Roots throughout pipe	CIPP, Root Treatment	3	0	0	0	\$0	\$3,511	\$3,511	\$0.00
2967	923	837	LD1	Dunlin Way	8	Vitrified Clay Pipe	258	Water level 2/3 at beginning of survey. Fracture longitudinal at 142' US, Roots fine joint throughout pipe. Large offset joint with fernco visible at 206' US	Spot Repair, Root Treatment	3	0	C	0	\$0	\$4,046	\$4,046	\$0.00
3000	817	5852	GR1	Portsmouth Blvd	8	PolyVinyl Chloride	191	Light grease throughout pipe	Monitor	2	0	(0	\$0	\$0	\$0) \$0.00
3089	5307	634	GR1	Commerce Way	10	Asbestos Cement	106	Light debris throughout pipe	Monitor	2	0	(0	\$0	\$0	\$0	
6453	5505	5307	GR1	Commerce Way	10	Asbestos Cement	183	Infiltration stain at 66.3' DS	Monitor	2	0	0	0	\$0	\$0	\$0	
238	1360	2741	HS11	Lovell St	8	Asbestos Cement			Monitor	2	0	(0	\$0	\$0		
1328	5110	1420	HS11	Cottage St	8	Asbestos Cement	128		Monitor	2	0	0	0	\$0	\$0		
193	5316	527	HS14	X-Country	12	PolyVinyl Chloride	170		Monitor	2	0	0	0	\$0	\$0		
5092 6377	527 530	5410 5316	HS14 HS14	Barberry Ln XC X-Country Brothwick	12 12	PolyVinyl Chloride PolyVinyl Chloride	136 289		Monitor Monitor	2	<u> </u>		0	\$0 \$0	\$0 \$0		
				Ave Dunlin Way			104	Light groose throughout sine	Monitor	2	0		0	\$0	ቀሳ	\$0	
2972 6451	2457 5496	2454 930	LD1 LD1	Blue Heron Dr	10 6	PolyVinyl Chloride PolyVinyl Chloride	<u>194</u> 131	Light grease throughout pipe Light grease throughout pipe	Monitor	2	0		0	\$0 \$0	\$0 \$0		
564	1631	394		Greenleaf Ave		Asbestos Cement	172		Monitor	2	0	C	0	\$0 \$0	\$0 \$0		
1843	419	418	LR4	Moffat St	8	PolyVinyl Chloride	169	Light grease throughout pipe	Monitor	2	٥	ſ	0	\$0	\$0	\$0) \$0.00
		110		McClintock Ave	-	PolyVinyl Chloride	107			Ζ.	0		0	\$0 \$0			

							Append	lix A.1 - Pipeline Rehabilitation Recommendations - Infiltration Removal Cos	t Effectiveness Prioritizat	tion							
SewerID		DS MH	Metering Basin	Street	Diameto (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab	Estimated Total Rehabilitation Cost	Cost Effectivenes s (\$ Spent per Gallon Per Day Removed)
569	1042A	1042	LR5	X-Country Highschool	10	Asbestos Cement	360	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0	\$0	\$0.00
570	1042	1043	LR5	Portsmouth High School	10	Asbestos Cement	167	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0	\$0	\$0.00
1909	1038	1040	LR5	Fields Ledgewood Dr	8	Vitrified Clay Pipe	98	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0	\$0	\$0.00
				Tuscan Market Parking				Light grease throughout pipe	Monitor	2	. 0		0	÷			
1925	1066	1065	LR5	lot	8	Asbestos Cement	173			2	. 0	0	0	\$0	\$0	\$0	\$0.00
826	102	101	M1	Maplewood Ave	8	PolyVinyl Chloride	138	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0		
831	2132	103	M1	Maplewood Ave	8	PolyVinyl Chloride	137	Moderate grease and debris buildup throughout pipe	Monitor	2	0	0	0	\$0	\$0		
832	103	102	M1	Maplewood Ave Maplewood Ave	8	PolyVinyl Chloride	89	Light grease throughout pipe	Monitor	2	0	0	0	\$0 \$0	\$0 \$0		
1448 3348	100 2794	99 95	M1 M1	Cutts St	10 10	PolyVinyl Chloride Vitrified Clay Pipe	274	Light grease throughout pipe Deposits settled gravel at 0' DS	Monitor Monitor	2		0	0	\$0 \$0	\$0 \$0		
560	1050	1049	LR4	Hillside Dr	8	Vitrified Clay Pipe	29	Roots fine barrel at 16' US	Root Treatment	2	0	0	0	\$0 \$0	\$0 \$176		
								Deposits settled gravel at 2.5' US. Pipe changes to 6" VCP at 9' US causing	Complete CCTV					÷			
1372	End of Pipe	1303	HS11	Thaxter Rd	8	Vitrified Clay Pipe	44	abandoned survey.		2	. 0	0	0	\$0	\$243	\$243	\$0.00
6391	5504	1302	HS11	Fells Rd	8	PolyVinyl Chloride	77	Protruding laterals at 6.9' and 16.1' DS	Cut Service	2	2 0	0	0	\$0	\$430	\$430	\$0.00
5419	End of Pipe	842	LD1	Osprey Dr	8	PolyVinyl Chloride	157	Light Grease throughout pipe. Survey abandoned at 98.5' US due to left turn	Complete CCTV	2	0	0	0	\$0	\$865	\$865	\$0.00
1917	1069	1068	LR5	Lafayette Rd	10	Asbestos Cement	158	(could not inspect by reversal) Surface spalling at 4' DS, debris at 79' US causing abandoned survey (no	Complete CCTV	2	0	0	0	\$0	\$868	\$868	
2974	EOP	931	LD1	Blue Heron Dr	6	PolyVinyl Chloride	174	reversal attempted) Survey abandoned at 41.4' US due to hard left turn (could not inspect by reversal)	Complete CCTV	2	0	0	0	\$0	\$956	\$956	\$0.00
838	769	106	M1	Maplewood Ave	8	PolyVinyl Chloride	141	Intruding lateral at 24' US causing abandoned survey (no reversal attempted)	Cut Service, Complete CCTV	2	2 0	0	0	\$0	\$1,206	\$1,206	\$0.00
1911	1039	1038	LR5	Ledgewood Dr	8	Asbestos Cement	329	Survey abandoned due to hard right turn at 131.5' DS	Complete CCTV	2	0	0	0	\$0	\$1,808	\$1,808	\$0.00
5407	5493	817	GR1	Sanderling Way	6	PolyVinyl Chloride	177	Light grease throughout pipe. Heavy infiltration during flow isolation.	Clean, T&S	2	2 0	0	0	\$0	\$1,999		
1994	2462	2460	LR3	Nathaniel Dr XC	10	PolyVinyl Chloride	182	Light grease throughout pipe. Heavy infiltration during flow isolation.	Clean, T&S	2	2 0	0	0	\$0	\$2,052	\$2,052	
3352	1646	2464	LR3	Nathaniel Dr XC	10	Asbestos Cement	211	Light grease throughout pipe. Heavy infiltration during flow isolation.	Clean, T&S	2	0	0	0	\$0	\$2,745	\$2,745	\$0.00
2962	936	935	LD1	Spinnaker Way	8	Vitrified Clay Pipe	206	Joint offset large at 60' DS change from VCP to PVC. Survey abandoned at 60' DS (no reversal attempted)	Complete CCTV, Spot Repair	2	0	0	0	\$0	\$3,634	\$3,634	
1481	2460	2458	LR3	Nathaniel Dr	10	Asbestos Cement	285	Light grease throughout pipe. Heavy infiltration during flow isolation.	Clean, T&S	2	0	0	0	\$0	\$3,706		
834 1552	111 2593	110 2591	M1	Fairview Ave	8	PolyVinyl Chloride PolyVinyl Chloride	28 160	Joint separated medium at 22.2' DS Roots fine joint at 82.2' US. Heavy infiltration during flow isolation.	Monitor Clean, T&S	1	0	0	0	\$0 \$0	\$0 \$1,799		+
2999	2595 818	639	LR3 GR1	Suzanne Dr Portsmouth Blvd	0 8	Asbestos Cement	62	No defects observed	Monitor	0		0	0	\$0 \$0			
211	1310	1309	HS11	Fields Rd	12	PolyVinyl Chloride	133	No defects observed	Monitor	0		0	0	\$0 \$0	\$0 \$0		
3443	1298	5916	HS11	Boss Ave	8	PolyVinyl Chloride	114	No defects observed	Monitor	0	0	0	0	\$0	\$0		
3495	5109A	5110	HS11	Manor Dr	8	Asbestos Cement	206	No defects observed	Monitor	0	0	0	0	\$0	\$0		
3497	1420	1419	HS11	Cottage St	8	Vitrified Clay Pipe	31	No defects observed	Monitor	0	0	0	0	\$0	\$0		
5763	5550	5551	HS11	Lovell St	12	PolyVinyl Chloride	208	No defects observed	Monitor	0	0	0	0	\$0	\$0		
192	2219	530	HS14	Borthwick Ave	10	PolyVinyl Chloride	341	No defects observed	Monitor	0	0	0	0	\$0	\$0		
4802	5342	541 1382	HS14	Coakley St	8	PolyVinyl Chloride	111	No defects observed	Monitor Monitor	0	0	0	0	\$0 \$0	\$0 \$0		
548 4154	1381 600	594	HS15 HS15	US Rt 1 Bypass N Essex Ave	8	Vitrified Clay Pipe Vitrified Clay Pipe	71 235	No defects observed No defects observed	Monitor	0		0	0	\$0 \$0	\$0 \$0		
893	79	2133	LD1	Leslie Dr	8	PolyVinyl Chloride	125	No defects observed	Monitor	0		0	0	\$0 \$0	\$0 \$0		
895	2140	78	LD1	Leslie Dr	8	PolyVinyl Chloride	123	No defects observed	Monitor	0	0	0	0	\$0 \$0	\$0 \$0		
916	984	985	LD1	Market St	8	Vitrified Clay Pipe	301	Infiltration stains throughout pipe	Monitor	0	0	0	0	\$0			
918	981	982	LD1	Market St	10	Asbestos Cement	248	No defects observed	Monitor	0	00	0	0	\$0	\$0	\$0	\$0.00
919	982	983	LD1	Market St	10	Asbestos Cement	196	No defects observed	Monitor	0	0	0	0	\$0	\$0		
2980	929	927	LD1	Blue Heron Dr	6	PolyVinyl Chloride	198	No defects observed	Monitor	0	0	0	0	\$0	\$0		
3035	2444	2440	LD1	Spinnaker Way XC	10	PolyVinyl Chloride	200	No defects observed	Monitor	0	0	0	0	\$0	\$0		
3108	830	17	LD1	Portsmouth Blvd	10	PolyVinyl Chloride	46	No defects observed	Monitor	0	0	0	0	0\$	0\$		
6464 6465	2361 5564	5564 5565	LD1 LD1	Market St Market St	8	PolyVinyl Chloride PolyVinyl Chloride	272	No defects observed No defects observed	Monitor Monitor	0		0	0	\$0 \$0	\$0 \$0		
637	2208	2209	LDT LR4	Middle Rd	8	Asbestos Cement	250	No defects observed	Monitor			0	0	\$0 \$0	\$0 \$0		
	2200	565	L117	Marjorie St	0	Asbestos Cement	200	No defects observed	Monitor	0	0	U	0	\$0 \$0			

							Append	ix A.1 - Pipeline Rehabilitation Recommendations - Infiltration Removal Cos	t Effectiveness Prioritization	n							
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Infiltration Removal Cost	Estimated Structural/ O&M Rehab	Estimated Total Rehabilitation Cost	Cost Effectivenes s (\$ Spent per Gallon Per Day Removed)
1830	396	395	LR4	Greenleaf Ave	10	Asbestos Cement	162	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	\$0.00
1842	420	419	LR4	Moffat St	8	Asbestos Cement	39	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	+ + + + + +
1850	551	2726	LR4	McClintock Ave	8	PolyVinyl Chloride	207	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	+
1884	391	390	LR4	Greenleaf Ave	8	Asbestos Cement	222	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	
1488	2489	2487	LR6	Lafayette Rd	8	Asbestos Cement	43	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	
1573	2651	2652	LR6	Ricci Ave	8	Asbestos Cement	110	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	
1579	2646	2647	LR6	Robert Ave	8	Asbestos Cement	119	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	
1858	2479	2477	LR6	Lafayette Rd	8	Asbestos Cement	30	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	
827	101	100	M1	Maplewood Ave	10	PolyVinyl Chloride	36	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	
872	99	98	M1	Maplewood Ave	10	PolyVinyl Chloride	19	No defects observed	Monitor	0	0	0	0	\$0	\$0	\$0	
6514	EOP	5736	HS11	US Route 1 Bypass	6	Vitrified Clay Pipe	43	Too small to navigate with 8" CCTV camera	Complete CCTV	0	0	0	0	\$0	\$235	\$235	
4164	580	2211	HS15	X-Country	8	PolyVinyl Chloride	105	No report or video provided	Complete CCTV	0	0	0	0	\$0	\$577	\$577	
337	1421	1422	HS11	US Rt 1 Bypass	8	Vitrified Clay Pipe	110	Survey abandoned at 11' DS due to turn in pipe (reversal incomplete)	Complete CCTV	0	0	0	0	\$0	\$606	\$606	\$0.00
4161	5685	580	HS15	Sheffield Rd	8	PolyVinyl Chloride	160	Infiltration stains throughout pipe. Survey abandoned at 11' DS due to turns (reversal incomplete)	Complete CCTV	0	0	0	0	\$0	\$881	\$881	\$0.00
1876	373	374	LR4	Greenleaf Ave X- Country	10	Asbestos Cement	208	Could not find MH's	Complete CCTV	0	0	0	0	\$0	\$1,141	\$1,141	\$0.00
5409	5495	817	GR1	Sanderling Way	6	PolyVinyl Chloride	105	No defects observed. Heavy infiltration during flow isolation.	Clean, T&S	0	0	0	0	\$0	\$1,183	\$1,183	\$ \$0.00
1918	1068	1067	LR5	Lafayette Rd	10	Asbestos Cement	114	Could not locate line	Clean, Complete CCTV	0	0	0	0	\$0	\$1,254	\$1,254	\$0.00
370	1330	1331	HS11	Bartlett St	36	Brick	203	Could not enter pipe- Full	Clean	0	0	0	0	\$0	\$1,423	\$1,423	\$0.00
2960	938	937	LD1	Spinnaker Way	8	Vitrified Clay Pipe	277	Buried/Could not locate	Complete CCTV	0	0	0	0	\$0	\$1,524	\$1,524	\$0.00
5405	EOP	5493	GR1	Sanderling Way	6	PolyVinyl Chloride	225	Survey abandoned at 157.6' US due to hard left turn (could not inspect by reversal). Heavy infiltration during flow isolation.	T&S, Complete CCTV	0	0	0	0	\$0	\$2,540	\$2,540	\$0.00
1914	1044	1045	LR5	Ledgewood Dr	10	Asbestos Cement	233	MH 1044 is buried, line is full of debris	Clean, Complete CCTV	0	0	0	0	\$0	\$2,565	\$2,565	\$0.00
1907	1062	1063	LR5	Lafayette Rd	8	Asbestos Cement	245	50% Full of Debris, could not attempt survey	Clean, Complete CCTV	0	0	0	0	\$0	\$2,699	\$2,699	\$0.00
1506	2464	2462	LR3	Nathaniel Dr XC	10	Asbestos Cement		No defects observed. Heavy infiltration during flow isolation.	Clean, T&S	0	0	0	0	\$0	\$2,849	\$2,849	
1482	2458	2455	LR3	Nathaniel Dr XC	10	Asbestos Cement	243	Infiltration stain at 159.4' US. Heavy infiltration during flow isolation.	Clean, T&S	0	0	0	0	\$0	\$3,154	\$3,154	\$0.00

					-		Appendix A	2 - Pipeline Rehabilitation Recommendations - Max Defect Score Prioritization							1
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
833	759	111	M1	Oleary Pl	6	Asbestos Cement	100	reversal attempted)	mplete CCTV	5	0	0	0	\$553	\$0.00
1908	1040	1062	LR5	Ledgewood Dr	8	Vitrified Clay Pipe	134	Deposits attached grease throughout pipe. Survey abandoned at 86.5' DS due to Con grease blockage (no reversal attempted)	mplete CCTV	5	0	0	0	\$735	\$0.00
2981	927	926	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	195	Survey abandoned at 7' US due to roots (no reversal attempted) Roo	ot Treatment	5	0	0	0	\$1,170	
1329	1400	1399	HS11	Bartlett St	8	Vitrified Clay Pipe	20	Broken pipe soil visible at 13.2' US.		5	0	0	0	\$1,216	\$0.00
1893	375	376	LR4	X-Country Greenleaf Woods Dr	10	Asbestos Cement	214		ort Liner	5	0	0	0	\$2,580	\$0.00
2977	928	926	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	154	5 11 11 1	ort Liner, Root eatment	5	0	0	0	\$3,442	\$0.00
3023	916	919	GR1	Blue Heron Dr	8	Vitrified Clay Pipe	238	Fracture multiple and broken pipe with soil visible at 150.2' US. Hole void visible at Con 152.2' US causing abandoned survey (no reversal attempted)	mplete CCTV, Spot pair	5	0	0	0	\$3,809	\$0.00
327	1412	1413	HS11	Boyd Rd	8	Vitrified Clay Pipe	260	· · · · ·	t Service, Spot Repair, ot Treatment	5	0	0	0	\$5,781	\$0.00
323	540	541	HS14	Coakley St	8	Vitrified Clay Pipe	121	Fractures throughout pipe. Hinge fracture 3 at 35' DS. Hinge fracture 4 at 38' DS. Broken pipe void visible at 39' DS. Fracture spiral at 48' DS. Survey abandoned at large offset joint (52.4' DS) (no reversal attempted)	PP, Spot Repair	5	0	0	0	\$12,288	\$0.00
343	1399	1398	HS11	Bartlett St	8	Vitrified Clay Pipe	219	Hole void visible at 4' DS. Hole void visible in lateral at 25.4' DS. Hole soil visible at CIP	PP, Cut Service, mplete CCTV	5	0	0	0	\$15,199	\$0.00
202	2728	596	HS15	Melbourne St	8	Vitrified Clay Pipe	248		PP, Root Treatment	5	0	0	0	\$16,377	\$0.00
321	533	534	HS14	Coakley Rd	8	Vitrified Clay Pipe	315		PP, Spot Repair	5	0	0	0	\$21,381	\$0.00
2966	924	923	LD1	Dunlin Way	8	Vitrified Clay Pipe	242		PP, Spot Repair	5	0	0	0	\$21,995	\$0.00
200	583	589	HS11	Sheffield Rd	8	Vitrified Clay Pipe	240		S, CIPP, Complete TV, Spot Repair	5	0	0	0	\$26,689	\$0.00
201	589	590	HS11	Melbourne St	10	Vitrified Clay Pipe	456		PP, Spot Repair	5	0	0	0	\$33,377	\$0.00
2961	937	936	LD1	Spinnaker Way	8	Vitrified Clay Pipe	212	Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at Con 79' US with Joint Offset Severe (sinking into ground) Rep	mplete CCTV, Spot pair	5	144	0	144	\$13,667	\$94.91
239	1364	1363	HS11	Hannaford	6	Asbestos Cement	218		S, CIPP	5	144	0	144	\$19,108	\$132.69
1833	395	372	LR4	Greenleaf Ave XC	10	Asbestos Cement	216	Survey abandoned at 214' DS due to severe root ball. Infiltration dripper at MH372. T&S	S, Root Treatment	5	288	0	288	\$2,921	\$10.14
1915	1045	1046	LR5	Ledgewood Dr	10	Asbestos Cement	167		S, Complete CCTV, ot Repair	5	288	0	288	\$5,168	\$17.94
2988	841	840	LD1	Osprey Dr	8	Vitrified Clay Pipe	146		PP, Root Treatment	5	0	288	288	\$9,605	\$33.35
4172	587	1381	HS15	Hampshire Rd	10	Vitrified Clay Pipe			S, CIPP	5	288		288		

							Appendix A	.2 - Pipeline Rehabilitation Recommendations - Max Defect Score Prioritization							
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
688	471	470	B1	Georges Ter	8	Vitrified Clay Pipe	111	, , , , , , , , , , , , , , , , , , , ,	out Lateral, CIPP, Cut rvice, Root Treatment	5	0	432	432	\$9,099	\$21.06
3525	605	5400	HS11	Islington St	8	Vitrified Clay Pipe	217	intruding laterals at 103.2' DS, 115.5' DS, and 216.8' DS. Clear water coming from Inspe	S, Grout Lateral, pect Lateral, CIPP, t Service	5	0	432	432	\$21,837	\$50.55
1389	596	598	HS15	Essex Ave	8	Vitrified Clay Pipe	390	(Unknown Source). Collapsed pipe at 150.6 DS. Spot	pect Lateral, CIPP, ot Repair, Root eatment	5	0	432	432	\$29,017	\$67.17
3243	EOP	1439	HS11	Islington St	8	Vitrified Clay Pipe	149	Clear water coming from lateral at 135.9' US. Clear water running from laterals at Grout	out Lateral, Inspect eral, Short Liner	5	0	576	576	\$4,470	\$7.76
547	1423	1382	HS15	US Rt 1 Byepass	8	Vitrified Clay Pipe	83	Infiltration stains throughout pipe. Crack longitudinal at 21' US, Broken pipe void visible at 56.8' US, Large rock intruding into broken pipe at 79.9' US with infiltration runner around rock. Roots medium joint at 82.1' US. Candidate for Dig & Replace.	до	5	720	0	720	\$4,956	\$6.88
2963	935	934	LD1	Spinnaker Way	8	Vitrified Clay Pipe	206		S, Spot Repair, Root atment	5	720	0	720	\$22,653	\$31.46
187	538	540	HS14	Coakley Rd	8	Vitrified Clay Pipe	560	Includes Pipe SewerID 1335. Roots throughout pipe. Broken pipe at 17.9' US. Inspe	pect Lateral, CIPP, ot Treatment	5	0	720	720	\$37,710	\$52.38
555	1056	1047	LR4	Greenleaf Ave	8	Asbestos Cement	305	Fractures and infiltration stains throughout pipe. Clear water running from laterals T&S,	S, Grout Lateral, pect Lateral, CIPP	5	144	864	1,008	\$22,229	\$22.05
328	1413	1414	HS11	Boyd Rd	8	Vitrified Clay Pipe	271	Intruding taps at 59' and 90' DS. Clear water coming from tap break-ins at 59' and T&S, 90' DS. Roots and infiltration stains throughout pipe with infiltration runner at 192.3' CIPP	S, Grout Lateral, PP, Cut Service, Spot pair, Root Treatment	5	144	864	1,008	\$28,968	\$28.74
1845	545	420	LR4	X-Country	8	Asbestos Cement	195	Infiltration gusher at US MH Connection, roots at DS MH Connection Clear	an, T&S	5	1,152	0	1,152	\$2,537	\$2.20
5120	5421	5422	LR4	Parking lot	8	Asbestos Cement	237	v	an, T&S, Inspect eral, Spot Repair	5	144	1,296	1,440	\$7,837	\$5.44
204	590	End Of Pipe	HS11	Rutland St	8	Vitrified Clay Pipe	240	Clear water dripping from laterals at 9.1' and 31' DS, intruding lateral at 10' DS. T&S, roots fine joint throughout pipe. Survey abandoned at 152' DS due to debris in pipe Servi	S, Grout Lateral, Cut vice, Complete TV, Root Treatment	5	0	1,584	1,584	\$10,076	\$6.36
1334	541	5341	HS14	Coakley Rd	8	Vitrified Clay Pipe	88		S, CIPP, Spot Repair, ot Treatment	5	1,728	0	1,728	\$10,527	\$6.09
4163	581	580	HS15	Sheffield Rd	8	Vitrified Clay Pipe	242	o 11 o 11	S, Inspect Lateral, PP, Cut Service, Spot pair	5	1,440	288	1,728	\$25,556	\$14.79
2982	926	925	LD1	Blue Heron dr	8	Vitrified Clay Pipe	228	from laterals at 145' and 148' DS (Unknown source). Fracture spiral with infiltration Spot	S, Inspect Lateral, ot Repair, Root eatment	5	1,152	1,008	2,160	\$11,064	\$5.12

SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)		Pipe Length (LF)	.2 - Pipeline Rehabilitation Recommendations - Max Defect Score Prioritization Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
210	1310	1311	HS11	Fields Rd	12	Fiberglass Reinforced Pipe	176	Infiltration drippers and runners throughout pipe. Broken pipe with infiltration weeper at 51.2' DS. Clear water running from laterals at 32.2' DS, 81.7' DS, and 156.8' DS. Candidate for Dig & Replace.	CIPP	5	432	2,016	2,448	\$10,553	\$4.31
2955	939	940	LD1	Spinnaker Way	8	Vitrified Clay Pipe	246	Roots throughout pipe. Infiltration runner at 92' DS coming from crack longitudinal. Infiltration runner at 114' DS. Deposits attached grease and encrustation throughout pipe. Clear water running from lateral at 146' DS (Unknown source). Infiltration dripper joint at 174' DS. Infiltration runner joint at 180' DS. Infiltration dripper at 206' DS.	Clean, T&S, Inspect Lateral, Spot Repair	5	2,160	432	2,592	\$10,769	\$4.15
5008	5401	2728	HS15	Melbourne St	8	Vitrified Clay Pipe	480	Fractures, holes, and roots throughout pipe. Intruding laterals at 21.6', 261', 301.4', 322.3', and 429.6' DS. Clear water running from laterals at 70.8', 261.7', 301.4, 350.7, and 364' DS.	T&S, Grout Lateral, CIPP, Cut Service, Root Treatment	5	0	2,592	2,592	\$48,069	\$18.55
640	562	565	LR4	Sylvester St	8	Asbestos Cement	199	Clear water coming from lateral at 160.3' DS. Infiltration gusher from hole in pipe at 190' DS	Lateral, Spot Repair	5	2,880	144	3,024	\$5,533	\$1.83
237	1361	1360	HS11	Lovell St	8	Asbestos Cement	183	Infiltration weeper at 46.1' DS. Intruding lateral with clear water running at 53.1' DS (Unknown Source). Broken pipe void visible 1' US. Clear water running from laterals at 10 and 94' US. Broken pipe void visible at 123.1' US	T&S, Inspect Lateral, CIPP	5	576	2,880	3,456	\$13,077	\$3.78
2000	2484	2479	LR6	Lafayette Rd	8	Asbestos Cement	284	Clear water running from lateral at 96.3' DS (Unknown Source), Infiltration runner from broken pipe/fracture spiral at 265' DS.	Inspect Lateral, Spot Repair	5	2,880	720	3,600	\$3,250	\$0.90
2957	941	942	LD1	Spinnaker Way	8	Vitrified Clay Pipe	225	Surface spalling at 14' US. Clear water coming from laterals at 69', 106', 166', and 204' US. Clear water from lateral at 21' US (unknown source). Crack longitudinal at 22' US. Broken pipe at 30' (no void visible). Fracture spiral at 44' US. Roots in lateral at 69' US. Roots fine barrel at 100' US. Infiltration stains at 126' US. Fracture spiral at 217' US with infiltration runner	Repair	5	288	3,312	3,600	\$7,570	\$2.1(
1587	2641	136	LR6	Heritage Rd	8	Asbestos Cement	285	Heavy grease and debris buildup in pipe. Infiltration gusher at 9.6' DS from defective wye. Infiltration stains at 127' DS	Clean, T&S, Spot Repair	5	4,320	0	4,320	\$3,961	\$0.92
1881	394	392	LR4	Greenleaf Ave	10	Asbestos Cement	321	Infiltration stains throughout pipe with gusher and runner at 238 and 248' DS, respectively. Protruding lateral at 256.8' DS	Clean, T&S, Cut Service, Spot Repair	5	5,040	0	5,040	\$7,599	\$1.51
1513	2595	2593	LR3	Suzanne Dr	8	Asbestos Cement	78	Infiltration gusher from hole at 15' US	Clean, T&S, Spot Repair	5	5,760	0	5,760	\$6,011	\$1.04
3210	5852	818	GR1	Portsmouth Blvd	8	Vitrified Clay Pipe	103	Infiltration throughout with runners and gushers. Survey abandoned due to debris (no reversal attempted)	T&S, CIPP	5	9,072	0	9,072	\$8,720	\$0.96
3021	921	920	GR1	Blue Heron Dr	8	Vitrified Clay Pipe	139	Roots fine joint at 26' US. Roots fine joint at 63' US. Crack spiral at 75' US. Roots ball joint at 120' US. Roots ball barrel at 125' US. Rag in joint at 135' US.	Root Treatment	4	0	0	0	\$836	\$0.00
4165	2211	587	HS15	Hampshire Rd	10	Vitrified Clay Pipe	89	Infiltration stains at 11.1' US. Survey abandoned at 68.8' US due to high grease and water level (reversal incomplete)	T&S, Complete CCTV	4	0	0	0	\$2,717	\$0.00
5006	End of Pipe	589	HS11	Melbourne St	10	Vitrified Clay Pipe	242	Roots fine and ball throughout pipe, Intruding tap at 169.5' US causing abandoned survey.	Cut Service, Complete CCTV, Root Treatment	4	0	0	0	\$3,209	\$0.00
5122	5423	5421	LR4	Parking lot	8	Asbestos Cement	325	Infiltration stains throughout pipe, Fractures at 120.5' DS.	Clean, T&S	4	0	0	0	\$4,220	\$0.0
4156	593	580	HS15	Essex Ave	8	Vitrified Clay Pipe	318	Infiltration stains and roots throughout pipe. Fracture at 47.4.	T&S, Short Liner, Root Treatment	4	0	0	0	\$12,389	\$0.00
2989	840	839	LD1	Osprey Dr	8	Vitrified Clay Pipe	326	Roots and fractures throughout pipe. Hinge fracture 3 at 120.2' DS.	CIPP	4	0	0	0	\$19,533	\$0.0
173	468	467	B1	Colonial Dr	8	Vitrified Clay Pipe	318	Infiltration stains throughout pipe. Intruding laterals at 81.7, 110.2, 138.8, 202.2, 243.9', 252.6', 301.2', and 309' DS. Fracture spiral at 21' DS, Fracture multiple at 24.2 and 27.3' DS. Clear water running from lateral at 64.4' DS (Unknown Source).	Inspect Lateral, CIPP, Cut Service	4	0	144	144	\$23,266	\$161.57

						/	Appendix A	A.2 - Pipeline Rehabilitation Recommendations - Max Defect Score Prioritization							
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
320	532	533	HS14	Coakley Rd	8	Vitrified Clay Pipe	178	Hinge fracture 4 at 34' DS, Clear water dripping from lateral at 48' DS, Hinge fracture 3 at 48-52' DS. Hinge fracture 3 from 149'-160' DS. Fractures throughout pipe. Candidate for Dig & Replace.	CIPP	4	0	144	144	\$10,685	\$74.20
4753	392	391	LR4	Greenleaf Ave	8	Asbestos Cement	274	Clear water running from lateral at 13.4' US (Unknown Source). Debris buildup at MH 392	Inspect Lateral	4	0	288	288	\$750	\$2.60
1327	2239A	2239	HS11	Cottage St	8	Vitrified Clay Pipe	339	Roots medium and ball throughout pipe, clear water running from lateral at 125.5' US (Unknown Source).	Inspect Lateral, Root Treatment	4	0	288	288	\$2,783	\$9.66
6468	597	5685	HS15	Sheffield Rd	8	Vitrified Clay Pipe	173	Fractures throughout pipe. Intruding laterals at 124.8' and 151.7' DS. Clear water dripping from lateral at 124.8' DS	T&S, Grout Lateral, CIPP, Cut Service	4	0	288	288	\$16,030	\$55.66
837	767	769	M1	Maplewood St	8	Vitrified Clay Pipe	213	Clear water running from lateral at 45.5' DS. Cracks and fractures throughout pipe. Survey abandoned at 110' DS due to turn in pipe (reversal incomplete) - City Currently Digging, Removed from Recommendation.	Monitor	4	0	0	0	\$0	\$0.00
4188	2728	598	HS15	Sims Ave	8	Vitrified Clay Pipe	238	Broken pipe at 69' DS. Infiltration Stains throughout pipe. Clear Water coming from lateral at 131.4 DS. Protruding lateral at 135.6' DS causing abandoned survey (reversal incomplete)	T&S, Grout Lateral, CIPP, Short Liner	4	0	288	288	\$23,222	\$80.63
1916	1046	1069	LR5	Lafayette Rd XC	10	Asbestos Cement	135	Infiltration runner at 30.3' DS, MH 1069 has infiltration at walls (1.5 gpm)	Clean, T&S	4	432	0	432	\$1,751	\$4.05
4142	554	555	LR4	Middle Rd	8	Vitrified Clay Pipe	161	Infiltration stains, roots, and fractures throughout pipe. Clear water coming from protruding lateral at 96' DS. reversal complete	T&S, Grout Lateral, CIPP, Cut Service, Root Treatment	4	0	432	432	\$15,537	\$35.97
2956	940	941	LD1	Spinnaker Way	8	Vitrified Clay Pipe	186	Fractures, roots, and infiltration stains throughout pipe. Clear water running from lateral at 114.8' DS (Unknown Source)	T&S, Inspect Lateral, CIPP, Root Treatment	4	0	432	432	\$17,682	\$40.93
4153	599	600	HS15	Sims Ave	8	Vitrified Clay Pipe	80	Infiltration Runner at DS MH Connection	Clean, T&S	4	720	0	720	\$2,440	\$3.39
3017	913	914	GR1	Blue heron Dr	6	PolyVinyl Chloride	231	Clear water running from lateral at 131' DS. Roots ball joint and fine joint throughout pipe.	T&S, Grout Lateral, Root Treatment	4	720	0	720	\$3,167	\$4.40
1988	2652	143	LR6	Ricci Ave	8	Asbestos Cement	314	Infiltration runner at intruding lateral 26.6' DS. Intruding lateral at 106' DS. Debris buildup at 307' DS	Clean, T&S, Grout Lateral, Cut Service	4	720	0	720	\$5,396	\$7.49
2958	942	932	LD1	Spinnaker Way	8	Vitrified Clay Pipe	219	Crack longitudinal at 10' US With infiltration weeper. Crack circumferential and infiltration stains at 14' US. Pipe half full of debris at 28' (grass and toilet paper). Settled gravel deposits at 36' US. Infiltration stain joint at 40' US. Clear water leaking from lateral at 62' US. Roots joint fine and roots barrel fine at 100' US with Clear water running from lateral 100' US. Infiltration dripper at joint 112' US. Heavy debris and gravel blocking remaining survey. (Reversal complete)	T&S, Grout Lateral, CIPP, Short Liner	4	288	432	720	\$23,750	\$32.99
334	1419	1418	HS11	Cottage St	8	Vitrified Clay Pipe	298	5 11 - 1	T&S, Inspect Lateral, CIPP, Spot Repair, Root Treatment	4	0	720	720	\$30,355	\$42.16
4554	1382	1383	HS15	US Rt 1 Bypass	12	Vitrified Clay Pipe	290	Includes Pipe Sewer ID 4555. Infiltration stains and drippers throughout pipe. Clear water running from laterals at 190.7 and 191.3' DS. lateral intruding at 190.7' DS. Survey abandoned at 290' DS due to high water level (no reversal attempted)	T&S, Grout Lateral, Complete CCTV	4	432	720	1,152	\$9,893	\$8.59
2976	930	928	LD1	Blue Heron Dr	6	PolyVinyl Chloride	243	Roots ball joint at 3' US. Clear Water running from lateral at 81' US (Unknown Source). Fracture spiral at 239.8' US (material changed to VCP at 232' US)	Inspect Lateral, Root Treatment	4	0	1,440	1,440	\$2,206	\$1.53
1892	374	375	LR4	X-Country Greenleaf woods Dr	10	Asbestos Cement	231	Infiltration runner joint at 116' US. Roots at US MH Connection	Clean, T&S	4	1,440	0	1,440	\$3,000	\$2.08
3027	943	2361	LD1	Spinnaker Way	8	Vitrified Clay Pipe	279	Infiltration runner in lateral at 207.6' DS. Infiltration stains and roots throughout pipe	T&S, Grout Lateral, Root Treatment	4	0	1,440	1,440	\$8,646	\$6.00

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SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
329	1414	1415	HS11	US 1B Off Ramp	8	Vitrified Clay Pipe	258	Infiltration runner at 6' DS due to fracture. Infiltration stains and debris throughout pipe. Protruding lateral at 76' DS causing abandoned survey (reversal incomplete). Protruding lateral at 185.8' DS (found on reversal inspection)	T&S, Cut Service, Complete CCTV, Spot Repair	4	1,440	0	1,440	\$11,226	\$7.80
3102	828	829	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	242	Infiltration, fractures, and roots throughout pipe. Clear water coming from laterals at 88', 172', and 198' US (Unknown Source).	T&S, Inspect Lateral, CIPP, Complete CCTV, Root Treatment	4	288	1,152	1,440	\$25,631	\$17.80
1834	372	5872	LR4	Greenleaf Ave XC	10	Asbestos Cement	184	Clear water dripping from lateral at 22.2' DS, Infiltration runner at DS MH connection	Clean, T&S, Grout Lateral	4	1,440	288	1,728	\$2,842	\$1.64
3209	816	5852	GR1	Portsmouth Blvd	10	Vitrified Clay Pipe	182	Fractures and infiltration throughout pipe	T&S, CIPP	4	2,448	0	2,448	\$15,462	\$6.32
3001	819	639	GR1	Portsmouth Blvd	8	Vitrified Clay Pipe	335	Fractures and infiltration throughout pipe, survey abandoned at 211' DS due to settled debris	T&S, CIPP	4	2,880	0	2,880	\$28,479	\$9.89
1640	237	236	LR6	Constitution Ave	8	Asbestos Cement	230	Clear water coming from lateral at 97.1' US (Unknown Source). Roots medium barrel at 104' US. Infiltration gusher at 107' US. Roots fine joint at 118' US.	T&S, Inspect Lateral, Root Treatment	4	4,320	0	4,320	\$3,853	\$0.89
2994	820	819	GR1	Portsmouth Blvd	8	Vitrified Clay Pipe	55	Chipped bell at 42.3' DS, light debris throughout pipe	Clean	3	0	0	0	\$300	\$0.00
2964	934	933	LD1	Dunlin Way	8	Vitrified Clay Pipe	99	Debris and roots throughout pipe	Root Treatment	3	0	0	0	\$595	
2965	933	924	LD1	Dunlin Way	8	Vitrified Clay Pipe	126	Roots throughout pipe	Root Treatment	3	0	0	0	\$755	
1919	1043	1044	LR5	Portsmouth High School Fields	10	Asbestos Cement	165	Survey abandoned at 75' DS due to debris (no reversal attempted)	Complete CCTV	3	0	0	0	\$909	\$0.00
1888	389	388	LR4	Holiday Dr	8	Asbestos Cement	256	Grease and debris throughout pipe, survey abandoned at 250' DS due to grease	Complete CCTV	3	0	0	0	\$1,408	\$0.00
331	1415	1416	HS11	US 1B Off Ramp	8	Vitrified Clay Pipe	296	Debris buildup throughout pipe, survey abandoned at 37.8' DS due to debris (no reversal attempted)	Complete CCTV	3	0	0	0	\$1,625	\$0.00
1343	469	468	B1	Odin St	8	Vitrified Clay Pipe	270	Roots medium and fine joint throughout pipe, intruding laterals at 9.5', 67.3', and 195.1' DS.	CIPP, Cut Service, Root Treatment	3	0	0	0	\$19,088	
1483	2455	2452	LR3	Nathaniel Dr XC	10	Asbestos Cement	249	Fracture spiral at 76' DS. Heavy infiltration during flow isolation.	Clean, T&S	3	0	0	0	\$3,241	
6438	5398	916	GR1	Blue Heron Dr	8	Vitrified Clay Pipe	53	Fractures and Roots throughout pipe	CIPP, Root Treatment	3	0	0	0	\$3,511	\$0.00
2967	923	837	LD1	Dunlin Way	8	Vitrified Clay Pipe	258	Water level 2/3 at beginning of survey. Fracture longitudinal at 142' US, Roots fine joint throughout pipe. Large offset joint with fernco visible at 206' US	Spot Repair, Root Treatment	3	0	0	0	\$4,046	\$0.00
3241	2239	2242	HS11	Cate St	8	Vitrified Clay Pipe	498	Roots throughout pipe. Intruding laterals at 13.2', 28.1' and 66.1' DS. Clear water dripping from lateral at 66.1' DS (Unknown Source). Survey abandoned at 66.1' DS (reversal incomplete)	Inspect Lateral, Cut Service, Complete CCTV, Root Treatment	3	0	144	144	\$7,767	\$53.94
2983	925	924	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	165	Fracture spiral at 1.6' DS. Clear water dripping from lateral at 42.3' DS (Unknown Source). Crack longitudinal at 105' DS. Broken pipe no void visible at 131' DS.	CIPP	3	0	144	144	\$9,899	\$68.74
326	1630	1402	HS11	Bartlett St	8	Vitrified Clay Pipe	91	Infiltration weeper at 52.9' US. Clear water running from lateral at 52.9' US. Defective short liner at 75' US	Clean, T&S, Grout Lateral, Spot Repair	3	0	288	288	\$5,713	\$19.84
195	1384	1383	HS11	US Rt 1 Bypass	12	Vitrified Clay Pipe	358	Infiltration stains and drippers throughout. Roots fine joint at 22' US. Settled gravel at 187' US causing abandoned survey (no reversal attempted)	T&S, Complete CCTV	3	288	0	288	\$11,108	\$38.57
2986	911	842	LD1	Osprey Dr	6	Vitrified Clay Pipe	270	Roots throughout pipe, clear water running from laterals at 84 and 87.4' US (Unknown Source). Survey abandoned at 91.5' US due to large offset joint (no reversal attempted)	Inspect Lateral, Complete CCTV, Root Treatment	3	0	576	576	\$4,601	\$7.99
220	1312	1311	HS11	Fields Rd	8	Unknown	264	Lining slightly detached at 27' US, clear water running from lateral at 81' US (Unknown Source), roots in lateral at 99' US. Survey abandoned at 170' US due to debris in pipe (no reversal attempted)	Inspect Lateral, Complete CCTV	3	0	1,440	1,440	\$2,199	\$1.53
194	1383	1384	HS15	US Rt 1 Bypass N	10	Vitrified Clay Pipe	399	Fracture spiral at 22' US. Infiltration drippers throughout pipe	Clean, T&S, Short Liner	3	1,728	0	1,728	\$14,747	\$8.53

							Appendix A	.2 - Pipeline Rehabilitation Recommendations - Max Defect Score Prioritization	I						
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)		Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
5095	524	5411	HS14	X-Country	18	PolyVinyl Chloride	412	Clear Water Gushing from around lateral at 388.2' DS.	Clean, T&S, Grout Lateral	3	0	2,880	2,880	\$6,882	\$2.39
3000	817	5852	GR1	Portsmouth Blvd	8	PolyVinyl Chloride	191	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
3089	5307	634	GR1	Commerce Way	10	Asbestos Cement	106	Light debris throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
6453	5505	5307	GR1	Commerce Way	10	Asbestos Cement	183	Infiltration stain at 66.3' DS	Monitor	2	0	0	0	\$0	\$0.00
238	1360	2741	HS11	Lovell St	8	Asbestos Cement	220	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
1328	5110	1420	HS11	Cottage St	8	Asbestos Cement	128	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
193	5316	527	HS14	X-Country	12	PolyVinyl Chloride	170	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
5092	527	5410	HS14	Barberry Ln XC	12	PolyVinyl Chloride	136	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
6377	530	5316	HS14	X-Country Brothwick Ave	12	PolyVinyl Chloride	289	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
2972	2457	2454	LD1	Dunlin Way	10	PolyVinyl Chloride	194	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
6451	5496	930	LD1	Blue Heron Dr	6	PolyVinyl Chloride	131	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
564	1631	394	LR4	Greenleaf Ave	8	Asbestos Cement	172	Deposits settled gravel with broken pipe debris at 149.3' DS (unknown origin)	Monitor	2	0	0	0	\$0	\$0.00
1843	419	418	LR4	Moffat St	8	PolyVinyl Chloride	169	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
1848	2726	544	LR4	McClintock Ave	8	PolyVinyl Chloride	200	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
569	1042A	1042	LR5	X-Country Highschool	10	Asbestos Cement	360	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
570	1042	1043	LR5	Portsmouth High School Fields	10	Asbestos Cement	167	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
1909	1038	1040	LR5	Ledgewood Dr	8	Vitrified Clay Pipe	98	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
1925	1066	1065	LR5	Tuscan Market Parking lot	8	Asbestos Cement	173	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
826	102	101	M1	Maplewood Ave	8	PolyVinyl Chloride	138	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
831	2132	103	M1	Maplewood Ave	8	PolyVinyl Chloride	137	Moderate grease and debris buildup throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
832	103	102	M1	Maplewood Ave	8	PolyVinyl Chloride	89	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
1448	100	99	M1	Maplewood Ave	10	PolyVinyl Chloride	274	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
3348	2794	95	M1	Cutts St	10	Vitrified Clay Pipe	37	Deposits settled gravel at 0' DS	Monitor	2	0	0	0	\$0	\$0.00
560	1050	1049	LR4	Hillside Dr	8	Vitrified Clay Pipe	29	Roots fine barrel at 16' US	Root Treatment	2	0	0	0	\$176	\$0.00
	End of Pipe		HS11	Thaxter Rd	8	Vitrified Clay Pipe	44	Deposits settled gravel at 2.5' US. Pipe changes to 6" VCP at 9' US causing abandoned survey.	Complete CCTV	2	0	0	0	\$243	\$0.00
6391	5504	1302	HS11	Fells Rd	8	PolyVinyl Chloride	77	Protruding laterals at 6.9' and 16.1' DS	Cut Service	2	0	0	0	\$430	\$0.00
5419	End of Pipe	842	LD1	Osprey Dr	8	PolyVinyl Chloride	157	Light Grease throughout pipe. Survey abandoned at 98.5' US due to left turn (could not inspect by reversal)		2	0	0	0	\$865	\$0.00
1917	1069	1068	LR5	Lafayette Rd	10	Asbestos Cement	158	attempted)	Complete CCTV	2	0	0	0	\$868	\$0.00
2974	EOP	931	LD1	Blue Heron Dr	6	PolyVinyl Chloride	174	Survey abandoned at 41.4' US due to hard left turn (could not inspect by reversal)	Complete CCTV	2	0	0	0	\$956	\$0.00
838	769	106	M1	Maplewood Ave	8	PolyVinyl Chloride	141	Intruding lateral at 24' US causing abandoned survey (no reversal attempted)	Cut Service, Complete CCTV	2	0	0	0	\$1,206	\$0.00
1911	1039	1038	LR5	Ledgewood Dr	8	Asbestos Cement	329	Survey abandoned due to hard right turn at 131.5' DS	Complete CCTV	2	0	0	0	\$1,808	\$0.00
5407	5493	817	GR1	Sanderling Way	6	PolyVinyl Chloride	177	Light grease throughout pipe. Heavy infiltration during flow isolation.	Clean, T&S	2	0	0	0	\$1,999	\$0.00
1994	2462	2460	LR3	Nathaniel Dr XC	10	PolyVinyl Chloride	182	Light grease throughout pipe. Heavy infiltration during flow isolation.	Clean, T&S	2	0	0	0	\$2,052	\$0.00
3352	1646	2464	LR3	Nathaniel Dr XC	10	Asbestos Cement	211	Light grease throughout pipe. Heavy infiltration during flow isolation.	Clean, T&S	2	0	0	0	\$2,745	\$0.00
2962	936	935	LD1	Spinnaker Way	8	Vitrified Clay Pipe	206	Joint offset large at 60' DS change from VCP to PVC. Survey abandoned at 60' DS (no reversal attempted)	Complete CCTV, Spot Repair	2	0	0	0	\$3,634	\$0.00
1481	2460	2458	LR3	Nathaniel Dr	10	Asbestos Cement	285	Light grease throughout pipe. Heavy infiltration during flow isolation.	Clean, T&S	2	0	0	0	\$3,706	\$0.00
1844	544	545	LR4	X-Country	8	Asbestos Cement	206	Clear water weeping from lateral at 91.4' DS (Unknown Source)	Inspect Lateral	2	0	144	144	\$750	\$5.21
896	78	73	LD1	Leslie Dr	8	PolyVinyl Chloride	154	Clear Water Weeping from lateral at 102' DS	Clean, T&S, Grout Lateral	2	0	144	144	\$2,186	\$15.18

							Appendix A	A.2 - Pipeline Rehabilitation Recommendations - Max Defect Score Prioritization	1						
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
212	1309	1308	HS11	Fields Rd	12	PolyVinyl Chloride	92	Intruding lateral at 47.5' DS with clear water weeping. Clear water running from lateral at 62.1' DS (Unknown Source)	Clean, T&S, Grout Lateral, Inspect Lateral	2	0	144	144	\$2,278	\$15.82
842	5565	2369	LD1	Market St	8	PolyVinyl Chloride	207	Light debris throughout pipe. Infiltration weeper and stain at 192' DS.	Clean, T&S	2	144	0	144	\$2,329	\$16.17
322	534	5342	HS14	Coakley St	8	PolyVinyl Chloride	230	Clear water running from lateral at 93.6' DS.	Clean, T&S, Grout Lateral	2	0	288	288	\$3,042	\$10.56
2975	931	5496	LD1	Blue Heron Dr	6	PolyVinyl Chloride	216	Clear water running from laterals at 56' DS and 187.6' DS (Unknown Source)	Inspect Lateral	2	0	432	432	\$1,500	\$3.47
563	1047	1631	LR4	Greenleaf Ave	8	Vitrified Clay Pipe	89	Clear water running from lateral at 80.5' DS (Unknown Source)	Inspect Lateral	2	0	576	576	\$750	\$1.30
6610	5819	5818	HS11	Aldrich Rd	8	PolyVinyl Chloride	274	Clear water running from lateral at 189.8' DS (Unknown Source).	Inspect Lateral	2	0	720	720	\$750	\$1.04
1333	1402	1401	HS11	Bartlett St	8	Vitrified Clay Pipe	249	Infiltration stain joint at 11.5' DS. Protruding lateral at 42.1' DS with clear water running (Unknown Source)	Inspect Lateral, Cut Service	2	0	720	720	\$1,180	\$1.64
3416	1344A	1344	HS11	Madison St	12	PolyVinyl Chloride	180	Intruding laterals 49.7' and 122.7' US. Clear water running from laterals at 49.7', 122.7', 137.3', and 142.7' US (Unknown Source). Survey abandoned at 146.1' US due to size change (no reversal attempted)	Inspect Lateral, Cut Service, Complete CCTV	2	0	864	864	\$4,941	\$5.72
236	1362	1361	HS11	Yoga Parking Lot	8	Asbestos Cement	109	Clear water running from lateral at 105.3' DS. Clear water dripping from lateral at 53.8' DS (Unknown Source). Protruding lateral at 53.8' DS	Clean, T&S, Grout Lateral, Inspect Lateral, Cut Service	2	0	1,152	1,152	\$3,051	\$2.65
556	1055	1056	LR4	Hillside Dr	8	PolyVinyl Chloride	397	Clear water running from laterals at 187.9' and 315.2' DS (Unknown Source)	Inspect Lateral	2	0	1,440	1,440	\$1,500	\$1.04
2979	932	920	LD1	Blue Heron Dr	6	PolyVinyl Chloride	208	Clear water running from lateral at 133' DS (Unknown Source). Survey abandoned at 160' DS due to hard left turn (no reversal attempted)	Inspect Lateral, Complete CCTV	2	0	1,440	1,440	\$1,894	\$1.32
5408	5494	817	GR1	Sanderling Way	6	PolyVinyl Chloride	115	Clear water running from lateral at 90.7' US (Unknown source). Heavy infiltration during flow isolation.	Clean, T&S, Inspect Lateral	2	0	1,440	1,440	\$2,050	\$1.42
338	1401	1400	HS11	Bartlett St	8	Vitrified Clay Pipe	259	Intruding laterals at 53.4, 197.4, 225, 273, and 309' US. Clear water running from	Inspect Lateral, Cut Service, Complete CCTV, Short Liner	2	0	1,440	1,440	\$6,844	\$4.75
689	470	469	B1	Odin St	8	Vitrified Clay Pipe	252	Clear water running from lateral at 70.9' US. Clear water running from laterals at 35.7' and 102.5' US (unknown source). Lateral at 70.9' US is intruding. Survey abandoned at 112.1' US due to offset joint and water level (reversal incomplete).	T&S, Grout Lateral, Inspect Lateral, CIPP, Cut Service, Complete CCTV	2	0	1,440	1,440	\$25,681	\$17.83
3016	912	913	GR1	Blue Heron Dr	6	PolyVinyl Chloride	300	Clear water running from laterals at 174.6 and 289.1' US (Unknown Source).	Inspect Lateral	2	0	2,880	2,880	\$1,500	\$0.52
3511	1344	5844	HS11	Lovell St	10	PolyVinyl Chloride	312	Clear water running from laterals at 3', 126.6', 161.5', and 282.3' DS (Unknown Source). Intruding laterals at 157.6, 161.5, 168.2, and 170.1' DS.	Inspect Lateral, Cut Service	2	0	2,880	2,880	\$4,720	\$1.64
834	111	110	M1	Fairview Ave	8	PolyVinyl Chloride	28	Joint separated medium at 22.2' DS	Monitor	1	0	0	0	\$0	\$0.00
1552	2593	2591	LR3	Suzanne Dr	8	PolyVinyl Chloride	160	Roots fine joint at 82.2' US. Heavy infiltration during flow isolation.	Clean, T&S	1	0	0	0	\$1,799	\$0.00
1453	EOP	2140	LD1	Leslie Dr	8	Vitrified Clay Pipe	304	Clear water running from lateral at 24.3' US. Survey abandoned at 46.6' US due to offset joint (could not inspect by reversal)	T&S, Grout Lateral, Cut Service, Complete CCTV	1	0	144	144	\$10,156	\$70.53
5121	5422	5394	LR4	Parking lot	8	Asbestos Cement	180	Clear water coming from laterals at 44.4' and 86.2' DS (Unknown Source)	Inspect Lateral	1	0	1,152	1,152	\$1,500	
2999	818	639	GR1	Portsmouth Blvd	8	Asbestos Cement	62	No defects observed	Monitor	0	0	0	0	\$0	
211	1310	1309	HS11	Fields Rd	12	PolyVinyl Chloride	133	No defects observed	Monitor	0	0	0	0	\$0	
3443	1298	5916	HS11	Boss Ave	8	PolyVinyl Chloride	114	No defects observed	Monitor	0	0	0	0	\$0	
3495	5109A 1420	5110 1419	HS11 HS11	Manor Dr	8	Asbestos Cement Vitrified Clay Pipe	206	No defects observed	Monitor Monitor	0	0	0	0	\$0 \$0	
3497 5763	5550	5551	HS11 HS11	Cottage St Lovell St	8	PolyVinyl Chloride	31 208	No defects observed No defects observed	Monitor	0	0	0	0	\$0 \$0	
192	2219	530	HS14	Borthwick Ave	12	PolyVinyl Chloride	341	No defects observed	Monitor	0	0	0	0	<u>\$0</u> \$0	
4802	5342	541		Coakley St	8	PolyVinyl Chloride	111	No defects observed	Monitor	0	0	0	0	<u>\$0</u> \$0	
548	1381	1382		US Rt 1 Bypass N	8	Vitrified Clay Pipe	71	No defects observed	Monitor	0	0	0	0	\$0	

							Appendix A	2 - Pipeline Rehabilitation Recommendations - Max Defect Score Prioritization	1						
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
4154	600	594	HS15	Essex Ave	8	Vitrified Clay Pipe	235	No defects observed	Monitor	0	0	0	0	\$0	
893	79	2133	LD1	Leslie Dr	8	PolyVinyl Chloride	125	No defects observed	Monitor	0	0	0	0	\$0	
895	2140	78	LD1	Leslie Dr	8	PolyVinyl Chloride	11	No defects observed	Monitor	0	0	0	0	\$0	
916	984	985	LD1	Market St	8	Vitrified Clay Pipe	301	Infiltration stains throughout pipe	Monitor	0	0	0	0	\$0	
918	981	982	LD1	Market St	10	Asbestos Cement	248	No defects observed	Monitor	0	0	0	0	\$0	
919	982	983	LD1	Market St	10	Asbestos Cement	196	No defects observed	Monitor	0	0	0	0	\$0	
2980	929	927	LD1	Blue Heron Dr	6	PolyVinyl Chloride	198	No defects observed	Monitor	0	0	0	0	\$0	
3035	2444	2440	LD1	Spinnaker Way XC	10	PolyVinyl Chloride	200	No defects observed	Monitor	0	0	0	0	\$0	
3108	830	17	LD1	Portsmouth Blvd	10	PolyVinyl Chloride	46	No defects observed	Monitor	0	0	0	0	\$0	
6464	2361	5564	LD1	Market St	8	PolyVinyl Chloride	272	No defects observed	Monitor	0	0	0	0	\$0	
6465	5564	5565	LD1	Market St	8	PolyVinyl Chloride	71	No defects observed	Monitor	0	0	0	0	\$0	
637	2208	2209	LR4	Middle Rd	8	Asbestos Cement	250	No defects observed	Monitor	0	0	0	0	\$0	
642	564	565	LR4	Marjorie St	8	Asbestos Cement	199	No defects observed	Monitor	0	0	0	0	\$0	
1830	396	395	LR4	Greenleaf Ave	10	Asbestos Cement	162	No defects observed	Monitor	0	0	0	0	\$0	
1842	420	419	LR4	Moffat St	8	Asbestos Cement	39	No defects observed	Monitor	0	0	0	0	\$0	
1850	551	2726	LR4	McClintock Ave	8	PolyVinyl Chloride	207	No defects observed	Monitor	0	0	0	0	\$0	
1884	391	390	LR4	Greenleaf Ave	8	Asbestos Cement	222	No defects observed	Monitor	0	0	0	0	\$0	
1488	2489	2487	LR6	Lafayette Rd	8	Asbestos Cement	43	No defects observed	Monitor	0	0	0	0	\$0	
1573	2651	2652	LR6	Ricci Ave	8	Asbestos Cement	110	No defects observed	Monitor	0	0	0	0	\$0	
1579	2646	2647	LR6	Robert Ave	8	Asbestos Cement	119	No defects observed	Monitor	0	0	0	0	\$0	
1858	2479	2477	LR6	Lafayette Rd	8	Asbestos Cement	30	No defects observed	Monitor	0	0	0	0	\$0	
827	101	100	M1	Maplewood Ave	10	PolyVinyl Chloride	36	No defects observed	Monitor	0	0	0	0	\$0	
872	99	98	M1	Maplewood Ave	10	PolyVinyl Chloride	19	No defects observed	Monitor	0	0	0	0	\$0	
6514	EOP	5736	HS11	US Route 1 Bypass	6	Vitrified Clay Pipe	43	Too small to navigate with 8" CCTV camera	Complete CCTV	0	0	0	0	φ200	
4164	580	2211	HS15	X-Country	8	PolyVinyl Chloride	105	No report or video provided	Complete CCTV	0	0	0	0	\$577	
337	1421	1422	HS11	US Rt 1 Bypass	8	Vitrified Clay Pipe	110	Survey abandoned at 11' DS due to turn in pipe (reversal incomplete)	Complete CCTV	0	0	0	0	\$606	\$0.00
4161	5685	580	HS15	Sheffield Rd	8	PolyVinyl Chloride	160	Infiltration stains throughout pipe. Survey abandoned at 11' DS due to turns (reversal incomplete)	Complete CCTV	0	0	0	0	\$881	\$0.00
1876	373	374	LR4	Greenleaf Ave X- Country	10	Asbestos Cement	208	Could not find MH's	Complete CCTV	0	0	0	0	\$1,141	
5409	5495	817	GR1	Sanderling Way	6	PolyVinyl Chloride	105	No defects observed. Heavy infiltration during flow isolation.	Clean, T&S	0	0	0	0	\$1,183	\$0.00
1918	1068	1067	LR5	Lafayette Rd	10	Asbestos Cement	114	Could not locate line	Clean, Complete CCTV	0	0	0	0	\$1,254	\$0.00
370	1330	1331	HS11	Bartlett St	36	Brick	203	Could not enter pipe- Full	Clean	0	0	0	0	\$1,423	\$0.00
2960	938	937	LD1	Spinnaker Way	8	Vitrified Clay Pipe	277	Buried/Could not locate	Complete CCTV	0	0	0	0	\$1,524	\$0.00
5405	EOP	5493	GR1	Sanderling Way	6	PolyVinyl Chloride	225	Survey abandoned at 157.6' US due to hard left turn (could not inspect by reversal). Heavy infiltration during flow isolation.	T&S, Complete CCTV	0	0	0	0	\$2,540	\$0.00
1914	1044	1045	LR5	Ledgewood Dr	10	Asbestos Cement	233	MH 1044 is buried, line is full of debris	Clean, Complete CCTV	0	0	0	0	\$2,565	\$0.00
1907	1062	1063	LR5	Lafayette Rd	8	Asbestos Cement	245	50% Full of Debris, could not attempt survey	Clean, Complete CCTV	0	0	0	0	\$2,699	\$0.00
1506	2464	2462	LR3	Nathaniel Dr XC	10	Asbestos Cement	219	No defects observed. Heavy infiltration during flow isolation.	Clean, T&S	0	0	0	0	\$2,849	\$0.00
1482	2458	2455	LR3	Nathaniel Dr XC	10	Asbestos Cement	243	Infiltration stain at 159.4' US. Heavy infiltration during flow isolation.	Clean, T&S	0	0	0	0	\$3,154	
894	2133	78		Leslie Dr	8	PolyVinyl Chloride	78	Clear Water Weeping from laterals at 39.1' US and 42.4' US (Unknown Source)	Inspect Lateral	0	0	144	144		
3496	5109	5109A	HS11	Manor Dr	8	PolyVinyl Chloride	33	Clear water running from lateral at 24' DS (Unknown Source)	Inspect Lateral	0	0	288	288	\$750	\$2.60
3408	5096	1340	HS11	Lovell St	12	PolyVinyl Chloride	76	Clear water running from lateral at 3' DS (Unknown Source).	Inspect Lateral	0	0	720			
								Clear water running from lateral at 94.4' DS	Clean, T&S, Grout						
1883	390	389	LR4	Greenleaf Ave	8	Asbestos Cement	209	,	Lateral	0	0	720	720	\$3,170	\$4.40

						A	Appendix A	2 - Pipeline Rehabilitation Recommendations - Max Defect Score Prioritization	I						
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
2978	EOP	932	LD1	Blue Heron Dr	6	PolyVinyl Chloride	211	Clear water running from laterals at 32.7 and 61.1' US. Clear water running from laterals at 37' and 58.4' US (unknown source)	Clean, T&S, Grout Lateral, Inspect Lateral	0	0	3,024	3,024	\$4,774	\$1.58

		_		_		A	ppendix A.	3 - Pipeline Rehabilitation Recommendations - Prioritization Per Basin Per Stree	et						
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
173	468	467	B1	Colonial Dr	8	Vitrified Clay Pipe	318	Infiltration stains throughout pipe. Intruding laterals at 81.7, 110.2, 138.8, 202.2, 243.9', 252.6', 301.2', and 309' DS. Fracture spiral at 21' DS, Fracture multiple at 24.2 and 27.3' DS. Clear water running from lateral at 64.4' DS (Unknown Source).	Inspect Lateral, CIPP, Cut Service	4	0	144	144	\$23,266	\$161.57
688	471	470	B1	Georges Ter	8	Vitrified Clay Pipe	111	Roots ball and joint throughout. Infiltration dripper at 18.4' DS from intruding lateral. Intruding lateral with clear water running at 49' DS	Grout Lateral, CIPP, Cut Service, Root Treatment	5	0	432	432	\$9,099	\$21.06
1343	469	468	B1	Odin St	8	Vitrified Clay Pipe	270	Roots medium and fine joint throughout pipe, intruding laterals at 9.5', 67.3', and 195.1' DS.	CIPP, Cut Service, Root Treatment	3	0	0	0	\$19,088	\$0.00
689	470	469	B1	Odin St	8	Vitrified Clay Pipe	252	Clear water running from lateral at 70.9' US. Clear water running from laterals at 35.7' and 102.5' US (unknown source). Lateral at 70.9' US is intruding. Survey abandoned at 112.1' US due to offset joint and water level (reversal incomplete).	T&S, Grout Lateral, Inspect Lateral, CIPP, Cut Service, Complete CCTV	2	0	1,440	1,440	\$25,681	\$17.83
3021	921	920	GR1	Blue Heron Dr	8	Vitrified Clay Pipe	139	Roots fine joint at 26' US. Roots fine joint at 63' US. Crack spiral at 75' US. Roots ball joint at 120' US. Roots ball barrel at 125' US. Rag in joint at 135' US.	Root Treatment	4	0	0	0	\$836	\$0.00
3016	912	913	GR1	Blue Heron Dr	6	PolyVinyl Chloride	300	Clear water running from laterals at 174.6 and 289.1' US (Unknown Source).	Inspect Lateral	2	0	2,880	2,880	\$1,500	\$0.52
3017	913	914	GR1	Blue heron Dr	6	PolyVinyl Chloride	231	Clear water running from lateral at 131' DS. Roots ball joint and fine joint throughout pipe.	T&S, Grout Lateral, Root Treatment	4	720	0	720	\$3,167	\$4.40
6438	5398	916	GR1	Blue Heron Dr	8	Vitrified Clay Pipe	53	Fractures and Roots throughout pipe	CIPP, Root Treatment	3	0	0	0	\$3,511	\$0.00
3023	916	919	GR1	Blue Heron Dr	8	Vitrified Clay Pipe	238	Fracture multiple and broken pipe with soil visible at 150.2' US. Hole void visible at 152.2' US causing abandoned survey (no reversal attempted)	Complete CCTV, Spot Repair	5	0	0	0	\$3,809	\$0.00
3089	5307	634	GR1	Commerce Way	10	Asbestos Cement	106	Light debris throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
6453	5505	5307	GR1	Commerce Way	10	Asbestos Cement	183	Infiltration stain at 66.3' DS	Monitor	2	0	0	0	\$0	\$0.00
2999	818	639	GR1	Portsmouth Blvd	8	Asbestos Cement	62	No defects observed	Monitor	0	0	0	0	\$0	\$0.00
3001	819	639	GR1	Portsmouth Blvd	8	Vitrified Clay Pipe	335	Fractures and infiltration throughout pipe, survey abandoned at 211' DS due to settled debris	T&S, CIPP	4	2,880	0	2,880	\$28,479	\$9.89
3210	5852	818		Portsmouth Blvd	8	Vitrified Clay Pipe	103	Infiltration throughout with runners and gushers. Survey abandoned due to debris (no reversal attempted)	T&S, CIPP	5	9,072	0	9,072	\$8,720	\$0.96
2994	820	819	GR1	Portsmouth Blvd	8	Vitrified Clay Pipe	55	Chipped bell at 42.3' DS, light debris throughout pipe	Clean	3	0	0	0	\$300	
3209	816	5852	GR1	Portsmouth Blvd	10	Vitrified Clay Pipe	182	Fractures and infiltration throughout pipe	T&S, CIPP	4	2,448	0	2,448	\$15,462	
3000	817	5852	GR1	Portsmouth Blvd	8	PolyVinyl Chloride	191	Light grease throughout pipe	Monitor	2	0	0	0	\$0	
5409	5495	817	GR1	Sanderling Way	6	PolyVinyl Chloride	105	No defects observed. Heavy infiltration during flow isolation.	Clean, T&S	0	0	0	0	\$1,183	
5407	5493	817	GR1	Sanderling Way	6	PolyVinyl Chloride	177	Light grease throughout pipe. Heavy infiltration during flow isolation. Clear water running from lateral at 90.7' US (Unknown source). Heavy infiltration	Clean, T&S Clean, T&S, Inspect	2	0	0	0	\$1,999	\$0.00
5408	5494	817	GR1	Sanderling Way	6	PolyVinyl Chloride	115	during flow isolation.	Lateral	2	0	1,440	1,440	\$2,050	\$1.42
5405	EOP	5493		Sanderling Way		PolyVinyl Chloride	225	Survey abandoned at 157.6' US due to hard left turn (could not inspect by reversal). Heavy infiltration during flow isolation.	T&S, Complete CCTV	0	0	0	0	\$2,540	\$0.00
6610	5819	5818	HS11	Aldrich Rd	8	PolyVinyl Chloride	274	Clear water running from lateral at 189.8' DS (Unknown Source).	Inspect Lateral	2	0	720	720		
370	1330	1331	HS11	Bartlett St	36	Brick	203	Could not enter pipe- Full	Clean	0	0	0	0	\$1,423	\$0.00
1333	1402	1401	HS11	Bartlett St	8	Vitrified Clay Pipe	249	Infiltration stain joint at 11.5' DS. Protruding lateral at 42.1' DS with clear water running (Unknown Source)	Inspect Lateral, Cut Service	2	0	720	720	\$1,180	\$1.64
343	1399	1398	HS11	Bartlett St	8	Vitrified Clay Pipe	219	Hole void visible at 4' DS. Hole void visible in lateral at 25.4' DS. Hole soil visible at 26.2' DS. Protruding laterals at 48.4' DS and 215.9' DS blocking complete survey (reversal unsuccessful)	CIPP, Cut Service, Complete CCTV	5	0	0	0	\$15,199	\$0.00
1329	1400	1399	HS11	Bartlett St	8	Vitrified Clay Pipe	20	Broken pipe soil visible at 13.2' US.	CIPP	5	0	0	0	\$1,216	\$0.00

						Ар	pendix A.	3 - Pipeline Rehabilitation Recommendations - Prioritization Per Basin Per Stree	t						
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
338	1401	1400	HS11	Bartlett St	8	Vitrified Clay Pipe	259	Intruding laterals at 53.4, 197.4, 225, 273, and 309' US. Clear water running from lateral at 152.2' US (Unknown Source). Hole soil visible at lateral break @ 24.9 US	Inspect Lateral, Cut Service, Complete CCTV, Short Liner	2	0	1,440	1,440	\$6,844	\$4.75
326	1630	1402	HS11	Bartlett St	8	Vitrified Clay Pipe	91	Infiltration weeper at 52.9' US. Clear water running from lateral at 52.9' US. Defective short liner at 75' US	Clean, T&S, Grout Lateral, Spot Repair	3	0	288	288	\$5,713	\$19.84
3443	1298	5916	HS11	Boss Ave	8	PolyVinyl Chloride	114	No defects observed	Monitor	0	0	0	0	\$0	\$0.00
327	1412	1413	HS11	Boyd Rd	8	Vitrified Clay Pipe	260	Hinge fracture 3 with void visible at 108' DS. Roots fine joint throughout. Intruding laterals at 123.7, 154.6, 199.6', and 233.2' DS.	Cut Service, Spot Repair, Root Treatment	5	0	0	0	\$5,781	\$0.00
328	1413	1414	HS11	Boyd Rd	8	Vitrified Clay Pipe	271	90' DS. Roots and infiltration stains throughout pipe with infiltration runner at 192.3' DS. Fractures at 157.1' and 189.2' DS. Broken pipe void visible at 133.2' and 258' DS.	T&S, Grout Lateral, CIPP, Cut Service, Spot Repair, Root Treatment	5	144	864	1,008	\$28,968	\$28.74
3241	2239	2242	HS11	Cate St	8	Vitrified Clay Pipe	498	Roots throughout pipe. Intruding laterals at 13.2', 28.1' and 66.1' DS. Clear water dripping from lateral at 66.1' DS (Unknown Source). Survey abandoned at 66.1' DS (reversal incomplete)	Inspect Lateral, Cut Service, Complete CCTV, Root Treatment	3	0	144	144	\$7,767	\$53.94
334	1419	1418	HS11	Cottage St	8	Vitrified Clay Pipe	298	ö 11	T&S, Inspect Lateral, CIPP, Spot Repair, Root Treatment	4	0	720	720	\$30,355	\$42.16
3497	1420	1419	HS11	Cottage St	8	Vitrified Clay Pipe	31	No defects observed	Monitor	0	0	0	0	\$0	
1328	5110	1420	HS11	Cottage St	8	Asbestos Cement	128	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
1327	2239A	2239	HS11	Cottage St	8	Vitrified Clay Pipe	339	Roots medium and ball throughout pipe, clear water running from lateral at 125.5' US (Unknown Source).	Inspect Lateral, Root Treatment	4	0	288	288	\$2,783	\$9.66
6391	5504	1302	HS11	Fells Rd	8	PolyVinyl Chloride	77	Protruding laterals at 6.9' and 16.1' DS	Cut Service	2	0	0	0	\$430	\$0.00
212	1309	1308	HS11	Fields Rd	12	PolyVinyl Chloride	92	Intruding lateral at 47.5' DS with clear water weeping. Clear water running from lateral at 62.1' DS (Unknown Source)	Clean, T&S, Grout Lateral, Inspect Lateral	2	0	144	144	\$2,278	\$15.82
211	1310	1309	HS11	Fields Rd	12	PolyVinyl Chloride	133	· · · · ·	Monitor	0	0	0	0	\$0	\$0.00
210	1310	1311	HS11	Fields Rd	12	Fiberglass Reinforced Pipe		Infiltration drippers and runners throughout pipe. Broken pipe with infiltration weeper at 51.2' DS. Clear water running from laterals at 32.2' DS, 81.7' DS, and 156.8' DS. Candidate for Dig & Replace.	CIPP	5	432	2,016	2,448	\$10,553	
220	1312	1311	HS11	Fields Rd	8	Unknown	264	Lining slightly detached at 27' US, clear water running from lateral at 81' US (Unknown Source), roots in lateral at 99' US. Survey abandoned at 170' US due to debris in pipe (no reversal attempted)	•	3	0	1,440	1,440	\$2,199	\$1.53
239	1364	1363	HS11	Hannaford	6	Asbestos Cement	218	This is a 6" Pipe. Infiltration weeper at 19' US, infiltration stain at 36' US. Deformed vertically at 203.3' US. Survey abandoned due to large amounts of debris in pipe and vertical deformation (no reversal attempted)	T&S, CIPP	5	144	0	144	\$19,108	\$132.69
3243	EOP	1439	HS11	Islington St	8	Vitrified Clay Pipe	149	Clear water coming from lateral at 135.9' US. Clear water running from laterals at 63.2' and 122.8' US (unknown source). Hinge fracture 3 at 144' US.	Grout Lateral, Inspect Lateral, Short Liner	5	0	576	576	\$4,470	\$7.76
3525	605	5400	HS11	Islington St	8	Vitrified Clay Pipe	217	laterals at 20', 133.9', and 161.3' DS. Clear water coming from lateral at 115.5' DS (unknown source)	T&S, Grout Lateral, Inspect Lateral, CIPP, Cut Service	5	0	432	432	\$21,837	\$50.55
3408	5096	1340	HS11	Lovell St	12	PolyVinyl Chloride	76		Inspect Lateral	0	0	720	720	\$750	\$1.04
237	1361	1360	HS11	Lovell St	8	Asbestos Cement	183	Infiltration weeper at 46.1' DS. Intruding lateral with clear water running at 53.1' DS (Unknown Source). Broken pipe void visible 1' US. Clear water running from laterals at 10 and 94' US. Broken pipe void visible at 123.1' US	T&S, Inspect Lateral, CIPP	5	576	2,880	3,456	\$13,077	\$3.78
238	1360	2741	HS11	Lovell St	8	Asbestos Cement	220	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00

		1					Appendix A.	3 - Pipeline Rehabilitation Recommendations - Prioritization Per Basin Per Stree	et				· · · · · · · · · · · · · · · · · · ·		
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
5763	5550	5551	HS11	Lovell St	12	PolyVinyl Chloride	208	No defects observed	Monitor	0	0	0	0	\$0	\$0.00
3511	1344	5844	HS11	Lovell St	10	PolyVinyl Chloride	312	Clear water running from laterals at 3', 126.6', 161.5', and 282.3' DS (Unknown Source). Intruding laterals at 157.6, 161.5, 168.2, and 170.1' DS.	Inspect Lateral, Cut Service	2	0	2,880	2,880	\$4,720	\$1.64
3416	1344A	1344	HS11	Madison St	12	PolyVinyl Chloride	180	Intruding laterals 49.7' and 122.7' US. Clear water running from laterals at 49.7', 122.7', 137.3', and 142.7' US (Unknown Source). Survey abandoned at 146.1' US due to size change (no reversal attempted)	Inspect Lateral, Cut Service, Complete CCTV	2	0	864	864	\$4,941	\$5.72
3495	5109A	5110	HS11	Manor Dr	8	Asbestos Cement	206	No defects observed	Monitor	0	0	0	0	\$0	
3496	5109	5109A	HS11	Manor Dr	8	PolyVinyl Chloride	33	Clear water running from lateral at 24' DS (Unknown Source)	Inspect Lateral	0	0	288	288	\$750	\$2.60
5006	End of Pipe	589	HS11	Melbourne St	10	Vitrified Clay Pipe	242	Roots fine and ball throughout pipe, Intruding tap at 169.5' US causing abandoned survey.	Cut Service, Complete CCTV, Root Treatment	4	0	0	0	\$3,209	\$0.00
201	589	590	HS11	Melbourne St	10	Vitrified Clay Pipe	456	Fracture multiple at 217' US. Roots and infiltration stains throughout pipe. Survey abandoned at 218' US due to sharp uphill bend (Reversal Complete)	CIPP, Spot Repair	5	0	0	0	\$33,377	\$0.00
204	590	End Of Pipe	HS11	Rutland St	8	Vitrified Clay Pipe	240	Clear water dripping from laterals at 9.1' and 31' DS, intruding lateral at 10' DS. roots fine joint throughout pipe. Survey abandoned at 152' DS due to debris in pipe (reversal incomplete)	T&S, Grout Lateral, Cut Service, Complete CCTV, Root Treatment	5	0	1,584	1,584	\$10,076	\$6.36
200	583	589	HS11	Sheffield Rd	8	Vitrified Clay Pipe	240	Hole soil visible at 15.4' US from separated joint. Fracture longitudinal at 22' US. Hole soil visible at 49' US (Bell completely separated from pipe). Infiltration stain at 107' US. Hole soil visible at 132.7' US. Survey abandoned at 132.7' US due to separated joint (no reversal attempted)	T&S, CIPP, Complete CCTV, Spot Repair	5	0	0	0	\$26,689	\$0.00
1372	End of Pipe	1303	HS11	Thaxter Rd	8	Vitrified Clay Pipe	44	Deposits settled gravel at 2.5' US. Pipe changes to 6" VCP at 9' US causing abandoned survey.	Complete CCTV	2	0	0	0	\$243	\$0.00
329	1414	1415	HS11	US 1B Off Ramp	8	Vitrified Clay Pipe	258	Infiltration runner at 6' DS due to fracture. Infiltration stains and debris throughout pipe. Protruding lateral at 76' DS causing abandoned survey (reversal incomplete). Protruding lateral at 185.8' DS (found on reversal inspection)	T&S, Cut Service, Complete CCTV, Spot Repair	4	1,440	0	1,440	\$11,226	\$7.80
331	1415	1416	HS11	US 1B Off Ramp	8	Vitrified Clay Pipe	296	Debris buildup throughout pipe, survey abandoned at 37.8' DS due to debris (no reversal attempted)	Complete CCTV	3	0	0	0	\$1,625	\$0.00
6514	EOP	5736	HS11	US Route 1 Bypass	6	Vitrified Clay Pipe	43	Too small to navigate with 8" CCTV camera	Complete CCTV	0	0	0	0	\$235	\$0.00
195	1384	1383	HS11	US Rt 1 Bypass	12	Vitrified Clay Pipe	358	Infiltration stains and drippers throughout. Roots fine joint at 22' US. Settled gravel at 187' US causing abandoned survey (no reversal attempted)	T&S, Complete CCTV	3	288	0	288	\$11,108	\$38.57
337	1421	1422	HS11	US Rt 1 Bypass	8	Vitrified Clay Pipe	110	Survey abandoned at 11' DS due to turn in pipe (reversal incomplete)	Complete CCTV	0	0	0	0	\$606	\$0.00
236	1362	1361	HS11	Yoga Parking Lot	8	Asbestos Cement	109	Clear water running from lateral at 105.3' DS. Clear water dripping from lateral at 53.8' DS (Unknown Source). Protruding lateral at 53.8' DS	Clean, T&S, Grout Lateral, Inspect Lateral, Cut Service	2	0	1,152	1,152	\$3,051	\$2.65
5092	527	5410	HS14	Barberry Ln XC	12	PolyVinyl Chloride	136	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
192	2219	530	HS14	Borthwick Ave	10	PolyVinyl Chloride	341	No defects observed	Monitor	0	0	0	0		
321	533	534	HS14	Coakley Rd	8	Vitrified Clay Pipe	315	Fractures throughout pipe. Hole and broken pipe soil visible at 143' DS. Survey abandoned at 143' DS due to broken pipe (reversal incomplete)	CIPP, Spot Repair	5	0	0	0	\$21,381	\$0.00
320	532	533	HS14	Coakley Rd	8	Vitrified Clay Pipe	178	Hinge fracture 4 at 34' DS, Clear water dripping from lateral at 48' DS, Hinge fracture 3 at 48-52' DS. Hinge fracture 3 from 149'-160' DS. Fractures throughout pipe. Candidate for Dig & Replace.	CIPP	4	0	144	144	\$10,685	\$74.20
187	538	540	HS14	Coakley Rd	8	Vitrified Clay Pipe	560	Includes Pipe SewerID 1335. Roots throughout pipe. Broken pipe at 17.9' US. Fracture longitudinal at 61' US. Clear water running from laterals at 173' and 389' US (Unknown Source). Protruding lateral at 247' US. Fracture spiral at 288' US. Hole soil visible at 481' US.	Inspect Lateral, CIPP, Root Treatment	5	0	720	720	\$37,710	\$52.38

							Appendix A.3	- Pipeline Rehabilitation Recommendations - Prioritization Per Basin Per Stre	et						
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
1334	541	5341	HS14	Coakley Rd	8	Vitrified Clay Pipe	88	Roots, fractures, and infiltration throughout pipe. Hinge fracture 3 at 47' DS	T&S, CIPP, Spot Repair, Root Treatment	5	1,728	0	1,728	\$10,527	\$6.09
323	540	541	HS14	Coakley St	8	Vitrified Clay Pipe	121	Fractures throughout pipe. Hinge fracture 3 at 35' DS. Hinge fracture 4 at 38' DS. Broken pipe void visible at 39' DS. Fracture spiral at 48' DS. Survey abandoned at large offset joint (52.4' DS) (no reversal attempted)	CIPP, Spot Repair	5	0	0	0	\$12,288	\$0.00
4802	5342	541	HS14	Coakley St	8	PolyVinyl Chloride	111	No defects observed	Monitor	0	0	0	0	\$0	\$0.00
322	534	5342	HS14	Coakley St	8	PolyVinyl Chloride	230	Clear water running from lateral at 93.6' DS.	Clean, T&S, Grout Lateral	2	0	288	288	\$3,042	\$10.56
193	5316	527	HS14	X-Country	12	PolyVinyl Chloride	170	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
5095	524	5411	HS14	X-Country	18	PolyVinyl Chloride	412	Clear Water Gushing from around lateral at 388.2' DS.	Clean, T&S, Grout Lateral	3	0	2,880	2,880	\$6,882	\$2.39
6377	530	5316	HS14	X-Country Brothwick Ave	12	PolyVinyl Chloride	289	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
4156	593	580	HS15	Essex Ave	8	Vitrified Clay Pipe	318	Infiltration stains and roots throughout pipe. Fracture at 47.4.	T&S, Short Liner, Root Treatment	4	0	0	0	\$12,389	\$0.00
4154	600	594	HS15	Essex Ave	8	Vitrified Clay Pipe	235	No defects observed	Monitor	0	0	0	0	\$0	\$0.00
1389	596	598	HS15	Essex Ave	8	Vitrified Clay Pipe	390	Fractures and roots throughout pipe, clear water dripping from lateral at 165.8' US (Unknown Source). Collapsed pipe at 150.6 DS.	Inspect Lateral, CIPP, Spot Repair, Root Treatment	5	0	432	432	\$29,017	\$67.17
4165	2211	587	HS15	Hampshire Rd	10	Vitrified Clay Pipe	89	Infiltration stains at 11.1' US. Survey abandoned at 68.8' US due to high grease and water level (reversal incomplete)	T&S, Complete CCTV	4	0	0	0	\$2,717	\$0.00
4172	587	1381	HS15	Hampshire Rd	10	Vitrified Clay Pipe	153	Infiltration and fractures throughout, broken pipe void visible at 35.2'.	T&S, CIPP	5	288	0	288	\$13,009	\$45.17
202	2728	596	HS15	Melbourne St	8	Vitrified Clay Pipe	248	Roots and fractures throughout pipe, hole with soil visible at 210' DS, chipped bell at 233' DS.	CIPP, Root Treatment	5	0	0	0	\$16,377	\$0.00
5008	5401	2728	HS15	Melbourne St	8	Vitrified Clay Pipe	480	Fractures, holes, and roots throughout pipe. Intruding laterals at 21.6', 261', 301.4', 322.3', and 429.6' DS. Clear water running from laterals at 70.8', 261.7', 301.4, 350.7, and 364' DS.	T&S, Grout Lateral, CIPP, Cut Service, Root Treatment	5	0	2,592	2,592	\$48,069	\$18.55
4163	581	580	HS15	Sheffield Rd	8	Vitrified Clay Pipe	242	Hinge fracture 3 with broken pipe at 2' DS. Fractures throughout remainder of pipe. Intruding laterals at 58.6', 136', 145.4', and 167.5' DS. Clear water running from lateral at 167.5' DS (Unknown Source). Hole soil visible at 57.5' DS. Infiltration stains and mineral deposits throughout pipe with infiltration runner from joint at 156.1' DS.	T&S, Inspect Lateral, CIPP, Cut Service, Spot Repair	5	1,440	288	1,728	\$25,556	\$14.79
4161	5685	580	HS15	Sheffield Rd	8	PolyVinyl Chloride	160	Infiltration stains throughout pipe. Survey abandoned at 11' DS due to turns (reversal incomplete)	Complete CCTV	0	0	0	0	\$881	\$0.00
6468	597	5685	HS15	Sheffield Rd	8	Vitrified Clay Pipe	173	Fractures throughout pipe. Intruding laterals at 124.8' and 151.7' DS. Clear water dripping from lateral at 124.8' DS	T&S, Grout Lateral, CIPP, Cut Service	4	0	288	288	\$16,030	\$55.66
4188	2728	598	HS15	Sims Ave	8	Vitrified Clay Pipe	238	Broken pipe at 69' DS. Infiltration Stains throughout pipe. Clear Water coming from lateral at 131.4 DS. Protruding lateral at 135.6' DS causing abandoned survey (reversal incomplete)	T&S, Grout Lateral, CIPP, Short Liner	4	0	288	288	\$23,222	\$80.63
4153	599	600	HS15	Sims Ave	8	Vitrified Clay Pipe	80	Infiltration Runner at DS MH Connection	Clean, T&S	4	720	0	720	\$2,440	\$3.39
547	1423	1382	HS15	US Rt 1 Byepass	8	Vitrified Clay Pipe	83	Infiltration stains throughout pipe. Crack longitudinal at 21' US, Broken pipe void visible at 56.8' US, Large rock intruding into broken pipe at 79.9' US with infiltration runner around rock. Roots medium joint at 82.1' US. Candidate for Dig & Replace.	CIPP	5	720	0	720	\$4,956	\$6.88
4554	1382	1383	HS15	US Rt 1 Bypass	12	Vitrified Clay Pipe	290	Includes Pipe Sewer ID 4555. Infiltration stains and drippers throughout pipe. Clear water running from laterals at 190.7 and 191.3' DS. lateral intruding at 190.7' DS. Survey abandoned at 290' DS due to high water level (no reversal attempted)	T&S, Grout Lateral, Complete CCTV	4	432	720	1,152	\$9,893	\$8.59
548	1381	1382	HS15	US Rt 1 Bypass N	8	Vitrified Clay Pipe	71	No defects observed	Monitor	0	0	0	0	\$0	\$0.00

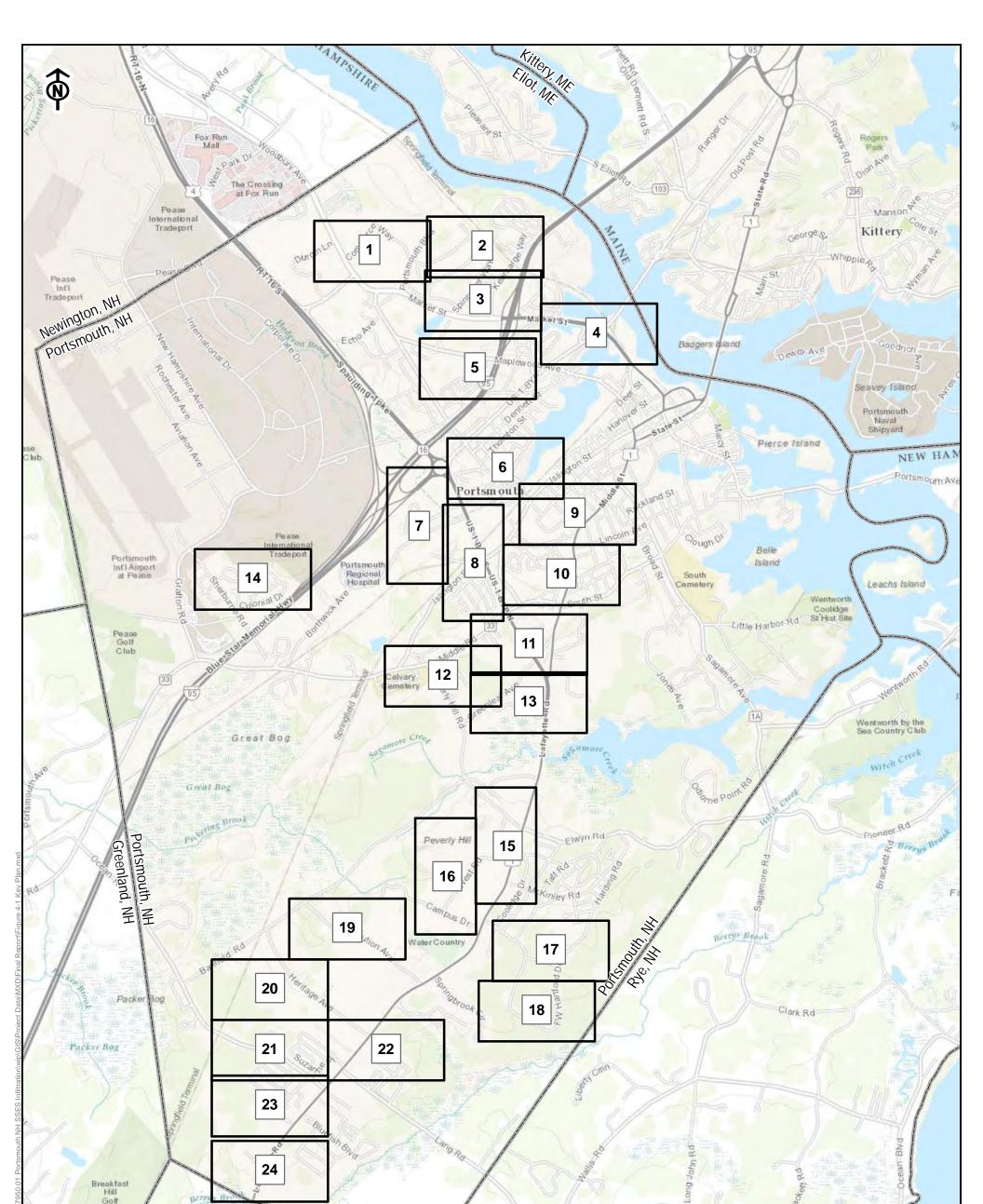
							Appendix A.	3 - Pipeline Rehabilitation Recommendations - Prioritization Per Basin Per Stre	et						1
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
194	1383	1384	HS15	US Rt 1 Bypass N	10	Vitrified Clay Pipe	399	Fracture spiral at 22' US. Infiltration drippers throughout pipe	Clean, T&S, Short Liner	3	1,728	0	1,728	\$14,747	\$8.53
4164	580	2211	HS15	X-Country	8	PolyVinyl Chloride	105	No report or video provided	Complete CCTV	0	0	0	0	\$577	\$0.00
3102	828	829	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	242	Infiltration, fractures, and roots throughout pipe. Clear water coming from laterals at 88', 172', and 198' US (Unknown Source).	T&S, Inspect Lateral, CIPP, Complete CCTV, Root Treatment	4	288	1,152	1,440	\$25,631	\$17.80
2979	932	920	LD1	Blue Heron Dr	6	PolyVinyl Chloride	208	Clear water running from lateral at 133' DS (Unknown Source). Survey abandoned at 160' DS due to hard left turn (no reversal attempted)	Inspect Lateral, Complete CCTV	2	0	1,440	1,440	\$1,894	\$1.32
2983	925	924	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	165	Fracture spiral at 1.6' DS. Clear water dripping from lateral at 42.3' DS (Unknown Source). Crack longitudinal at 105' DS. Broken pipe no void visible at 131' DS.	CIPP	3	0	144	144	\$9,899	\$68.74
2982	926	925	LD1	Blue Heron dr	8	Vitrified Clay Pipe	228	Roots throughout pipe. Infiltration weeper at joint 117' DS. Clear Water coming from laterals at 145' and 148' DS (Unknown source). Fracture spiral with infiltration runner at 147' DS.	T&S, Inspect Lateral, Spot Repair, Root Treatment	5	1,152	1,008	2,160	\$11,064	\$5.12
2981	927	926	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	195	Survey abandoned at 7' US due to roots (no reversal attempted)	Root Treatment	5	0	0	0	\$1,170	\$0.00
2977	928	926	LD1	Blue Heron Dr	8	Vitrified Clay Pipe	154	Roots throughout pipe. Broken pipe void visible at 146.2' DS. Fracture spiral at 0' US.	Short Liner, Root Treatment	5	0	0	0	\$3,442	
2980	929	927	LD1	Blue Heron Dr	6	PolyVinyl Chloride	198	No defects observed	Monitor	0	0	0	0	\$0	\$0.00
2976	930	928	LD1	Blue Heron Dr	6	PolyVinyl Chloride	243	Roots ball joint at 3' US. Clear Water running from lateral at 81' US (Unknown Source). Fracture spiral at 239.8' US (material changed to VCP at 232' US)	Inspect Lateral, Root Treatment	4	0	1,440	1,440	\$2,206	\$1.53
6451	5496	930	LD1	Blue Heron Dr	6	PolyVinyl Chloride	131	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
2974	EOP	931	LD1	Blue Heron Dr	6	PolyVinyl Chloride	174	Survey abandoned at 41.4' US due to hard left turn (could not inspect by reversal)	Complete CCTV	2	0	0	0	\$956	\$0.00
2978	EOP	932	LD1	Blue Heron Dr	6	PolyVinyl Chloride	211	Clear water running from laterals at 32.7 and 61.1' US. Clear water running from laterals at 37' and 58.4' US (unknown source)	Clean, T&S, Grout Lateral, Inspect Lateral	0	0	3,024	3,024	\$4,774	\$1.58
2975	931	5496	LD1	Blue Heron Dr	6	PolyVinyl Chloride	216	Clear water running from laterals at 56' DS and 187.6' DS (Unknown Source)	Inspect Lateral	2	0	432	432	\$1,500	\$3.47
2966	924	923	LD1	Dunlin Way	8	Vitrified Clay Pipe	242	Fractures throughout pipe. Sag in pipe at 41' DS. Broken pipe no void visible at 95' DS. Pipe sag at 110' DS. Hinge fracture 3 from 135'-170' DS. Broken pipe with Hole soil visible at 160' DS (continuation of fracture).	CIPP, Spot Repair	5	0	0	0	\$21,995	\$0.00
2967	923	837	LD1	Dunlin Way	8	Vitrified Clay Pipe	258	Water level 2/3 at beginning of survey. Fracture longitudinal at 142' US, Roots fine joint throughout pipe. Large offset joint with fernco visible at 206' US	Spot Repair, Root Treatment	3	0	0	0	\$4,046	\$0.00
2965	933	924	LD1	Dunlin Way	8	Vitrified Clay Pipe	126	Roots throughout pipe	Root Treatment	3	0	0	0	\$755	
2964	934	933	LD1	Dunlin Way	8	Vitrified Clay Pipe	99	Debris and roots throughout pipe	Root Treatment	3	0	0	0	\$595	
2972	2457	2454	LD1	Dunlin Way	10	PolyVinyl Chloride	194	Light grease throughout pipe Clear Water Weeping from lateral at 102' DS	Monitor Clean, T&S, Grout	2	0	0	0	\$0	
896	78	73	LD1	Leslie Dr	8	PolyVinyl Chloride	154		Lateral	2	0	144	144	\$2,186	\$15.18
894	2133	78	LD1	Leslie Dr	8	PolyVinyl Chloride	78	Clear Water Weeping from laterals at 39.1' US and 42.4' US (Unknown Source)	Inspect Lateral	0	0	144	144	\$1,500	
895 893	2140 79	78 2133	LD1 LD1	Leslie Dr Leslie Dr	8	PolyVinyl Chloride PolyVinyl Chloride	11	No defects observed No defects observed	Monitor Monitor	0	0	0	0	\$0 \$0	
1453	EOP	2133	LD1 LD1	Leslie Dr	8	Vitrified Clay Pipe	304	Clear water running from lateral at 24.3' US. Survey abandoned at 46.6' US due to offset joint (could not inspect by reversal)	T&S, Grout Lateral, Cut Service, Complete CCTV	1	0	144	144	\$0 \$10,156	
918	981	982	LD1	Market St	10	Asbestos Cement	248	No defects observed	Monitor	0	0	0	0	\$0	\$0.00
919	982	983	LD1	Market St	10	Asbestos Cement	196	No defects observed	Monitor	0	0	0	0	\$0 \$0	
916	984	985	LD1	Market St	8	Vitrified Clay Pipe		Infiltration stains throughout pipe	Monitor	0	0	0	0	\$0	

Sever D US MH DS MH Metering Basin Street (n) Diameter (n) Material (n) Pipe Length (LF) Observations Rehab Recommendation 842 565 2369 LD1 Material 8 PolyWing Choidié 272 No detects observed Monitor 6464 2564 5964 LD1 Material 8 PolyWing Choidié 71 No detects observed Monitor 6464 2566 100 Material 8 PolyWing Choidié 71 No detects observed Monitor 2966 911 842 LD1 Oprey Dr 6 Withing Choidié 71 No detects observed Monitor 2968 401 840 LD1 Osprey Dr 8 Withing Choidié 17 No detects observed Monitor 2960 938 937 LD1 Osprey Dr 8 Withing Choidié 176 Indirects observed Monitor 2960 938 937 LD1 Spremouble Bod 10 Po	Max Defect Score	ect Infiltratio	on Infiltratio (gpd)	Intiltration	Estimated Rehab Cost	: (\$ spent / GPD removed)
6446 2361 5554 LD1 Market St 8 PolyVinyl Chloride 277 No defects observed Monitor 2986 911 842 LD1 Osprey Dr 6 Vitrified Clay Pipe 270 Roots throughout pipe, clear water running from laterals at 84 and 87.4' US Inspect Lateral, Complete CCTV, Ro 2986 911 842 LD1 Osprey Dr 6 Vitrified Clay Pipe 236 Roots and fractures throughout pipe, lear water running from laterals at 84 and 87.4' US Inspect Lateral, Complete CCTV, Ro 2986 840 639 LD1 Osprey Dr 8 Vitrified Clay Pipe 236 Roots and fractures throughout pipe. Hinge fracture at 110 25. ClipP CliPP. Root Treatment 5419 End of Pipe 842 LD1 Osprey Dr 8 PolyVinyl Chloride 157 Lipht Grease throughout pipe. Solval joint at 111 DS Complete CCTV 3108 830 17 LD1 Portsmouth Blwd 10 PolyVinyl Chloride 46 No defects observed Monitor 2957 941 942 LD1 Spinnaker Way		2 14 0 0 3 4	0	0 144 0 (0 0 (0	D \$(9 \$16.17
6465 5564 5564 5565 LD1 Market St 8 PolyVinyl Chloride 71 No defects observed Monitor 2986 911 842 LD1 Osprey Dr 6 Vitrified Clay Pipe 270 No defects observed (Unknown Source). Survey abandoned at 91.5 'US due to large offset joint (no) Treatment 2989 840 839 LD1 Osprey Dr 8 Vitrified Clay Pipe 260 Roots and fracures finuaghout pipe. Hinge fracture 3 at 120.2' DS. CIPP 2988 841 840 LD1 Osprey Dr 8 Vitrified Clay Pipe 126 Roots and fractures finuaghout pipe. Survey abandoned at 91.5' US due to leit unr (coud) CIPP. Root Treatmer 5419 End of Pipe 842 LD1 Osprey Dr 8 Vitrified Clay Pipe 126 No defects observed Monitor 3108 830 17 LD1 Spinnaker Way 8 Vitrified Clay Pipe 227 Buriad/Could not locale No defects observed Monitor 2967 941 942 LD1 Spinnaker Way	0 3 4 5 2	0 0 3 4	0 0 0 57	0 0		
2986 911 842 LD1 Osprey Dr 6 Virified Clay Pipe 270 Roots throughout pipe. clear water running from tlerals at 84 and 97.4* US (Unknown Source). Survey abandoned at 91.5* US due to large offset joint (no Complete CCTV, Ro Treatment 2989 840 839 LD1 Osprey Dr 8 Vitrified Clay Pipe 226 Roots and fractures throughout pipe. Root Set light (no Complete CCTV, Ro Treatment 2981 840 LD1 Osprey Dr 8 Vitrified Clay Pipe 126 Roots and fractures and infiltration stains throughout pipe. Root Set light (no Complete CCTV Complete CCTV 3108 630 17 LD1 Portsmouth Blvd 10 PolyVingt Chloride 46 No defects observed Monitor 2960 938 937 LD1 Spinnaker Way 8 Vitrified Clay Pipe 27 Buried/Could not tocate Complete CCTV Complete CCTV 2957 941 942 LD1 Spinnaker Way 8 Vitrified Clay Pipe 275 Suffered at 64° US. Koots in the atreat at 21° US (unknown source). Crack longitudinat at Lateral, Short Liner, Staretat 46° US. Roots mind taterat a	$ \begin{array}{c} $	0 3 4	0 57	0 (
2986 911 842 LD1 Osprey Dr 6 Vitrified Clay Pipe 270 (Unknown Source): Survey abandoned at 91.5' US due to large offset joint (no reversal attempted) Complete CCTV, Rot Treatment 2989 840 839 LD1 Osprey Dr 8 Vitrified Clay Pipe 326 Roots and fractures throughout pipe. Hinge fractures at 120.2' DS. CIPP 2988 841 840 LD1 Osprey Dr 8 Vitrified Clay Pipe 146 Fractures and infittration stains throughout pipe. Roots ball pint at 111'DS CIPP, Root Treatment 5419 End of Pipe 842 LD1 Osprey Dr 8 Vitrified Clay Pipe 176 Infit Grease throughout pipe. Survey abandoned at 98.5' US due to left turn (could ont inspect by reversal) Complete CCTV 3108 830 17 LD1 Pertsmouth Blvd 10 PolyVinyl Chloride 46 No defects observed Monitor Complete CCTV 2960 938 937 LD1 Spinnaker Way 8 Vitrified Clay Pipe 277 Burfed/Could not locate Corack longitudinal at 14'US. Clear water coming from laterals at 69', 106', 166', and Crack longitudinal at 14'US. Clear water coming from laterals at 69', 106', 166', and <td< td=""><td>3 4 5 2</td><td>3</td><td>0 57</td><td></td><td>D \$(</td><td>0 \$0.00</td></td<>	3 4 5 2	3	0 57		D \$(0 \$0.00
2988 841 840 LD1 Osprey Dr 8 Vitrified Clay Pipe 146 Fractures and infiltration stains throughout pipe. Survey abandoned at 98.5 'US due to left turn (could complete CCTV 3108 830 17 LD1 Osprey Dr 8 PolyVinyl Choride 157 Light Grease throughout pipe. Survey abandoned at 98.5 'US due to left turn (could complete CCTV Complete CCTV 3108 830 17 LD1 Portsmouth Bivd 10 PolyVinyl Choride 46 No defects observed Monitor 2960 938 937 LD1 Spinnaker Way 8 Vitrified Clay Pipe 277 Burled/Could not locate Complete CCTV 2957 941 942 LD1 Spinnaker Way 8 Vitrified Clay Pipe 225 Surface spaling at 14' US. Clear water roming from laterals at 69', 106', 166', and Gregot Lateral, Rspec 2957 941 942 LD1 Spinnaker Way 8 Vitrified Clay Pipe 225 Crack longitudinal at 10' US. Infiltration stains at 126' US. Fracture spiral at 44' US. Roots in lateral at 69' US. Roots in locate at 60' US. Infiltration stain sing int at 40' US. Clear water running from lateral at 61' US. Clear water running from lateral at 61' US. Clear water running from lateral 100' US. Infiltration stain ingin at 14' US.	4 5 2	4		76 576	5 \$4,601	1 \$7.99
5419 End of Pipe 842 LD1 Osprey Dr 8 PolyVinyl Chloride 157 Light Grease throughout pipe. Survey abandoned at 98.5' US due to left turn (could not inspect by reversal) Complete CCTV 3108 830 17 LD1 Portsmouth Blvd 10 PolyVinyl Chloride 46 No defects observed Monitor 2960 938 937 LD1 Spinnaker Way 8 Vitrified Clay Pipe 277 Burled/Could not locate Complete CCTV Complete CCTV 2957 941 942 LD1 Spinnaker Way 8 Vitrified Clay Pipe 225 Surface spaling at 14' US. Clear water from lateral at 21' US (unknown source). Crack longitudinal at 126' US. Roots in lateral at 6' US. Roots in be barrel at 100' US. Infiltration stains at 126' US. Fracture spiral at 217' US with infiltration runner Repair 2958 942 932 LD1 Spinnaker Way 8 Vitrified Clay Pipe 219 Crack longitudinal at 10' US. With infiltration stains at 126' US. Roots in lateral at 6' US. Roots in filtration stain sot 10' US. Infiltration TKS, Grout Lateral, ISG Grout Lateral, Settled gravel deposits at 36' US. Infiltration stain sot 10' US. Infiltration TKS, Grout Lateral, ISG Grout Lateral, ISG Grout Lateral, Infiltrat	2		0	0 (53 \$19,53	
arry End of Pipe arry Moniference Complete CCTV Grout Lateral, Inspect Surface spalling at 14' US. Clear water coming from laterals at 69', 106', 166', and Lateral, Short Latera	2	5	0 28	38 288	8 \$9,60	5 \$33.35
2960 938 937 LD1 Spinnaker Way 8 Vitrified Clay Pipe 277 Buried/Could not locate Complete CCTV 2957 941 942 LD1 Spinnaker Way 8 Vitrified Clay Pipe 225 Surface spalling at 14" US. Clear water coming from laterals at 69", 106", 166", and Grout Lateral, Inspec Complete CCTV 2957 941 942 LD1 Spinnaker Way 8 Vitrified Clay Pipe 225 Surface spalling at 14" US. Clear water from lateral at 21" US (unknown source). Crack longitudinal at 10" US. Infiltration stains at 126" US. Fracture spiral at 44" US. Roots in lateral at 69" US. Roots in barrel at 10" US. Infiltration stains at 126" US. Fracture spiral at 217" US with infiltration stains at 126" US. Fracture spiral at 217" US with infiltration stains at 126" US. Fracture spiral at 217" US with infiltration stains at 126" US. Fracture spiral at 217" US with infiltration stain grass and toilet paper). Scitted gravel deposits at 36" US. Roots joint fine and roots barrel fine at 100" US with Clar water running from lateral 100" US. Infiltration stain grass and toilet paper). Scitted gravel deposits at 36" US. Roots joint fine and roots barrel fine at 100" US with Clar water running from lateral at 62" US. Roots joint fine and roots barrel fine at 100" US with Clar water running from lateral 100" US. Infiltration dripper at joint 112" US. Heavy debriss and gravel blocking remaining survey. (Reversal complete) T&S, Spot Repair, Ro 2963 935 LD1 Spinnaker Way 8 Vitrified Cla		2	0	0 0	5 \$865	
2957 941 942 LD1 Spinnaker Way 8 Vitrified Clay Pipe 225 Surface spalling at 14' US. Clear water coming from laterals at 69', 106', 166', and 204' US. Clear water from lateral at 21' US (unknown source). Crack longitudinal at Lateral, Isport Lateral, Short Liner, Starture spiral at 14' US. Clear water from lateral at 21' US (unknown source). Crack longitudinal at Lateral, Short Liner, Starture spiral at 21' US with infiltration stains at 126' US. Fracture spiral at 21' US with infiltration stains at 126' US. Fracture spiral at 21' US with infiltration stains at 126' US. Fracture spiral at 21' US with infiltration stain joint 14' US. Clear water from lateral at 69' US. Infiltration stain joint 14' US. Clear water Grout Lateral, Inspec 2958 942 932 LD1 Spinnaker Way 8 Vitrified Clay Pipe Crack longitudinal at 10' US With infiltration stain joint 14' US. Clear water Repair 2958 942 932 LD1 Spinnaker Way 8 Vitrified Clay Pipe Crack longitudinal at 10' US. With infiltration stain joint 14' US. Clear water Clear water running from lateral 16' US. Infiltration dripper at joint 112' US. Heavy debris and gravel blocking remaining survey. (Reversal complete) T&S, Spot Repair, R 2963 935 934 LD1 Spinnaker Way 8 Vitrified Clay Pipe 206 Roots and debris throughout pipe. Broken pipe void visible at 62' US. Infiltration dripper at 50' US. Collapsed pipe at 106' US. Hinge fracture 3 from 130' and	0	0	0	0 0	D \$(
2958942932LD1Spinnaker Way8Vitrified Clay Pipe219Infltration stains at 14' US. Pipe half full of debris at 28' (grass and toilet paper). Settled gravel deposits at 36' US. Infiltration stain joint at 40' US. Clear water leaking from lateral 100' US. Infiltration stain joint at 40' US. Clear water leaking from lateral 100' US. Infiltration dripper at joint 112' US. Heavy debris and gravel blocking remaining survey. (Reversal complete)CIPP, Short Liner2963935934LD1Spinnaker Way8Vitrified Clay Pipe206Roots and debris throughout pipe. Broken pipe void visible at 62' US. Infiltration weeper joint at 98' US and 102' US. Collapsed pipe at 106' US. Hinge fracture 3 from 130' and 155' US.T&S, Spot Repair, Re Treatment2962936935LD1Spinnaker Way8Vitrified Clay Pipe206Roots and debris throughout pipe. Broken pipe void visible at 62' US. Infiltration weeper joint at 98' US and 102' US. Collapsed pipe at 106' US. Hinge fracture 3 from 130' and 155' US.T&S, Spot Repair, Re Treatment2961937936LD1Spinnaker Way8Vitrified Clay Pipe206Joint offset large at 60' DS change from VCP to PVC. Survey abandoned at 60' DS (no reversal attempted)Complete CCTV, Spi Repair2961937936LD1Spinnaker Way8Vitrified Clay Pipe212Infiltration dripper at 55' US. Broken pipe soll visible at 55' US. PVC Spot Repair at RepairComplete CCTV, Spi Repair2961937936LD1Spinnaker Way8Vitrified Clay Pipe212Infiltration dripper at 55' US.	0)t 5	0 5 28	0 88 3,31	0 (12 3,600	0 \$1,524) \$7,570	
2963935934LD1Spinnaker Way8Vitrified Clay Pipe206weeper joint at 98' US and 102' US. Collapsed pipe at 106' US. Hinge fracture 3Treatment2962936935LD1Spinnaker Way8Vitrified Clay Pipe206Joint offset large at 60' DS change from VCP to PVC. Survey abandoned at 60' DS (no reversal attempted)Complete CCTV, Spot Repair2961937936LD1Spinnaker Way8Vitrified Clay Pipe212Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at 79' US with Joint Offset Severe (sinking into ground)Complete CCTV, Spot Repair2961937936LD1Spinnaker Way8Vitrified Clay Pipe212Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at 79' US with Joint Offset Severe (sinking into ground)Complete CCTV, Spot Repair2961937936LD1Spinnaker Way8Vitrified Clay Pipe212Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at 79' US with Joint Offset Severe (sinking into ground)Complete CCTV, Spot Repair2961937936LD1Spinnaker Way8Vitrified Clay Pipe212Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at Repair2961937936LD1Spinnaker Way8Vitrified Clay Pipe212Infiltration dripper at 55' US. PVC Spot Repair at Repair2961937936LD1External Conternal Clay PipeExternal Clay Pipe <td>4</td> <td>4 28</td> <td>88 43</td> <td>32 720</td> <td>) \$23,750</td> <td>0 \$32.99</td>	4	4 28	88 43	32 720) \$23,750	0 \$32.99
2962 936 935 LD1 Spinnaker way 8 Vitrilied Clay Pipe 206 (no reversal attempted) Repair 2961 937 936 LD1 Spinnaker Way 8 Vitrified Clay Pipe 212 Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at Complete CCTV, Spot Repair Complete CCTV, Spot Repair 2961 937 936 LD1 Spinnaker Way 8 Vitrified Clay Pipe 212 Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at Repair Complete CCTV, Spot Repair 2961 937 936 LD1 Spinnaker Way 8 Vitrified Clay Pipe 212 Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at Repair Complete CCTV, Spot Repair 2961 937 936 LD1 Spinnaker Way 8 Vitrified Clay Pipe 212 Infiltration dripper at 55' US. Broken pipe soil visible at 55' US. PVC Spot Repair at Repair Complete CCTV, Spot Repair 2901 8 Vitrified Clay Pipe 212 Roots throughout pipe. Infiltration runner at 92' DS coming from crack longitudinal. Clean, T&S, Inspect	5	5 72	20	0 720) \$22,653	3 \$31.46
2901 957 956 LD1 Spinitakei Way 6 Vitilieu Clay Pipe 212 79' US with Joint Offset Severe (sinking into ground) Repair Image: Classical Content of the spinitakei Way 6 Vitilieu Clay Pipe 212 79' US with Joint Offset Severe (sinking into ground) Repair Image: Classical Content of the spinitakei Way 6 Vitilieu Clay Pipe 212 79' US with Joint Offset Severe (sinking into ground) Repair Image: Classical Content of the spinitakei Way 6 Vitilieu Clay Pipe 212 79' US with Joint Offset Severe (sinking into ground) Repair	2	2	0	0 0) \$3,634	4 \$0.00
	5	5 14	44	0 144	\$13,667	7 \$94.91
2955 939 940 LD1 Spinnaker Way 8 Vitrified Clay Pipe 246 throughout pipe. Clear water running from lateral at 146 DS. Unknown source). Infiltration dripper at 206 DS.	5	5 2,16	60 43	32 2,592	2 \$10,769	9 \$4.15
2956 940 941 LD1 Spinnaker Way 8 Vitrified Clay Pipe 186 Fractures, roots, and infiltration stains throughout pipe. Clear water running from Clea	4	4	0 43	32 432	2 \$17,682	2 \$40.93
3027 943 2361 LD1 Spinnaker Way 8 Vitrified Clay Pipe 279 Infiltration runner in lateral at 207.6' DS. Infiltration stains and roots throughout pipe T&S, Grout Lateral, R Treatment	t 4	4	0 1,44	40 1,440	\$8,646	6 \$6.00
3035 2444 2440 LD1 Spinnaker Way XC 10 PolyVinyl Chloride 200 No defects observed Monitor	0	0	0	0 (D \$(
1481 2460 2458 LR3 Nathaniel Dr 10 Asbestos Cement 285 Light grease throughout pipe. Heavy infiltration during flow isolation. Clean, T&S	2	2	0	0 (0 \$3,700	
1483 2455 2452 LR3 Nathaniel Dr XC 10 Asbestos Cement 249 Fracture spiral at 76' DS. Heavy infiltration during flow isolation. Clean, T&S	3	3	0	0 (3,24	
1482 2458 2455 LR3 Nathaniel Dr XC 10 Asbestos Cement 243 Infiltration stain at 159.4' US. Heavy infiltration during flow isolation. Clean, T&S 1204 2440 2440 10 Asbestos Cement 243 Infiltration stain at 159.4' US. Heavy infiltration during flow isolation. Clean, T&S	0	0	0	0 (0 \$3,154	
1994 2462 2460 LR3 Nathaniel Dr XC 10 PolyVinyl Chloride 182 Light grease throughout pipe. Heavy infiltration during flow isolation. Clean, T&S 150/ 24/4 24/4 LB3 Nathaniel Dr XC 10 Asherter Correct 210 Na defeate shear ind Users infiltration during flow isolation. Clean, T&S	2	2	0	U (0 \$2,052	
150624642462LR3Nathaniel Dr XC10Asbestos Cement219No defects observed. Heavy infiltration during flow isolation.Clean, T&S335216462464LR3Nathaniel Dr XC10Asbestos Cement211Light grease throughout pipe. Heavy infiltration during flow isolation.Clean, T&S	<u> </u>	0	0) \$2,849	
335216462464LR3Nathaniel Dr XC10Asbestos Cement211Light grease throughout pipe. Heavy infiltration during flow isolation.Clean, T&S155225932591LR3Suzanne Dr8PolyVinyl Chloride160Roots fine joint at 82.2' US. Heavy infiltration during flow isolation.Clean, T&S		2	0		0 \$2,745 0 \$1,799	

SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral	Estimated Infiltration from CCTV (gpd)		Cost Effectiveness (\$ spent / GPD removed)
1513	2595	2593	LR3	Suzanne Dr	8	Asbestos Cement	78	Infiltration gusher from hole at 15' US	Clean, T&S, Spot Repair	5	5,760	0	5,760	\$6,011	\$1.04
1883	390	389	LR4	Greenleaf Ave	8	Asbestos Cement	209	Clear water running from lateral at 94.4' DS	Clean, T&S, Grout Lateral	0	0	720	720	\$3,170	\$4.40
1884	391	390	LR4	Greenleaf Ave	8	Asbestos Cement	222	No defects observed	Monitor	0	0	0	0	\$0	\$0.0
4753	392	391	LR4	Greenleaf Ave	8	Asbestos Cement	274	Clear water running from lateral at 13.4' US (Unknown Source). Debris buildup at MH 392	Inspect Lateral	4	0	288	288	\$750	\$2.60
1881	394	392	LR4	Greenleaf Ave	10	Asbestos Cement	321	Infiltration stains throughout pipe with gusher and runner at 238 and 248' DS, respectively. Protruding lateral at 256.8' DS	Clean, T&S, Cut Service, Spot Repair	5	5,040	0	5,040	\$7,599	\$1.5
564	1631	394	LR4	Greenleaf Ave	8	Asbestos Cement	172	Deposits settled gravel with broken pipe debris at 149.3' DS (unknown origin)	Monitor	2	0	0	0	\$0	\$0.0
1830	396	395	LR4	Greenleaf Ave	10	Asbestos Cement	162	No defects observed	Monitor	0	0	0	0	\$0	\$0.0
555	1056	1047	LR4	Greenleaf Ave	8	Asbestos Cement	305	Fractures and infiltration stains throughout pipe. Clear water running from laterals at 24.5' and 138.5' US. Clear water coming from lateral at 217.2' US (unknown source).	T&S, Grout Lateral, Inspect Lateral, CIPP	5	144	864	1,008	\$22,229	\$22.0
563	1047	1631	LR4	Greenleaf Ave	8	Vitrified Clay Pipe	89	Clear water running from lateral at 80.5' DS (Unknown Source)	Inspect Lateral	2	0	576	576	\$750	\$1.3
1833	395	372	LR4	Greenleaf Ave XC	10	Asbestos Cement	216	Survey abandoned at 214' DS due to severe root ball. Infiltration dripper at MH372.	T&S, Root Treatment	5	288	0	288	\$2,921	\$10.1
1834	372	5872	LR4	Greenleaf Ave XC	10	Asbestos Cement	184	Clear water dripping from lateral at 22.2' DS, Infiltration runner at DS MH connection	Clean, T&S, Grout Lateral	4	1,440	288	1,728	\$2,842	\$1.6
1876	373	374	LR4	Greenleaf Ave X- Country	10	Asbestos Cement	208	Could not find MH's	Complete CCTV	0	0	0	0	\$1,141	\$0.0
560	1050	1049	LR4	Hillside Dr	8	Vitrified Clay Pipe	29	Roots fine barrel at 16' US	Root Treatment	2	0	0	0	\$176	\$0.0
556	1055	1056	LR4	Hillside Dr	8	PolyVinyl Chloride	397	Clear water running from laterals at 187.9' and 315.2' DS (Unknown Source)	Inspect Lateral	2	0	1,440	1,440	\$1,500	\$1.0
1888	389	388	LR4	Holiday Dr	8	Asbestos Cement	256	Grease and debris throughout pipe, survey abandoned at 250' DS due to grease	Complete CCTV	3	0	0	0	\$1,408	\$0.0
642	564	565	LR4	Marjorie St	8	Asbestos Cement	199	No defects observed	Monitor	0	0	0	0	\$0	
1848	2726	544	LR4	McClintock Ave	8	PolyVinyl Chloride	200	Light grease throughout pipe	Monitor Monitor	2	0	0	0	\$0 \$0	\$0.0 \$0.0
1850 4142	551 554	2726 555	LR4 LR4	McClintock Ave	8	PolyVinyl Chloride Vitrified Clay Pipe	207 161	No defects observed Infiltration stains, roots, and fractures throughout pipe. Clear water coming from protruding lateral at 96' DS. reversal complete	T&S, Grout Lateral, CIPP, Cut Service, Root Treatment	4	0	432	432	\$0 \$15,537	\$0.0
637	2208	2209	LR4	Middle Rd	8	Asbestos Cement	250	No defects observed	Monitor	0	0	0	0	\$0	
1843	419	418	LR4	Moffat St	8	PolyVinyl Chloride	169	Light grease throughout pipe	Monitor	2	0	0	0	\$0	
1842	420	419	LR4	Moffat St	8	Asbestos Cement	39	No defects observed	Monitor	0	0	0	0	\$0	
5121	5422 5423	5394 5421	LR4	Parking lot	8	Asbestos Cement Asbestos Cement	180	Clear water coming from laterals at 44.4' and 86.2' DS (Unknown Source)	Inspect Lateral	1	0	1,152	1,152	\$1,500 \$4,220	\$1.3 \$0.0
5122 5120	5423	5421 5422	LR4 LR4	Parking lot Parking lot	8	Asbestos Cement	325 237	Infiltration stains throughout pipe, Fractures at 120.5' DS. Clear water coming from laterals at 59', 75', and 154.9' US (Unknown Source). Broken pipe void visible with infiltration dripper at 65' US. Infiltration drippers and stains throughout pipe	Clean, T&S Clean, T&S, Inspect Lateral, Spot Repair	5	144	1,296	1,440	\$4,220	\$0.0 \$5.4
640	562	565	LR4	Sylvester St	8	Asbestos Cement	199	Clear water coming from lateral at 160.3' DS. Infiltration gusher from hole in pipe at 190' DS	Clean, T&S, Grout Lateral, Spot Repair	5	2,880	144	3,024	\$5,533	\$1.8
1845	545	420	LR4	X-Country	8	Asbestos Cement	195	Infiltration gusher at US MH Connection, roots at DS MH Connection	Clean, T&S	5	1,152	0	1,152	\$2,537	\$2.2
1844	544	545	LR4	X-Country	8	Asbestos Cement	206	Clear water weeping from lateral at 91.4' DS (Unknown Source)	Inspect Lateral	2	0	144	144	\$750	\$5.2
1892	374	375	LR4	X-Country Greenleaf woods Dr	10	Asbestos Cement	231	Infiltration runner joint at 116' US. Roots at US MH Connection	Clean, T&S	4	1,440	0	1,440	\$3,000	\$2.0
1893	375	376	LR4	X-Country Greenleaf Woods Dr	10	Asbestos Cement	214	Broken pipe at 34.8' US	Short Liner	5	0	0	0	\$2,580	\$0.0

		-		-		, I	Appendix A.	3 - Pipeline Rehabilitation Recommendations - Prioritization Per Basin Per Stree	ət						
SewerID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
1907	1062	1063	LR5	Lafayette Rd	8	Asbestos Cement	245	50% Full of Debris, could not attempt survey	Clean, Complete CCTV	0	0	0	0	\$2,699	\$0.00
1918	1068	1067	LR5	Lafayette Rd	10	Asbestos Cement	114	Could not locate line	Clean, Complete CCTV	0	0	0	0	\$1,254	\$0.00
1917	1069	1068	LR5	Lafayette Rd	10	Asbestos Cement	158	Surface spalling at 4' DS, debris at 79' US causing abandoned survey (no reversal attempted)	Complete CCTV	2	0	0	0	\$868	\$0.00
1916	1046	1069	LR5	Lafayette Rd XC	10	Asbestos Cement	135	Infiltration runner at 30.3' DS, MH 1069 has infiltration at walls (1.5 gpm)	Clean, T&S	4	432	0	432	\$1,751	\$4.05
1914	1044	1045	LR5	Ledgewood Dr	10	Asbestos Cement	233	MH 1044 is buried, line is full of debris	Clean, Complete CCTV	0	0	0	0	\$2,565	\$0.00
1915	1045	1046	LR5	Ledgewood Dr	10	Asbestos Cement	167	Broken pipe at 17.4' US. Hole soil visible at 40' US. Infiltration stains throughout pipe, infiltration runner joint at 224' US. Survey abandoned due to high water level in pipe at 226' US (no reversal attempted)	T&S, Complete CCTV, Spot Repair	5	288	0	288	\$5,168	\$17.94
1911	1039	1038	LR5	Ledgewood Dr	8	Asbestos Cement	329	Survey abandoned due to hard right turn at 131.5' DS	Complete CCTV	2	0	0	0	\$1,808	\$0.00
1909	1038	1040	LR5	Ledgewood Dr	8	Vitrified Clay Pipe	98	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
1908	1040	1062	LR5	Ledgewood Dr	8	Vitrified Clay Pipe	134	Deposits attached grease throughout pipe. Survey abandoned at 86.5' DS due to grease blockage (no reversal attempted)	Complete CCTV	5	0	0	0	\$735	\$0.00
570	1042	1043	LR5	Portsmouth High School Fields	10	Asbestos Cement	167	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
1919	1043	1044	LR5	Portsmouth High School Fields	10	Asbestos Cement	165	Survey abandoned at 75' DS due to debris (no reversal attempted)	Complete CCTV	3	0	0	0	\$909	\$0.00
1925	1066	1065	LR5	Tuscan Market Parking lot	8	Asbestos Cement	173	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
569	1042A	1042	LR5	X-Country Highschool	10	Asbestos Cement	360	Light grease throughout pipe	Monitor	2	0	0	0	\$0	\$0.00
1640	237	236	LR6	Constitution Ave	8	Asbestos Cement	230	Clear water coming from lateral at 97.1' US (Unknown Source). Roots medium barrel at 104' US. Infiltration gusher at 107' US. Roots fine joint at 118' US.	T&S, Inspect Lateral, Root Treatment	4	4,320	0	4,320	\$3,853	\$0.89
1587	2641	136	LR6	Heritage Rd	8	Asbestos Cement	285	Heavy grease and debris buildup in pipe. Infiltration gusher at 9.6' DS from defective wye. Infiltration stains at 127' DS	Clean, T&S, Spot Repair	5	4,320	0	4,320	\$3,961	\$0.92
1858	2479	2477	LR6	Lafayette Rd	8	Asbestos Cement	30	No defects observed	Monitor	0	0	0	0	\$0	\$0.00
2000	2484	2479	LR6	Lafayette Rd	8	Asbestos Cement	284	Clear water running from lateral at 96.3' DS (Unknown Source), Infiltration runner from broken pipe/fracture spiral at 265' DS.	Inspect Lateral, Spot Repair	5	2,880	720	3,600	\$3,250	\$0.90
1488	2489	2487	LR6	Lafayette Rd	8	Asbestos Cement	43	No defects observed	Monitor	0	0	0	0	\$0	\$0.00
1988	2652	143	LR6	Ricci Ave	8	Asbestos Cement	314	Infiltration runner at intruding lateral 26.6' DS. Intruding lateral at 106' DS. Debris buildup at 307' DS	Clean, T&S, Grout Lateral, Cut Service	4	720	0	720	\$5,396	
1573	2651	2652	LR6	Ricci Ave	8	Asbestos Cement	110	No defects observed	Monitor	0	0	0	0	\$0	
1579	2646	2647	LR6	Robert Ave	8	Asbestos Cement	119	No defects observed	Monitor	0	0	0	0	\$0	
3348	2794	95	M1	Cutts St	10	Vitrified Clay Pipe	37	Deposits settled gravel at 0' DS	Monitor	2	0	0	0	\$0	
834	111	110	M1	Fairview Ave	8	PolyVinyl Chloride	28	Joint separated medium at 22.2' DS	Monitor	1	0	0	0	\$0	
831 872	2132 99	103 98	M1 M1	Maplewood Ave Maplewood Ave	8 10	PolyVinyl Chloride PolyVinyl Chloride	137	Moderate grease and debris buildup throughout pipe No defects observed	Monitor Monitor	2	0	0	0	\$0 \$0	
872 1448	100	98 99	M1 M1	Maplewood Ave	10	PolyVinyl Chloride	19 274	Light grease throughout pipe	Monitor	0 2	0	0	0	\$0 \$0	
827	100	100	M1	Maplewood Ave	10	PolyVinyl Chloride	36	No defects observed	Monitor	2 	0	0 0	0	\$0 \$0	
826	101	100	M1	Maplewood Ave	8	PolyVinyl Chloride	138	Light grease throughout pipe	Monitor	2	0	0	0	\$0 \$0	
832	102	101	M1	Maplewood Ave	8	PolyVinyl Chloride	89	Light grease throughout pipe	Monitor	2	0	0	0	\$0	
838	769	106		Maplewood Ave	8	PolyVinyl Chloride	141	Intruding lateral at 24' US causing abandoned survey (no reversal attempted)	Cut Service, Complete CCTV	2	0	0	0	\$1,206	
837	767	769	M1	Maplewood St	8	Vitrified Clay Pipe	213	Clear water running from lateral at 45.5' DS. Cracks and fractures throughout pipe. Survey abandoned at 110' DS due to turn in pipe (reversal incomplete) - City Currently Digging, Removed from Recommendation.	Monitor	4	0	0	0	\$0	\$0.00

	Appendix A.3 - Pipeline Rehabilitation Recommendations - Prioritization Per Basin Per Street															
Sew	verID	US MH	DS MH	Metering Basin	Street	Diameter (in.)	Material	Pipe Length (LF)	Observations	Rehab Recommendations	Max Defect Score	Mainline Infiltration (gpd)	Lateral Infiltration (gpd)	Estimated Infiltration from CCTV (gpd)	Estimated Rehab Cost	Cost Effectiveness (\$ spent / GPD removed)
8	33	759	111	M1	Oleary Pl	6	Asbestos Cement	100	Rag wedged in joint at 29' DS. Survey abandoned at 33' DS due to offset joint (no reversal attempted)	Complete CCTV	5	0	0	0	\$553	\$0.00



Washington Rd sheet Hill Rd Rye, NH Greenland, NH Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USCS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community City of Portsmouth, NH 2017 SSES Dover Legend FIGURE 4-1: Pipe Rehabilitation Key Plan Portsmouth Pipe Rehabilitation Page Outline Woodard & Curran shall assume no liability for any of the following; 1. Any errors, omissions, or inaccuracies in the information provided regardless of how caused or; 2. Any decision or action taken or not taken by the reader in relance upon any information or data furnished hereunder. Data Sources: ESRI, GRANIT, MEGIS 40 Shattuck Rd, Suite 110 40 Shattuck Rd, Sulle 110 Andover, Massachusetts 01810 866.702.6371 | www.woodardcurran.com COMMITMENT & INTEGRITY DRIVE RESULTS City Boundary WOODARD Esri, HERE, DeLorme, MapinyIndia, © n OpenStreetMap contributors, and the GIS user community, SCALE: 1 " = 2,500 ' PROJECT #: 227950.01 5.000 1.250 2.500 DATE: DECEMBER 2017 DRAWN BY: AM Fee

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Breakfast Hill Golf Club

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General Notes:

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LEGEND

• Sewer Manhole SewerLine

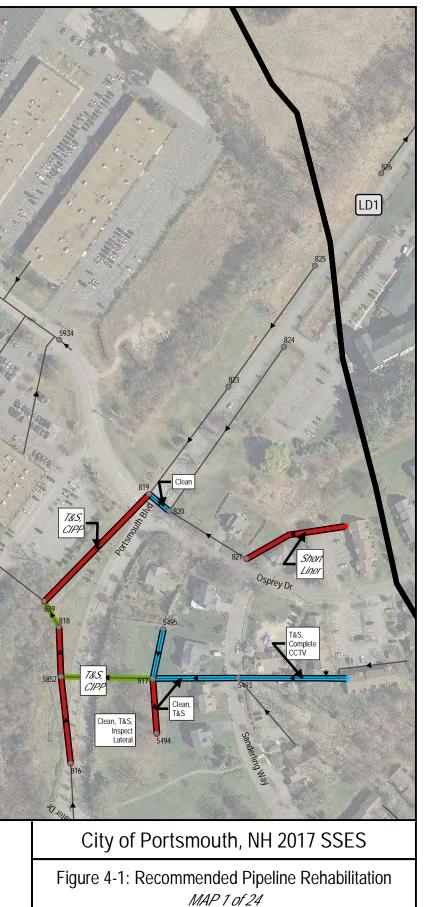
Sanitary Sewer System Features Metering Basin Rehabilitation Type Geographical Features

Structural/O&M Monitor

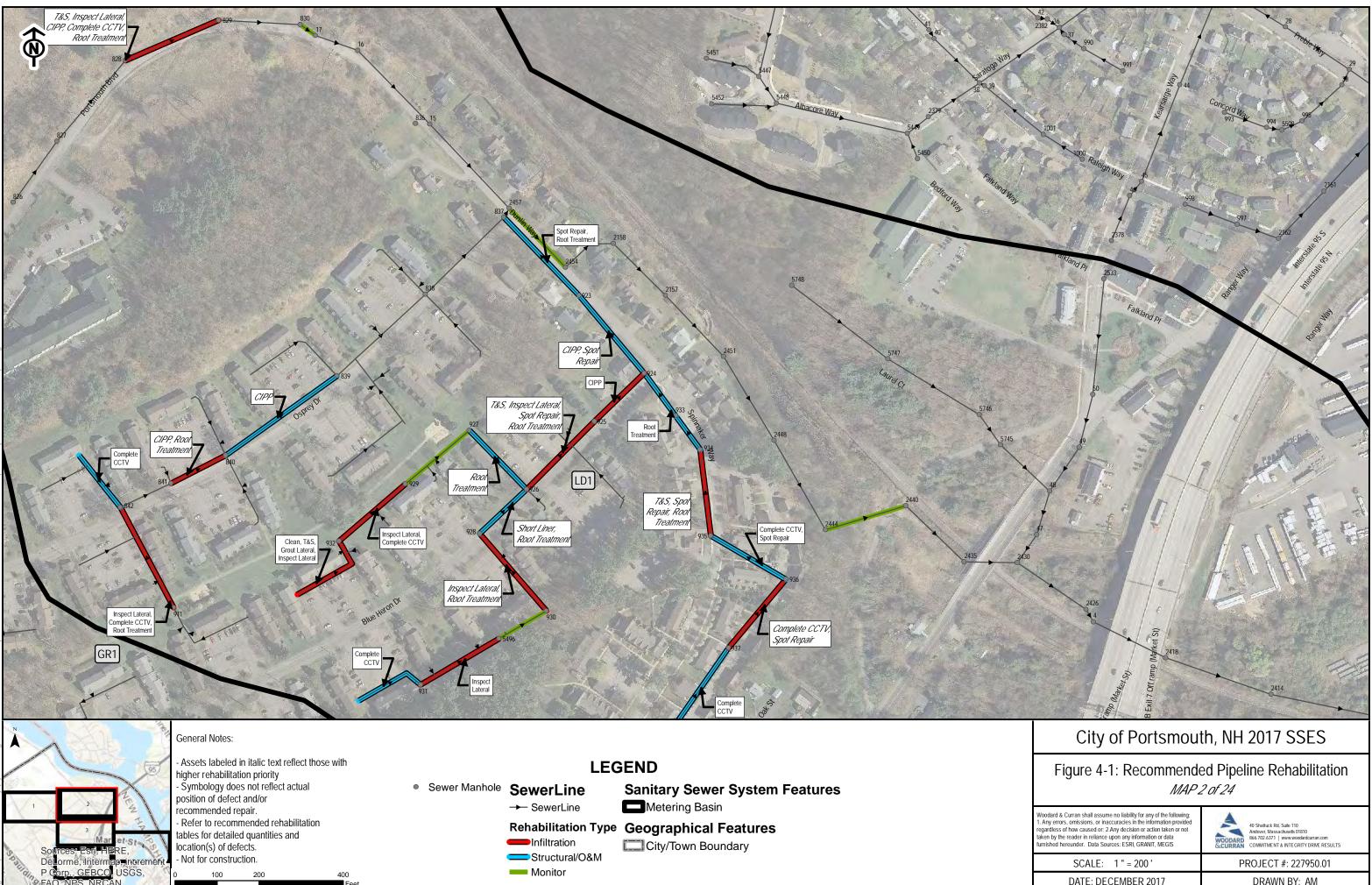
- SewerLine

Infiltration

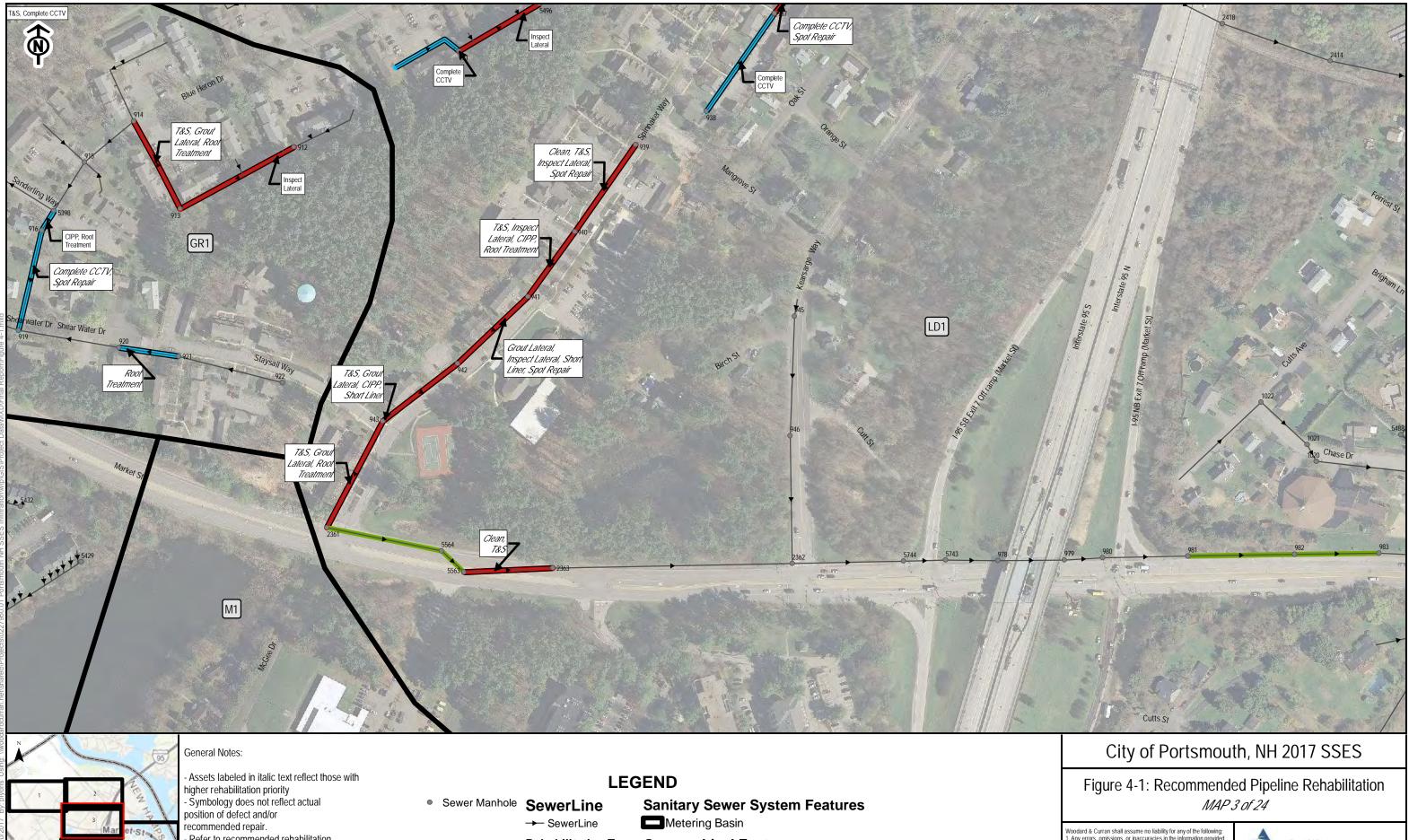
City/Town Boundary



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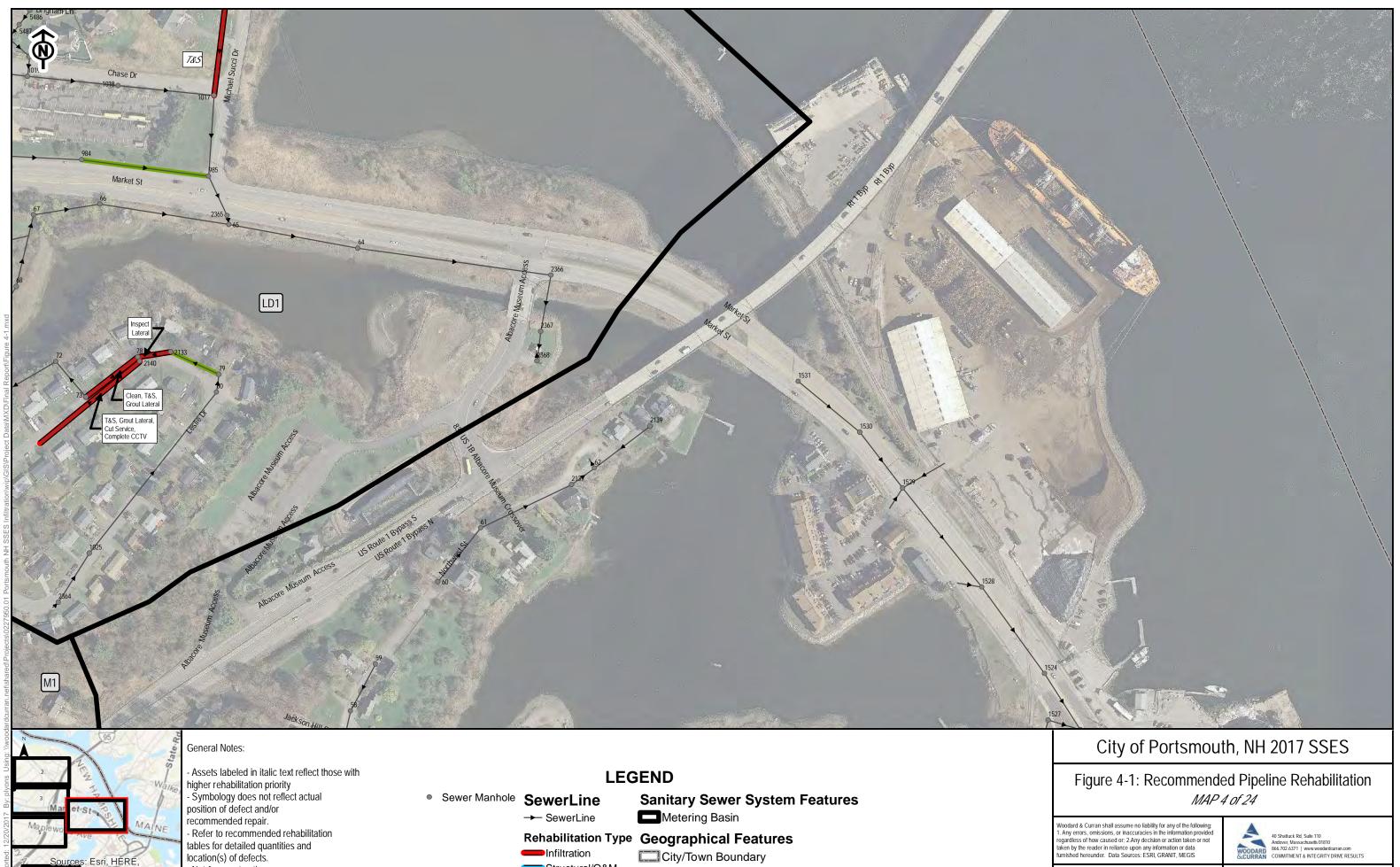


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Rehabilitation Type	Geographical Features
	City/Town Boundary

Infiltration	
Structural/O&M	

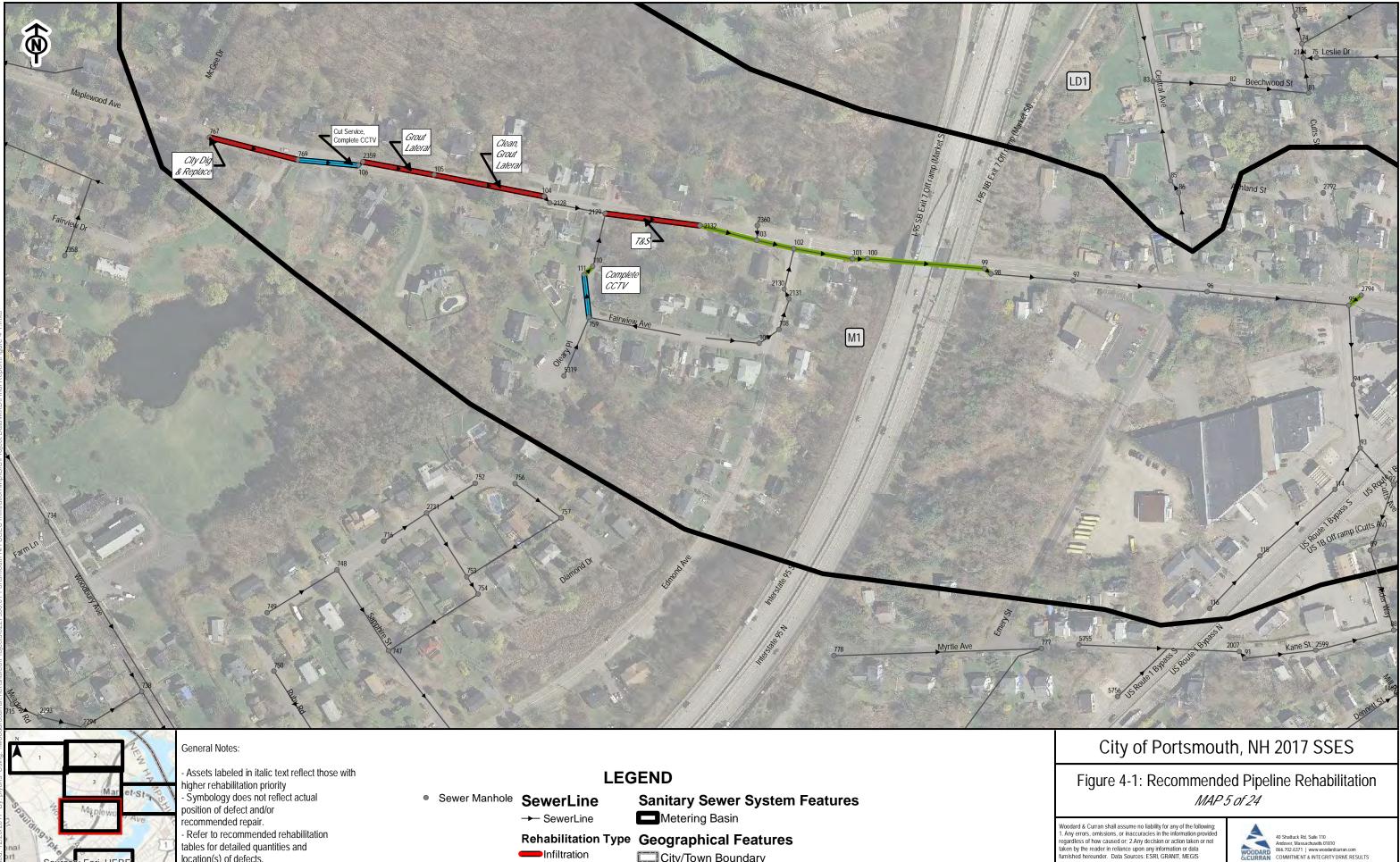
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- Not for construction.

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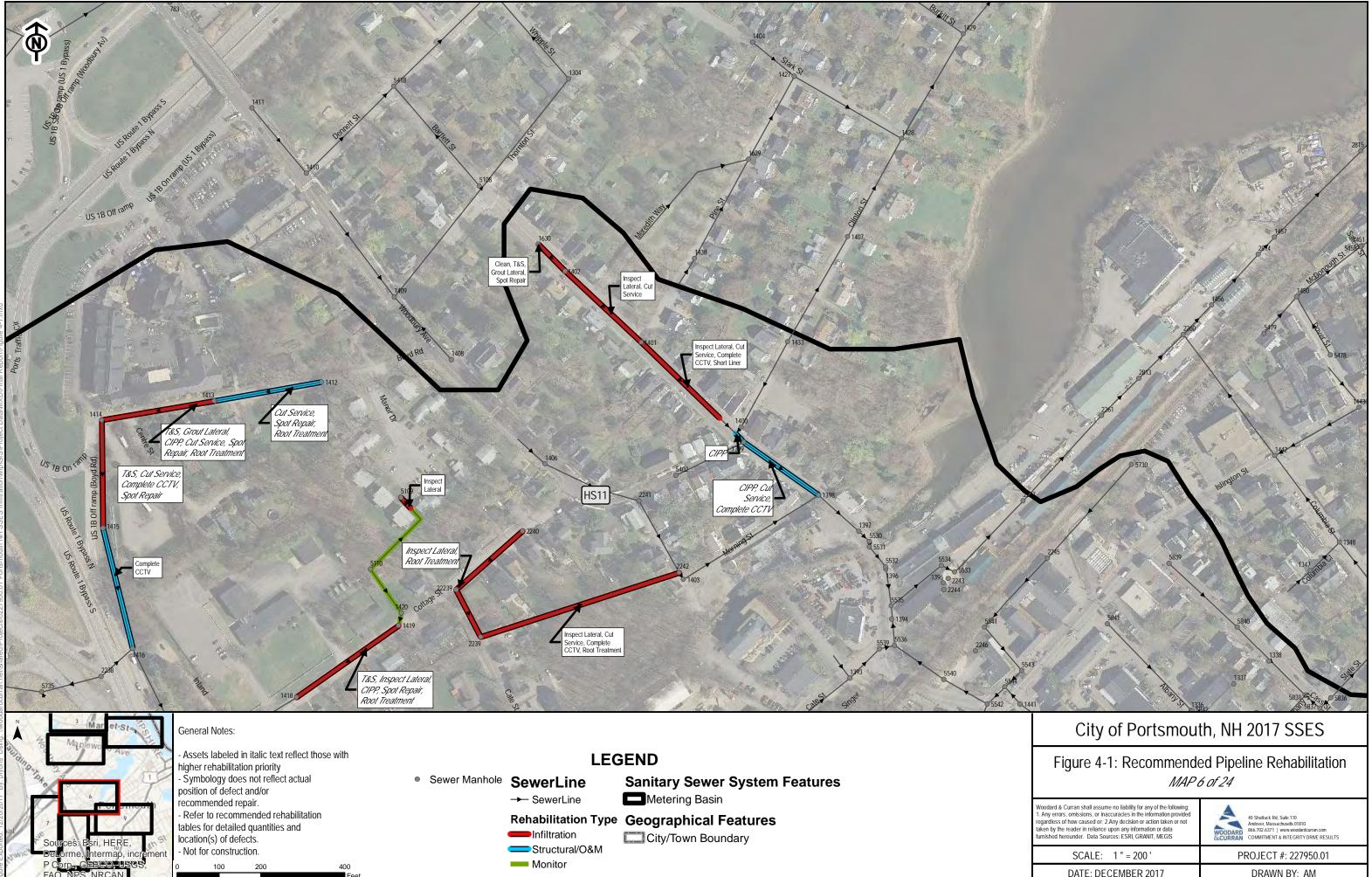
Structural/O&M

Monitor

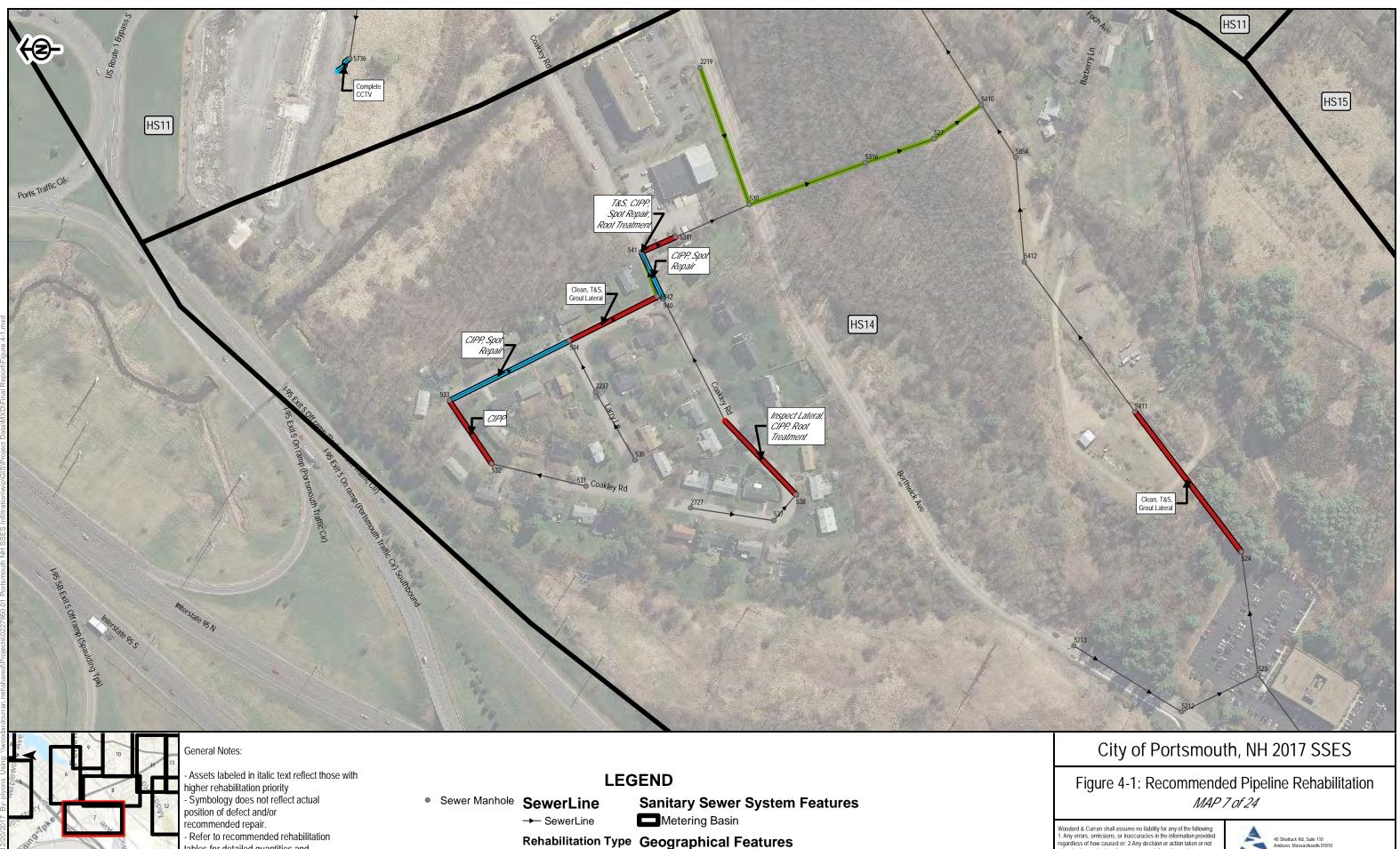
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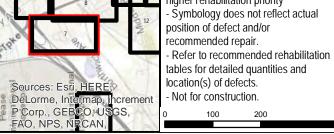
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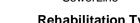
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City/Town Boundary





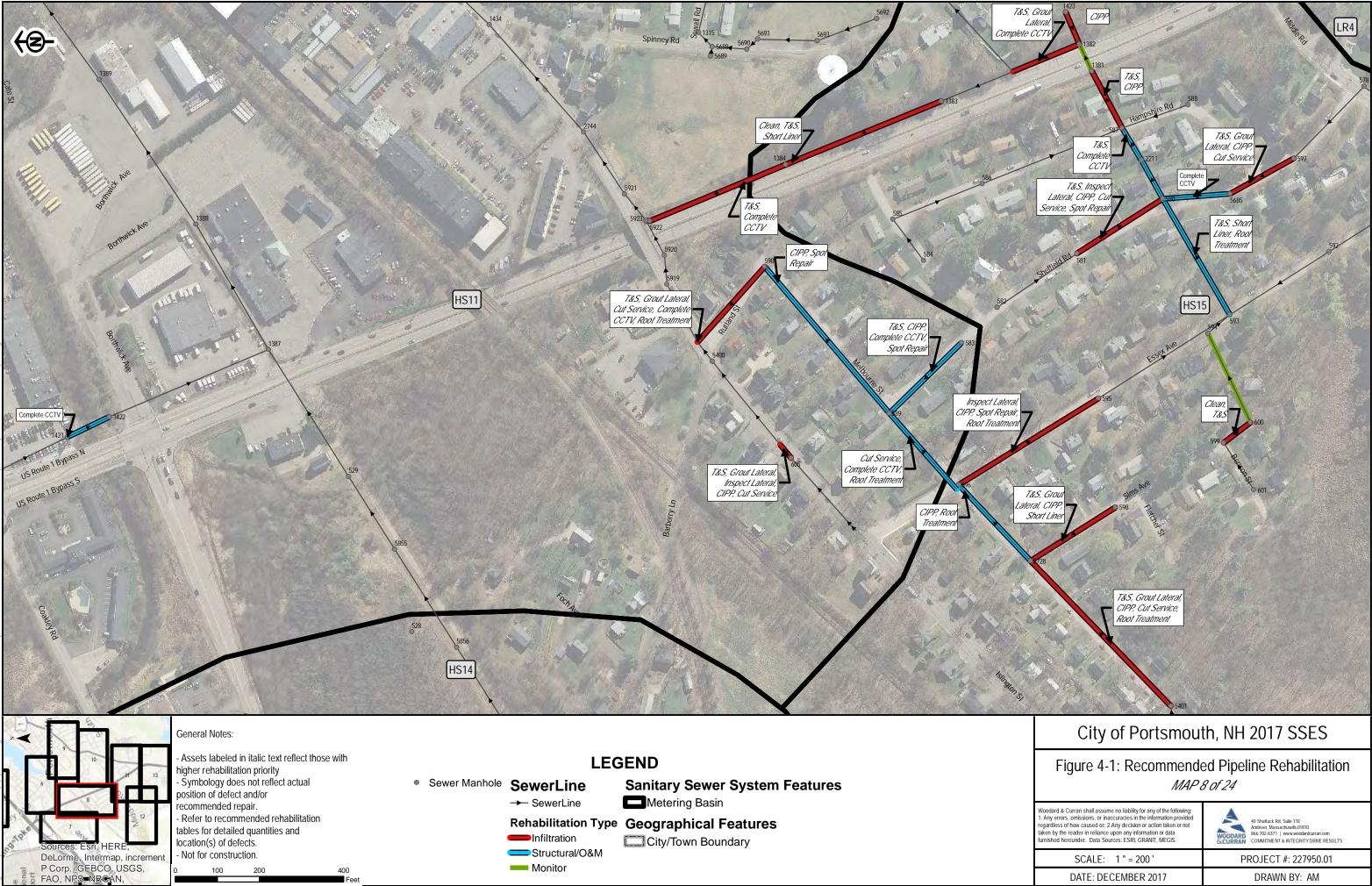


Infiltration

Monitor

Structural/O&M

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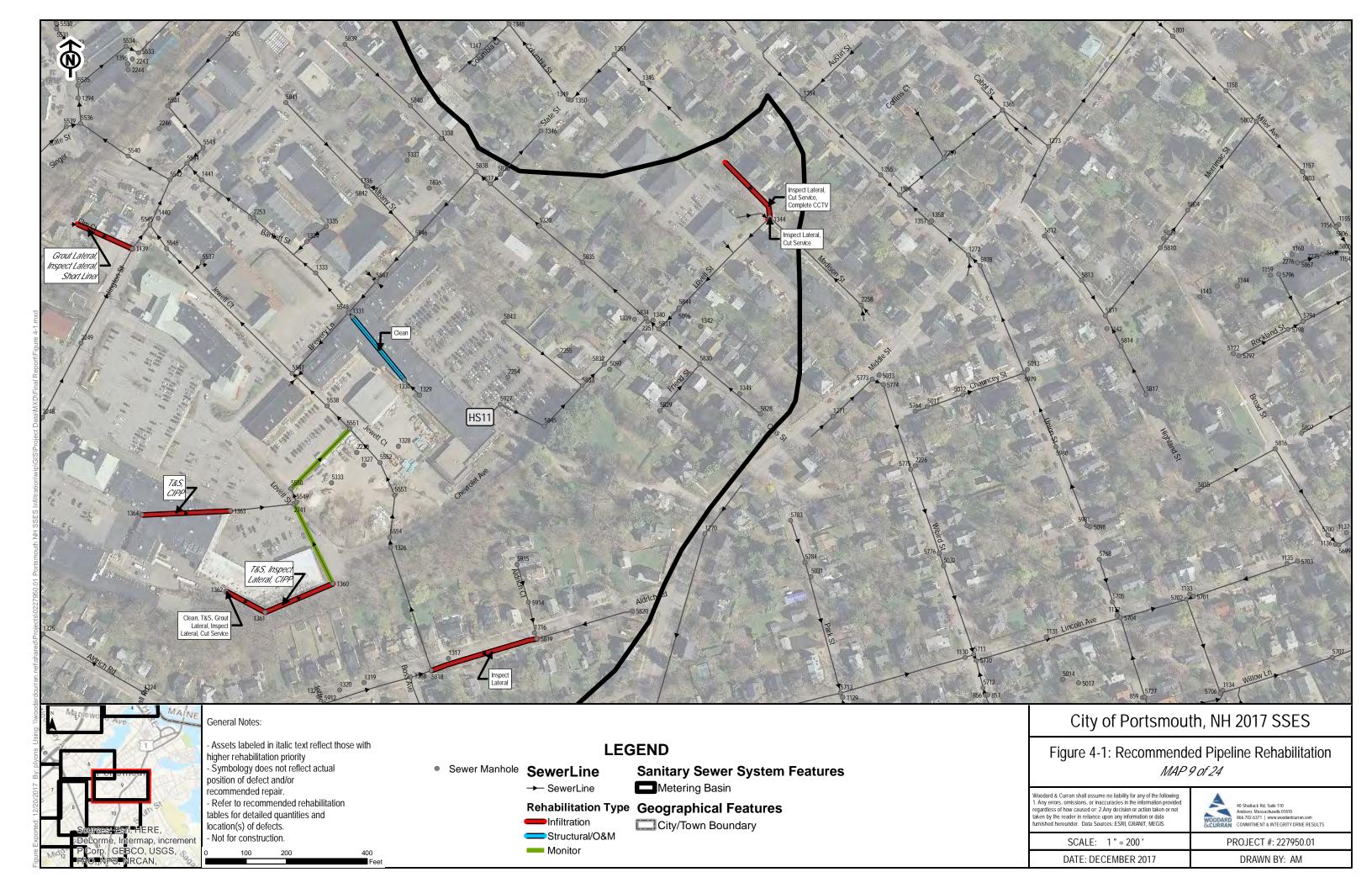
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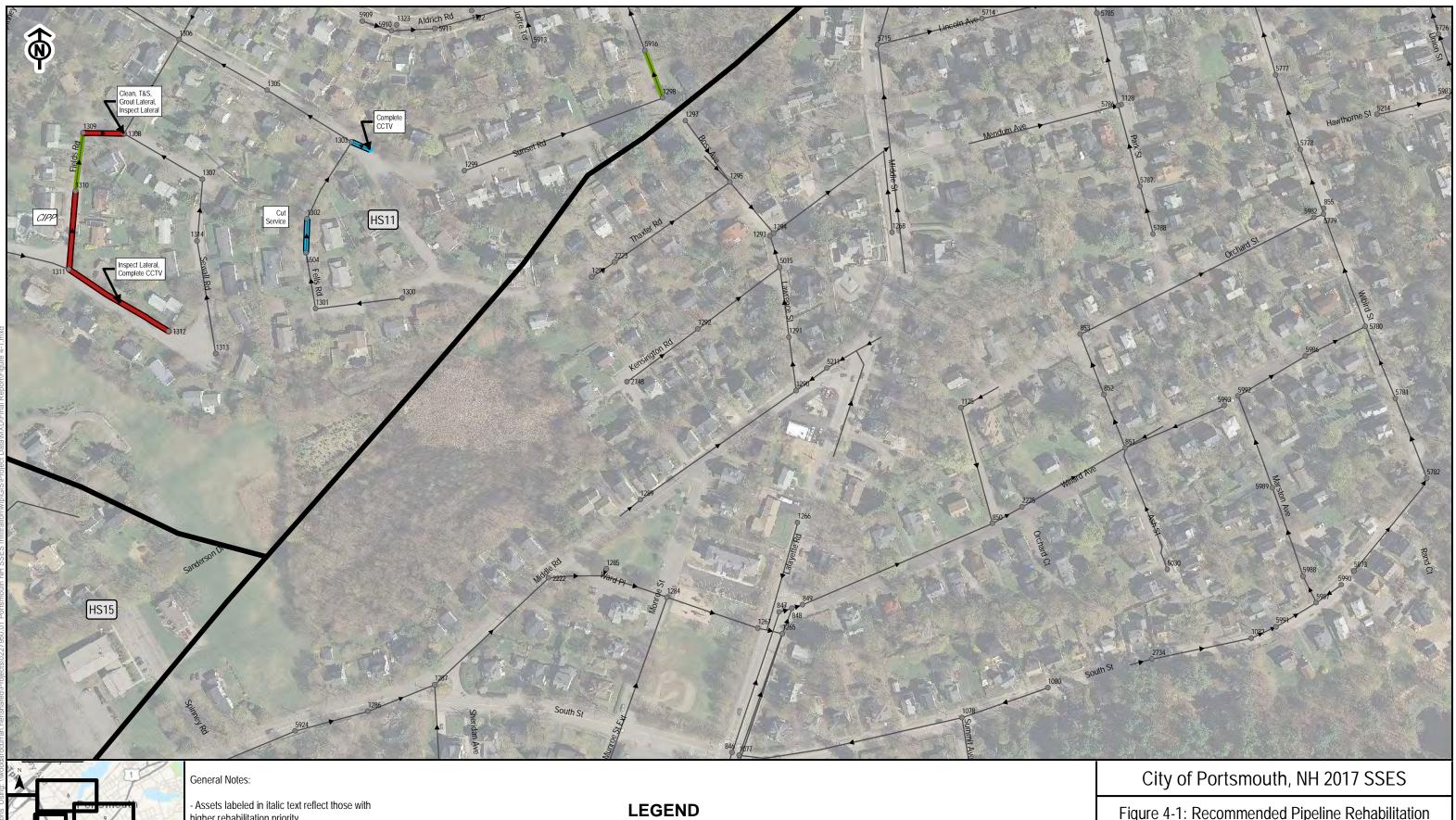
Monitor

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Sanitary Sewer System Features

Metering Basin

City/Town Boundary

Rehabilitation Type Geographical Features

 Assets labeled in falle textremet in higher rehabilitation priority
 Symbology does not reflect actual position of defect and/or recommended repair. - Refer to recommended rehabilitation tables for detailed quantities and location(s) of defects. - Not for construction. 400

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• Sewer Manhole SewerLine

- SewerLine

Infiltration

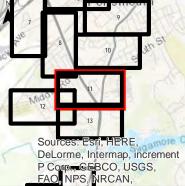
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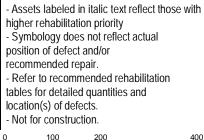
Structural/O&M

Figure 4-1: Recommended Pipeline Rehabilitation MAP 10 of 24

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SCALE: 1 " = 200 '	PROJECT #: 227950.01		
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- SewerLine

Sanitary Sewer System Features
Metering Basin

Rehabilitation Type Geographical Features

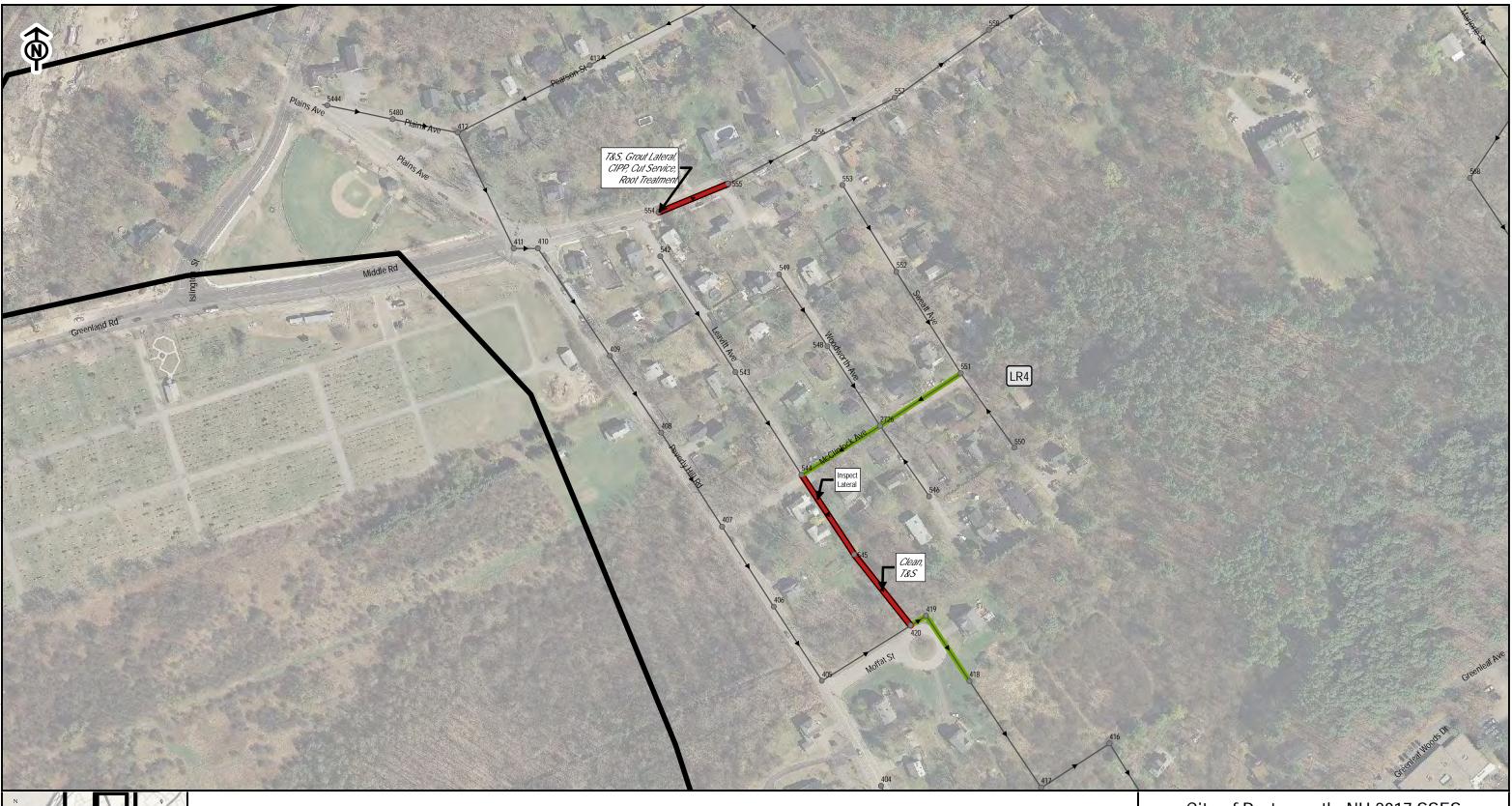
Structural/O&M

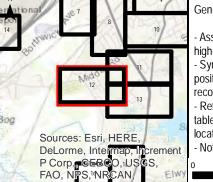
Monitor

City/Town Boundary

Figure 4-1: Recommended Pipeline Rehabilitation MAP 11 of 24

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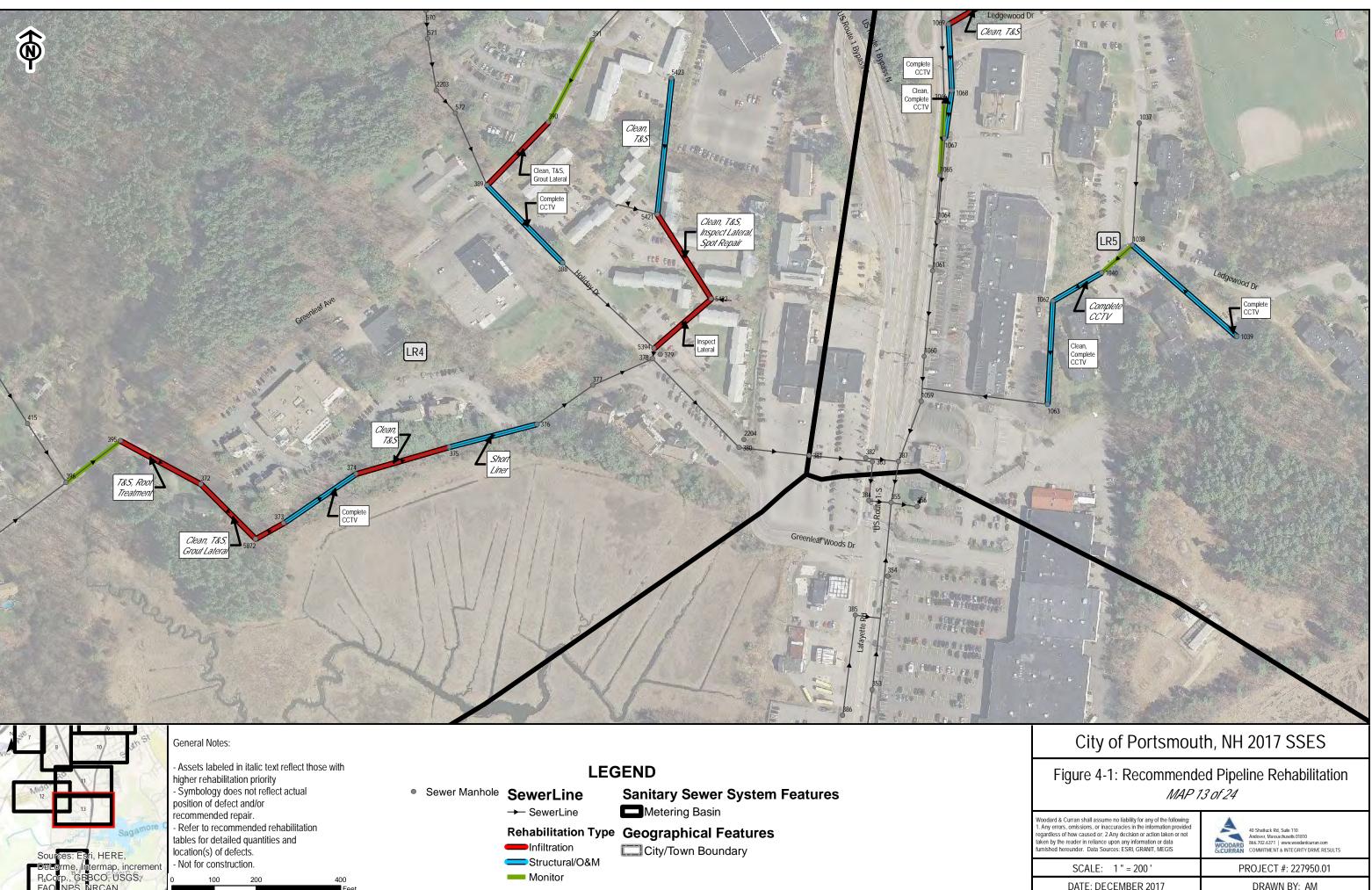


General Notes: Assets labeled in italic text reflect those with LEGEND Assets labeled in ratic text check in higher rehabilitation priority
Symbology does not reflect actual position of defect and/or • Sewer Manhole SewerLine Sanitary Sewer System Features Metering Basin - SewerLine , recommended repair. - Refer to recommended rehabilitation Rehabilitation Type Geographical Features tables for detailed quantities and Infiltration City/Town Boundary location(s) of defects. Structural/O&M - Not for construction. Monitor 400

City of Portsmouth, NH 2017 SSES

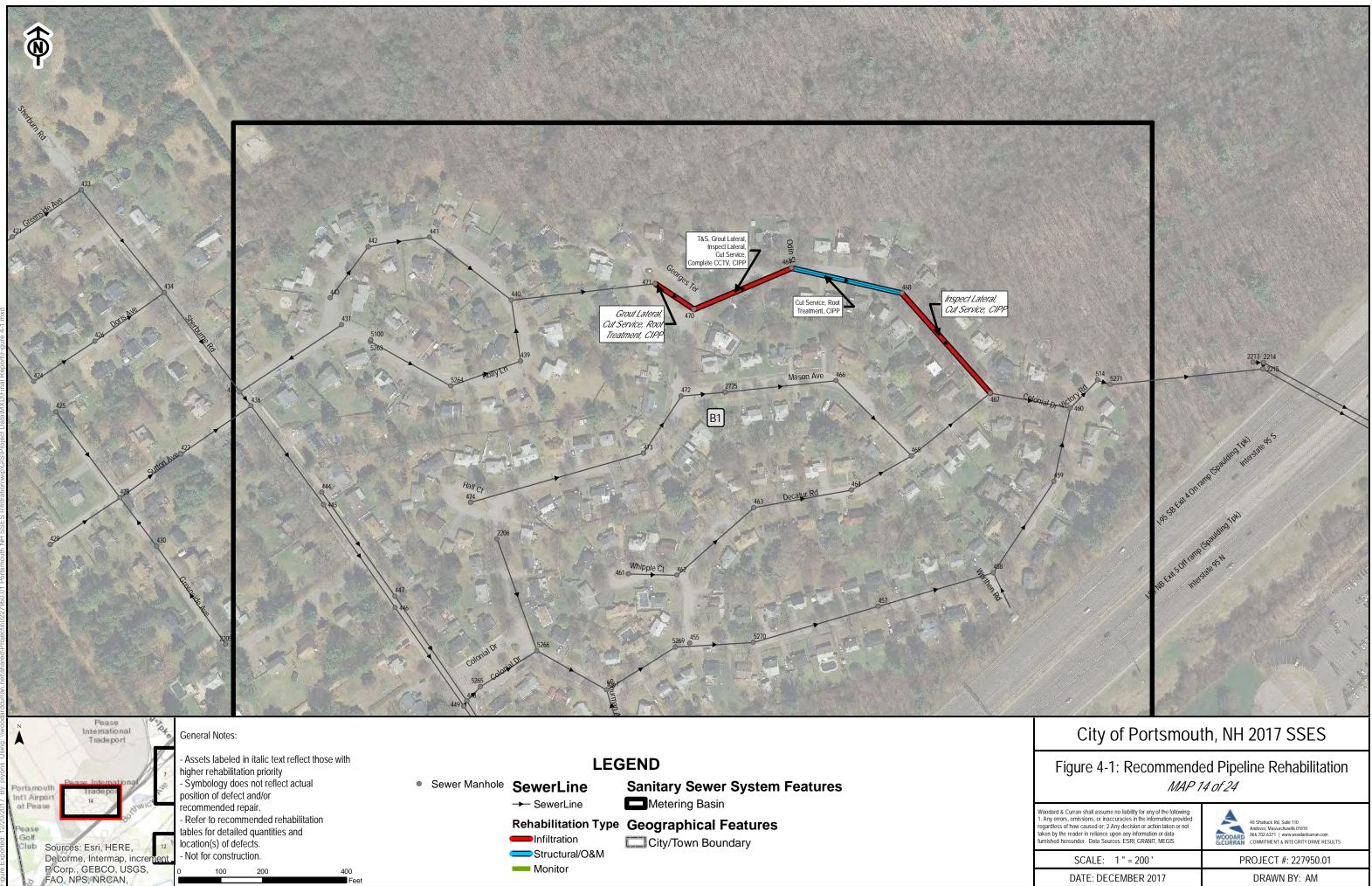
Figure 4-1: Recommended Pipeline Rehabilitation MAP 12 of 24

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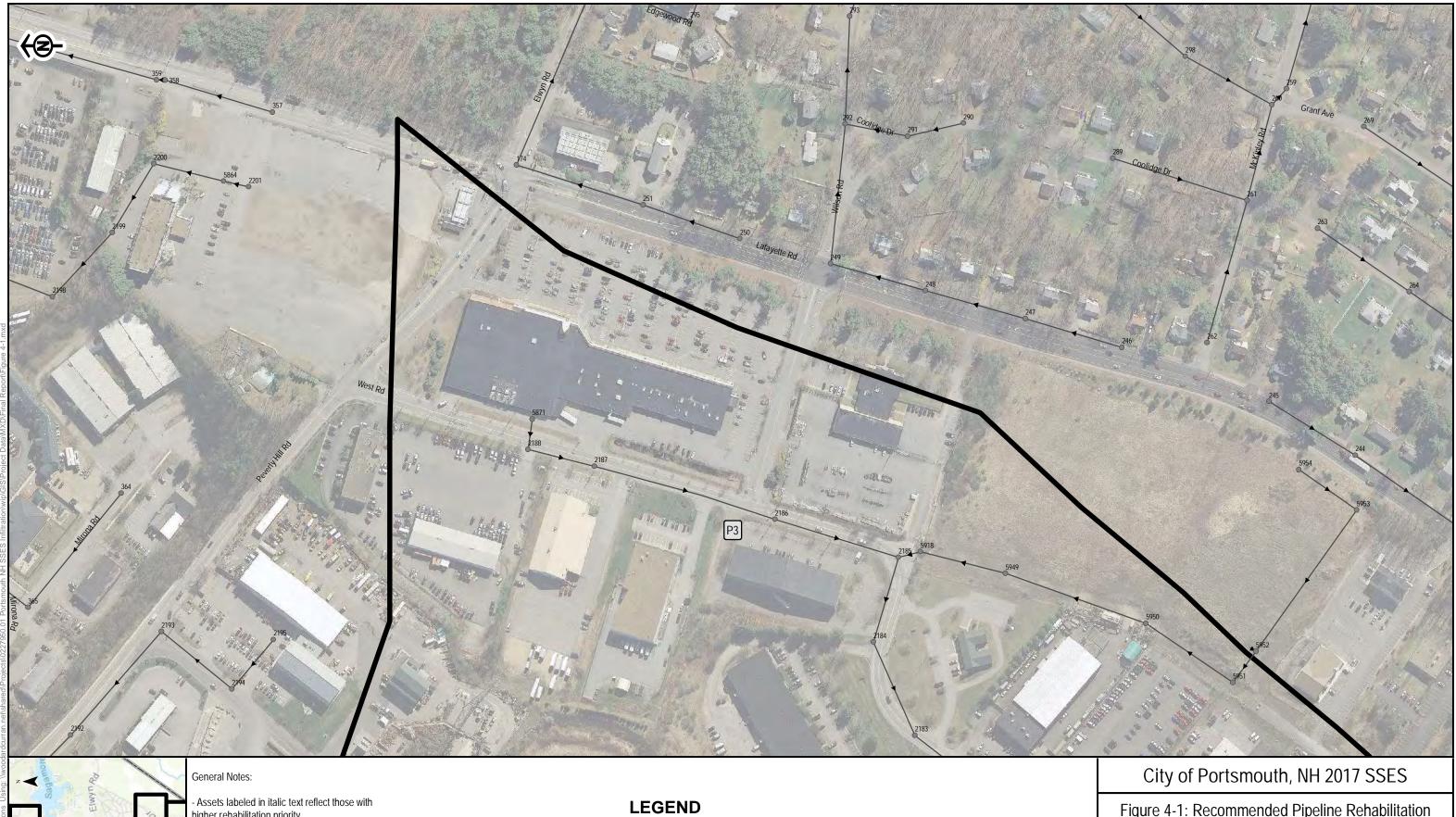


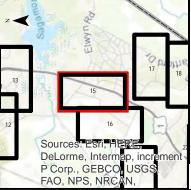
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 Assets labeled in italic text reflect those with higher rehabilitation priority
 Symbology does not reflect actual position of defect and/or recommended repair. - Refer to recommended rehabilitation tables for detailed quantities and location(s) of defects. - Not for construction.

• Sewer Manhole SewerLine

Sanitary Sewer System Features Metering Basin

Rehabilitation Type Geographical Features Infiltration

Structural/O&M

Monitor

- SewerLine

City/Town Boundary

Figure 4-1: Recommended Pipeline Rehabilitation MAP 15 of 24

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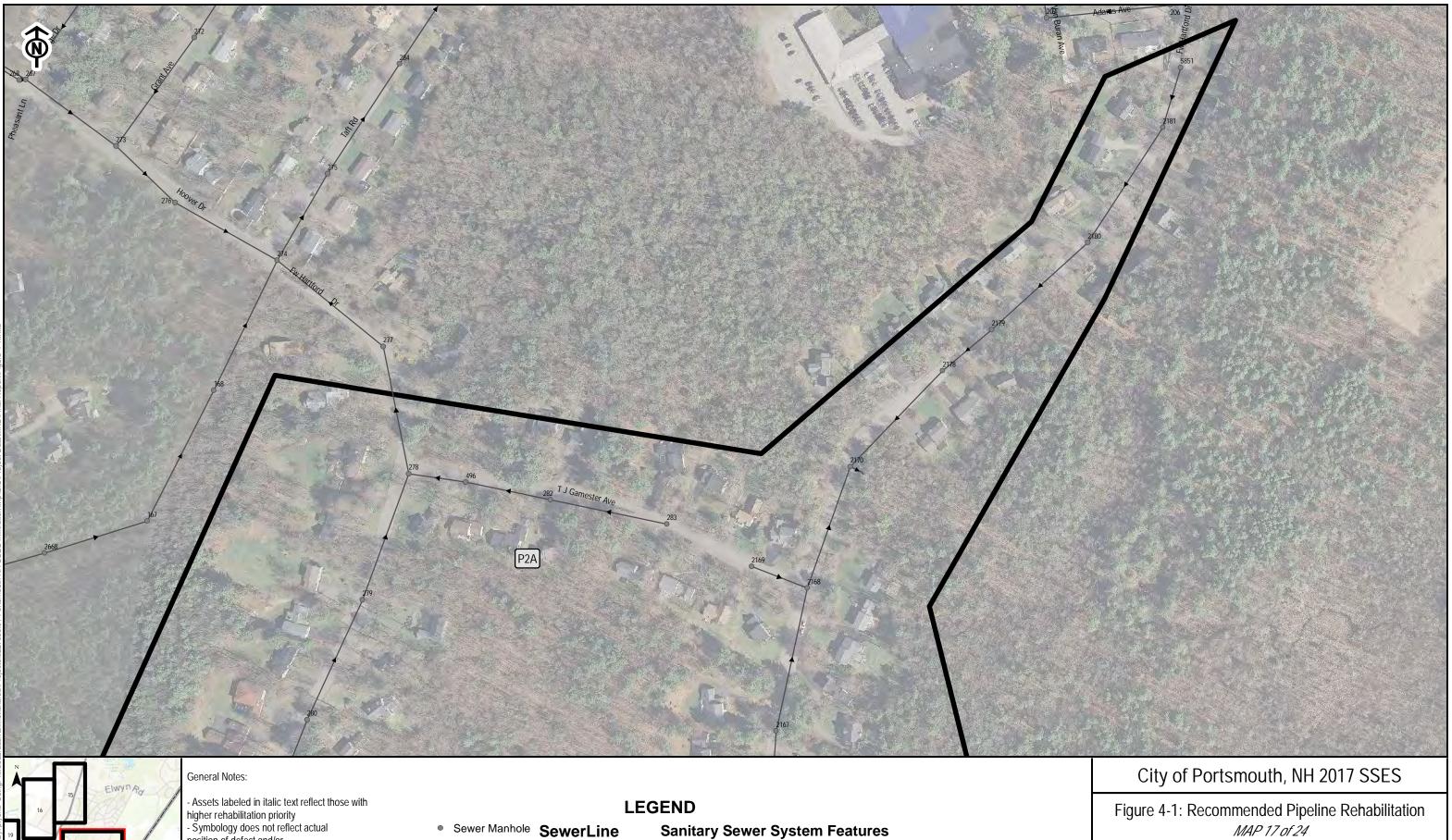


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Metering Basin Rehabilitation Type Geographical Features

Structural/O&M

Monitor

- SewerLine

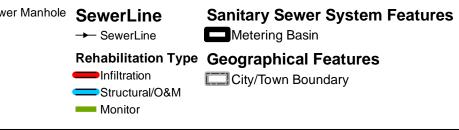
Infiltration

City/Town Boundary

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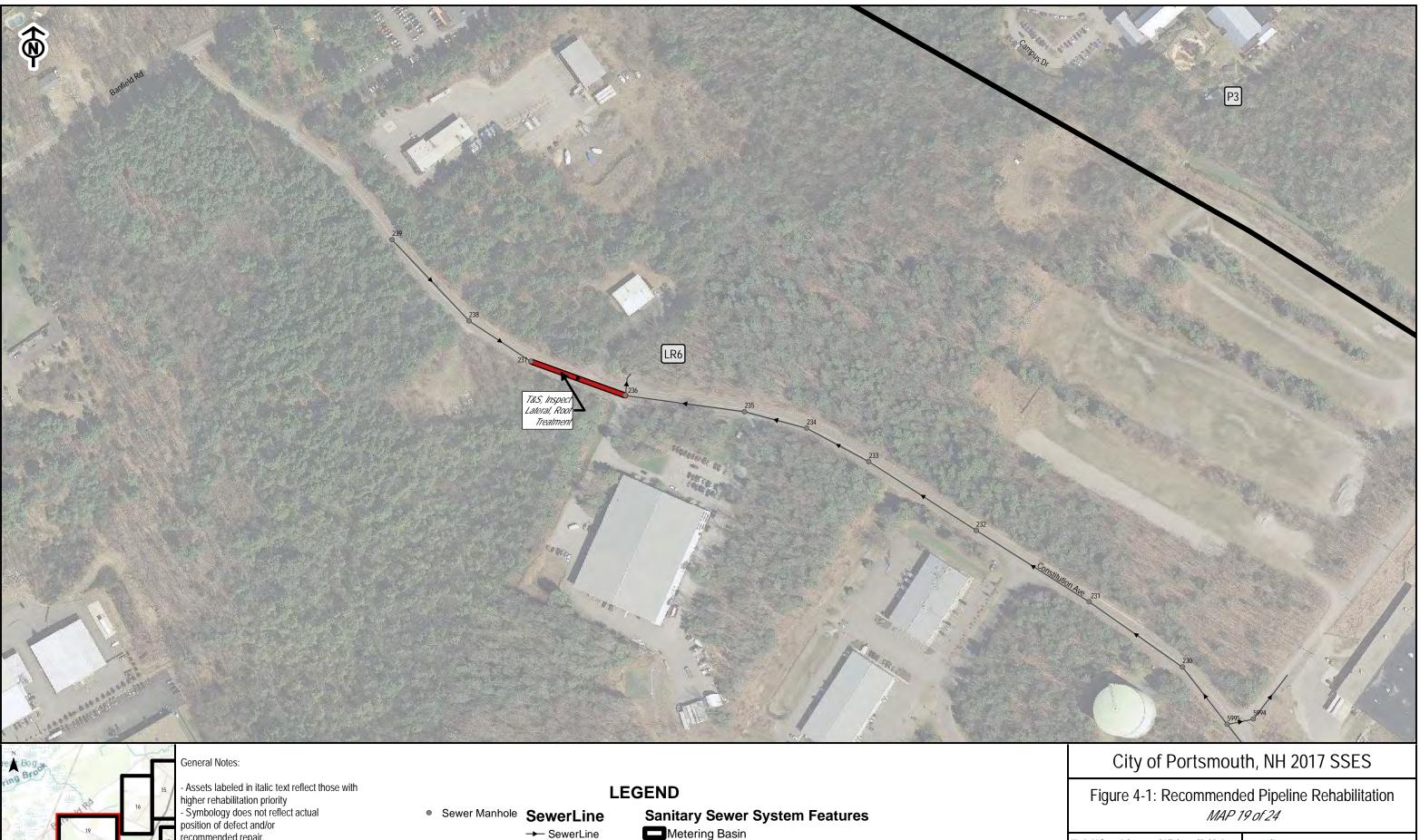


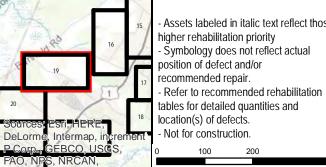
11/05	- Assets labeled in italic text reflect those w higher rehabilitation priority		O succes Marshala	-
	 Symbology does not reflect actual position of defect and/or 	•	Sewer Manhole	
The a	recommended repair.			→ SewerLine
	- Refer to recommended rehabilitation			Rehabilitation
	tables for detailed quantities and			
Sources: Esri, HERE,	location(s) of defects.			
DeLorme, Intermap, increment	- Not for construction.			Structural/O
P Corp., GEBCO, USGS,	0 100 200	400		Monitor
FAO, NPS, NRCAN,		Feet		

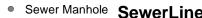


MAP 18 of 24

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furnished hereunder. Data Sources: ESRI, GRANIT, MEGIS	COMMITMENT & INTEGRITY DRIVE RESULTS
SCALE: 1 " = 200 '	PROJECT #: 227950.01
DATE: DECEMBER 2017	DRAWN BY: AM







Metering Basin

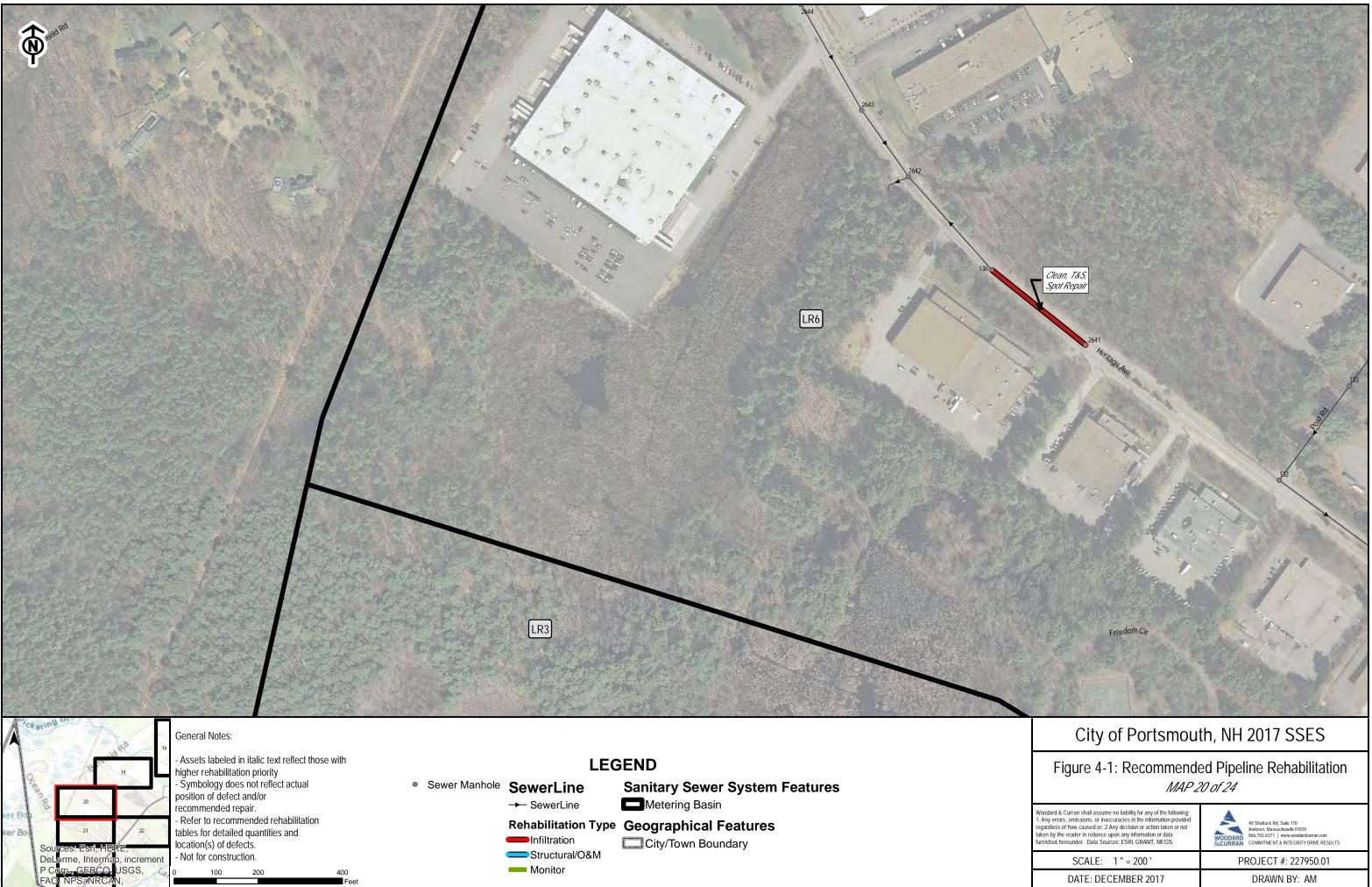
Rehabilitation Type Geographical Features Infiltration

Structural/O&M

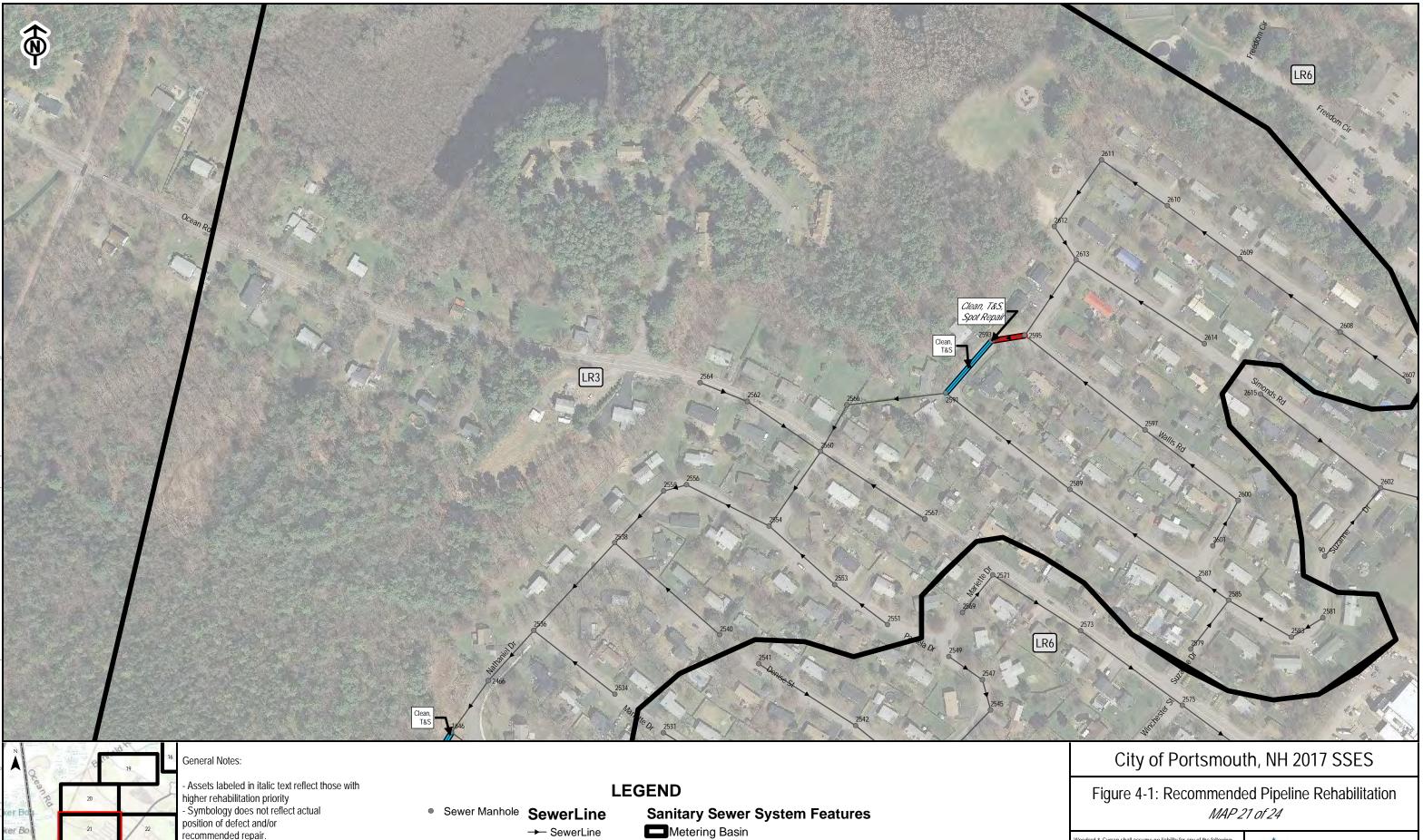
Monitor

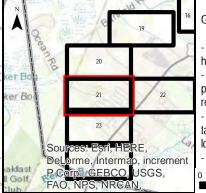
City/Town Boundary

Woodard & Curran shall assume no liability for any of the following: 1. Any errors, omissions, or inaccuracies in the information provided regardless of how caused or; 2.Any decision or action taken or not taken by the reader in reliance upon any information or data furnished hereunder. Data Sources: ESRI, GRANIT, MEGIS	40 Shattuck Rd, Suile 110 Androver, Massachuseks 01810 866 702.6371 www.woodardurana.com COMMITMENT & INTE GRITY DRIVE RESULTS
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	Sources: Es DeLorme, In P Corp., GE FAO, NPS34	ri, HERE, termap, incre BCO, USGS, NRCAN,	ment





 Assets labeled in faile text relicer in
 higher rehabilitation priority
 Symbology does not reflect actual
 position of defect and/or
 recommended repair. - Refer to recommended rehabilitation tables for detailed quantities and location(s) of defects. - Not for construction. 400

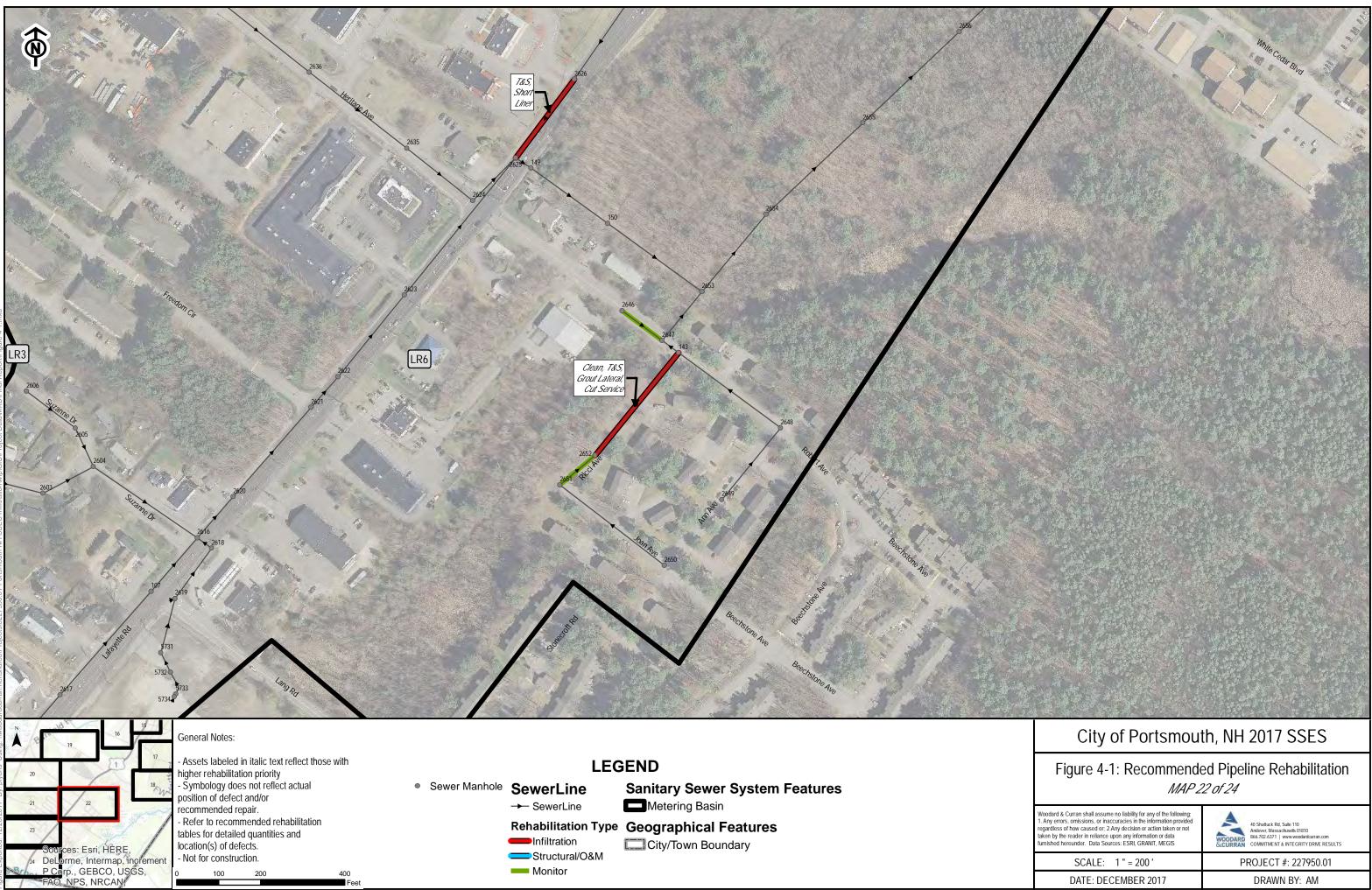
Rehabilitation Type Geographical Features Infiltration

Structural/O&M

Monitor

City/Town Boundary

Woodard & Curran shall assume no liability for any of the following: 1. Any errors, omissions, or inaccuracies in the information provided regardless of how caused or; 2. Any decision or action taken or not taken by the reader in reliance upon any information or data furnished hereunder. Data Sources: ESRI, GRANIT, MEGIS	40 Shatuck Rd, Suile 110 Andover, Massachusek 10810 865/702.6371 J www.woodrdurran.com CCUMRIAN COMMITMENT & INTEGRITY DRIVE RESULTS
SCALE: 1 " = 200 '	PROJECT #: 227950.01
DATE: DECEMBER 2017	DRAWN BY: AM



Monitor

400

Woodard & Curran shall assume no liability for any of the following; 1. Any errors, omissions, or inaccuracies in the information provided regardless of how caused or; 2. Any decision or action taken or not taken by the reader in reliance upon any information or data furnished hereunder. Data Sources: ESRI, GRANIT, MEGIS	40 Shatluck Rd, Sulle 110 Androver, Massachureske 01810 866 702.6371 www.woodardurara.com COMMITMENT & INTE GRITY DR/NE RESULTS
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DATE: DECEMBER 2017	DRAWN BY: AM



anRo	1	20		General Notes:					
0	4	21	22	- Assets labeled in italic text reflect those higher rehabilitation priority	e with		LEG	GEND	
	1	-26520	10	- Symbology does not reflect actual		Sewer Manhole	SewerLine	Sanitary Sewer System Features	
V		23		position of defect and/or recommended repair.			- SewerLine	Metering Basin	
L	E	24	2019	- Refer to recommended rehabilitation tables for detailed quantities and			Rehabilitation Type	Geographical Features	
S	ources	s Esni, HE	RE.	location(s) of defects.				City/Town Boundary	
			p, increment	- Not for construction.			Structural/O&M		
		, GEBCO, PS, NRCA		0 100 200	400		Monitor		
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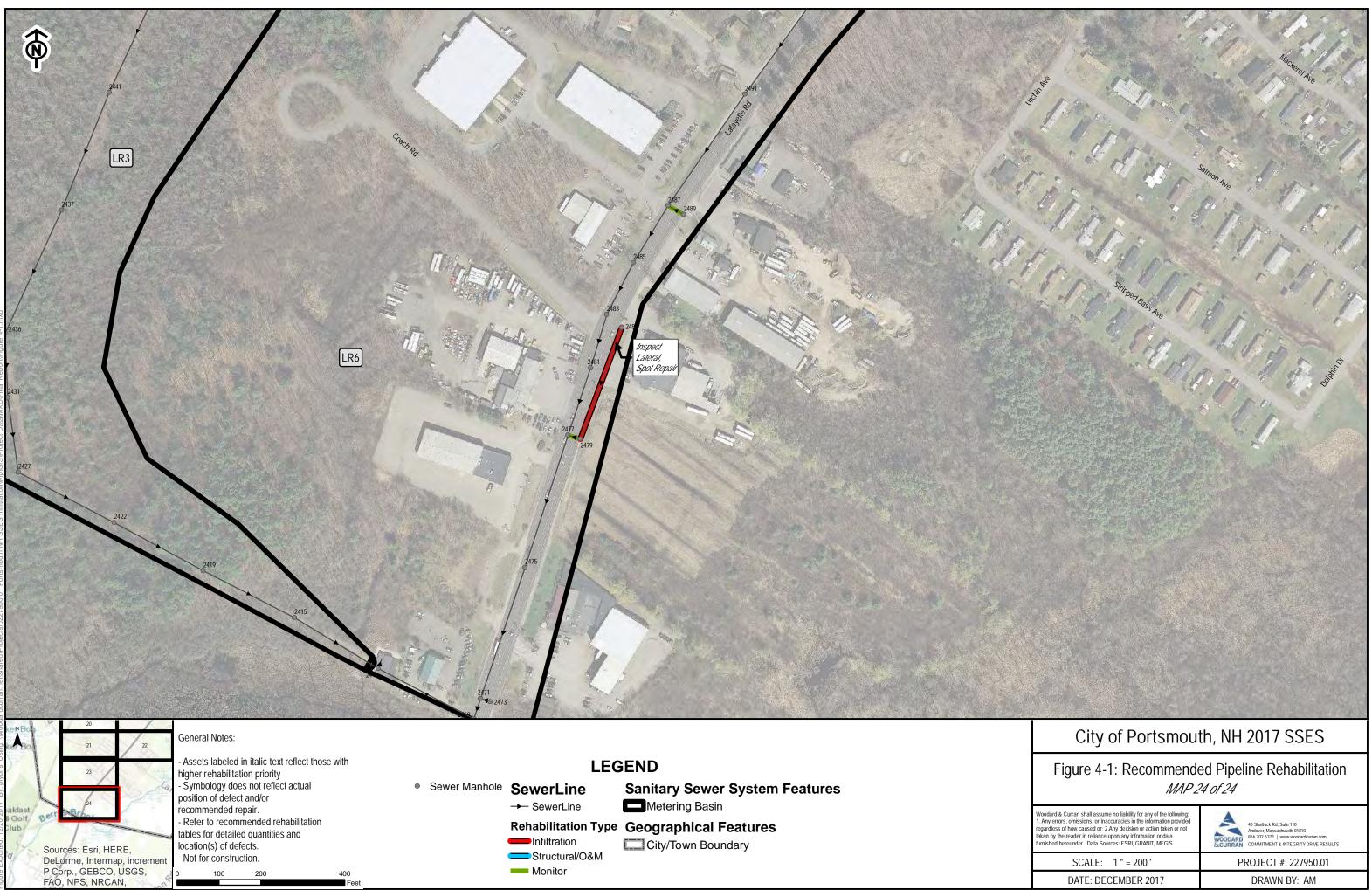
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Figure 4-1: Recommended Pipeline Rehabilitation *MAP 23 of 24*

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SCALE: 1 " = 200 '	PROJECT #: 227950.01
DATE: DECEMBER 2017	DRAWN BY: AM



SewerLine	
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DATE:	DECEMBER	2017

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APPENDIX B: MANHOLE INSPECTIONS FINDINGS AND RECOMMENDATIONS

	T				Appendix B.1 - Manhole Rehabilitation Recommendations - Infilt		1		Estimated	Estimated		Infiltration Removal Cost
MH Number	Metering Basin	Street	MH Depth (ft)	h Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Infiltration	Structural / O&M	Estimated Total Rehab Cost	Effectiveness (\$ Spent per
			()		Manhole walls leaking at 11.6 gpm per flow isolation, no picture taken of infiltration.			(01-7	Removal Cost	Rehab		Gallon Per Day Removed
821	GR1	Osprey Drive	9	BRICK	Also, possible industrial connection/service infiltration.	Grout Manhole, Cementitious Liner	4	16,704	\$3,700	\$0	\$3,700	\$0.22
396		Greenleaf Woods Drive	7	PRECAST	Incoming pipe connection leak, voids visible around inlet and outlet pipe connections.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	9,360	\$2,590	\$2,200		\$0.22
377		Greenleaf Woods Drive	14	PRECAST	Mineral deposits at pipe connections (primary in/out) with active infiltration	Grout Manhole, Cementitious Liner	4	17,280	\$5,180	\$0		\$0.30
					Pipe connection leak from north and west pipes. Possible industrial connection/service							
920	GR1	Shearwater Drive	9	BRICK	infiltration.	Grout Manhole, Cementitious Liner	4	10,080	\$3,330	\$0	\$3,330	\$0.33
					Corbel missing bricks and mortar, light debris on bench. 6 gpm leak observed during							
397	LR4	Greenleaf Avenue	8	PRECAST	flow isolation.	Corbel Repair, Grout Manhole, Cementitious Liner	3	8,640	\$2,960	\$1,000		\$0.34
2646		Robert Avenue	6	PRECAST	Mineral deposits at wall and void visible at outgoing pipe connection	Grout Manhole, Cementitious Liner	3	5,040	\$2,220	\$0		\$0.44
816	GR1	Portsmouth Boulevard	8	BRICK	Mineral deposits at wall. Pipe connection leak.	Grout Manhole, Cementitious Liner	3	7,200	\$3,330	\$0	\$3,330	\$0.46
2385	GR1	Commerce Way Easement	0	BRICK	Severe infiltration from corbel, surcharging (no bench or invert visible), ponding around frame causing inflow. Located on Pease effluent line.	Corbel Repair, Rebuild Bench, Grout Manhole, Raise to Surface	4	2,880	\$1,600	\$4,300	\$5,900	\$0.56
818	GR1 GR1	Portsmouth Boulevard	10	BLOCK	Active infiltration and mineral deposits at wall, roots	Root Treatment, Grout Manhole, Cementitious Liner	4	7,200	\$1,000	\$2,200		\$0.50
1646	LR3	Nathaniel Drive R.O.W.	5	PRECAST	Wall leaks, hole in wall at connection to bench	Grout Manhole, Cementitious Liner	3	2,880	\$1,850	\$2,200		\$0.57
2248	HS11	Islington Street	8	PRECAST	No bench and invert. Infiltration at manhole wall.	Rebuild Bench, Grout Manhole, Cementitious Liner	4	2,880	\$2,960	\$2,200		\$1.03
2210				111201101		New Frame and Cover, Grout Manhole, Cementitious		2,000	427,000	\$2,200	\$0,100	÷
2445	LR3	Nathaniel Drive R.O.W.	8	PRECAST	Light infiltration stains at walls, cracked cover	Liner	3	2,880	\$2,960	\$820	\$3,780	\$1.03
					Mineral deposits at bench and invert, roots in corbel. Walls weaping during MH							
942	LD1	Spinnaker Way	9	BRICK	Inspection. Active infiltration during flow isolation.	Grout Manhole, Cementitious Liner	3	2,880	\$3,330	\$0	\$3,330	\$1.16
5316	HS14	Barberry Lane Easement	7	PRECAST	Active infiltration and mineral deposits at wall, corbel missing mortar	Corbel Repair, Grout Manhole, Cementitious Liner	3	2,160	\$2,590	\$1,000	\$3,590	\$1.20
					Light debris on bench and invert. Infiltration at bench/wall connection. Possible industria							
2487	LR6	Lafayette Road at Coach Road	8	PRECAST	connection/service infiltration.	Grout Manhole, Cementitious Liner	2	2,520	\$3,330	\$0		\$1.32
406	LR4	Peverly Hill Road	7	PRECAST	Incoming and outgoing pipe connection leaks.	Grout Manhole, Cementitious Liner	3	2,232	\$2,960	\$0		\$1.33
629	GR1	Oriental Gardens R.O.W.	11	PRECAST	Heavy mineral deposits, aggregate visible at wall due to H2S	Grout Manhole, Epoxy Liner	3	1,440	\$2,200	\$5,500		\$1.53
5819	HS11	Aldrich Road at Aldrich Court	8	PRECAST	Incoming pipe connection leak (estimated at 2 gpm)	Rebuild Bench, Grout Manhole, Cementitious Liner	3	1,800	\$2,960	\$2,200	\$5,160	\$1.64
1015	11011	Souvell Dood at Chinney Dood	0	PRECAST	Faulty drop connection in manhole, light debris on bench and invert, walls weeping at ioints	Crout Manhala, Comontitious Liner	3	1 700	¢2.220	¢O	¢0.000	¢1.02
<u>1315</u> 1311		Sewall Road at Spinney Road Fields Road and Sewall Road	9	BLOCK	Moderate debris in bench and invert, active infiltration from wall	Grout Manhole, Cementitious Liner Grout Manhole, Cementitious Liner	3	1,728 1,440	\$3,330 \$2,960	\$0 \$0	\$3,330 \$2,960	\$1.93 \$2.06
1311	11311		1	DLUCK	Roots in corbel, Active infiltration with mineral deposits at wall, heavy debris in invert.		5	1,440	\$2,700	\$U	\$2,700	φ2.00
2386	GR1	Commerce Way Easement	9	BRICK	Located on Pease effluent line.	Root Treatment, Grout Manhole, Cementitious Liner	3	1,440	\$3,330	\$2,200	\$5,530	\$2.31
407		Peverly Hill Road at McClintock Avenue	8	PRECAST	Outgoing pipe connection leak.	Grout Manhole, Cementitious Liner	3	1,440	\$3,330	\$0		\$2.31
460	B1	Victory Road	8	BRICK	Roots at wall, corbel has broken bricks and missing mortar	Corbel Repair, Root Treatment, Grout Manhole	2	720	\$1,800	\$3,200		\$2.50
599	HS15	Sims Avenue at Benson Street	8	PRECAST	Infiltration at manhole wall	Grout Manhole	2	720	\$1,800	\$0		\$2.50
2362	LD1	Kearsarge Road at Market Street	10	PRECAST	Invert leak. Infiltration at manhole wall.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	1,440	\$3,700	\$2,200	\$5,900	\$2.57
2642	LR6	Heritage Avenue	9	PRECAST	Light Infiltration observed at walls, mineral deposits	Grout Manhole, Cementitious Liner	3	1,440	\$3,700	\$0		\$2.57
587	HS15	Hampshire Road	10	BLOCK	Mineral deposits at wall, no bench and invert, heavy debris buildup	Rebuild Bench, Grout Manhole	4	720	\$2,000	\$2,200		\$2.78
642	GR1	Woodbury Avenue	11	PRECAST	Missing bricks and mortar from corbel, Mineral deposits at wall, debris buildup in bench.	Corbel Repair, Grout Manhole, Cementitious Liner	3	1,440	\$4,070	\$1,000	\$5,070	\$2.83
4000	11011				Bench and invert gone/broken/sinking, infiltration staining at walls, piece of frame	New Frame and Cover, Rebuild Bench, Grout Manhole,	-	700	*** ***	***	414 400	*****
1330	HS11	Brewery Lane	11	PRECAST	missing Missian bride in bouch and invest Linkt data is builder in booth and showed by fillestic	Epoxy Liner	5	720	\$2,400	\$9,020	\$11,420	\$3.33
5334	GR1	Woodhung Avenue	12	PRECAST	Missing bricks in bench and invert. Light debris buildup in bench and channel. Infiltratior staining at wall. Possible industrial connection/service infiltration.	Rebuild Bench, Grout Manhole	4	720	\$2,400	\$2,200	\$4,600	\$3.33
1392	HS11	Woodbury Avenue Cate Street	5	PRECAST	Mineral deposits at wall, corbel missing mortar	Grout Manhole	4	360	\$2,400	\$2,200		\$3.33
2471	1.5.(Lafayette Road	6	PRECAST	Active infiltration at walls	Grout Manhole, Cementitious Liner	3	720	\$1,200			
1303	HS11	Thaxter Road at Fells Road	11	BLOCK	Loose bricks in wall, no bench and invert, active infiltration at wall	Rebuild Bench, Grout Manhole, Cementitious Liner	4	1,080	\$4,070	\$2,200		\$3.77
1000				BEGOIN	No bench and invert, roots at wall. Large gaps in wall. Possible industrial			.,	<i><i><i></i></i></i>	\$2,200	¢0,270	÷0111
1331	HS11	Brewery Lane	14	BRICK/STONE	connection/service infiltration.	Rebuild Bench, Grout Manhole, Cementitious Liner	4	1,440	\$5,550	\$2,200	\$7,750	\$3.85
					Active infiltration at wall, bench and invert not visible, corbel missing mortar and cracked	Corbel Repair, Rebuild Bench, Grout Manhole,						
2221	HS11	Islington Street	11	BRICK	Active initiation at wall, bench and invent not visible, corbet missing monal and cracked	Cementitious Liner	4	1,080	\$4,440	\$3,200	\$7,640	\$4.11
378	LR4	Greenleaf Woods Drive	15	PRECAST	Active infiltration from wall	Grout Manhole, Cementitious Liner	4	1,440	\$5,920	\$0	\$5,920	\$4.11
					Moderate debris on bench, broken frame, loose and broken bricks from corbel, missing	New Frame and Cover, Corbel Repair, Grout Manhole,						
540		Coakley Road	8	BLOCK	mortar from walls	Cementitious Liner	3	720	\$2,960	\$1,820		\$4.11
17	LD1	Portsmouth Boulevard R.O.W.	7		Missing mortar from corbel with roots in corbel. Infiltration at pipe connection.	Corbel Repair, Grout Manhole, Cementitious Liner	2	720	\$2,960	\$1,000		\$4.11
2727	HS14	Coakley Road	8	BLOCK	Missing mortar in wall, no bench and invert, heavy debris buildup	Rebuild Bench, Grout Manhole, Cementitious Liner	4	720	\$3,330	\$2,200		\$4.63
638	GR1	Commerce Way Edmund Avenue near Fairview Avenue	16	PRECAST PRECAST	Infiltration staining	Grout Manhole New Frame and Cover, Grout Manhole	2	720 360	\$3,400 \$1,800			\$4.72
108 2741	M1 HS11	Lovell Street R.O.W.	8	BLOCK	Cracked cover Walls missing mortar, no bench and invert, mineral deposits in incoming line	Rebuild Bench, Grout Manhole, Cementitious Liner	4	720	\$1,800	\$820 \$2,200		\$5.65
5852	GR1	Portsmouth Boulevard Easement	10	PRECAST	Mineral deposits at bench, broken bricks and missing mortar from corbel	Corbel Repair, Grout Manhole, Cementitious Liner	2	720	\$4,070	\$2,200		\$5.65
2507	LR6	Lafayette Road	6	PRECAST	Infiltration at bench/wall connection	Grout Manhole, Cementitious Liner	2	432	\$2,590	\$1,000		\$5.03
2483	LR6	Lafayette Road at Coach Road	8	PRECAST	Light infiltration at manhole wall	Grout Manhole	2	288	\$1,800	\$0		\$6.25
		,	-		Infiltration staining at wall, aggregate visible at wall due to H2S. Located on Pease		1 -			*	+ 1,500	÷0120
2387	GR1	Woodbury Avenue	12	PRECAST	effluent line.	Grout Manhole, Epoxy Liner	2	360	\$2,400	\$6,000	\$8,400	\$6.67
1388	HS11	US Bypass 1 at rear	11	PRECAST	Mineral deposits at wall, corbel missing mortar	Grout Manhole	2	360	\$2,400			\$6.67
					Broken and missing bricks from wall, loose bricks in corbel, no bench or invert, heavy	Corbel Repair, Rebuild Bench, Grout Manhole,						
593	HS15	Essex Avenue	12	BLOCK	debris buildup	Cementitious Liner	4	720	\$4,810	\$3,200	\$8,010	\$6.68
					Active infiltration at walls, cracked frame with broken pieces	New Frame and Cover, Grout Manhole, Cementitious						
5332	GR1	Commerce Way US Rt 1 Bypass	13	PRECAST	·	Liner	3	720 288	\$4,810			\$6.68 \$6.94
116	M1		9	PRECAST	Light infiltration at walls and light debris in invert	Grout Manhole	2		\$2,000	\$0		

					Appendix B.1 - Manhole Rehabilitation Recommendations - Infilt	auton Removal Cost Effectiveness Prioritization			Estimate 1	Estim t		
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)		Estimated Structural / O&M	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per
421	GR1	Oriental Gardens R.O.W.	12	PRECAST	Minoral denocito	Grout Manhole	2		Removal Cost	Rehab	\$2,400	Gallon Per Day Removed
<u>631</u> 632	GR1	Commerce Way Easement	13	PRECAST	Mineral deposits Mineral deposits	Grout Manhole	2	360 360	\$2,600 \$2,600	\$0 \$0	\$2,600 \$2,600	\$7.22 \$7.22
032	GKI	Commerce way Easement	15	FRECASI	Active infiltration at wall, roots in corbel, loose bricks and debris on bench. Collapsed		2	300	\$2,000	\$U	\$2,000	\$1.22
1382	HS15	US Rt 1 Bypass North	11	BLOCK	pipe connection found during flow isolation. Possible industrial connection/service	Remove and Replace Manhole	4	1,728	\$13,100	\$0	\$13,100	\$7.58
1002				BLOOK	1 I Y	New Frame and Cover, Rebuild Bench, Grout Manhole,		1,120	\$10,100	÷.	¢10/100	¢1100
1044	LR5	Ledgewood Drive R.O.W.	5	PRECAST	No bench and invert, heavy debris buildup, active infiltration at wall, frame chipped	Cementitious Liner	4	288	\$2,220	\$3,020	\$5,240	\$7.71
2219	HS14	Borthwick Avenue at Marriot Hotel	6	PRECAST	Mineral deposits at outlet pipe with active infiltration	Grout Manhole, Cementitious Liner	3	288	\$2,220	\$0	\$2,220	\$7.71
92	M1	US Rt 1 Bypass at Cutts Avenue	8	PRECAST	Broken bricks in corbel, Light infiltration at walls	Corbel Repair, Grout Manhole, Cementitious Liner	3	360	\$2,960	\$1,000	\$3,960	\$8.22
916	GR1	Blue Heron Drive Easement	8	BRICK	Roots and infiltration staining at wall	Root Treatment, Grout Manhole, Cementitious Liner	2	360	\$2,960	\$2,200	\$5,160	\$8.22
					No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris							
591	HS15	Essex Avenue and Middle Road	6	BLOCK	buildup	Rebuild Bench, Grout Manhole, Cementitious Liner	4	288	\$2,590	\$2,200	\$4,790	\$8.99
					Active infiltration at walls, hole in bench, corbel missing mortar, chipped frame	New Frame and Cover, Rebuild Bench, Grout Manhole,						
1307		Sewall Road	6	PRECAST	U	Cementitious Liner	3	288	\$2,590	\$3,020	\$5,610	\$8.99
2455	-	Nathaniel Drive R.O.W.	10	PRECAST	Active infiltration at walls	Grout Manhole, Cementitious Liner	3	288	\$2,590	\$0		\$8.99
2368 2657		Albacore Museum Access Pump Station White Cedar Boulevard R.O.W.	18	PRECAST PRECAST	Light infiltration stains at walls	Grout Manhole, Cementitious Liner	3	720 360	\$6,660 \$3,330	\$0 \$0		\$9.25 \$9.25
813	GR1	Portsmouth Boulevard near Market Street	0	BRICK	Mineral deposits at wall Active infiltration and mineral deposits at wall	Grout Manhole, Cementitious Liner Grout Manhole, Cementitious Liner	3	432	\$3,330	\$0 \$0		\$9.42
013	GKI		11	DRICK		New Frame and Cover, Grout Manhole, Cementitious	3	432	\$4,070	\$U	\$4,070	\$7.42
1314	HS11	Sewall Road	8	PRECAST	Chipped cover, active infiltration coming from wall	Liner	3	288	\$2,960	\$820	\$3,780	\$10.28
1381	HS11	Hampshire Road	8	BLOCK	Active infiltration and mineral deposits at wall	Grout Manhole, Cementitious Liner	3	288	\$2,960	\$0		\$10.28
1390	HS11	Cate Street	9	BLOCK	Active infiltration and mineral deposits at wall, corbel missing mortar	Grout Manhole, Cementitious Liner	3	288	\$3,330	\$0		\$11.56
1045	LR5	Ledgewood Drive R.O.W.	8	PRECAST	Infiltration staining and mineral deposits at wall. Active infiltration from wall joints	Grout Manhole, Cementitious Liner	3	288	\$3,330	\$0		\$11.56
2388	GR1	Woodbury Avenue	13	PRECAST	Mineral deposits, debris buildup in bench and channel. Bricks missing from bench.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	360	\$4,810	\$2,200	\$7,010	\$13.36
1064	LR5	Lafayette Road	11	PRECAST	Active infiltration with mineral deposits at wall	Grout Manhole, Cementitious Liner	3	288	\$4,070	\$0	\$4,070	\$14.13
2635	LR6	Heritage Avenue	12	PRECAST	Active infiltration at wall	Grout Manhole, Cementitious Liner	3	288	\$4,440	\$0		\$15.42
5685	HS15	Sheffield Road	7	BLOCK	Mineral deposits at wall	Grout Manhole, Cementitious Liner	3	144	\$2,590	\$0	\$2,590	\$17.99
					Chipped frame, Active infiltration with mineral deposits at wall	New Frame and Cover, Grout Manhole, Cementitious						
380	LR4	Greenleaf Woods Drive	14	PRECAST		Liner	3	288	\$5,180	\$820	\$6,000	\$17.99
5412		Barberry Lane Easement	17	PRECAST	Infiltration staining at wall	Grout Manhole, Cementitious Liner	3	360	\$6,660	\$0	\$6,660	\$18.50
1387	HS11	US Bypass 1	12	BLOCK	Roots, Active infiltration and mineral deposits at wall	Root Treatment, Grout Manhole, Cementitious Liner	3	144	\$4,440	\$2,200	\$6,640	\$30.83
5729	GR1	Granite Street R.O.W.	6	PRECAST	Evidence of surcharge, bench and invert not visible due to high water.	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
1329	HS11 HS11	Brewery Lane Madison Street at Lovell Street	14	PRECAST PRECAST	No bench and invert No bench and invert, heavy debris buildup	Rebuild Bench	4	0	\$0 \$0	\$2,200 \$2,200	\$2,200 \$2,200	\$0.00 \$0.00
1344	НЭП		0	PRECASI	Broken and loose bricks on corbel, missing mortar from corbel. No bench and invert,	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
1397	HS11	Bartlett Street	7	BRICK	heavy debris buildup	Rebuild Bench, Cementitious Liner	1	0	\$0	\$3,390	\$3,390	\$0.00
534	HS14	Coakley Road	10	PARGED	No bench and invert, heavy debris buildup	Rebuild Bench	4	0	\$0 \$0	\$2,200	\$2,200	\$0.00
541	HS14	Coakley Road	7	BLOCK	Missing mortar in walls, No bench and invert, heavy debris buildup	Rebuild Bench, Cementitious Liner	4	0	\$0 \$0	\$3,560	\$3,560	\$0.00
563	HS15	Mariorie Street at Middle Road	7	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
577	HS15	Middle Road	8	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
578	HS15	Middle Road	10	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
584	HS15	Hampshire Road	7	BLOCK	No bench and invert, heavy debris buildup, corbel missing mortar	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
586	HS15	Hampshire Road	7	BLOCK	No bench and invert, heavy debris	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
598	HS15	Sims Avenue	9	BRICK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0	\$2,200		\$0.00
2454	LD1	Dunlin Way	14	PRECAST	No bench and invert, debris buildup	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
2458	LR3	Nathaniel Drive R.O.W.	9	PRECAST	Rocks on bench	New Frame and Cover	4	0	\$0	\$820	\$820	\$0.00
554		Middle Road at Leavitt Avenue	5	BLOCK	No bench and invert, heavy debris buildup, corbel blocks missing/deteriorating	Corbel Repair, Rebuild Bench	4	0	\$0	\$3,200	\$3,200	\$0.00
961	LR4	Middle Road	6	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0 \$0	\$2,200	\$2,200	\$0.00
2501	LR6	Lafayette Road at Blue Fish Boulevard Lafayette Road at Constitution Avenue	6	PRECAST	Moderate debris on bench, broken cover	New Frame and Cover, Rebuild Bench	4	0	\$0 \$0	\$3,020	\$3,020	\$0.00
2631 2632	LR6 LR6	Larayette Road at Constitution Avenue	<u>ठ</u>	PRECAST PRECAST	Broken frame, light debris on bench, bench missing bricks, corbel missing mortar Broken frame, light debris on bench	New Frame and Cover New Frame and Cover	4	0	\$0 \$0	\$820 \$820	\$820 \$820	\$0.00 \$0.00
<u> </u>	M1	Cutts Street at Rt 1 Bypass	У 7	PRECAST	Evidence of surcharge, heavy debris blocking flow, cracked cover	Clean, New Frame and Cover	4	0	\$0 \$0	\$820 \$1,370	\$820 \$1,370	\$0.00
93 111	M1	Fairview Avenue	Δ	PRECAST	Cracked cover	New Frame and Cover	4 4	0	\$0 \$0	\$1,370	\$1,370	\$0.00
767		Maplewood Avenue	4	BRICK	No bench and invert, corbel breaking	Corbel Repair, Rebuild Bench	4	0	\$0 \$0	\$3,200	\$3,200	\$0.00
5495		Osprey Drive Easement	8	BRIOK	Cover broken	New Frame and Cover	4	0	\$0 \$0	\$3,200	\$3,200	\$0.00
5271	B1	Victory Road Easement	8	PRECAST	Roots at wall	Root Treatment, Cementitious Liner	3	0	\$0	\$3,730	\$3,730	\$0.00
1432	HS11	Islington Street	8	PRECAST	Light debris on bench, heavy debris in channel	Clean	3	0	\$0	\$550	\$550	\$0.00
5503	HS11	Thaxter Road	9	PRECAST	Evidence of surcharge, moderate debris on bench	Clean	3	0	\$0	\$550	\$550	\$0.00
5550	HS11	Lovell Street R.O.W.	8	PRECAST	Frame and cover below grade	Raise to Surface	3	0	\$0	\$1,100	\$1,100	\$0.00
5855	HS11	Barberry Lane Easement	11	PRECAST	Outside of corbel exposed, moderate debris on bench and invert	Clean, Corbel Repair	3	0	\$0	\$1,550	\$1,550	\$0.00
					Missing mortar from corbel and walls, loose/broken bricks in corbel. Open joint in clay							
595	HS15	Essex Avenue	14	BLOCK	invert.	Corbel Repair, Cementitious Liner	3	0	\$0	\$3,550	\$3,550	\$0.00
1384		Rt 1 Bypass near Islington Street	12	BLOCK	Deteriorating wall	Cementitious Liner	3	0	\$0	\$2,040	\$2,040	\$0.00
985		Market Street at Michael Succi Drive	9	PRECAST	Cracked around drop connection, bench separating from base section, rocks on bench	Cementitious Liner	3	0	\$0	\$1,700	\$1,700	\$0.00
2366		Market Street at Michael Succi Drive	17	PRECAST	Floor Missing Bricks	Rebuild Bench	3	0	\$0	\$2,200	\$2,200	\$0.00
2608	LR3	Suzanne Drive	6	PRECAST	Missing mortar from corbel	Corbel Repair	3	0	\$0	\$1,000	\$1,000	\$0.00
110	LR4	Middle Road at Peverly Hill Road	13	PRECAST	Missing pieces of frame	New Frame and Cover	3	0	\$0	\$820	\$820	\$0.00
410 556		Middle Road	-	BLOCK	Heavy debris on bench and invert, missing mortar from corbel	Clean	3		\$0	\$550	\$550	\$0.00

	I		-		Appendix B.1 - Manhole Rehabilitation Recommendations - Infilt	auon Removal Cost Enectiveness Phontization				Est of the		Infilmetic D 10
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
387	LR5	Lafayette Drive	9	PRECAST	Chipped frame, broken bricks in corbel	New Frame and Cover, Corbel Repair	3	0	Removal Cost	\$1.820	\$1,820	Gallon Per Day Removed \$0.00
007	Litto		,	THEORET	Mineral deposits at wall, Exposed aggregate at MH wall due to H2S, moderate debris in		0		ψũ	¢1,020	\$1,020	40.00
1062	LR5	Lafayette Road	14	PRECAST	bench and invert	Epoxy Liner	3	0	\$0	\$7,000	\$7,000	\$0.00
1074	LR5	Lafayette Road at Andrew Jarvis Drive	8	PRECAST	Frame and cover below grade	Raise to Surface	3	0	\$0	\$1,100	\$1,100	\$0.00
1075	LR5	Lafayette Road	9	PRECAST	Moderate debris on bench and roots at wall	Cementitious Liner	3	0	\$0	\$1,700	\$1,700	\$0.00
107	LR6	Lafayette Road	6	PRECAST	Light debris buildup, missing mortar at corbel.	Cementitious Liner	3	0	\$0	\$1,020	\$1,020	\$0.00
2470		Lafavatta Daad	,	PRECAST	Manhole cover significantly below grade, roots at bench and wall. Debris on bench	Corbel Repair, Root Treatment, Cementitious Liner, Raise to Surface	2	0	¢o	¢F 400	¢F 400	¢0.00
2479 2484	LR6 LR6	Lafayette Road Lafayette Road at Coach Road	6	PRECAST	Infiltration staining at wall, frame missing piece	New Frame and Cover	3	0	\$0 \$0	\$5,490 \$820	\$5,490 \$820	\$0.00 \$0.00
2404	LKO		0	PRECASI	Brick loose on bench, moderate debris on bench. Possible industrial connection/service		3		<u>۵</u> 0	\$02U	\$020	\$0.00
2499	LR6	Lafayette Road	7	PRECAST	infiltration.	Rebuild Bench	3	0	\$0	\$2,200	\$2,200	\$0.00
2505	LR6	Lafayette Road	7	PRECAST	Moderate debris on bench	Rebuild Bench	3	0	\$0	\$2,200	\$2,200	\$0.00
2511	LR6	Lafayette Road at Longmeadow Road	4	PRECAST	Moderate debris on bench	Rebuild Bench	3	C	\$0	\$2,200	\$2,200	\$0.00
2617	LR6	Lafayette Road	7	PRECAST	Exposed aggregate at MH wall due to H2S. Missing mortar from bench	Epoxy Liner	3	0	\$0	\$4,000	\$4,000	\$0.00
2619	LR6	Lafayette Road at Lang Road	6	PRECAST	Broken invert and bench	Rebuild Bench	3	0	\$0	\$2,200	\$2,200	\$0.00
106		Maplewood Avenue	7	PRECAST	Cracked cover, corbel missing bricks	New Frame and Cover	3	0	\$0	\$820	\$820	\$0.00
112	M1	US Rt 1 Bypass	/	PRECAST	Broken and missing bricks in corbel, Light debris in bench and invert Broken and missing bricks in corbel, Light debris in bench and invert, infiltration stains a	Corbel Repair	3	0	\$0	\$1,000	\$1,000	\$0.00
113	M1	US Rt 1 Bypass	5	PRECAST	Broken and missing bricks in corbei, Light debris in bench and invert, inititation stains a walls	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
113	M1	US Rt 1 Bypass at Cutts Street	5	PRECAST	Broken and missing bricks in corbel, Light debris throughout manhole	Corbel Repair	3	0	\$0	\$1,000	\$1,000	\$0.00
2131	M1	Edmond Avenue	11	PRECAST	Missing mortar and bricks from corbel	Corbel Repair	3	0	\$0	\$1,000	\$1,000	\$0.00
2169		TJ Gamester Avenue	10	PRECAST	See Appendix F	Continue to Monitor	3	0	\$0	\$0	\$0	\$0.00
458	B1	Colonial Drive at Worthen Road	7	BRICK	Missing bricks and mortar from corbel	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
459	B1	Colonial Drive	6	BRICK	Missing bricks and mortar from corbel	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
628	GR1	Oriental Gardens R.O.W.	12	PRECAST	Roots in corbel and wall	Root Treatment	2	0	\$0	\$2,200	\$2,200	\$0.00
639	GR1	Portsmouth Boulevard Easement	10	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
640	GR1	Commerce Way	11	PRECAST	Roots and debris on bench	Root Treatment	2	0	\$0	\$2,200	\$2,200	\$0.00
643	GR1	Woodbury Avenue	13	PRECAST	Roots at wall	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
656	GR1	Woodbury Avenue	6	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
657 658	GR1 GR1	Woodbury Avenue at Arthur Brady Drive	5	PRECAST PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0 \$0	\$0	\$0 \$0	\$0.00 \$0.00
812	GR1	Woodbury Avenue Granite Street R.O.W.	10	BRICK	No defects Roots and debris on bench	Continue to Monitor Root Treatment	2	0	\$0	\$0 \$2,200	\$0 \$2,200	\$0.00
817	GR1	Sanderling Way Easement	9	PRECAST	Missing mortar from corbel	Continue to Monitor	2		\$0	\$2,200	\$2,200	\$0.00
820	GR1	Portsmouth Boulevard at Osprey Drive	5	BRICK	Roots at wall	Continue to Monitor	2	0	\$0	\$0 \$0	\$0 \$0	\$0.00
823	GR1	Portsmouth Boulevard	7	BRICK	Frame cracked and missing pieces, Roots and debris on bench, corbel missing mortar	New Frame and Cover, Root Treatment	2	0	\$0	\$3.020	\$3,020	\$0.00
					Manhole cover below grade, no bench and invert in manhole. Manhole bottom full of						+++++++++++++++++++++++++++++++++++++++	
824	GR1	Portsmouth Boulevard	8	BRICK	debris, corbel missing bricks and mortar	Clean, Corbel Repair	2	0	\$0	\$1,550	\$1,550	\$0.00
913	GR1	Blue Heron Drive	6	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
915	GR1	Blue Heron Drive near Sanderling Way	9	BRICK	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
917		Shearwater Drive	9	BRICK	Abandoned Manhole	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
921	GR1	Staysail Way	8	BRICK	Missing bricks and mortar from corbel. Possible industrial connection/service infiltration.	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
2372	GR1 GR1	Shearwater Drive	10	PRECAST PRECAST	Abandoned Manhole	Continue to Monitor	2	0	\$0	\$0 \$0	\$0 ¢0	\$0.00 \$0.00
2373 5399	GR1	Shearwater Drive Sanderling Way	10	PRECAST	Abandoned Manhole Missing mortar from corbel	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0 \$0	\$0.00
5490		Shearwater Drive near Portsmouth Boulevard	12	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0 \$0	0 \$0	\$0.00
529		Barberry Lane Easement	10	PRECAST	Heavy debris on bench, corbel missing mortar	Clean	2		\$0	\$550	\$550	\$0.00
1308	HS11	Fields Road	7	BLOCK	Light debris on bench, chipped frame	New Frame and Cover	2	0	\$0	\$820	\$820	\$0.00
1310	HS11	Fields Road	8	PRECAST	Crack in wall, frame missing pieces. Possible industrial connection/service infiltration.	New Frame and Cover, Cementitious Liner	2	0	\$0	\$2,180	\$2,180	\$0.00
1389	HS11	US Bypass 1 at rear	11	BRICK	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
1441	HS11	Islington Street	9	PRECAST	Bench and invert missing mortar	Rebuild Bench	2	0	\$0	\$2,200	\$2,200	\$0.00
2245	HS11	Islington Street	12	PRECAST	Moderate debris in bench and invert, roots at wall. Brick repair at bottom of MH wall.	Cementitious Liner	2	0	\$0	\$2,210	\$2,210	\$0.00
2253	HS11	Islington Street	9	PRECAST	Bench and invert missing mortar	Rebuild Bench	2	0	\$0	\$2,200	\$2,200	\$0.00
5530		Bartlett Street	7	PRECAST	No defects	Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0	\$0.00
5531 5532	HS11 HS11	Bartlett Street Bartlett Street	0	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0 ¢0	\$0.00 \$0.00
5533	HS11	Bartlett Street	8	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0 \$0	۵۵ ۵۷	\$0.00
5535		Bartlett Street	8	PRECAST	No defects	Continue to Monitor	2		\$0	\$0 \$0	\$0 \$0	\$0.00
5536		Bartlett Street at Cate Street	8	PRECAST	Broken bricks in corbel	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
5547		Brewery Lane	15	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5549	HS11	Lovell Street R.O.W.	10	PRECAST	Disconnected drop connection in manhole	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5818		Aldrich Road	8	PRECAST	Heavy debris in invert	Clean	2	0	\$0	\$550	\$550	\$0.00
523	HS14	Borthwick Avenue	18	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
500	HS14	Borthwick Avenue	8	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
530	11011					1/ companyities to Linear			0.0	¢1 100		\$0.00
530 531	HS14	Coakley Road	6	BLOCK	Heavy debris in bench and invert, missing mortar in wall Loose brick in corbel, missing mortar in wall. Possible industrial connection/service	Cementitious Liner	2	0	\$0	\$1,190	\$1,190	\$0.00

					Appendix B.1 - Manhole Rehabilitation Recommendations - Infilt				Estimated	Estimated		Infiltration Removal Cost
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Infiltration	Structural / O&M Rehab	Estimated Total Rehab Cost	Effectiveness (\$ Spent per
					Missing mortar from wall, light debris on bench. Loose, missing, and broken bricks from				Removal Cost	Renab		Gallon Per Day Removed
533	HS14	Coakley Road	10	BLOCK	corbel	Corbel Repair, Cementitious Liner	2	0	\$0	\$2,870	\$2,870	\$0.00
535	HS14	Larry Lane			Missing mortar from corbel and walls, loose bricks in corbel	Corbel Repair, Cementitious Liner	2	0	\$0	+=1===	\$2,020	\$0.00
537	HS14	Coakley Road		BLOCK	Light debris on bench	Continue to Monitor	2	0	\$0		\$0	\$0.00
2237	HS14	Larry Lane	6	PRECAST	Loose bricks in corbel, missing mortar from corbel	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
5212	HS14	Borthwick Avenue	6	PRECAST	Moderate debris on bench and invert Heavy debris on bench and invert, missing mortar from corbel.Possible industrial	Clean	2	0	\$0	\$550	\$550	\$0.00
5213	HS14	Borthwick Avenue	9	PRECAST	connection/service infiltration.	Clean	2	0	\$0	\$550	\$550	\$0.00
5341	HS14	Granite Group parking lot	7	PRECAST	Heavy sediment on bench	Clean	2	0	\$0		\$550	\$0.00
580	HS15	Sheffield Road			Missing mortar from corbel	Continue to Monitor	2	0	\$0		\$0	\$0.00
581	HS15	Sheffield Road	7	BLOCK	Crack in invert, light debris on bench, broken brick and missing mortar from corbel	Corbel Repair	2	0	\$0	+ -	\$1,000	\$0.00
582	HS15	Sheffield Road	5		Broken and loose bricks on corbel	Corbel Repair	2	0	\$0	+ . / • • •	\$1,000	\$0.00
585	HS15	Hampshire Road	7		Moderate debris on bench, broken and loose bricks in corbel	Clean, Corbel Repair	2	0	\$0 \$0	\$1,550	\$1,550	\$0.00
592 596	HS15 HS15	Essex Avenue near easement Essex Avenue and Melbourne Street	12		Missing mortar from corbel and walls. Open joint in clay invert. Broken frame, missing mortar from corbel, missing mortar from walls	Continue to Monitor New Frame and Cover, Cementitious Liner	2	0	\$0 \$0	\$0 \$2,860	\$0 \$2,860	\$0.00 \$0.00
601	HS15	Benson Street	12		Missing mortar from corbel. Possible industrial connection/service infiltration.	Continue to Monitor	2	0	\$0		\$2,000	\$0.00
2728	HS15	Melbourne Street at Sims Avenue	9		Missing bricks and mortar from corbel	Continue to Monitor	2	0	\$0		\$0	\$0.00
5401	HS15	Melbourne Street at Vine Street	5		Broken corbel with loose and missing bricks	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
830	LD1	Portsmouth Boulevard R.O.W.	5	BRICK	Light debris in bench and invert, deteriorating corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
836	LD1	Dunlin Way	11		Possible industrial connection/service infiltration.	Continue to Monitor	2	0	\$0	\$0		\$0.00
1014	LD1	Michael Succi Drive	7	PRECAST	Light debris on bench	Continue to Monitor	2	0	\$0	+-		\$0.00
1015 1016	LD1 LD1	Michael Succi Drive	6	PRECAST PRECAST	Light infiltration stains at walls	Continue to Monitor	2	0	\$0 \$0			\$0.00 \$0.00
2157	LD1 LD1	Michael Succi Drive Dunlin Way R.O.W.	11		Roots coming in at bench, moderate debris buildup on bench. No defects	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	÷ •		
2158	LD1	Dunlin Way R.O.W.	13		Missing bricks in invert, moderate debris buildup	Clean	2	0	\$0	\$550		\$0.00
2365	LD1	Market Street at Michael Succi Drive	7		Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2367	LD1	Albacore Museum Access Pump Station	16		Cracked and missing mortar from corbel	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
2375	LD1	Michael Succi Drive	9	PRECAST	Light infiltration stains at walls	Continue to Monitor	2	0	\$0		\$0	\$0.00
2440	LD1	Kearsarge Way R.O.W.	8		Roots at wall and bench	Continue to Monitor	2	0	\$0	7 -		\$0.00
2451 1648	LD1 LR3	Spinnaker Way R.O.W. Nathaniel Drive	12	PRECAST PRECAST	Bricks missing from bench No defects	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0		\$0.00 \$0.00
1649	LR3 LR3	Nathaniel Drive	9	PRECAST	Light debris buildup	Continue to Monitor	2	0	\$0	\$0		\$0.00
2422	LR3	Nathaniel Drive R.O.W.	10		Rocks on bench	Continue to Monitor	2	0	\$0	\$0		\$0.00
2431	LR3	Nathaniel Drive R.O.W.	8	PRECAST	Infiltration staining at wall	Continue to Monitor	2	0	\$0			\$0.00
2449	LR3	Nathaniel Drive R.O.W.	5	PRECAST	Loose Frame	Continue to Monitor	2	0	\$0	+ -		\$0.00
2460	LR3	Nathaniel Drive R.O.W.	7		Rocks on bench	Continue to Monitor	2	0	\$0	+-		\$0100
2551	LR3	Pamela Drive	7	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0		\$0.00
2583 2585	LR3 LR3	Suzanne Drive Suzanne Drive			Moderate debris in bench and invert Moderate debris in bench and invert	Clean Clean	2	0	\$0 \$0	\$550 \$550	\$550 \$550	\$0.00 \$0.00
2565	LR3 LR3	Suzanne Drive	0 Q		No defects	Continue to Monitor	2	0	\$0		\$030	\$0.00
2613	LR3	Simmons Road at Suzanne Drive	8		Warped Cover	New Frame and Cover	2	0	\$0	7 -	\$820	\$0.00
411	LR4	Plains Avenue at Peverly Hill Road	12		Light debris on bench	Continue to Monitor	2	0	\$0	+	\$0	\$0.00
555	LR4	Middle Road at Woodbury Avenue			Heavy debris on bench and invert, moderate roots throughout manhole	Root Treatment	2	0	\$0			\$0.00
557	LR4	Middle Road			Missing mortar from walls	Continue to Monitor	2	0	\$0	\$0		\$0.00
5394	LR4	Holiday Drive			Roots at corbel	Root Treatment	2	0	\$0	\$2,200		\$0.00
1037 1040	LR5 LR5	Ledgewood Drive			Missing mortar from corbel, light debris in bench and invert	Clean Carbol Dopoir	2	0	\$0 \$0	+++++	\$550 \$1,000	\$0.00 \$0.00
1040	LR5 LR5	Ledgewood Drive Portsmouth High School Parking lot			Missing mortar and bricks from corbel Frame cracked. Possible industrial connection/service infiltration.	Corbel Repair New Frame and Cover	2	0	\$0		\$1,000	\$0.00
1041	LR5	Lafayette Road			Roots at corbel. No channel for pipe connection. Corbel missing brick.	Rebuild Bench	2	0	\$0	++=+	\$2,200	\$0.00
117	LR6	Lafayette Road		PRECAST	Light debris in channel	Clean	2	0	\$0		\$550	\$0.00
118	LR6	Lafayette Road	9	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
132	LR6	Heritage Avenue at Post Road			Missing mortar from invert	Continue to Monitor	2	0	\$0	+-		\$0.00
133	LR6	Post Road			Missing mortar from corbel	Continue to Monitor	2	0	\$0			\$0.00
150	LR6	Robert Avenue R.O.W.		PRECAST	Corroded Frame	Continue to Monitor	2	0	\$0 \$0			\$0.00
226 2469	LR6 LR6	Constitution Avenue at Lafayette Road Lafayette Road	6 0	PRECAST PRECAST	Light debris on bench, corbel missing mortar Light debris on bench	Continue to Monitor Continue to Monitor	2	0	\$0	**		\$0.00 \$0.00
2409	LR0 LR6	Lafayette Road	6		Roots in corbel	Continue to Monitor	2	0	\$0	\$0		\$0.00
2475	LR6	Lafayette Road	7	PRECAST	Moderate debris on bench	Clean	2	0	\$0			\$0.00
2483	LR6	Lafayette Road at Coach Road	8	PRECAST	Light debris on bench, invert not fully visible	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2485	LR6	Lafayette Road at Coach Road	9		Light debris on bench	Continue to Monitor	2	0	\$0	+-		\$0.00
2489	LR6	Lafayette Road at Coach Road	6		No defects	Continue to Monitor	2	0	\$0	+-		\$0.00
2493	LR6	Lafayette Road		PRECAST	Light debris on bench	Continue to Monitor	2	0	\$0	\$0		\$0.00
2497	LR6	Lafayette Road		PRECAST PRECAST	Light debris in bench and invert Missing mortar from cortal Light debris on banch	Continue to Monitor	2	0	\$0 \$0	\$0		\$0.00 \$0.00
2509 2578	LR6 LR6	Lafayette Road Lafayette Road at Ocean Road	6		Missing mortar from corbel, Light debris on bench Missing mortar from bench	Continue to Monitor Continue to Monitor	2	0	\$0 \$0			\$0.00
2618	LR0 LR6	Lafayette Road	8		Infiltration staining at wall	Continue to Monitor	2	0	\$0			
2621	LR6	Lafayette Road at Freedom Circle	9		Missing mortar from corbel. Possible industrial connection/service infiltration.	Continue to Monitor	2	0	\$0			

					Appendix B.1 - Manhole Rehabilitation Recommendations -	Infiltration Removal Cost Effectiveness Prioritization	n					
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
2624	LR6	Heritage Avenue at Lafayette Road	11	PRECAST	No defects	Continue to Monitor	2	C	\$0	\$0	\$0	\$0.00
2625	LR6	Lafayette Road	14	PRECAST	Cracked frame, bricks missing from bench and invert	New Frame and Cover	2	0	\$0	\$820	\$820	\$0.00
2626 2627	LR6 LR6	Lafayette Road	13	PRECAST PRECAST	Corbel missing mortar	Continue to Monitor	2	0	\$0 \$0	\$0		¥0100
2627	LR6	Lafayette Road Lafayette Road	8	PRECAST	Infiltration staining on wall Corroded Frame	Continue to Monitor Continue to Monitor	2) \$0 \$0	, -		
2629	LR6	Lafayette Road	7		Debris on bench	Continue to Monitor	2	0) \$0	**		1.1.1.1
2630	LR6	Lafayette Road	6	PRECAST	Infiltration staining at wall	Continue to Monitor	2	0) \$0			
2639	LR6	Heritage Avenue	6	PRECAST	Chipped frame	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2644	LR6	Heritage Avenue	8		Bench missing mortar	Rebuild Bench	2	0	\$0			
2645	LR6	Heritage Avenue	5	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2658 2661	LR6 LR6	White Cedar Boulevard R.O.W. Springbrook Circle R.O.W.	10		Roots at wall Roots at corbel and wall	Continue to Monitor Root Treatment	2	0	\$0 \$0	, -	\$0 \$2,200	\$0100
89		Alder Way	9	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0) <u>\$0</u>	<u>\$2,200</u> \$0	\$2,200	\$0.00
94	M1	Cutts Street	7	PRECAST	Light debris on bench, cracked cover	New Frame and Cover	2	0	\$0	\$820	\$820) \$0.00
95	M1	Maplewood Avenue at Cutts Street	11		Infiltration staining at walls, missing mortar from corbel	Continue to Monitor	2	C) \$0	\$0	\$0	
96	M1	Maplewood Avenue	12		Moderate debris on bench	Clean	2	0	\$0) \$0.00
97	M1	Maplewood Avenue	9		No defects	Continue to Monitor	2	0	\$0	\$0		\$0.00
98	M1	Maplewood Avenue	5		Missing mortar and bricks from corbel	Continue to Monitor	2	0	\$0	, -		\$0100
99 100	M1 M1	Maplewood Avenue near Rt 95 overpass Maplewood Avenue	6	PRECAST PRECAST	Light debris on bench, loose bricks and missing mortar from corbel Infiltration staining at walls, moderate debris on bench	Continue to Monitor Clean	2	0	\$0 \$0	\$0 \$550) \$0.00 \$0.00
100	M1	Maplewood Avenue	5		Missing mortar from corbel	Clean Continue to Monitor	2		50 \$0	۵۵۵ <u>۶</u> \$0		\$0.00 \$0.00
101	M1	Maplewood Avenue	11	PRECAST	Loose bricks in corbel	Continue to Monitor	2	0) \$0			
104	M1	Maplewood Avenue	8	PRECAST	Loose debris on bench, corbel missing bricks and mortar, loose frame	Continue to Monitor	2	0	\$0	ţŢ		
105	M1	Maplewood Avenue	9	PRECAST	Infiltration staining at walls	Continue to Monitor	2	C	\$0	\$0		*0100
110	M1	Fairview Avenue	5	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0		,
115	M1	US Rt 1 Bypass	6	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0		ψ0.00
759	M1	Fairview Avenue at O'Leary Place	4	PRECAST PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0 \$0	\$0		¥0100
2128 2129	M1 M1	Maplewood Avenue Maplewood Avenue at Fairview Avenue	0		Light debris on bench, corbel missing mortar Missing mortar from corbel, loose frame	Continue to Monitor Continue to Monitor	2	0	50 \$0			
2359	M1	Maplewood Avenue	7	PRECAST	Light debris on bench	Continue to Monitor	2	0) \$0	, -		
2360	M1	Maplewood Avenue	5		Evidence of surcharge, bench and invert non-existent	Rebuild Bench	2	0	\$0		\$2,200	
2794	M1	Maplewood Avenue at Cutts Street	12	PRECAST	Light debris in bench and invert	Continue to Monitor	2	C	\$0	\$0	\$0	\$0.00
5319	M1	O'Leary Place	6	PRECAST	Light debris in manhole	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2165		FW Hartford Drive	6		See Appendix F	Continue to Monitor	2	0	\$0	\$0		*0100
2166	P2A	FW Hartford Drive	9		See Appendix F	Continue to Monitor	2	0	\$0 \$0			\$0.00
2170 514	P2A B1	FW Hartford Drive Victory Road	12		See Appendix F Manhole buried	Continue to Monitor Raise to Surface	<u> </u>	0	\$0 \$0	, -		0 \$0.00 \$0.00
633	GR1	Commerce Way Easement	13		No defects	Continue to Monitor	1	0) \$0	÷.,	\$1,100	\$0.00
634	GR1	Commerce Way Easement	12		No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
815	GR1	Portsmouth Boulevard near Shearwater Drive	14		No defects	Continue to Monitor	1	C	\$0	\$0		\$0.00
819	GR1	Portsmouth Boulevard at Commerce Way	6	BRICK	Light debris on bench and invert	Clean	1	0	\$0	1		\$0.00
912	GR1	Blue Heron Drive	7		No defects	Continue to Monitor	1	0	\$0			+0100
914		Blue Heron Drive	12		No defects	Continue to Monitor	1	0	\$0 \$0	\$0	\$0 \$0	ψ0.00
919 922	GR1 GR1	Shearwater Drive at Blue Heron Drive Staysail Way	7		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$0 \$0		\$0100
5307	GR1	Commerce Way R.O.W.			No defects	Continue to Monitor	1	0) \$0	\$0 \$0		
5398	GR1	Blue Heron Drive at Sanderling Way			No defects	Continue to Monitor	1	0	\$0			
5491	GR1	Shearwater Drive	9		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
5492	GR1	Shearwater Drive	8		No defects	Continue to Monitor	1	0	\$0			÷0100
5493	GR1	Sanderling Way	6		Possible industrial connection/service infiltration.	Continue to Monitor	1	0	\$0	7-		*0100
1302	HS11	Fells Road	8	BLOCK	No defects	Continue to Monitor	1		\$0 \$0	\$0		\$0.00
1305 1306	HS11 HS11	Thaxter Road Thaxter Road	9		No defects No defects	Continue to Monitor Continue to Monitor	1		\$0 \$0	\$0 \$0		*0100
1308	HS11 HS11	Fields Road	8		No defects	Continue to Monitor	1	0) <u>\$0</u> \$0			
1307		Aldrich Road	5		No defects	Continue to Monitor	1	C C) \$0 \$0			
1326	HS11	Chevrolet Avenue R.O.W.	11	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	,
1393	HS11	Cate Street	6		No defects	Continue to Monitor	1	0	\$0	\$0		ψ0.00
1437	HS11	Islington Street at Aldrich Road			No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
1439		Islington Street at Elm Court	8		No defects	Continue to Monitor	1	0	\$0			*0100
2247 2249		Ricci Lumber Yard	/ 7		No defects No defects	Continue to Monitor	1	0	\$0 \$0 \$0	\$0 \$0		0 \$0.00 \$0.00
2749	HS11 HS11	Islington Street Islington Street	14		No defects	Continue to Monitor Continue to Monitor	1		\$0 \$0			
5534	-	Bartlett Street	8		No defects	Continue to Monitor	1	0) \$0 \$0	ţŢ		
5539		Bartlett Street at Cate Street	6		No defects	Continue to Monitor	1	0) \$0 \$0	\$0		\$0100
	HS11	Islington Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
5540												
5540 5542 5544	HS11	Islington Street at Bartlett Street Islington Street	9		No defects No defects	Continue to Monitor Continue to Monitor	1	C	\$0 \$0			1.1.1.1

					Appendix B.1 - Manhole Rehabilitation Recommendations - Infiltr	ation Removal Cost Effectiveness Prioritization						
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
5545	HS11	Islington Street at Jewell Court	9	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
5546 5548	HS11 HS11	Islington Street Brewery Lane	12		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$0 \$0		\$0.00 \$0.00
5551	HS11	Brewery Lane	9		No defects	Continue to Monitor	1	0	\$0			
5830	HS11	Cass Street	8		No defects	Continue to Monitor	1	0	\$0			\$0.00
5831	HS11	Cass Street at Lovell Street	7		No defects	Continue to Monitor	1	0	\$0	, . , .		\$0.00
5834	HS11	Cass Street at Lovell Street	8		No defects	Continue to Monitor	1	0	\$0 \$0			\$0100
5839 5840	HS11 HS11	Cass Street Cass Street	8	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0	\$0 \$0		\$0.00 \$0.00
5844	HS11	Lovell Street	7		No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
524	HS14	Borthwick Avenue Easement	20		No defects	Continue to Monitor	1	0	\$0			\$0.00
527	HS14	Barberry Lane Easement	11		No defects	Continue to Monitor	1	0	\$0			+
538	HS14	Coakley Road	7		No defects	Continue to Monitor	1	0	\$0 \$0	, . , .		+ • • • • •
5342 5410	HS14 HS14	Coakley Road Barberry Lane Easement	14		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0	\$0 \$0		\$0.00 \$0.00
5411	HS14	Barberry Lane Easement	14		No defects	Continue to Monitor	1	0	\$0			\$0.00
5854	HS14	Barberry Lane Easement	16		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
5856	HS14	Barberry Lane Easement	13		No defects	Continue to Monitor	1	0	\$0			\$0.00
594	HS15	Essex Avenue	12		No defects	Continue to Monitor	1	0	\$0			40100
597 837	HS15 LD1	Sheffield Road Dunlin Way and Osprey Drive	6		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00 \$0.00
1017	LD1	Chase Drive at Michael Succi Drive	8		No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
2430	LD1	Kearsarge Way R.O.W.	14		No defects	Continue to Monitor	1	0	\$0			\$0.00
2444	LD1	Spinnaker Way R.O.W.	10		No defects	Continue to Monitor	1	0	\$0			\$0.00
2448	LD1	Spinnaker Way R.O.W.	12		No defects	Continue to Monitor	1	0	\$0			\$0.00
2457 1647	LD1 LR3	Dunlin Way Nathaniel Drive	13	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0			\$0.00 \$0.00
2415	LR3 LR3	Nathaniel Drive R.O.W.	8		No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
2419	LR3	Nathaniel Drive R.O.W.	10		No defects	Continue to Monitor	1	0	\$0			
2427	LR3	Nathaniel Drive R.O.W.	8	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
2436	LR3	Nathaniel Drive R.O.W.	7		No defects	Continue to Monitor	1	0	\$0	+-		\$0.00
2437	LR3	Nathaniel Drive R.O.W.	8		No defects No defects	Continue to Monitor	1	0	\$0 \$0	+-		\$0.00 \$0.00
2441 2452	LR3 LR3	Nathaniel Drive R.O.W. Nathaniel Drive R.O.W.	7		No defects	Continue to Monitor Continue to Monitor	1	0	\$0	\$0 \$0		\$0.00
2462	LR3	Nathaniel Drive R.O.W.	7		No defects	Continue to Monitor	1	0	\$0			\$0.00
2464	LR3	Nathaniel Drive R.O.W.	6	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
2466	LR3	Nathaniel Drive	9		No defects	Continue to Monitor	1	0	\$0			
2534	LR3	Mariette Drive	7		No defects	Continue to Monitor	1	0	\$0	÷		+0100
2536 2538	LR3 LR3	Mariette Drive at Nathaniel Drive Mariette Drive	9		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00 \$0.00
2540	LR3	Denise Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
2554	LR3	Mariette Drive	17	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2556		Mariette Drive			No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2558	LR3	Mariette Drive			No defects	Continue to Monitor	1	0	\$0	7.		,
2560 2566	LR3 LR3	Mariette Drive at Ocean Road Ocean Road	17		No defects Manhole buried behind home	Continue to Monitor Raise to Surface	1	0	\$0 \$0	\$(\$1,100		\$0.00 \$0.00
2567	LR3 LR3	Ocean Road	9		No defects	Continue to Monitor	1	0	\$0			\$0.00
2579	LR3	Suzanne Drive near Ocean Drive		PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
2581	LR3	Suzanne Drive	6		No defects	Continue to Monitor	1	0	\$0			\$0.00
2587	LR3	Suzanne Drive			No defects	Continue to Monitor	1	0	\$0			+ • • • •
2589 2593	LR3 LR3	Suzanne Drive Suzanne Drive	9		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00 \$0.00
2595	LR3	Suzanne Drive	7		No defects	Continue to Monitor	1	0	\$0			\$0.00
2597	LR3	Wallis Road	7		No defects	Continue to Monitor	1	0	\$0			
2600	LR3	Wallis Road	7		No defects	Continue to Monitor	1	0	\$0			\$0100
2601	LR3	Wallis Road	7		No defects	Continue to Monitor	1	0	\$0			+
2607 2609	LR3 LR3	Suzanne Drive Suzanne Drive	/ Q		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00 \$0.00
2610	LR3	Suzanne Drive	9		No defects	Continue to Monitor	1	0	\$0	\$(\$(\$0.00
2611	LR3	Suzanne Drive	7		No defects	Continue to Monitor	1	0	\$0			\$0.00
2612	LR3	Simmons Road at Suzanne Drive	5	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0100
2614	LR3	Simmons Road	7		No defects	Continue to Monitor	1	0	\$0	7.		\$0100
558 559	LR4 LR4	Middle Road Middle Road	8		No defects	Continue to Monitor	1	0	\$0 \$0	\$0 \$0		\$0.00 \$0.00
559	LR4 LR4	Middle Road At entrance of The Chase Home			No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0	\$(\$(\$0.00
2208	LR4 LR4	Middle Road at The Chase Home			No defects	Continue to Monitor	1	0	\$0			
2209	LR4	Middle Road			No defects	Continue to Monitor	1	0	\$0			\$0.00

					Appendix B.1 - Manhole Rehabilitation Recommendations - Inf	iltration Removal Cost Effectiveness Prioritization	1					
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
2210	LR4	Middle Road	13	PRECAST	Possible industrial connection/service infiltration.	Continue to Monitor	1	0	\$0	\$0) \$0.00
381	LR5	Lafayette Drive	12	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
1038 1039	LR5 LR5	Ledgewood Drive	5	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1		\$0 \$0	\$0 \$0		*0100
1037	LR5	Ledgewood Drive R.O.W.	11		No defects	Continue to Monitor	1	0) \$0 \$0			· · · · · · · · · · · · · · · · · · ·
1059	LR5	Lafayette Road	10	PRECAST	No defects	Continue to Monitor	1	C	\$0			\$0.00
1060	LR5	Lafayette Road	11		No defects	Continue to Monitor	1	0	\$0	**		ψ0.00
1063	LR5	Ledgewood Drive	13		No defects	Continue to Monitor	1	0	\$0 \$0	\$0) \$0.00 \$0.00
1068 1070	LR5 LR5	Lafayette Road Lafayette Road at Edgewood Drive	10	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1		50 \$0	\$0 \$0		\$0.00 \$0.00
1070	LR5	Lafayette Road	9		No defects	Continue to Monitor	1	0	\$0			
1072	LR5	Lafayette Road at Artwill Avenue	9		No defects	Continue to Monitor	1	C	\$0	\$0	\$0) \$0.00
1073	LR5	Lafayette Road at Andrew Jarvis Drive	9	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		φ0.00
136	LR6 LR6	Heritage Avenue	5		No defects	Continue to Monitor	1	0	\$0 \$0	\$0		0 \$0.00 \$0.00
149 2477	LR6	Lafayette Road Lafayette Road	14		No defects No defects	Continue to Monitor Continue to Monitor	1		50 \$0	\$0 \$0		
2481	LR6	Lafayette Road	8		No defects	Continue to Monitor	1	C) \$0 \$0	\$0		
2491	LR6	Lafayette Road	8	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
2495	LR6	Lafayette Road	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		ψ0.00
2503	LR6	Lafayette Road at Blue Fish Boulevard	5	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2616	LR6 LR6	Lafayette Road at Suzanne Drive	8	PRECAST	No defects Manhole buried	Continue to Monitor	1	0	\$0 \$0) \$0.00 \$0.00
2620 2622	LR6	Lafayette Road Lafayette Road	0 0	PRECAST	No defects	Raise to Surface Continue to Monitor	1		50 \$0			\$0.00
2623	LR6	Lafayette Road	9		No defects	Continue to Monitor	1	C) \$0 \$0	\$0		
2633	LR6	Lafayette Road	8	PRECAST	Possible industrial connection/service infiltration.	Continue to Monitor	1	C	\$0	\$0	\$0) \$0.00
2636	LR6	Heritage Avenue	12	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2637	LR6	Heritage Avenue	10		No defects	Continue to Monitor	1	0	\$0	\$0		\$3100
2638 2641	LR6 LR6	Heritage Avenue Heritage Avenue	/		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0			¥0.00
2643	LR6	Heritage Avenue	9		No defects	Continue to Monitor	1) <u>\$0</u> \$0			
2653	LR6	Robert Avenue R.O.W.	8		No defects	Continue to Monitor	1	0	\$0			
2654	LR6	Robert Avenue R.O.W.	8	PRECAST	No defects	Continue to Monitor	1	C	\$0	\$0	\$0) \$0.00
2655		White Cedar Boulevard R.O.W.			No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2656		White Cedar Boulevard R.O.W.			No defects	Continue to Monitor	1	0	\$0	\$0		\$9190
2659 2660		White Cedar Boulevard R.O.W. Springbrook Circle Parking lot	12		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	1.1		0 \$0.00 \$0.00
102	M1	Maplewood Avenue	10		No defects	Continue to Monitor	1	0) \$0			
102	M1	Fairview Avenue	7		No defects	Continue to Monitor	1	0) \$0			
2130	M1	Edmond Avenue	12		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2132	M1	Maplewood Avenue	10		No defects	Continue to Monitor	1	0	\$0	\$0		φ0:00
167 278		FW Hartford Drive Easement FW Hartford Drive at TJ Gamester Avenue	8		See Appendix F	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$0 \$0		*0.00
278		FW Hartford Drive			See Appendix F See Appendix F	Continue to Monitor	1	0) <u></u> \$0			\$0.00
280		FW Hartford Drive			See Appendix F	Continue to Monitor	1	0	\$0		\$0	
281	P2A	FW Hartford Drive		PRECAST	See Appendix F	Continue to Monitor	1	0	\$0	\$0	\$0	φ0.00
283	P2A	TJ Gamester Avenue			See Appendix F	Continue to Monitor	1	C	\$0	\$0		7
496	P2A	TJ Gamester Avenue			See Appendix F	Continue to Monitor	1	0	\$0			,
2167 2168	P2A P2A	FW Hartford Drive FW Hartford Drive at TJ Gamester Avenue			See Appendix F See Appendix F	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	1.1		
2405		FW Hartford Drive	9		See Appendix F	Continue to Monitor	1	0) \$0 \$0	1.1		
2412		FW Hartford Drive	7		See Appendix F	Continue to Monitor	1	0) \$0	\$0		
2416		FW Hartford Drive			See Appendix F	Continue to Monitor	1	0	\$0	\$0	\$0	40100
2420		FW Hartford Drive			See Appendix F	Continue to Monitor	1	0	\$0	\$0		\$0100
2423 2428		FW Hartford Drive FW Hartford Drive			See Appendix F See Appendix F	Continue to Monitor Continue to Monitor	1	0	\$0 \$0			Ţ
2420	P2A P2A	FW Hartford Drive			See Appendix F	Continue to Monitor	1	0) <u>\$0</u>			
2438		FW Hartford Drive			See Appendix F	Continue to Monitor	1	0	\$0	\$0		
2442		FW Hartford Drive	8	PRECAST	See Appendix F	Continue to Monitor	1	0	\$0	\$0) \$0.00
2446		FW Hartford Drive			See Appendix F	Continue to Monitor	1	0	\$0	1.1		+
2668		FW Hartford Drive Easement			See Appendix F	Continue to Monitor	1		\$0 \$0 \$0	\$0		\$5105
5850 630		FW Hartford Road Oriental Gardens R.O.W.	8		See Appendix F Can not locate manhole	Continue to Monitor Locate Manhole	1		\$0 \$0			+ • • • •
637	GR1	Commerce Way	8	1	Can not locate manhole	Locate Manhole	1		\$0	÷.••		\$0.00
641	GR1	· · · · · · · · · · · · · · · · · · ·	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
659	GR1		8		Can not locate manhole	Locate Manhole	1	0	\$0			
814	GR1	Destance with Deviley and	8		Can not locate manhole	Locate Manhole	1	0	\$0			
825	GR1	Portsmouth Boulevard	8	I	Can not locate manhole	Locate Manhole	1	I C	\$0	\$100	\$100	\$0.00

					Appendix B.1 - Manhole Rehabilitation Recommenda	ations - Infiltration Removal Cost Effectiveness Prioritization	า					
	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
918	-	Shearwater Drive R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	+	\$100	\$0.00
2374		Shearwater Drive	8		Can not locate manhole	Locate Manhole	1	0	\$0	φ100	\$100	\$0.00
2384	GR1		8		Can not locate manhole. Located on Pease effluent line.	Locate Manhole	1	0	\$0	+	\$100	\$0.00
5494	GR1	Common Wass Francisco	8		Can not locate manhole	Locate Manhole	1	0	\$0	+	\$100	\$0.00
5505 1327		Commerce Way Easement Brewery Avenue R.O.W.	8		Can not locate manhole	Locate Manhole Locate Manhole	1	0	\$0 \$0	÷	\$100 \$100	\$0.00 \$0.00
1327		Jewell Court R.O.W.	8	-	Can not locate manhole Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
1333		Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
1334	-	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	+	\$100	\$0.00
1335		Albany Street	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
1338		Cass Street	8		Can not locate manhole	Continue to Monitor	1	0	\$0		\$0	\$0.00
1339		Cass Street	8		Manhole Abandoned	Continue to Monitor	1	0	\$0		\$C	\$0.00
1340	HS11	Cass Street	8		Manhole Abandoned	Continue to Monitor	1	C	\$0		\$C	
1394	HS11	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1395	HS11	Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	+	\$100	\$0.00
1396	HS11	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	C	\$0	\$100	\$100	\$0.00
1434		Islington Street	8		Can not locate manhole	Locate Manhole	1	C	\$0	†	\$100	\$0.00
1440		Islington Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	4	\$100	\$0.00
2243		Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
2244		Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	+	\$100	\$0.00
2246		Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
2251		Cass Street	8		Manhole Abandoned	Continue to Monitor	1	0	\$0	T	\$C	\$0.00
2254		Chevrolet Avenue	8		Manhole Abandoned	Continue to Monitor	1	0	\$0		\$C	\$0.00
2255		Chevrolet Avenue	8		Manhole Abandoned	Continue to Monitor	1	0	\$0	- + -	\$C	
5096		Lovell Street	8		Manhole Abandoned	Continue to Monitor	1	0	\$0	1.1	\$0	
5333 5537		Brewery Avenue R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	φ100	\$100	\$0.00 \$0.00
588		Jewell Court Hampshire Road	8		Can not locate manhole	Locate Manhole Locate Manhole	1	0	\$0		\$100 \$100	\$0.00
1383		US Rt 1 Bypass	0		Can not locate manhole Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
1423		Spinney Road	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
2211		Hampshire Road R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
600 Duplicate		Sims Avenue	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
4		Kearsarge Way R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
64		Market Street R.O.W.	8		Cover too large to open	New Frame and Cover	1	0	\$0		\$820	\$0.00
65	LD1	Market Street R.O.W.	8		Cover too large to open	New Frame and Cover	1	C	\$0	\$820	\$820	\$0.00
2410	LD1	Michael Succi Drive Railroad Easement	8		Cover too large to open	New Frame and Cover	1	0	\$0	\$820	\$820	\$0.00
2414	LD1	Michael Succi Drive Railroad Easement	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
2418		Michael Succi Drive Railroad Easement	8		Can not locate manhole	Locate Manhole	1	0	\$0	†	\$100	\$0.00
2426		Kearsarge Way R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	†	\$100	\$0.00
2435		Kearsarge Way R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
2553		Pamela Drive	8		Can not locate manhole	Locate Manhole	1	0	\$0	+	\$100	\$0.00
2562		Ocean Road	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
2564		Ocean Road	8		Can not locate manhole	Locate Manhole	1	0	\$0	ψ100	\$100	\$0.00
2204		Greenleaf Woods Drive	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	
1042		Portsmouth High School fields	8		Can not locate manhole	Locate Manhole	1	0	\$0	+	\$100	
1043		Portsmouth High School fields	8		Can not locate manhole	Locate Manhole		0	\$0		\$100	\$0.00
1061		Lafayette Road	8		Can not locate manhole	Locate Manhole	1	0	\$0 \$0		\$100	\$0.00 \$0.00
1066 1067		Lafayette Road Lafayette Road	0 0		Can not locate manhole	Locate Manhole Locate Manhole	1	0	\$0		\$100 \$100	\$0.00
1067 1069 Duplicate		Lafayette Road R.O.W.	0 Q		Can not locate manhole Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
2634		Lafayette Road	8		Can not locate manhole	Raise to Surface	1	0	\$0		\$1,100	\$0.00
769		Maplewood Avenue	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
2792		Cutts Street at Ashland Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	†	\$100	\$0.00
168		FW Hartford Drive	8		Can not locate manhole	Continue to Monitor	1	0	\$0		\$100	
100		TJ Gamester Avenue	8		Can not locate manhole	Continue to Monitor	1	0	\$0		\$100	

MH Number Metering Basin Street I Manhole Material Observations I Renabilitation Recommendations I Inflittration Structural / UKM						Appendix B.2 - Manhole Rehabilitation Recommendati	ons - Max Defect Score Prioritization						
1010 4000 julies 11 4000 julies 11 4000 julies 12 400 julies 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12 12	MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations			Infiltration	Structural / O&M	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
Hole Hole Hole Y ALCOM Participant Control A D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D D <thd< th=""> <thd< th=""> D <th< td=""><td></td><td></td><td></td><td></td><td></td><td>Bench and invert gone/broken/sinking, infiltration staining at walls, piece of frame</td><td>New Frame and Cover, Rebuild Bench, Grout Manhole,</td><td></td><td></td><td></td><td></td><td></td><td>_</td></th<></thd<></thd<>						Bench and invert gone/broken/sinking, infiltration staining at walls, piece of frame	New Frame and Cover, Rebuild Bench, Grout Manhole,						_
No. 116 Upp for Surgic Surgi Surgi Surgi Surgic Surgic Surgi Surgic Surgic Surgi Surgic Surg			,	11		5		5	720			\$11,420	\$3.33
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111 0 18° mount 1 18° mount 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 <th1< th=""> <th1< th=""></th1<></th1<>				8					0	÷ •		\$820 \$820	\$0.00 \$0.00
959 671 Open Extraction 9 Amplitude Amplitude				4		, j			0	÷ •		\$820	\$0.00
370 6/11 Space field (2) Solar angle field and state				8				4	0	+-	+	\$820	\$0.00
UDB NOT Water into and service 14 Weak Service 000000000000000000000000000000000000	93	M1	Cutts Street at Rt 1 Bypass	7		Evidence of surcharge, heavy debris blocking flow, cracked cover	Clean, New Frame and Cover	4	0			\$1,370	\$0.00
131 151 Stability and Start a				6		3		4	0	1.1	1 1 1 1	\$2,200	\$0.00
S1: Option Disc Disc <thdisc< th=""> Disc Disc <th< td=""><td></td><td></td><td>, , , , , , , , , , , , , , , , , , ,</td><td>14</td><td></td><td></td><td></td><td></td><td>0</td><td>1.1</td><td></td><td>\$2,200</td><td>\$0.00</td></th<></thdisc<>			, , , , , , , , , , , , , , , , , , ,	14					0	1.1		\$2,200	\$0.00
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S/7 S/80 Method 6 B/0X Mark destingend and wind destingend and wind destingend and set destingend Method 6 B/0X Method wind destingend wind destingend set destingend Method and set destingend Method and				10	-			4	0	÷o		\$2,200	\$0.00
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981 1673 1673 1670 17 BCCC 100 consultant respective links, constraint respective links, constraint, constraint respective links, constraint respectind				10				4	0	+-		\$2,200	\$0.00
996 Hith Immediate 9 BEAL Separation And Local								4	0	\$0		\$2,200	\$0.00
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NI Intel Weight Start 6 000000000000000000000000000000000000				9				4	0	÷ •	+= ===	\$2,200	\$0.00
2981 LLB Under Board ellise Fiel Discretaria 6 PECCAT Moder solar endorm construction by an and and construction by an analysis of the solar and more, cool funding, and the solar and t				14				4	0	÷o	\$E/200	\$2,200	\$0.00
554 IAI Mail Mail Mark Soul at Least Reverse Sould Sould at Least Reverse Call Deput Relations 4 6 9 D372 9/1 Mark Mark Soul at Least Reverse 9 Reverse Control Deput Relations 4 10.00 9.0 State 9/1 Reverse Participant Relations 9 Reverse Control Deput Relations 4 10.00 State 1977 HIST State Table Participant Relations 4 10.00 State 10.00 State 10.00 State 10.00 State 10.00 State 10.00 State 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 <td></td> <td></td> <td></td> <td>6</td> <td></td> <td></td> <td></td> <td>4</td> <td>0</td> <td>+-</td> <td></td> <td>\$2,200 \$3,020</td> <td>\$0.00 \$0.00</td>				6				4	0	+-		\$2,200 \$3,020	\$0.00 \$0.00
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Jose Pipe concells has have not all set pipe for books have have not all set pipe for books have have not all set pipe for books have have have have have have have have				6					0	ţŢ		\$3,200	\$0.00
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Sh1 Code Code Res Microg contri valls, Buchord minute, Roog durins under,	920	GR1	Shearwater Drive	9	BRICK	infiltration.	Grout Manhole, Cementitious Liner	4	10,080	\$3,330	\$0	\$3,330	\$0.33
Part Part Marabe walk salaring at 1.4 gamp or force taken of Prillarion. Coul Marbale, councillosy using fillarion. Coul Marbale 4 16.0 37.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00 32.00	1397	HS11	Bartlett Street	7	BRICK	heavy debris buildup	Rebuild Bench, Cementitious Liner	4	0	\$0	\$3,390	\$3,390	\$0.00
827 1031 Hugs Park 9 BRCK Monet ploces in and in borch and invert. Lange Active Hulding Deck and Active Hulding Deck and invert. Lange Active Hulding Deck and Invert. Deck Active Hulding Deck and Invert. Deck Active Hulding Deck Activ	541	HS14	Coakley Road	7	BLOCK	Missing mortar in walls, No bench and invert, heavy debris buildup	Rebuild Bench, Cementitious Liner	4	0	\$0	\$3,560	\$3,560	\$0.00
Sh7 Introgene Road 10 BLOCK Minoris depoist and in roc bench and more, Ligd dorfs building Robuil Serie, Goul Marchie, Carrellina Land 4 7/70 97.000 97.200 538 GRI Wordbury, Meruiso 12 PECAST staining at mail roc bench and market. Ligd dorfs building incent, and staining at market, staini						5 51 T							
Statk Cent Sector (Sector Sector Sec		-		9				4				\$3,700	\$0.22
S33 GR1 Woodbary Acouse F1 Relation from and matching and investimation from works with infinition and work show infinition and work infinit	587	HS15	Hampshire Road	10	BLOCK			4	/20	\$2,000	\$2,200	\$4,200	\$2.78
Pin Pin <td>F224</td> <td>CD1</td> <td>Woodbury Avenue</td> <td>12</td> <td>DDECAST</td> <td></td> <td></td> <td>4</td> <td>720</td> <td>¢2,400</td> <td>\$2.200</td> <td>\$4.600</td> <td>\$3.33</td>	F224	CD1	Woodbury Avenue	12	DDECAST			4	720	¢2,400	\$2.200	\$4.600	\$3.33
591 H515 Essex Avenue and Midde Road 6 BLOCK buildage Rebuild Bech, Goud Manho, Cementitious Liner 4 288 452.90 52.20 377 L48 Grandard Woods Dhu 14 PECCAST Moned deposits at pic convicts (mining indu) indu ache effiliation Grand Manho, Cementitious Liner 4 17.280 53.100 1044 L55 Ldgswood Dine R OW. 5 PECCAST No bench and invest (bits buildig). Res (build Bench, Grand Manho, Cementitious Liner 4 2.88 52.20 53.100 1044 L55 Ldgswood Dine R OW. 5 PECCAST No bench and invest (bits buildig). Res (build Bench, Grand Manho, Cementitious Liner 4 2.88 51.200 1047 L55 DECCAST Avench and Manho, Cementitious Liner 4 1.400 55.90 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00 59.00	0004	GRI		12	FREGASI	5		4	720	\$2,400	\$2,200	\$4,000	ە.JJ
228 HST1 Singler Steel 8 PRECAST No bench and invest finitional matrice wait. Retuil Bench, Carout Manchale, Carout Man	591	HS15	Essex Avenue and Middle Road	6	BLOCK		Rebuild Bench, Grout Manhole, Cementitious Liner	4	288	\$2.590	\$2,200	\$4,790	\$8.99
377 LR4 Greeniest Woods Dive 14 PRECAST Minuted sposts at pice connections (primary linked) with active infiltration Greeniest Woods Main active striktion				8				4				\$5,160	\$1.03
10H3 Ledgwood Dwe R O.W. 5 PRCAST Works Adv and stars function, advers funding, advers fundis, advers funding, advers funding, advers funding, adve	377	LR4	Greenleaf Woods Drive	14	PRECAST	Mineral deposits at pipe connections (primary in/out) with active infiltration	Grout Manhole, Cementitious Liner	4	17,280	\$5,180	\$0	\$5,180	\$0.30
ID4 LRs CodeWood Line 4 228 Checkenitious Line 4 228 S2.20 S3.00 2121 HS14 CodeW Read 8 BLOCK Missing mortar in wall, no bench and invert, heavy debris buildug Robuild Bench, Grout Manhole, Cementitious Liner 4 720 \$3.00 228 GR Commerce Way Essement 8 BROCK Hirsting in the causing inflow. Located news in two bills, ponding around Cohe Repair, Rebuild Bench, Grout Manhole, Cementitious Liner 4 1.440 \$5.200 \$4.00 378 LR4 Greeneled Woods Drive 15 PRECAST Active inflitation and miner deposits at wall. costs Root Treathmert, Grout Manhole, Cementitious Liner 4 1.440 \$5.200 1303 HS11 Thader Road at Pols Road 10 BLOCK Locce Wish missing mortar, no bench and invert, notar wall. Robuild Bench, Grout Manhole, Cementitious Liner 4 1.040 \$4.00 \$2.000 2201 HS11 Thader Road at Pols Road 10 BLOCK Locce Wish missing mortar and wall, mortar in and mort miniter deposits in incoming line Rebuild Bench, Grout Manhole, Cementitious Liner						No bench and invert, beavy debris buildun, active infiltration at wall, frame chinned							
2385 GR1 Commerce Way Easement 8 BRICK Tame causing infour. Located on Pease efficient of more view twishle), ponding around function. Contel Repair, Rebuild Bench, Grout Mathole, Raise to 4 2,880 6,400 5,800 5,000 5,400 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000 5,000				5				4				\$5,240	\$7.71
228 GR1 Commerce Way Easement 8 BR(K) frame coupling inflow. Located on Pease effluentline. Surface 4 2.880 51.400 54.300 378 LR4 Ceretrielal Wood Drive 15 Prechast And Coupling inflow. Located on Pease effluentline. Grult Manhale. Cementilious Liner 4 1.440 55.200 52.200 1303 H511 Thatef Road at Fiels Road 10 BLOCK Active infiltation at wall post-sh and invert, anioral deposits in incoming line Rebuild Bench, Grout Manhale. Cementilious Liner 4 1.080 54.070 52.200 2221 HS11 Instart Road at Fiels Road 10 BLOCK Walls missing mortar, no bench and invert, noise at wall, corbel missing mortar and cacket Carbel Repair, Rebuild Bench, Grout Manhale. 4 1.080 53.200 2221 HS11 Islington Street 14 BRICKS TONE No bench and invert, nois at wall. Large gais in wall. Possible industrial Carbel Repair, Rebuild Bench, Grout Manhale. 4 1.400 55.550 52.200 1331 HS11 Brecker Andere Manhalization at wall. Large an invert, nois at wall. Large gais in wall. Possible industrial Carbel	2727	HS14	Coakley Road	8	BLOCK			4	720	\$3,330	\$2,200	\$5,530	\$4.63
138 LR4 Greented Woods Drive 15 PRECAST Active infitiation rom wall Grout Manhole, Comentitious Liner 4 1.440 \$5,200 \$30 1303 HS11 Thaxter Road at Fells Road 11 BLOCK Active infitiation and mineral deposits at wall, nock Red Linde Send, Crout Manhole, Cementitious Liner 4 7.200 \$4,070 \$5,200 2741 HS11 Thaxter Road at Fells Road 10 BLOCK Wein infitiation at and invert, mineral deposits in incoming line Rebuild Bench, Grout Manhole, Cementitious Liner 4 7.200 \$4,070 \$5,200 2271 HS11 Islington Street 10 BLOCK Wein infittation at wall, bench and invert, most and croad to dissing mortar and croaded Cementitious Liner 4 1,080 \$4,400 \$5,200 1313 HS11 Browey Lane 14 BRICK Active infittation at wall, note in corbel, no bench or invert, missing mortar and croaded Cementitious Liner 4 1,440 \$5,550 \$2,200 1333 HS15 Essex Avenue 12 BLOCK debris buildup Cementitious Liner 4 </td <td>220E</td> <td>CD1</td> <td>Commorce Way Ecoment</td> <td>0</td> <td>PDICK</td> <td></td> <td></td> <td>4</td> <td>2 000</td> <td>¢1 400</td> <td>\$4.200</td> <td>\$5,900</td> <td>¢0 E4</td>	220E	CD1	Commorce Way Ecoment	0	PDICK			4	2 000	¢1 400	\$4.200	\$5,900	¢0 E4
BR Optiminate Bouleward 10 BLOCK All initiation and mineral deposits at wall, notes Red Tradement, Grout Manhole, Cementitous Liner 4 7.00 54.07 1303 HS11 Tabder Road #Fells Rod 10 BLOCK Lose hirds in wiret, adve finitiation at wall, mech adm and mixet, adve finitiation at wall. Roberds and mixet, adve finitiation. Roberds and mixet, adve finitiation at wall. Roberds and mixet, adve finitiation. Roberds and mixet, adve finitiation at wall. Roberds and mixet, adve finitiation at wall. Roberds and mixet, adve finitiation. Roberds and mixet, adve finitiation at wall. Roberds and mixet, adve finitiation. Roberds and mixet, adve finitiation at wall. Roberds and mixet, adve finitiation. Roberds and mixet, adve finitiation at wall. Roberds and mixet, adve finitis and mixet, adve finitiation at wall. Roberds				8 15				4				\$5,900	\$0.56 \$4.11
HS11 Thatter Road at Folls Road 11 BLOCK Lock back bicks in wall, no bench and invert, and invert, and invert, notice hand invert, noti				10	BLOCK			4				\$6,270	\$0.57
2741 HS11 Lovel Street R.O.W. 10 BLOCK Walks missing motar, no bench and invert, mineral deposits in incoming line Rebuild Bench, Grout Manhole, Camentilitous Liner 4 720 \$4,070 \$2,200 2221 HS11 Isligton Street 11 BRICK Active Infiltration at wall, bench and invert, notissing motar and cade Concel Repair, Rebuild Bench, Grout Manhole, Camentilitous Liner 4 1,080 \$4,400 \$2,200 1331 HS11 Brewery Lane 14 BRICKSTOME Connection/service infiltration. Rebuild Bench, Grout Manhole, Camentilitous Liner 4 1,080 \$4,400 \$2,200 593 HS15 Essex Avenue 12 BLOCK dehris buildup Connection/service infiltration. Rebuild Bench, Grout Manhole, Camentilious Liner 4 1,080 \$4,400 \$2,200 1331 HS15 Brewery Lane 12 BLOCK dehris buildup Contenction/service Rebuild Bench, Grout Manhole, Camentilious Liner 4 1,728 \$3,200 \$3,200 1432 HS15 US R1 Bypass North 11 BLOCK dehris buildup Contenction/service Renove and Repair, Rebuild Bench, Grout Manhole, Camentilious Liner								4				\$6,270	\$3.77
2221 HS11 Isington Street 11 BRICK Active infitiation at wait, bench and invert, notisate wait, large gaps in wall. Cordet insisting mortal and cracked Cementitious Liner 4 1,080 \$4,40 \$3,200 1331 HS11 Brewery Lane 14 BRICK/STONE connection/service infiltration. Rebuild Bench, Grout Manhole, Cementitious Liner 4 1,440 \$55,50 \$2,200 593 HS15 Essex Avenue 12 BLOCK debris buildup. Corde Reptitous Liner 4 1,440 \$3,200 1332 HS15 Essex Avenue 12 BLOCK debris buildup. Corde Reptitous Liner 4 1,728 \$3,300 1342 HS15 US R1 Bypass North 11 BLOCK pipe connection found during flow isolation. Possible industrial connection/service. Remove and Replace Manhole. - - - - - - - - - - - - - - - - - - - - - - - - - <td>2741</td> <td>HS11</td> <td>Lovell Street R.O.W.</td> <td></td> <td></td> <td>Walls missing mortar, no bench and invert, mineral deposits in incoming line</td> <td>Rebuild Bench, Grout Manhole, Cementitious Liner</td> <td>4</td> <td></td> <td></td> <td>\$2,200</td> <td>\$6,270</td> <td>\$5.65</td>	2741	HS11	Lovell Street R.O.W.			Walls missing mortar, no bench and invert, mineral deposits in incoming line	Rebuild Bench, Grout Manhole, Cementitious Liner	4			\$2,200	\$6,270	\$5.65
221 Kill singlof strete Kill singlof strete Kill singlof strete Kill strete Kill singlof						Active infiltration at wall, bench and invert not visible, corbel missing mortar and cracke	d i i i						
1311HS11Brewery Lane14BRICK/STONEconnection/service infiltration.RebuildRebuild Bench, Grout Manhole, Cementitious Liner41,440\$5,550\$2,200593HS15Essex Avenue12BLOCKBroken and missing bricks from wall, loose bricks in orbel, no bench or invert, hew, Corbel Repair, Rebuild Bench, Grout Manhole, Corbel Repair, Rebuild Bench, Grout Manhole, <br< td=""><td>2221</td><td>HS11</td><td>Islington Street</td><td>11</td><td>BRICK</td><td></td><td>Cementitious Liner</td><td>4</td><td>1,080</td><td>\$4,440</td><td>\$3,200</td><td>\$7,640</td><td>\$4.11</td></br<>	2221	HS11	Islington Street	11	BRICK		Cementitious Liner	4	1,080	\$4,440	\$3,200	\$7,640	\$4.11
Space HS15 Essex Avenue 12 Broken and missing bricks from wall, loose bricks in corbel, no bench or invert, heavy debris buildup Corbel Repair, Rebuild Bench, Grout Manhole, Cementilious Liner 4 700 \$4.0 \$3.200 1382 HS15 US R1 Bypass North 11 BLOCK pipe connection found during flow isolation. Possible industrial connection/service Remove and Replace Manhole 4 1,728 \$13.100 \$0 2169 P2A I J Gamester Avenue 10 PRECAST See Appendix F Cortinue to Monitor 3 0 \$0 \$550 1132 HS11 Isington Street 8 PRECAST Evidence of surcharge, moderate debris on bench. heavy debris in channel Clean 3 0 \$0 \$550 5503 HS11 Thater Road 9 BICOK Heavy debris on bench, main missing motar from corbel Clean 3 0 \$0 \$550 1432 LR4 Middle Road at Deverly Hill Road 13 PRECAST Inifiltration at wall, frame missing picce New Frame and Cover 3 0 \$0 \$820 2484 LR6 Lafyetle Road at Cocach Road 6 PRE	1001	11011			DDIOKICTONE	0 0 1			1.440	#F FF0	* 2.000	47 7F0	¢0.05
593HS15Essex Avenue12BLOCKdebris buildupCementitious Liner4720\$4,810\$3,2001382HS15KS11 Bypass North11BLOCKdebris buildupActive infilitation at wall, roots in corbel, loose bricks and debris on bench. Collapsedmore and Replace Manhole111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111<	1331	HSII	Brewery Lane	14	BRICK/STONE			4	1,440	\$5,550	\$2,200	\$7,750	\$3.85
1382HS15US R1 Bypass North11BLOCKpipe connection found during flow isolation. Possible industrial connection/serviceRemove and Replace Manhole41,728\$13,100\$02169P2AT Gamester Avenue10PRECASTSee Appendix FContinue to Monitor30\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0\$0 <td< td=""><td>593</td><td>HS15</td><td>Essex Avenue</td><td>12</td><td>BLOCK</td><td>debris buildup</td><td>• •</td><td>4</td><td>720</td><td>\$4,810</td><td>\$3,200</td><td>\$8,010</td><td>\$6.68</td></td<>	593	HS15	Essex Avenue	12	BLOCK	debris buildup	• •	4	720	\$4,810	\$3,200	\$8,010	\$6.68
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112 M1 US Rt 1 Bypass 7 PRECAST Broken and missing bricks in corbel, Light debris in bench and invert Corbel Repair 3 0 \$0 \$1,000 113 M1 US Rt 1 Bypass 5 PRECAST Broken and missing bricks in corbel, Light debris in bench and invert, infiltration stains at walls Corbel Repair 3 0 \$0 \$1,000				7				-	0			\$820	\$0.00
Image: 113 M1 US Rt 1 Bypass 5 PRECAST Broken and missing bricks in corbel, Light debris in bench and invert, infiltration stains at walls Corbel Repair 3 0 \$0 \$1,000								-	0			\$1,000	\$0.00
113 M1 US Rt 1 Bypass 5 PRECAST walls Corbel Repair 3 0 \$1,000	112	M1	US Rt 1 Bypass	7	PRECAST			3	0	\$0	\$1,000	\$1,000	\$0.00
	110	1.11	LIS Dt 1 Bypass	E	DDECAST			2	_	¢0	¢1 000	\$1.000	\$0.00
				C 6				ő	0			\$1,000	\$0.00
2131 M1 Edmond Avenue 11 PRECAST Missing mortar and bricks from corbel Corbel Repair 3 0 \$0 \$1,000			1	11				-	0				

					Appendix B.2 - Manhole Rehabilitation Recommendati	ons - Max Defect Score Prioritization						
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
107	LR6	Lafayette Road	6	PRECAST	Light debris buildup, missing mortar at corbel.	Cementitious Liner	3	0	\$0	\$1,020	\$1,020	\$0.00
5550	HS11	Lovell Street R.O.W.	8	PRECAST	Frame and cover below grade	Raise to Surface	3	0	\$0	\$1,100		\$0.00
1074	LR5	Lafayette Road at Andrew Jarvis Drive	8	PRECAST	Frame and cover below grade	Raise to Surface	3	0	\$0	\$1,100		\$0.00
5855		Barberry Lane Easement	11	PRECAST	Outside of corbel exposed, moderate debris on bench and invert	Clean, Corbel Repair	3	0	\$0	\$1,550		\$0.00
985		Market Street at Michael Succi Drive	9	PRECAST	Cracked around drop connection, bench separating from base section, rocks on bench	Cementitious Liner	3	0	\$0	\$1,700		\$0.00
1075	LR5	Lafayette Road	9	PRECAST	Moderate debris on bench and roots at wall	Cementitious Liner	3	0	\$0	\$1,700		\$0.00
387	LR5	Lafayette Drive	9	PRECAST	Chipped frame, broken bricks in corbel	New Frame and Cover, Corbel Repair	3	0	\$0	\$1,820		\$0.00
1646	LR3 HS15	Nathaniel Drive R.O.W.	5	PRECAST	Wall leaks, hole in wall at connection to bench	Grout Manhole, Cementitious Liner	3	2,880	\$1,850	\$0 \$2,040		\$0.64
1384 2366	LD1	Rt 1 Bypass near Islington Street Market Street at Michael Succi Drive	12	BLOCK PRECAST	Deteriorating wall Floor Missing Bricks	Cementitious Liner Rebuild Bench	3	0	\$0 \$0	\$2,040		\$0.00 \$0.00
2300	LDT		17	FRECASI	Brick loose on bench, moderate debris on bench. Possible industrial connection/service		3	0	<u>م</u>	φ2,200	\$2,200	\$0.00
2499	LR6	Lafayette Road	7	PRECAST	infiltration.	Rebuild Bench	3	0	\$0	\$2,200	\$2,200	\$0.00
2505	LR6	Lafayette Road	7	PRECAST	Moderate debris on bench	Rebuild Bench	3	0	\$0 \$0	\$2,200		\$0.00
2511	LR6	Lafayette Road at Longmeadow Road	4	PRECAST	Moderate debris on bench	Rebuild Bench	3	0	\$0	\$2,200		\$0.00
2619	LR6	Lafayette Road at Lang Road	6	PRECAST	Broken invert and bench	Rebuild Bench	3	0	\$0	\$2,200	\$2,200	\$0.00
2646	LR6	Robert Avenue	6	PRECAST	Mineral deposits at wall and void visible at outgoing pipe connection	Grout Manhole, Cementitious Liner	3	5,040	\$2,220	\$C		\$0.44
2219	HS14	Borthwick Avenue at Marriot Hotel	6	PRECAST	Mineral deposits at outlet pipe with active infiltration	Grout Manhole, Cementitious Liner	3	288	\$2,220	\$C		\$7.71
2471	LR6	Lafayette Road	6	PRECAST	Active infiltration at walls	Grout Manhole, Cementitious Liner	3	720	\$2,590	\$0		\$3.60
2455	LR3	Nathaniel Drive R.O.W.	7	PRECAST	Active infiltration at walls	Grout Manhole, Cementitious Liner	3	288	\$2,590	\$C		\$8.99
5685	HS15	Sheffield Road	7	BLOCK	Mineral deposits at wall	Grout Manhole, Cementitious Liner	3	144	\$2,590	\$0		\$17.99
1311	HS11	Fields Road and Sewall Road	1	BLOCK	Moderate debris in bench and invert, active infiltration from wall	Grout Manhole, Cementitious Liner	3	1,440	\$2,960	\$0		\$2.06
1381	HS11	Hampshire Road	8	BLOCK	Active infiltration and mineral deposits at wall	Grout Manhole, Cementitious Liner	3	288	\$2,960	\$0		\$10.28
406 816	LR4 GR1	Peverly Hill Road Portsmouth Boulevard	/	PRECAST BRICK	Incoming and outgoing pipe connection leaks.	Grout Manhole, Cementitious Liner Grout Manhole, Cementitious Liner	3	2,232 7,200	\$2,960 \$3,330	\$0 \$0		\$1.33 \$0.46
010	GRI		0	DRICK	Mineral deposits at wall. Pipe connection leak. Mineral deposits at bench and invert, roots in corbel. Walls weaping during MH		3	7,200	\$3,330	¢۲	\$3,330	¢0.40
942	LD1	Spinnaker Way	9	BRICK	Inspection. Active infiltration during flow isolation.	Grout Manhole, Cementitious Liner	3	2,880	\$3,330	\$0	\$3,330	\$1.16
1315	HS11	Sowall Road at Spinnov Road	0	PRECAST	Faulty drop connection in manhole, light debris on bench and invert, walls weeping at	Crout Manholo, Comontitious Linor	2	1,728	\$3,330	02	\$3,330	\$1.93
2657	LR6	Sewall Road at Spinney Road White Cedar Boulevard R.O.W.	9	PRECAST	joints Mineral deposits at wall	Grout Manhole, Cementitious Liner Grout Manhole, Cementitious Liner	3	360	\$3,330 \$3,330	\$0 \$0		\$1.93
1390	HS11	Cate Street	0	BLOCK	Active infiltration and mineral deposits at wall, corbel missing mortar	Grout Manhole, Cementitious Liner	3	288	\$3,330	\$0		\$9.25
1045	LR5	Ledgewood Drive R.O.W.	9	PRECAST	Infiltration staining and mineral deposits at wall. Active infiltration from wall joints	Grout Manhole, Cementitious Liner	3	288	\$3,330	\$0		\$11.56
407	LR3	Peverly Hill Road at McClintock Avenue	8	PRECAST	Outgoing pipe connection leak.	Grout Manhole, Cementitious Liner	3	1,440	\$3,330	\$0		\$11.30
107	ERT			TREGNOT	Missing mortar from corbel and walls, loose/broken bricks in corbel. Open joint in clay		Ŭ	1,110	\$0,000	ψū	\$0,000	φ2.01
595	HS15	Essex Avenue	14	BLOCK	invert.	Corbel Repair, Cementitious Liner	3	0	\$0	\$3,550	\$3,550	\$0.00
5316	HS14	Barberry Lane Easement	7	PRECAST	Active infiltration and mineral deposits at wall, corbel missing mortar	Corbel Repair, Grout Manhole, Cementitious Liner	3	2,160	\$2,590	\$1,000		\$1.20
2642	LR6	Heritage Avenue	9	PRECAST	Light Infiltration observed at walls, mineral deposits	Grout Manhole, Cementitious Liner	3	1,440	\$3,700	\$C	\$3,700	\$2.57
5271	B1	Victory Road Easement	8	PRECAST	Roots at wall	Root Treatment, Cementitious Liner	3	0	\$0	\$3,730	\$3,730	\$0.00
					Light infiltration stains at walls, cracked cover	New Frame and Cover, Grout Manhole, Cementitious						
2445	LR3	Nathaniel Drive R.O.W.	8	PRECAST		Liner New Frame and Cover, Grout Manhole, Cementitious	3	2,880	\$2,960	\$820	\$3,780	\$1.03
1314	HS11	Sewall Road	8	PRECAST	Chipped cover, active infiltration coming from wall	Liner	3	288	\$2,960	\$820	\$3,780	\$10.28
92	M1	US Rt 1 Bypass at Cutts Avenue	8	PRECAST	Broken bricks in corbel, Light infiltration at walls Corbel missing bricks and mortar, light debris on bench. 6 gpm leak observed during	Corbel Repair, Grout Manhole, Cementitious Liner	3	360	\$2,960	\$1,000	\$3,960	\$8.22
397	LR4	Greenleaf Avenue	8	PRECAST	flow isolation.	Corbel Repair, Grout Manhole, Cementitious Liner	2	8,640	\$2,960	\$1,000	\$3,960	\$0.34
2617	LR4 LR6	Lafayette Road	7	PRECAST	Exposed aggregate at MH wall due to H2S. Missing mortar from bench	Epoxy Liner	3	0,040	\$2,700	\$4,000		\$0.00
813		Portsmouth Boulevard near Market Street	11	BRICK	Active infiltration and mineral deposits at wall	Grout Manhole, Cementitious Liner	3	432	\$4,070	\$0		\$9.42
1064	LR5	Lafayette Road	11	PRECAST	Active infiltration with mineral deposits at wall	Grout Manhole, Cementitious Liner	3	288	\$4,070	\$C		\$14.13
2635	LR6	Heritage Avenue	12	PRECAST	Active infiltration at wall	Grout Manhole, Cementitious Liner	3	288	\$4,440	\$C		\$15.42
		5			Moderate debris on bench, broken frame, loose and broken bricks from corbel, missing	New Frame and Cover, Corbel Repair, Grout Manhole,				·		
540	HS14	Coakley Road	8	BLOCK	mortar from walls	Cementitious Liner	3	720	\$2,960	\$1,820	\$4,780	\$4.11
396	LR4	Greenleaf Woods Drive	7	PRECAST	Incoming pipe connection leak, voids visible around inlet and outlet pipe connections.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	9,360	\$2,590	\$2,200		\$0.28
642	GR1	Woodbury Avenue	11	PRECAST	Missing bricks and mortar from corbel, Mineral deposits at wall, debris buildup in bench		3	1,440	\$4,070	\$1,000		\$2.83
5819	HS11	Aldrich Road at Aldrich Court	8	PRECAST	Incoming pipe connection leak (estimated at 2 gpm)	Rebuild Bench, Grout Manhole, Cementitious Liner	3	1,800	\$2,960	\$2,200	\$5,160	\$1.64
2479	LR6	Lafayette Road	6	PRECAST	Manhole cover significantly below grade, roots at bench and wall. Debris on bench	Corbel Repair, Root Treatment, Cementitious Liner, Raise to Surface	3	0	\$0	\$5,490	\$5,490	\$0.00
					Roots in corbel, Active infiltration with mineral deposits at wall, heavy debris in invert.							
2386	GR1	Commerce Way Easement	9	BRICK	Located on Pease effluent line.	Root Treatment, Grout Manhole, Cementitious Liner	3	1,440	\$3,330	\$2,200	\$5,530	\$2.31
1307	HS11	Sewall Road	6	PRECAST	Active infiltration at walls, hole in bench, corbel missing mortar, chipped frame	New Frame and Cover, Rebuild Bench, Grout Manhole, Cementitious Liner	3	288	\$2,590	\$3,020	\$5,610	\$8.99
5332	GR1	Commerce Way	13	PRECAST	Active infiltration at walls, cracked frame with broken pieces	New Frame and Cover, Grout Manhole, Cementitious Liner	3	720	\$4,810	\$820		\$6.68
2362	LD1	Kearsarge Road at Market Street	10	PRECAST	Invert leak. Infiltration at manhole wall.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	1,440	\$3,700	\$2,200		\$2.57
2002						New Frame and Cover, Grout Manhole, Cementitious	Ť	1,110	40,700	<i>\\</i> 2,200	\$3,750	ψ2.01
380	LR4	Greenleaf Woods Drive	14	PRECAST	Chipped frame, Active infiltration with mineral deposits at wall	Liner	3	288	\$5,180	\$820		\$17.99
	HS11	US Bypass 1	12	BLOCK	Roots, Active infiltration and mineral deposits at wall	Root Treatment, Grout Manhole, Cementitious Liner	3	144	\$4,440	\$2,200	\$6,640	\$30.83
1387												
1387 2368 5412	LD1	Albacore Museum Access Pump Station Barberry Lane Easement	18	PRECAST PRECAST	Light infiltration stains at walls Infiltration staining at wall	Grout Manhole, Cementitious Liner Grout Manhole, Cementitious Liner	3	720 360	\$6,660 \$6,660	\$C	\$6,660 \$6,660	\$9.25 \$18.50

					Appendix B.2 - Manhole Rehabilitation Recommendat				Estimated	Estimated		Infiltration Removal Cost
MH Number	Metering Basin	Street	MH Depth	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect	Estimated	Infiltration	Structural / O&M	Estimated Total	Effectiveness (\$ Spent per
	John Grand		(ft)				Score	Infiltration (gpd)	Removal Cost	Rehab	Rehab Cost	Gallon Per Day Removed
					Mineral deposits at wall, Exposed aggregate at MH wall due to H2S, moderate debris i							
1062	LR5 GR1	Lafayette Road	14	PRECAST PRECAST	bench and invert	Epoxy Liner	3	0	\$0 \$4,810	\$7,000 \$2,200	\$7,000 \$7,010	\$0.00 \$13.36
2388 629	GR1	Woodbury Avenue Oriental Gardens R.O.W.	13		Mineral deposits, debris buildup in bench and channel. Bricks missing from bench. Heavy mineral deposits, aggregate visible at wall due to H2S	Rebuild Bench, Grout Manhole, Cementitious Liner Grout Manhole, Epoxy Liner	3	360 1,440	\$4,810	\$2,200	\$7,010	\$13.30
639	GR1	Portsmouth Boulevard Easement	10		Missing mortar from corbel	Continue to Monitor	2	1,440	\$2,200	\$3,300	\$7,700	\$1.55
643	GR1	Woodbury Avenue	13	PRECAST	Roots at wall	Continue to Monitor	2	0	\$0	\$0 \$0	\$0	\$0.00
656	GR1	Woodbury Avenue	6	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
657	GR1	Woodbury Avenue at Arthur Brady Drive	5		Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
658	GR1	Woodbury Avenue	10		No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
817	GR1	Sanderling Way Easement	1		Missing mortar from corbel	Continue to Monitor	2	0	\$0 \$0	\$0	\$0 \$0	\$0.00
<u>820</u> 913	GR1 GR1	Portsmouth Boulevard at Osprey Drive Blue Heron Drive	5	BRICK PRECAST	Roots at wall Missing mortar from corbel	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$U \$0	\$0.00 \$0.00
915	GR1	Blue Heron Drive near Sanderling Way	9	BRICK	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
917	GR1	Shearwater Drive	9	BRICK	Abandoned Manhole	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2372	GR1	Shearwater Drive	10	PRECAST	Abandoned Manhole	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2373	GR1	Shearwater Drive	10	PRECAST	Abandoned Manhole	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5399	GR1	Sanderling Way	8		Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5490	GR1	Shearwater Drive near Portsmouth Boulevard	12		Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
1389 5530	HS11 HS11	US Bypass 1 at rear Bartlett Street	11	BRICK PRECAST	Missing mortar from corbel No defects	Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0 \$0	\$0.00 \$0.00
5530	HST1 HS11	Bartlett Street	6		No defects	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0	\$0.00
5532	HS11	Bartlett Street	6		No defects	Continue to Monitor	2	0	\$0 \$0	\$0	\$0	\$0.00
5533	HS11	Bartlett Street	8		No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5535	HS11	Bartlett Street	8	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5547	HS11	Brewery Lane	15	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5549	HS11	Lovell Street R.O.W.	10	PRECAST	Disconnected drop connection in manhole	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
523	HS14	Borthwick Avenue	18		Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
530	HS14	Borthwick Avenue	8		No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
537 580	HS14 HS15	Coakley Road Sheffield Road	/	BLOCK PRECAST	Light debris on bench Missing mortar from corbel	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0 \$0	\$0.00 \$0.00
592	HS15	Essex Avenue near easement	9		Missing mortar from corbet and walls. Open joint in clay invert.	Continue to Monitor	2	0	\$0 \$0	\$0 \$0	50 \$0	\$0.00
601	HS15	Benson Street	4		Missing mortar from corbet and wars. Open joint in easy invert. Missing mortar from corbel. Possible industrial connection/service infiltration.	Continue to Monitor	2	0	\$0	\$0 \$0	\$0	\$0.00
2728	HS15	Melbourne Street at Sims Avenue	9		Missing bricks and mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
830	LD1	Portsmouth Boulevard R.O.W.	5	BRICK	Light debris in bench and invert, deteriorating corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
836	LD1	Dunlin Way	11		Possible industrial connection/service infiltration.	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
1014	LD1	Michael Succi Drive	7		Light debris on bench	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
1015	LD1	Michael Succi Drive	6		Light infiltration stains at walls	Continue to Monitor	2	0	\$0	\$0		\$0.00
1016 2157	LD1 LD1	Michael Succi Drive Dunlin Way R.O.W.	8		Roots coming in at bench, moderate debris buildup on bench. No defects	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0 \$0	\$0.00 \$0.00
2365	LD1	Market Street at Michael Succi Drive	7		Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0 \$0	\$0.00
2375	LD1	Michael Succi Drive	9	PRECAST	Light infiltration stains at walls	Continue to Monitor	2	0	\$0	\$0 \$0	\$0	\$0.00
2440	LD1	Kearsarge Way R.O.W.	8		Roots at wall and bench	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2451	LD1	Spinnaker Way R.O.W.	12	PRECAST	Bricks missing from bench	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
1648	LR3	Nathaniel Drive			No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
1649	LR3	Nathaniel Drive		PRECAST	Light debris buildup	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2422	LR3	Nathaniel Drive R.O.W.	10		Rocks on bench	Continue to Monitor	2	0	\$0	\$0 ¢0	\$0 \$0	\$0.00
2431 2449	LR3 LR3	Nathaniel Drive R.O.W. Nathaniel Drive R.O.W.	<u>б</u>	PRECAST PRECAST	Infiltration staining at wall Loose Frame	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0	\$0.00 \$0.00
2449	LR3 LR3	Nathaniel Drive R.O.W.			Rocks on bench	Continue to Monitor	2	0	\$0	\$0 \$0	¥3	\$0.00
2551	LR3	Pamela Drive			Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2591	LR3	Suzanne Drive			No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
411	LR4	Plains Avenue at Peverly Hill Road	12	PRECAST	Light debris on bench	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
557	LR4	Middle Road	8		Missing mortar from walls	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
118	LR6	Lafayette Road			Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
<u>132</u> 133	LR6 LR6	Heritage Avenue at Post Road Post Road		PRECAST PRECAST	Missing mortar from invert Missing mortar from corteal	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0 \$0	\$0.00 \$0.00
133	LR6 LR6	Robert Avenue R.O.W.		PRECAST	Missing mortar from corbel Corroded Frame	Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$U \$0	\$0.00
226	LR6	Constitution Avenue at Lafayette Road			Light debris on bench, corbel missing mortar	Continue to Monitor	2	0	\$0	\$0 \$0	\$0	\$0.00
2469	LR6	Lafayette Road			Light debris on bench	Continue to Monitor	2	0	\$0	\$0 \$0	\$0	\$0.00
2473	LR6	Lafayette Road	6		Roots in corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2483	LR6	Lafayette Road at Coach Road	8	PRECAST	Light debris on bench, invert not fully visible	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2485	LR6	Lafayette Road at Coach Road	9		Light debris on bench	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2489	LR6	Lafayette Road at Coach Road	6		No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2493	LR6	Lafayette Road	/		Light debris on bench	Continue to Monitor	2	0	\$0	\$0 \$0	\$0	\$0.00
2497 2509	LR6 LR6	Lafayette Road Lafayette Road	6		Light debris in bench and invert Missing mortar from corbel, Light debris on bench	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0	\$0 \$0	\$0.00 \$0.00
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					Appendix B.2 - Manhole Rehabilitation Recommendati	ions - Max Defect Score Prioritization					1	
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
2618	LR6	Lafayette Road	8	PRECAST	Infiltration staining at wall	Continue to Monitor	2	0	\$0	\$(0 \$0) \$0.00
2621	LR6	Lafayette Road at Freedom Circle	9	PRECAST	Missing mortar from corbel. Possible industrial connection/service infiltration.	Continue to Monitor	2	0	\$0	\$() \$0	\$0.00
2624	LR6	Heritage Avenue at Lafayette Road			No defects	Continue to Monitor	2	0	\$0	\$0		\$0.00
2626	LR6	Lafayette Road			Corbel missing mortar	Continue to Monitor	2	0	\$0	\$0		\$0.00
2627	LR6	Lafayette Road		PRECAST	Infiltration staining on wall	Continue to Monitor	2	0	\$0	\$(ψ0.00
2628 2629	LR6 LR6	Lafayette Road Lafayette Road		PRECAST PRECAST	Corroded Frame Debris on bench	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$(\$(0 \$0.00 0 \$0.00
2630	LR6	Lafayette Road		PRECAST	Infiltration staining at wall	Continue to Monitor	2	0	\$0	\$(\$0.00
2639	LR6	Heritage Avenue		PRECAST	Chipped frame	Continue to Monitor	2	0	\$0	\$0		
2645	LR6	Heritage Avenue	5	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$(φ0.00
2658	LR6	White Cedar Boulevard R.O.W.	10		Roots at wall	Continue to Monitor	2	0	\$0	\$(ψ0.00
89	M1	Alder Way	9		Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$(ψ0.00
95	M1	Maplewood Avenue at Cutts Street	11	PRECAST	Infiltration staining at walls, missing mortar from corbel	Continue to Monitor	2	0	\$0	\$(\$0.00
97 98	M1 M1	Maplewood Avenue Maplewood Avenue			No defects Missing mortar and bricks from corbel	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$(\$(0 \$0.00 \$0.00
90	M1	Maplewood Avenue near Rt 95 overpass	5	PRECAST	Light debris on bench, loose bricks and missing mortar from corbel	Continue to Monitor	2	0	\$0	\$(
101	M1	Maplewood Avenue	5		Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$		
103	M1	Maplewood Avenue		PRECAST	Loose bricks in corbel	Continue to Monitor	2	0	\$0	\$0		
104	M1	Maplewood Avenue		PRECAST	Loose debris on bench, corbel missing bricks and mortar, loose frame	Continue to Monitor	2	0	\$0	\$0	50 \$0	\$0.00
105	M1	Maplewood Avenue		PRECAST	Infiltration staining at walls	Continue to Monitor	2	0	\$0	\$(\$0.00
110	M1	Fairview Avenue			Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$(\$0.00
115	M1	US Rt 1 Bypass			No defects	Continue to Monitor	2	0	\$0	\$0) \$0.00
759 2128	M1 M1	Fairview Avenue at O'Leary Place Maplewood Avenue		PRECAST PRECAST	Missing mortar from corbel	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$(\$(\$0:00
2128	M1	Maplewood Avenue at Fairview Avenue			Light debris on bench, corbel missing mortar Missing mortar from corbel, loose frame	Continue to Monitor	2	0	\$0	<u>ه</u> (\$(
2359	M1	Maplewood Avenue Maplewood Avenue		PRECAST	Light debris on bench	Continue to Monitor	2	0	\$0	\$(\$0.00
2794	M1	Maplewood Avenue at Cutts Street		PRECAST	Light debris in bench and invert	Continue to Monitor	2	0	\$0	\$(\$0.00
5319	M1	O'Leary Place			Light debris in manhole	Continue to Monitor	2	0	\$0	\$0) \$0.00
2165	P2A	FW Hartford Drive			See Appendix F	Continue to Monitor	2	0	\$0	\$0	D \$0) \$0.00
2166	P2A	FW Hartford Drive			See Appendix F	Continue to Monitor	2	0	\$0	\$(φ0.00
2170	P2A	FW Hartford Drive			See Appendix F	Continue to Monitor	2	0	\$0	\$0		ψ0.00
529		Barberry Lane Easement		PRECAST	Heavy debris on bench, corbel missing mortar	Clean	2	0	\$0	\$550		\$0.00
5818	HS11 HS14	Aldrich Road Borthwick Avenue	8		Heavy debris in invert	Clean Clean	2	0	\$0 \$0	\$550 \$550		0 \$0.00 \$0.00
5212	H514	Bolthwick Avenue	0	PRECASI	Moderate debris on bench and invert Heavy debris on bench and invert, missing mortar from corbel.Possible industrial	Clean	2	0	\$0	\$00(J \$000	\$0.00
5213	HS14	Borthwick Avenue	9	PRECAST	connection/service infiltration.	Clean	2	0	\$0	\$550	\$550	\$0.00
5341	HS14	Granite Group parking lot	7	PRECAST	Heavy sediment on bench	Clean	2	0	\$0	\$550		\$0.00
2158	LD1	Dunlin Way R.O.W.			Missing bricks in invert, moderate debris buildup	Clean	2	0	\$0	\$550		\$0.00
2583	LR3	Suzanne Drive			Moderate debris in bench and invert	Clean	2	0	\$0	\$550		\$0.00
2585	LR3	Suzanne Drive			Moderate debris in bench and invert	Clean	2	0	\$0	\$550		\$0.00
1037	LR5	Ledgewood Drive		PRECAST	Missing mortar from corbel, light debris in bench and invert	Clean	2	0	\$0	\$550		\$0.00
117	LR6	Lafayette Road			Light debris in channel	Clean	2	0	\$0	\$550		\$0.00
2475 96	LR6 M1	Lafayette Road Maplewood Avenue		PRECAST PRECAST	Moderate debris on bench Moderate debris on bench	Clean	2	0	\$0 \$0	\$550 \$550		
100	M1	Maplewood Avenue		PRECAST	Infiltration staining at walls, moderate debris on bench	Clean	2	0	\$0	\$550		
1308	HS11	Fields Road			Light debris on bench, chipped frame	New Frame and Cover	2	0	\$0	\$330		\$0.00
2613	LR3	Simmons Road at Suzanne Drive			Warped Cover	New Frame and Cover	2	0	\$0	\$820	\$820	\$0.00
1041	LR5	Portsmouth High School Parking lot			Frame cracked. Possible industrial connection/service infiltration.	New Frame and Cover	2	0	\$0	\$820	\$820) \$0.00
2625	LR6	Lafayette Road		PRECAST	Cracked frame, bricks missing from bench and invert	New Frame and Cover	2	0	\$0	\$820		\$0.00
94	M1	Cutts Street		PRECAST	Light debris on bench, cracked cover	New Frame and Cover	2	0	\$0	\$820		\$0.00
458	B1	Colonial Drive at Worthen Road			Missing bricks and mortar from corbel	Corbel Repair	2	0	\$0	\$1,000		\$0.00
459 921	B1 GR1	Colonial Drive Staysail Way			Missing bricks and mortar from corbel Missing bricks and mortar from corbel.Possible industrial connection/service infiltration.	Corbel Repair Corbel Repair	2	0	\$0 \$0	\$1,000 \$1,000		0 \$0.00 \$0.00
5536		Bartlett Street at Cate Street			Broken bricks and mortal from corber. Possible industrial connection/service initiation.	Corbel Repair	2	0	\$0	\$1,000		
2237	HS14	Larry Lane			Loose bricks in corbel, missing mortar from corbel	Corbel Repair	2	0	\$0	\$1,000		
581	HS15	Sheffield Road			Crack in invert, light debris on bench, broken brick and missing mortar from corbel	Corbel Repair	2	0	\$0	\$1,000		\$0.00
582	HS15	Sheffield Road	5	BLOCK	Broken and loose bricks on corbel	Corbel Repair	2	0	\$0	\$1,000) \$0.00
5401	HS15	Melbourne Street at Vine Street			Broken corbel with loose and missing bricks	Corbel Repair	2	0	\$0	\$1,000		
2367	LD1	Albacore Museum Access Pump Station			Cracked and missing mortar from corbel	Corbel Repair	2	0	\$0	\$1,000		
1040	LR5	Ledgewood Drive			Missing mortar and bricks from corbel	Corbel Repair	2	0	\$0	\$1,000		
531	HS14	Coakley Road	6	BLOCK	Heavy debris in bench and invert, missing mortar in wall	Cementitious Liner	2	0	\$0	\$1,190	5 \$1,190	\$0.00
532	HS14	Coakley Road	7	BLOCK	Loose brick in corbel, missing mortar in wall. Possible industrial connection/service infiltration.	Cementitious Liner	2	^	\$0	\$1,190	\$1,190	\$0.00
1392	HS11	Cate Street			Mineral deposits at wall, corbel missing mortar	Grout Manhole	2	360		\$1,190 \$(\$0.00
1372			5		Manhole cover below grade, no bench and invert in manhole. Manhole bottom full of			500	ψ1,200	φt	φ1,200	φ3.33
824	GR1	Portsmouth Boulevard	8		debris, corbel missing bricks and mortar	Clean, Corbel Repair	2	0	\$0	\$1,550	\$1,550	\$0.00
		Hampshire Road			Moderate debris on bench, broken and loose bricks in corbel	Clean, Corbel Repair	2		\$0			

					Appendix B.2 - Manhole Rehabilitation Recommendation	ons - Max Defect Score Prioritization						
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
599	HS15	Sims Avenue at Benson Street	8	PRECAST	Infiltration at manhole wall	Grout Manhole	2	720	\$1,800	\$0		\$2.50
2483	LR6	Lafayette Road at Coach Road	8	PRECAST	Light infiltration at manhole wall	Grout Manhole	2	288	\$1,800	\$0		\$6.25
116	M1	US Rt 1 Bypass	9	PRECAST	Light infiltration at walls and light debris in invert	Grout Manhole	2	288	\$2,000	\$0	1 1 1 2 2 2	\$6.94
535	HS14	Larry Lane	5	BLOCK	Missing mortar from corbel and walls, loose bricks in corbel	Corbel Repair, Cementitious Liner	2	0	\$0			\$0.00
1310	HS11 GR1	Fields Road Oriental Gardens R.O.W.	12	PRECAST PRECAST	Crack in wall, frame missing pieces. Possible industrial connection/service infiltration.	New Frame and Cover, Cementitious Liner	2	0	\$0 \$0			\$0.00 \$0.00
628 640	GR1	Commerce Way	12	PRECAST	Roots in corbel and wall Roots and debris on bench	Root Treatment Root Treatment	2	0	\$0 \$0			\$0.00
812	GR1	Granite Street R.O.W.	9	BRICK	Roots and debris on bench	Root Treatment	2	0	\$0			\$0.00
1441	HS11	Islington Street	9	PRECAST	Bench and invert missing mortar	Rebuild Bench	2	0	\$0			\$0.00
2253	HS11	Islington Street	9	PRECAST	Bench and invert missing mortar	Rebuild Bench	2	0	\$0			\$0.00
555	LR4	Middle Road at Woodbury Avenue	8	BLOCK	Heavy debris on bench and invert, moderate roots throughout manhole	Root Treatment	2	0	\$0	\$2,200	\$2,200	\$0.00
5394	LR4	Holiday Drive	8	PRECAST	Roots at corbel	Root Treatment	2	0	\$0	+= ===		\$0.00
1065	LR5	Lafayette Road	10	PRECAST	Roots at corbel. No channel for pipe connection. Corbel missing brick.	Rebuild Bench	2	0	\$0			\$0.00
2644	LR6	Heritage Avenue	8	PRECAST	Bench missing mortar	Rebuild Bench	2	0	\$0			\$0.00
2661	LR6	Springbrook Circle R.O.W.	11	PRECAST	Roots at corbel and wall	Root Treatment	2	0	\$0			\$0.00
2360	M1	Maplewood Avenue	5	PRECAST PRECAST	Evidence of surcharge, bench and invert non-existent	Rebuild Bench	2	0	\$0 \$0			\$0.00 \$0.00
2245 1388	HS11 HS11	Islington Street US Bypass 1 at rear	12	PRECAST	Moderate debris in bench and invert, roots at wall. Brick repair at bottom of MH wall. Mineral deposits at wall, corbel missing mortar	Cementitious Liner Grout Manhole	2	360	\$0 \$2,400			\$0.00
2507	LR6	Lafayette Road	6	PRECAST	Infiltration at bench/wall connection	Grout Manhole, Cementitious Liner	2	432	\$2,400	\$0		\$6.00
631	GR1	Oriental Gardens R.O.W.	13	PRECAST	Mineral deposits	Grout Manhole	2	360	\$2,600	\$0		\$7.22
632		Commerce Way Easement	13	PRECAST	Mineral deposits	Grout Manhole	2	360	\$2,600	\$0		\$7.22
108	M1	Edmund Avenue near Fairview Avenue	8	PRECAST	Cracked cover	New Frame and Cover, Grout Manhole	2	360	\$1,800	\$820		\$5.00
596	HS15	Essex Avenue and Melbourne Street	12	BLOCK	Broken frame, missing mortar from corbel, missing mortar from walls	New Frame and Cover, Cementitious Liner	2	0	\$0	\$2,860	\$2,860	\$0.00
					Missing mortar from wall, light debris on bench. Loose, missing, and broken bricks from							
533		Coakley Road	10	BLOCK	corbel	Corbel Repair, Cementitious Liner	2	0	\$0	\$2,870		\$0.00
823	GR1	Portsmouth Boulevard	7	BRICK	Frame cracked and missing pieces, Roots and debris on bench, corbel missing mortar	New Frame and Cover, Root Treatment	2	0	\$0	\$3,020	\$3,020	\$0.00
					Light debris on bench and invert. Infiltration at bench/wall connection. Possible industria							
2487	LR6	Lafayette Road at Coach Road	8	PRECAST	connection/service infiltration.	Grout Manhole, Cementitious Liner	2	2,520	\$3,330	\$0	\$3,330	\$1.32
638	GR1	Commerce Way	16	PRECAST	Infiltration staining	Grout Manhole	2	720	\$3,400	\$0		\$4.72
17 460	LD1 B1	Portsmouth Boulevard R.O.W.	/	PRECAST BRICK	Missing mortar from corbel with roots in corbel. Infiltration at pipe connection.	Corbel Repair, Grout Manhole, Cementitious Liner Corbel Repair, Root Treatment, Grout Manhole	2	720 720	\$2,960 \$1,800	\$1,000 \$3,200		\$4.11 \$2.50
5852	GR1	Victory Road Portsmouth Boulevard Easement	0	PRECAST	Roots at wall, corbel has broken bricks and missing mortar Mineral deposits at bench, broken bricks and missing mortar from corbel	Corbel Repair, Grout Manhole, Cementitious Liner	2	720	\$1,800	\$3,200		\$2.50
916	GR1	Blue Heron Drive Easement	8	BRICK	Roots and infiltration staining at wall	Root Treatment, Grout Manhole, Cementitious Liner	2	360	\$2,960	\$2,200		\$3.03
,10	GILI		Ŭ	Dition	Infiltration staining at wall, aggregate visible at wall due to H2S. Located on Pease		2	000	\$2,700	\$2,200	\$0,100	\$0.22
2387	GR1	Woodbury Avenue	12	PRECAST	effluent line.	Grout Manhole, Epoxy Liner	2	360	\$2,400	\$6,000	\$8,400	\$6.67
633	GR1	Commerce Way Easement	13	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
634	GR1	Commerce Way Easement	12	PRECAST	No defects	Continue to Monitor	1	0	\$0			+ • • • •
815	GR1	Portsmouth Boulevard near Shearwater Drive	14	BRICK	No defects	Continue to Monitor	1	0	\$0			,
912	GR1	Blue Heron Drive	7	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
914	GR1	Blue Heron Drive	12	BRICK	No defects	Continue to Monitor	1	0	\$0			+
919	GR1	Shearwater Drive at Blue Heron Drive	1	BRICK BRICK	No defects	Continue to Monitor	1	0	\$0 \$0			+ • • • •
922 5307	GR1 GR1	Staysail Way Commerce Way R.O.W.	15	PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0			
5398	GR1	Blue Heron Drive at Sanderling Way	6	PRECAST	No defects	Continue to Monitor	1	0	\$0 \$0		\$0	
5491	GR1	Shearwater Drive	9	PRECAST	No defects	Continue to Monitor	1	0	\$0			
5492	GR1	Shearwater Drive	8	PRECAST	No defects	Continue to Monitor	1	0	\$0			
5493	GR1	Sanderling Way	6	PRECAST	Possible industrial connection/service infiltration.	Continue to Monitor	1	0	\$0			
1302	HS11	Fells Road	8		No defects	Continue to Monitor	1	0	\$0		\$0	+
1305	HS11	Thaxter Road	9		No defects	Continue to Monitor	1	0	\$0			,
1306	HS11	Thaxter Road	6		No defects	Continue to Monitor	1	0	\$0	-		+ • • • •
1309	HS11	Fields Road	8	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
1325	HS11	Aldrich Road	5	PRECAST	No defects	Continue to Monitor	1	0	\$0 \$0			+
1326 1393	HS11 HS11	Chevrolet Avenue R.O.W. Cate Street	11	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	-		10.00
1393	HS11	Islington Street at Aldrich Road	10		No defects	Continue to Monitor	1	0	\$0 \$0			
1437	HS11	Islington Street at Elm Court	8	BRICK	No defects	Continue to Monitor	1	0	\$0 \$0	Ţ.		
2247	HS11	Ricci Lumber Yard	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	Ţ.		
2249	HS11	Islington Street	7	PRECAST	No defects	Continue to Monitor	1	0	\$0			
2744	HS11	Islington Street	14	PRECAST	No defects	Continue to Monitor	1	0	\$0			
5534	HS11	Bartlett Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0			
5539	HS11	Bartlett Street at Cate Street	6	PRECAST	No defects	Continue to Monitor	1	0	\$0			
5540	HS11	Islington Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0			+
5542	HS11	Islington Street at Bartlett Street	9	PRECAST	No defects	Continue to Monitor	1	0	\$0			+
5544 5545	HS11 HS11	Islington Street Islington Street at Jewell Court	9	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0			
5546	HS11 HS11	Islington Street at Jeweil Court	12	PRECAST	No defects	Continue to Monitor	1	0	\$0 \$0			
5548		Brewery Lane	12		No defects	Continue to Monitor	1	0	\$0			
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					Appendix B.2 - Manhole Rehabilitation Recommendat	ions - Max Defect Score Prioritization						
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
5551	HS11	Brewery Lane	9	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
5830 5831	HS11 HS11	Cass Street Cass Street at Lovell Street	8	PRECAST PRECAST	No defects No defects	Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00 \$0.00
5834	HS11	Cass Street at Lovell Street	8		No defects	Continue to Monitor Continue to Monitor	1	0	\$0			\$0.00
5839	HS11	Cass Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
5840	HS11	Cass Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
5844	HS11	Lovell Street	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	ţ.		φ0.00
524 527	HS14 HS14	Borthwick Avenue Easement Barberry Lane Easement	20	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00 \$0.00
538	HS14 HS14	Coakley Road	7	BLOCK	No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
5342	HS14	Coakley Road	9		No defects	Continue to Monitor	1	0	\$0			\$0.00
5410		Barberry Lane Easement	14		No defects	Continue to Monitor	1	0	\$0	÷.		\$0.00
5411		Barberry Lane Easement	16		No defects	Continue to Monitor	1	0	\$0	÷.		+0100
5854 5856		Barberry Lane Easement Barberry Lane Easement	16		No defects No defects	Continue to Monitor	1	0	\$0 \$0	\$(\$0.00 \$0.00
5850	HS14 HS15	Essex Avenue	13	PRECAST	No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00
597	HS15	Sheffield Road	6	BLOCK	No defects	Continue to Monitor	1	0	\$0	\$		\$0.00
837	LD1	Dunlin Way and Osprey Drive	7	BRICK	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1017	LD1	Chase Drive at Michael Succi Drive	8		No defects	Continue to Monitor	1	0	\$0	\$(\$0	\$0.00
2430	LD1	Kearsarge Way R.O.W.	14		No defects	Continue to Monitor	1	0	\$0	÷.		+0100
2444 2448	LD1 LD1	Spinnaker Way R.O.W. Spinnaker Way R.O.W.	10	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00 \$0.00
2446	LD1 LD1	Dunlin Way	12	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
1647	LR3	Nathaniel Drive	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$		\$0.00
2415	LR3	Nathaniel Drive R.O.W.	8		No defects	Continue to Monitor	1	0	\$0	Ŧ		\$0.00
2419	LR3	Nathaniel Drive R.O.W.	10		No defects	Continue to Monitor	1	0	\$0	ţ.		ψ0.00
2427	LR3	Nathaniel Drive R.O.W.	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	÷.		\$0.00
2436 2437	LR3 LR3	Nathaniel Drive R.O.W. Nathaniel Drive R.O.W.	/	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00 \$0.00
2437	LR3	Nathaniel Drive R.O.W.	7	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
2452		Nathaniel Drive R.O.W.	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	÷.		
2462	LR3	Nathaniel Drive R.O.W.	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	Ŧ		40100
2464	LR3	Nathaniel Drive R.O.W.	6	PRECAST	No defects	Continue to Monitor	1	0	\$0	**		ψ0.00
2466	LR3	Nathaniel Drive	9	PRECAST PRECAST	No defects	Continue to Monitor	1	0	\$0 \$0	\$(\$0.00 \$0.00
2534 2536	LR3 LR3	Mariette Drive Mariette Drive at Nathaniel Drive	9	PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00
2538	LR3	Mariette Drive	11		No defects	Continue to Monitor	1	0	\$0			
2540	LR3	Denise Street	8		No defects	Continue to Monitor	1	0	\$0			\$0.00
2554	LR3	Mariette Drive	17		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2556	LR3	Mariette Drive	13		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2558 2560	LR3 LR3	Mariette Drive Mariette Drive at Ocean Road	12	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$(\$(\$0.00 \$0.00
2567		Ocean Road	9		No defects	Continue to Monitor	1	0	\$0	\$(
2579	LR3	Suzanne Drive near Ocean Drive	8		No defects	Continue to Monitor	1	0	\$0			
2581	LR3	Suzanne Drive	6	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	*0100
2587	LR3	Suzanne Drive	9		No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
2589	LR3	Suzanne Drive			No defects	Continue to Monitor	1	0	\$0 \$0			\$0.00 \$0.00
2593 2595	LR3 LR3	Suzanne Drive Suzanne Drive	7		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0			
2597		Wallis Road	7		No defects	Continue to Monitor	1	0	\$0			
2600	LR3	Wallis Road	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2601	LR3	Wallis Road	7		No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
2607	LR3	Suzanne Drive	7		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2609 2610	LR3 LR3	Suzanne Drive Suzanne Drive	9		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0			
2610	LR3	Suzanne Drive	7		No defects	Continue to Monitor	1	0	\$0			
2612	LR3	Simmons Road at Suzanne Drive	5	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
2614	LR3	Simmons Road	7		No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
558	LR4	Middle Road			No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
559 560	LR4 LR4	Middle Road Middle Road at entrance of The Chase Home	6		No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0			\$0.00 \$0.00
2208		Middle Road at entrance of The Chase Home	-		No defects No defects	Continue to Monitor	1	0	\$0			· · · · · · · · · · · · · · · · · · ·
2200		Middle Road	15		No defects	Continue to Monitor	1	0	\$0			
2210		Middle Road		PRECAST	Possible industrial connection/service infiltration.	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
381	LR5	Lafayette Drive			No defects	Continue to Monitor	1	0	\$0	\$(\$0.00
1038	LR5	Ledgewood Drive			No defects	Continue to Monitor	1	0	\$0 \$0			ţ = . = =
1039	LR5	Ledgewood Drive	5	PRECAST	No defects	Continue to Monitor	1	I U	\$0	\$0	\$0	\$0.00

					Appendix B.2 - Manhole Rehabilitation Recommend	ations - Max Defect Score Prioritization					
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Estimate Score Infiltration (Infiltration	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
1046	LR5	Ledgewood Drive R.O.W.		PRECAST	No defects	Continue to Monitor	1	•	\$0 \$		0 \$0.00
1059	LR5	Lafayette Road	10	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	v	\$0 \$ \$0 \$		0 \$0.00 0 \$0.00
1060 1063	LR5 LR5	Lafayette Road Ledgewood Drive	11	PRECAST	No defects	Continue to Monitor	1	•	\$0 \$ \$0 \$		
1068		Lafayette Road	10	PRECAST	No defects	Continue to Monitor	1		\$0 \$		
1070	LR5	Lafayette Road at Edgewood Drive	10	PRECAST	No defects	Continue to Monitor	1	0		0 \$0	0 \$0.00
1071	LR5	Lafayette Road		PRECAST	No defects	Continue to Monitor	1	•	\$0 \$		ψ0.00
1072	LR5	Lafayette Road at Artwill Avenue		PRECAST	No defects	Continue to Monitor	1		\$0 \$ \$0 \$		0 \$0.00
1073 136	LR5 LR6	Lafayette Road at Andrew Jarvis Drive Heritage Avenue		PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	÷	\$0 <u>\$</u> \$0\$\$		φ0:00
149	LR6	Lafayette Road	14	PRECAST	No defects	Continue to Monitor	1		\$0 \$		
2477	LR6	Lafayette Road	7	PRECAST	No defects	Continue to Monitor	1	0	\$0 \$		
2481	LR6	Lafayette Road		PRECAST	No defects	Continue to Monitor	1	÷		0 \$0	φ0.00
2491	LR6	Lafayette Road		PRECAST	No defects	Continue to Monitor	1	-	\$0 \$		φ0.00
2495 2503	LR6 LR6	Lafayette Road Lafayette Road at Blue Fish Boulevard		PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor		-	\$0 \$ \$0 \$		0 \$0.00 0 \$0.00
2505	LR6	Lafayette Road at Suzanne Drive		PRECAST	No defects	Continue to Monitor	1	÷	\$0 \$		
2622	LR6	Lafayette Road	9	PRECAST	No defects	Continue to Monitor	1		\$0 \$		
2623	LR6	Lafayette Road	9	PRECAST	No defects	Continue to Monitor	1	-	\$0 \$	0 \$0	0 \$0.00
2633	LR6	Lafayette Road	8	PRECAST	Possible industrial connection/service infiltration.	Continue to Monitor	1	0	\$0 \$		φ0.00
2636	LR6	Heritage Avenue		PRECAST	No defects	Continue to Monitor	1	-	\$0 \$		\$0108
2637 2638	LR6 LR6	Heritage Avenue Heritage Avenue		PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor		•	\$0 \$ \$0 \$		*****
2638	LR6 LR6	Heritage Avenue		PRECAST	No defects	Continue to Monitor	1		\$0 \$ \$0 \$		
2643	LR6	Heritage Avenue	9	PRECAST	No defects	Continue to Monitor	1		\$0 \$		
2653	LR6	Robert Avenue R.O.W.		PRECAST	No defects	Continue to Monitor	1	-	\$0 \$		φ0.00
2654	LR6	Robert Avenue R.O.W.		PRECAST	No defects	Continue to Monitor	1	÷	\$0 \$		\$0100
2655	LR6	White Cedar Boulevard R.O.W.		PRECAST PRECAST	No defects	Continue to Monitor	1	-	\$0 \$ \$0 \$		¢0100
2656 2659	LR6 LR6	White Cedar Boulevard R.O.W. White Cedar Boulevard R.O.W.	8	PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	•	\$0 \$ \$0 \$		\$0:00
2660	LR6	Springbrook Circle Parking lot	12	PRECAST	No defects	Continue to Monitor	1		\$0 \$		
102	M1	Maplewood Avenue		PRECAST	No defects	Continue to Monitor	1	0		0 \$0	
109	M1	Fairview Avenue		PRECAST	No defects	Continue to Monitor	1		\$0 \$		÷0108
2130	M1	Edmond Avenue		PRECAST	No defects	Continue to Monitor	1	•	\$0 \$		*0100
2132 167	M1 P2A	Maplewood Avenue FW Hartford Drive Easement	10	PRECAST PRECAST	No defects See Appendix F	Continue to Monitor Continue to Monitor	1		\$0 \$ \$0 \$		*****
278	P2A	FW Hartford Drive at TJ Gamester Avenue	10	PRECAST	See Appendix F	Continue to Monitor	1		\$0 \$		
279	P2A	FW Hartford Drive	10	PRECAST	See Appendix F	Continue to Monitor	1	-	\$0 \$		
280	P2A	FW Hartford Drive	9	PRECAST	See Appendix F	Continue to Monitor	1		\$0 \$		φ0.00
281	P2A	FW Hartford Drive	7	PRECAST	See Appendix F	Continue to Monitor	1	-	\$0 \$		*0100
283 496	P2A P2A	TJ Gamester Avenue TJ Gamester Avenue	6	PRECAST PRECAST	See Appendix F See Appendix F	Continue to Monitor Continue to Monitor	1	•	\$0 \$ \$0 \$		*****
2167		FW Hartford Drive			See Appendix F	Continue to Monitor	1	0	2 01		
2168	P2A	FW Hartford Drive at TJ Gamester Avenue		PRECAST	See Appendix F	Continue to Monitor	1		\$0 \$	0 \$0	0 \$0.00
2405	P2A	FW Hartford Drive		PRECAST	See Appendix F	Continue to Monitor	1	•	\$0 \$	0 \$0	ψ0.00
2412		FW Hartford Drive		PRECAST	See Appendix F	Continue to Monitor	1		\$0 \$		40100
2416 2420	P2A P2A	FW Hartford Drive FW Hartford Drive		PRECAST PRECAST	See Appendix F See Appendix F	Continue to Monitor Continue to Monitor	1		\$0 \$ \$0 \$		
2420	P2A P2A	FW Hartford Drive		PRECAST	See Appendix F	Continue to Monitor	1		\$0 \$ \$0 \$		
2428	P2A	FW Hartford Drive		PRECAST	See Appendix F	Continue to Monitor	1		\$0		
2432	P2A	FW Hartford Drive		PRECAST	See Appendix F	Continue to Monitor	1	•	\$0 \$	0 \$0	0 \$0.00
2438		FW Hartford Drive		PRECAST	See Appendix F	Continue to Monitor	1	÷	\$0 \$		φ0.00
2442 2446	P2A P2A	FW Hartford Drive FW Hartford Drive		PRECAST PRECAST	See Appendix F See Appendix F	Continue to Monitor Continue to Monitor	1	-	\$0 \$ \$0 \$		\$0.00
2668		FW Hartford Drive Easement		PRECAST	See Appendix F	Continue to Monitor	1		\$0 \$ \$0 \$		
5850	P2A	FW Hartford Road		PRECAST	See Appendix F	Continue to Monitor	1			0 \$0	0 \$0.00
1338	HS11	Cass Street	8		Can not locate manhole	Continue to Monitor	1	-	\$0 \$	0 \$0	40100
1339	HS11	Cass Street	8		Manhole Abandoned	Continue to Monitor	1		\$0 \$		φ0100
1340 2251	HS11 HS11	Cass Street Cass Street	8 Q		Manhole Abandoned Manhole Abandoned	Continue to Monitor Continue to Monitor	1	-	\$0 <u>\$</u> \$0\$\$		φ0:00
2251	HS11 HS11	Class Street Chevrolet Avenue	8		Manhole Abandoned	Continue to Monitor	1		\$0 \$ \$0 \$		
2255	HS11	Chevrolet Avenue	8		Manhole Abandoned	Continue to Monitor	1		\$0 \$		
5096	HS11	Lovell Street	8		Manhole Abandoned	Continue to Monitor	1		\$0 \$	0 \$0	0 \$0.00
630	GR1	Oriental Gardens R.O.W.	8		Can not locate manhole	Locate Manhole	1		\$0 \$10		
637	GR1	Commerce Way	8		Can not locate manhole	Locate Manhole	1		\$0 \$10 \$0 \$10		
641 659	GR1 GR1		8 8		Can not locate manhole Can not locate manhole	Locate Manhole Locate Manhole	1	-	\$0 <u>\$10</u> \$0\$10		
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					Appendix B.2 - Manhole Rehabilitation Re	commendations - Max Defect Score Prioritization						
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
814	GR1		8		Can not locate manhole	Locate Manhole	1	0	\$0	+	\$100	\$0.00
825	GR1	Portsmouth Boulevard	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
918	GR1	Shearwater Drive R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0 \$0			\$0.00 \$0.00
2374 2384	GR1 GR1	Shearwater Drive	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100 \$100	\$0.00
<u>2384</u> 5494	GR1 GR1		8		Can not locate manhole. Located on Pease effluent line. Can not locate manhole	Locate Manhole Locate Manhole	1	0	\$0			\$0.00
5505	GR1	Commerce Way Easement	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
1327	HS11	Brewery Avenue R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
1328	HS11	Jewell Court R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
1333	HS11	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	÷		\$0.00
1334	HS11	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
1335	HS11	Albany Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1394	HS11	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1395	HS11	Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1396	HS11	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1434	HS11	Islington Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	÷		\$0.00
1440	HS11	Islington Street	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2243	HS11	Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2244	HS11	Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2246	HS11	Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
5333	HS11	Brewery Avenue R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
5537	HS11	Jewell Court	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
588	HS15	Hampshire Road	8	-	Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
1383	HS15	US Rt 1 Bypass	8		Can not locate manhole	Locate Manhole	1	0	\$0 \$0			\$0.00 \$0.00
1423 2211	HS15 HS15	Spinney Road Hampshire Road R.O.W.	8		Can not locate manhole	Locate Manhole Locate Manhole		0	\$0			\$0.00
	HS15	Sims Avenue	0	-	Can not locate manhole Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
600 Duplicate	LD1	Kearsarge Way R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2414	LD1	Michael Succi Drive Railroad Easement	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2418	LD1	Michael Succi Drive Railroad Easement	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2426	LD1	Kearsarge Way R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2435	LD1	Kearsarge Way R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2553	LR3	Pamela Drive	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2562	LR3	Ocean Road	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2564	LR3	Ocean Road	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
2204	LR4	Greenleaf Woods Drive	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1042	LR5	Portsmouth High School fields	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1043	LR5	Portsmouth High School fields	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1061	LR5	Lafayette Road	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
1066	LR5	Lafayette Road	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
1067	LR5	Lafayette Road	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
1069 Duplicate	LR5	Lafayette Road R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
769	M1	Maplewood Avenue	8		Can not locate manhole	Locate Manhole	1	0	\$0	φ100		\$0.00
2792		Cutts Street at Ashland Street	8		Can not locate manhole	Locate Manhole	1	0	\$0			\$0.00
168	P2A	FW Hartford Drive	8		Can not locate manhole	Continue to Monitor	1	0	\$0			\$0.00
282	P2A	TJ Gamester Avenue	8	PDICK	Can not locate manhole	Continue to Monitor	1	0	\$0			\$0.00
819	GR1	Portsmouth Boulevard at Commerce Way	6	BRICK	Light debris on bench and invert	Clean	1	0	\$0			\$0.00
64	LD1	Market Street R.O.W.	8		Cover too large to open	New Frame and Cover		0	\$0		\$820	\$0.00
65	LD1	Market Street R.O.W.	8		Cover too large to open	New Frame and Cover New Frame and Cover		0	\$0 \$0		\$820 \$820	\$0.00
2410 514	LD1 B1	Michael Succi Drive Railroad Easement Victory Road	0 0		Cover too large to open Manhole buried	Raise to Surface	1	0	\$0			\$0.00 \$0.00
2566	LR3	Ocean Road	8		Manhole buried behind home	Raise to Surface	1	0	\$0			\$0.00
2620	LR3 LR6	Lafayette Road	8		Manhole buried	Raise to Surface	1	0	\$0			\$0.00
2634	LR0 LR6	Lafayette Road	8		Can not locate manhole	Raise to Surface	1	0	\$0			\$0.00
2037	LIVU		U	1			1	0	φU	φ1,100	ψ1,100	φ0.00

					Appendix B.3 - Manhole Rehabilitation Recommendatio	ns - Prioritization Per Basin Per Street						
		04	MH Depth				Max Defect	Estimated	Estimated	Estimated	Estimated Total	Infiltration Removal Cost
MH Number	Metering Basin	Street	(ft)	Manhole Material	Observations	Rehabilitation Recommendations	Score	Infiltration (gpd)	Infiltration Removal Cost	Structural / O&M Rehab	Rehab Cost	Effectiveness (\$ Spent per Gallon Per Day Removed
459	B1	Colonial Drive	6	BRICK	Missing bricks and mortar from corbel	Corbel Repair	2	0	so	\$1,000	\$1,000	Salion Per Day Removed \$0.00
458	B1	Colonial Drive at Worthen Road	7	BRICK	Missing bricks and mortar from corbei	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
460	B1	Victory Road	8	BRICK	Roots at wall, corbel has broken bricks and missing mortar	Corbel Repair, Root Treatment, Grout Manhole	2	720	÷ •	\$3,200	\$5,000	\$2.50
514	B1	Victory Road	8		Manhole buried	Raise to Surface	1	0	\$0	\$1,100	\$1,100	\$0.00
5271	B1	Victory Road Easement	8	PRECAST	Roots at wall	Root Treatment, Cementitious Liner	3	0	\$0	\$3,730	\$3,730	\$0.00
641	GR1		8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
659	GR1		8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
814	GR1		8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
2384	GR1		8		Can not locate manhole. Located on Pease effluent line.	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
5494	GR1		8	DDFALAT	Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
912	GR1	Blue Heron Drive	1	PRECAST	No defects	Continue to Monitor	1	0	\$0 \$0	\$0	\$0 \$0	\$0.00
913	GR1 GR1	Blue Heron Drive	6	PRECAST BRICK	Missing mortar from corbel No defects	Continue to Monitor	2	0	\$0 \$0	\$0 ¢0	\$0 \$0	\$0.00 \$0.00
<u>914</u> 5398	-	Blue Heron Drive Blue Heron Drive at Sanderling Way			No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$0 \$0	\$0 \$0	\$0.00
916	GR1	Blue Heron Drive Easement	8	BRICK	Roots and infiltration staining at wall	Root Treatment, Grout Manhole, Cementitious Liner	2	360	\$2,960	\$2,200	\$5,160	\$8.22
915	GR1	Blue Heron Drive near Sanderling Way	9	BRICK	Missing mortar from corbel	Continue to Monitor	2	500	\$0	\$0	\$0,100	\$0.00
637	GR1	Commerce Way	8	DIGIC	Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
638	GR1	Commerce Way	16	PRECAST	Infiltration staining	Grout Manhole	2	720	÷0	\$0	\$3,400	\$4.72
640	GR1	Commerce Way	11	PRECAST	Roots and debris on bench	Root Treatment	2	0	\$0	\$2,200	\$2,200	\$0.00
		· · · · · · · · · · · · · · · · · · ·				New Frame and Cover, Grout Manhole, Cementitious			, ve	+=,=30	+=,=30	
5332	GR1	Commerce Way	13	PRECAST	Active infiltration at walls, cracked frame with broken pieces	Liner	3	720	\$4,810	\$820	\$5,630	\$6.68
632	GR1	Commerce Way Easement	13	PRECAST	Mineral deposits	Grout Manhole	2	360	\$2,600	\$0	\$2,600	\$7.22
633	GR1	Commerce Way Easement	13		No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
634	GR1	Commerce Way Easement	12	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
					Severe infiltration from corbel, surcharging (no bench or invert visible), ponding around	Corbel Repair, Rebuild Bench, Grout Manhole, Raise to						
2385	GR1	Commerce Way Easement	8	BRICK	frame causing inflow. Located on Pease effluent line.	Surface	4	2,880	\$1,600	\$4,300	\$5,900	\$0.56
					Roots in corbel, Active infiltration with mineral deposits at wall, heavy debris in invert.							
2386	GR1	Commerce Way Easement	9	BRICK	Located on Pease effluent line.	Root Treatment, Grout Manhole, Cementitious Liner	3	1,440	\$3,330	\$2,200	\$5,530	\$2.31
5505	GR1	Commerce Way Easement	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
5307	GR1	Commerce Way R.O.W.	15	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
812	GR1	Granite Street R.O.W.	9	BRICK	Roots and debris on bench	Root Treatment	2	0	\$0	\$2,200	\$2,200	\$0.00
5729	GR1	Granite Street R.O.W.	6	PRECAST	Evidence of surcharge, bench and invert not visible due to high water.	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
628	GR1	Oriental Gardens R.O.W.	12	PRECAST	Roots in corbel and wall	Root Treatment	2	0	\$0	\$2,200	\$2,200	\$0.00
629	GR1	Oriental Gardens R.O.W.	11	PRECAST	Heavy mineral deposits, aggregate visible at wall due to H2S	Grout Manhole, Epoxy Liner	3	1,440		\$5,500	\$7,700	\$1.53
630	GR1	Oriental Gardens R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
631	GR1	Oriental Gardens R.O.W.	13	PRECAST	Mineral deposits	Grout Manhole	2	360	\$2,600	\$0	\$2,600	\$7.22
001	0.01			PDIOK	Manhole walls leaking at 11.6 gpm per flow isolation, no picture taken of infiltration.			1/ 70/	¢0.700	\$ 0	\$0.700	¢0.00
821	GR1	Osprey Drive	9	BRICK	Also, possible industrial connection/service infiltration.	Grout Manhole, Cementitious Liner	4	16,704	\$3,700 \$0	\$0	\$3,700	\$0.22
5495	GR1	Osprey Drive Easement	8	DDICK	Cover broken	New Frame and Cover	4	0	ψU	\$820	\$820	\$0.00
816		Portsmouth Boulevard Portsmouth Boulevard	10	BRICK	Mineral deposits at wall. Pipe connection leak.	Grout Manhole, Cementitious Liner	3	7,200 7,200	\$3,330 \$4,070	\$0 ¢2.200	\$3,330 \$6,270	\$0.46 \$0.57
818 823	GR1 GR1	Portsmouth Boulevard	10	BLOCK BRICK	Active infiltration and mineral deposits at wall, roots Frame cracked and missing pieces, Roots and debris on bench, corbel missing mortar	Root Treatment, Grout Manhole, Cementitious Liner New Frame and Cover, Root Treatment	4	7,200	\$4,070 \$0	\$2,200 \$3,020	\$6,270	\$0.07
023	GRI		/	DRICK			Z	0	\$U	\$3,020	\$3,020	¢U.UU
824	GR1	Portsmouth Boulevard	Q	BRICK	Manhole cover below grade, no bench and invert in manhole. Manhole bottom full of debris, corbel missing bricks and mortar	Clean, Corbel Repair	2	0	\$0	\$1,550	\$1,550	\$0.00
825	GR1 GR1	Portsmouth Boulevard	8	DRICK	Can not locate manhole	Locate Manhole	1	0	\$0 \$0	\$1,550	\$1,550	\$0.00
819		Portsmouth Boulevard at Commerce Way	6	BRICK	Light debris on bench and invert	Clean	1	0	\$0	\$550	\$550	\$0.00
820		Portsmouth Boulevard at Osprey Drive	-	BRICK	Roots at wall	Continue to Monitor	2	0	\$0	\$0 \$0	\$050	\$0.00
639	GR1	Portsmouth Boulevard Easement		PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0 \$0	\$0 \$0	\$0.00
5852		Portsmouth Boulevard Easement			Mineral deposits at bench, broken bricks and missing mortar from corbel	Corbel Repair, Grout Manhole, Cementitious Liner	2	720	÷0	\$1,000	\$5,070	\$5.65
813		Portsmouth Boulevard near Market Street			Active infiltration and mineral deposits at wall	Grout Manhole, Cementitious Liner	3	432	\$4,070	\$0	\$4,070	\$9.42
815	GR1	Portsmouth Boulevard near Shearwater Drive			No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5399	GR1	Sanderling Way	8	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5493	GR1	Sanderling Way	6	PRECAST	Possible industrial connection/service infiltration.	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
817	GR1	Sanderling Way Easement	7	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
917	GR1	Shearwater Drive	9	BRICK	Abandoned Manhole	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
					Pipe connection leak from north and west pipes. Possible industrial connection/service							
920	GR1	Shearwater Drive		BRICK	infiltration.	Grout Manhole, Cementitious Liner	4	10,080	\$3,330	\$0	\$3,330	\$0.33
2372	GR1	Shearwater Drive		PRECAST	Abandoned Manhole	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2373	GR1	Shearwater Drive	10	PRECAST	Abandoned Manhole	Continue to Monitor	2	0	\$0	\$0		\$0.00
2374	GR1	Shearwater Drive	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
5491	GR1	Shearwater Drive			No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5492	GR1	Shearwater Drive	8		No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
919	GR1	Shearwater Drive at Blue Heron Drive	7		No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5490	GR1	Shearwater Drive near Portsmouth Boulevard	12	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
		Shearwater Drive R.O.W.	1 8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
918	GR1		°	DDIOK		0.1.18	~	-	a -			أننيد
	GR1	Staysail Way Staysail Way	8	BRICK BRICK	Missing bricks and mortar from corbel.Possible industrial connection/service infiltration. No defects	Corbel Repair Continue to Monitor	2	0	\$0 \$0	\$1,000 \$0	\$1,000 \$0	\$0.00 \$0.00

					Appendix B.3 - Manhole Rehabilitation Recommendati	ons - Prioritization Per Basin Per Street						Infiltration Domewool Coast
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Materia	nole Material Observations Rehabilitation	Rehabilitation Recommendations	Max Defect		Estimated Infiltration	Estimated Structural / O&M	Estimated Total	Infiltration Removal Cost Effectiveness (\$ Spent per
						Rendbindation Recommendations	Score	Infiltration (gpd)	Removal Cost	Rehab	Rehab Cost	Gallon Per Day Removed
642	GR1	Woodbury Avenue	11	PRECAST	Missing bricks and mortar from corbel, Mineral deposits at wall, debris buildup in benc	n. Corbel Repair, Grout Manhole, Cementitious Liner	3	1,440	\$4,070	\$1,000	\$5,070	\$2.83
643	GR1	Woodbury Avenue	13	PRECAST	Roots at wall	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
656		Woodbury Avenue	6	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
658	GR1	Woodbury Avenue	10	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
0007	0.54		10	DDFALAT	Infiltration staining at wall, aggregate visible at wall due to H2S. Located on Pease				* 0.400	* (22	*** ***	A
2387	GR1 GR1	Woodbury Avenue Woodbury Avenue	12	PRECAST PRECAST	effluent line.	Grout Manhole, Epoxy Liner	2	360 360	\$2,400 \$4,810	\$6,000 \$2,200	\$8,400 \$7.010	\$6.67 \$13.36
2388	GRI		13	PRECASI	Mineral deposits, debris buildup in bench and channel. Bricks missing from bench. Missing bricks in bench and invert. Light debris buildup in bench and channel. Infiltrati	Rebuild Bench, Grout Manhole, Cementitious Liner	3	300	\$4,810	\$2,200	\$7,010	\$13.30
5334	GR1	Woodbury Avenue	12	PRECAST	staining at wall. Possible industrial connection/service infiltration.	Rebuild Bench, Grout Manhole	4	720	\$2,400	\$2,200	\$4,600	\$3.33
657		Woodbury Avenue at Arthur Brady Drive	5	PRECAST	Missing mortar from corbel	Continue to Monitor	2	,20	\$0	\$0	\$0	\$0.00
1335	-	Albany Street	8	TREGNOT	Can not locate manhole	Locate Manhole	1	0	\$0 \$0		\$100	\$0.00
1325		Aldrich Road	5	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5818	HS11	Aldrich Road	8	PRECAST	Heavy debris in invert	Clean	2	0	\$0	\$550	\$550	\$0.00
5819	HS11	Aldrich Road at Aldrich Court	8	PRECAST	Incoming pipe connection leak (estimated at 2 gpm)	Rebuild Bench, Grout Manhole, Cementitious Liner	3	1,800	\$2,960	\$2,200	\$5,160	\$1.64
529		Barberry Lane Easement	10	PRECAST	Heavy debris on bench, corbel missing mortar	Clean	2	0	\$0		\$550	\$0.00
5855	HS11	Barberry Lane Easement	11	PRECAST	Outside of corbel exposed, moderate debris on bench and invert	Clean, Corbel Repair	3	0	\$0	1 1	\$1,550	\$0.00
1333	HS11	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
1334	HS11	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
1394	HS11	Bartlett Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1396	HS11	Bartlett Street	8		Can not locate manhole Proken and locate bricks on corbol missing marter from corbol. No bonch and invert	Locate Manhole		0	\$0	\$100	\$100	\$0.00
1397	HS11	Bartlett Street	7	BRICK	Broken and loose bricks on corbel, missing mortar from corbel. No bench and invert,	Rebuild Bench, Cementitious Liner	4	0	\$0	\$3,390	\$3,390	\$0.00
5530	HS11	Bartlett Street	7	PRECAST	heavy debris buildup No defects	Continue to Monitor	4	0	\$0		۵,390 ¢۵	\$0.00
5531	HS11	Bartlett Street	6	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0	۵۵ ۵۷	\$0.00
5532	HS11	Bartlett Street	6	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0	ψυ	\$0.00
5533	HS11	Bartlett Street	8	PRECAST	No defects	Continue to Monitor	2	0	\$0			\$0.00
5534	HS11	Bartlett Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5535	HS11	Bartlett Street	8	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5536	HS11	Bartlett Street at Cate Street	8	PRECAST	Broken bricks in corbel	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
5539	HS11	Bartlett Street at Cate Street	6	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1395	HS11	Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
2243	HS11	Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
2244	HS11	Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
2246		Bartlett Street R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0		\$100	\$0.00
1327	HS11	Brewery Avenue R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0 \$0	\$100 \$100	\$100	\$0.00 \$0.00
5333 1329	HS11 HS11	Brewery Avenue R.O.W. Brewery Lane	14	PRECAST	Can not locate manhole No bench and invert	Locate Manhole Rebuild Bench	1	0	\$0 \$0	\$100	\$100 \$2,200	\$0.00
1329	пэтт	Diewery Lane	14	FRECASI	Bench and invert gone/broken/sinking, infiltration staining at walls, piece of frame	New Frame and Cover, Rebuild Bench, Grout Manhole,	4	0	پ 0	\$2,200	\$2,200	\$U.UU
1330	HS11	Brewery Lane	11	PRECAST	missing	Epoxy Liner	5	720	\$2,400	\$9,020	\$11,420	\$3.33
1550	11511			TRECAST	No bench and invert, roots at wall. Large gaps in wall. Possible industrial		5	120	ψ2,400	\$7,020	\$11,420	ψ0.00
1331	HS11	Brewery Lane	14	BRICK/STONE	connection/service infiltration.	Rebuild Bench, Grout Manhole, Cementitious Liner	4	1,440	\$5,550	\$2,200	\$7,750	\$3.85
5547	HS11	Brewery Lane	15	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5548	11011	Brewery Lane	14	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5551	HS11	Brewery Lane	9	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1338	HS11	Cass Street	8		Can not locate manhole	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1339	HS11	Cass Street	8		Manhole Abandoned	Continue to Monitor	1	0	\$0			\$0.00
1340	HS11	Cass Street	8		Manhole Abandoned	Continue to Monitor	1	0	\$0	÷ •		\$0.00
2251	HS11	Cass Street	8		Manhole Abandoned	Continue to Monitor	1	0	\$0	\$0		\$0.00
5830	HS11	Cass Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
5839	HS11	Cass Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
5840	HS11	Cass Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00 \$0.00
5831 5834	HS11 HS11	Cass Street at Lovell Street Cass Street at Lovell Street	/	PRECAST PRECAST	No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$0 \$0		\$0.00
1390	HS11	Cate Street	0	BLOCK	Active infiltration and mineral deposits at wall, corbel missing mortar	Grout Manhole, Cementitious Liner	3	288	÷0	\$0		\$0.00
1390	HS11	Cate Street	5	PRECAST	Mineral deposits at wall, corbel missing mortar	Grout Manhole	2	360		\$0		\$3.33
1393	HS11	Cate Street	6	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2254	HS11	Chevrolet Avenue	8		Manhole Abandoned	Continue to Monitor	1	0	\$0			\$0.00
2255	HS11	Chevrolet Avenue	8		Manhole Abandoned	Continue to Monitor	1	0	\$0			\$0.00
1326	HS11	Chevrolet Avenue R.O.W.	11	PRECAST	No defects	Continue to Monitor	1	0	\$0			\$0.00
1302	HS11	Fells Road	8	BLOCK	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
1308	HS11	Fields Road	7	BLOCK	Light debris on bench, chipped frame	New Frame and Cover	2	0	\$0		\$820	\$0.00
1309	HS11	Fields Road	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1310	HS11	Fields Road	8	PRECAST	Crack in wall, frame missing pieces. Possible industrial connection/service infiltration.	New Frame and Cover, Cementitious Liner	2	0	\$0	+=1	\$2,180	\$0.00
1311	HS11	Fields Road and Sewall Road	7	BLOCK	Moderate debris in bench and invert, active infiltration from wall	Grout Manhole, Cementitious Liner	3	1,440			\$2,960	\$2.06
1381	HS11	Hampshire Road	8	BLOCK	Active infiltration and mineral deposits at wall	Grout Manhole, Cementitious Liner	3	288		\$0		\$10.28
		Iclington Stroot	8	PRECAST	Light debris on bench, heavy debris in channel	Clean	3	0	\$0	\$550	\$550	\$0.00
1432 1434		Islington Street Islington Street	8		Can not locate manhole	Locate Manhole			\$0			

					Appendix B.3 - Manhole Rehabilitation Recommendation	ns - Prioritization Per Basin Per Street						
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
1440	HS11	Islington Street	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1441	HS11	Islington Street	9	PRECAST	Bench and invert missing mortar	Rebuild Bench	2	0	\$0	\$2,200	\$2,200	\$0.00
					Active infiltration at wall, bench and invert not visible, corbel missing mortar and cracked	Corbel Repair, Rebuild Bench, Grout Manhole,						
2221	HS11 HS11	Islington Street	11	BRICK PRECAST	Moderate debris in bench and invert, roots at wall. Brick repair at bottom of MH wall.	Cementitious Liner	4	1,080	\$4,440 \$0	\$3,200 \$2,210	\$7,640 \$2,210	\$4.11 \$0.00
2245 2248	HS11 HS11	Islington Street Islington Street			Noderate debris in bench and invert, roots at wall. Brick repair at bottom of MH wall.	Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	2	2,880	\$0 \$2,960	\$2,210 \$2,200	\$2,210 \$5,160	\$0.00
2240	HS11	Islington Street		PRECAST	No defects	Continue to Monitor	1	2,000	\$0	\$2,200	\$0	\$0.00
2253	HS11	Islington Street		PRECAST	Bench and invert missing mortar	Rebuild Bench	2	0	\$0	\$2,200	\$2,200	\$0.00
2744	HS11	Islington Street	14	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5540	HS11	Islington Street	8		No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5544	HS11	Islington Street	9		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
5546	HS11	Islington Street	12		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
1437 5542	HS11 HS11	Islington Street at Aldrich Road Islington Street at Bartlett Street	10		No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$0 \$0		\$0.00 \$0.00
1439	HS11	Islington Street at Elm Court	9	BRICK	No defects	Continue to Monitor	1	0	\$0 \$0	\$0 \$0		\$0.00
5545	HS11	Islington Street at Jewell Court	9	PRECAST	No defects	Continue to Monitor	1	0	\$0 \$0	\$0 \$0	\$0 \$0	\$0.00
5537	HS11	Jewell Court	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1328	HS11	Jewell Court R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
5096	HS11	Lovell Street	8		Manhole Abandoned	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5844	HS11	Lovell Street		PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2741	HS11	Lovell Street R.O.W.		BLOCK	Walls missing mortar, no bench and invert, mineral deposits in incoming line	Rebuild Bench, Grout Manhole, Cementitious Liner	4	720	\$4,070	\$2,200	\$6,270	\$5.65
5549 5550	HS11 HS11	Lovell Street R.O.W.	10	PRECAST PRECAST	Disconnected drop connection in manhole	Continue to Monitor	2	0	\$0 \$0	\$0 \$1,100	\$0 \$1,100	\$0.00 \$0.00
1344	HS11 HS11	Lovell Street R.O.W. Madison Street at Lovell Street	8	PRECAST	Frame and cover below grade No bench and invert, heavy debris buildup	Raise to Surface Rebuild Bench	3	0	\$0 \$0	\$1,100 \$2,200	\$1,100	\$0.00
2247	HS11	Ricci Lumber Yard	7	PRECAST	No defects	Continue to Monitor	4	0	\$0 \$0	\$2,200 \$0	\$2,200 \$0	\$0.00
2247	11311		,	TREGNOT		New Frame and Cover, Rebuild Bench, Grout Manhole,	1	0	4 0	40	Ψ0	\$0.00
1307	HS11	Sewall Road	6	PRECAST	Active infiltration at walls, hole in bench, corbel missing mortar, chipped frame	Cementitious Liner	3	288	\$2,590	\$3,020	\$5,610	\$8.99
-						New Frame and Cover, Grout Manhole, Cementitious						
1314	HS11	Sewall Road	8	PRECAST	Chipped cover, active infiltration coming from wall	Liner	3	288	\$2,960	\$820	\$3,780	\$10.28
					Faulty drop connection in manhole, light debris on bench and invert, walls weeping at							
1315	HS11	Sewall Road at Spinney Road		PRECAST	joints	Grout Manhole, Cementitious Liner	3	1,728	\$3,330	\$0	\$3,330	\$1.93
1305	HS11	Thaxter Road			No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1306	HS11	Thaxter Road		PRECAST PRECAST	No defects Evidence of supported and the set hand	Continue to Monitor	1	0	\$0 \$0	\$0 \$550	\$0 ¢550	\$0.00 \$0.00
5503 1303	HS11 HS11	Thaxter Road Thaxter Road at Fells Road	9	BLOCK	Evidence of surcharge, moderate debris on bench Loose bricks in wall, no bench and invert, active infiltration at wall	Clean Rebuild Bench, Grout Manhole, Cementitious Liner	3	1,080	\$0 \$4,070	\$550 \$2,200	\$550 \$6,270	\$0.00
1303	HS11	US Bypass 1	11	BLOCK	Roots, Active infiltration and mineral deposits at wall	Root Treatment, Grout Manhole, Cementitious Liner	4	1,080	\$4,070	\$2,200	\$6,640	\$30.83
1388	HS11	US Bypass 1 at rear	11	PRECAST	Mineral deposits at wall, corbel missing mortar	Grout Manhole	2	360	\$2,400	\$0	\$2,400	\$6.67
1389	HS11	US Bypass 1 at rear			Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
527	HS14	Barberry Lane Easement	11	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5316	HS14	Barberry Lane Easement	7	PRECAST	Active infiltration and mineral deposits at wall, corbel missing mortar	Corbel Repair, Grout Manhole, Cementitious Liner	3	2,160	\$2,590	\$1,000	\$3,590	\$1.20
5410	HS14	Barberry Lane Easement	14	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
5411		Barberry Lane Easement	16	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
5412 5854	HS14 HS14	Barberry Lane Easement Barberry Lane Easement			Infiltration staining at wall No defects	Grout Manhole, Cementitious Liner Continue to Monitor	3	360	\$6,660 \$0	\$0 \$0	\$6,660	\$18.50 \$0.00
5856	HS14	Barberry Lane Easement			No defects	Continue to Monitor	1	0	\$0 \$0	\$0 \$0	ېر ۵۷	\$0.00
523	HS14	Borthwick Avenue			Missing mortar from corbel	Continue to Monitor	2	0	\$0 \$0	\$0 \$0		\$0.00
530	HS14	Borthwick Avenue			No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
5212	HS14	Borthwick Avenue		PRECAST	Moderate debris on bench and invert	Clean	2	0	\$0	\$550	\$550	\$0.00
					Heavy debris on bench and invert, missing mortar from corbel. Possible industrial							
5213	HS14	Borthwick Avenue		PRECAST	connection/service infiltration.	Clean	2	0	\$0	\$550	\$550	\$0.00
2219	HS14	Borthwick Avenue at Marriot Hotel			Mineral deposits at outlet pipe with active infiltration	Grout Manhole, Cementitious Liner	3	288	\$2,220	\$0	\$2,220	\$7.71
524	HS14	Borthwick Avenue Easement			No defects	Continue to Monitor	1	0	\$0	\$0 \$1 100	\$0	\$0.00 \$0.00
531	HS14	Coakley Road	6	BLOCK	Heavy debris in bench and invert, missing mortar in wall Loose brick in corbel, missing mortar in wall. Possible industrial connection/service	Cementitious Liner	2	0	\$0	\$1,190	\$1,190	\$0.00
532	HS14	Coakley Road	7	BLOCK	infiltration.	Cementitious Liner	2	n	\$0	\$1,190	\$1,190	\$0.00
552	11017		,	22001	Missing mortar from wall, light debris on bench. Loose, missing, and broken bricks from		2	0	ψŲ	φ1,170	φ1,170	ψ0.00
533	HS14	Coakley Road	10	BLOCK	corbel	Corbel Repair, Cementitious Liner	2	0	\$0	\$2,870	\$2,870	\$0.00
534	HS14	Coakley Road			No bench and invert, heavy debris buildup	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
537	HS14	Coakley Road		BLOCK	Light debris on bench	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
538	HS14	Coakley Road	7	BLOCK	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
			_		Moderate debris on bench, broken frame, loose and broken bricks from corbel, missing	New Frame and Cover, Corbel Repair, Grout Manhole,			** ***		· · · ·	.
540 E 41	HS14	Coakley Road		BLOCK	mortar from walls Missing moster is wells. No hansh and isvart, has a dabris buildur.	Cementitious Liner	3	720	\$2,960	\$1,820	\$4,780	\$4.11
541 2727	HS14 HS14	Coakley Road		BLOCK BLOCK	Missing mortar in walls, No bench and invert, heavy debris buildup Missing mortar in wall, no bench and invert, heavy debris buildup	Rebuild Bench, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	4	720	\$0 \$3,330	\$3,560 \$2,200	\$3,560 \$5,530	\$0.00 \$4.63
5342	HS14 HS14	Coakley Road Coakley Road			No defects	Continue to Monitor	4	/20 0	\$3,330 \$0	\$2,200 \$0	060,04 N¢	\$4.63
5341	HS14	Granite Group parking lot		PRECAST	Heavy sediment on bench	Clean	2	0	\$0 \$0	\$550	\$550	\$0.00
535	HS14	Larry Lane			Missing mortar from corbel and walls, loose bricks in corbel	Corbel Repair, Cementitious Liner	2	0	\$0	\$2,020		\$0.00
•	•						•		1			

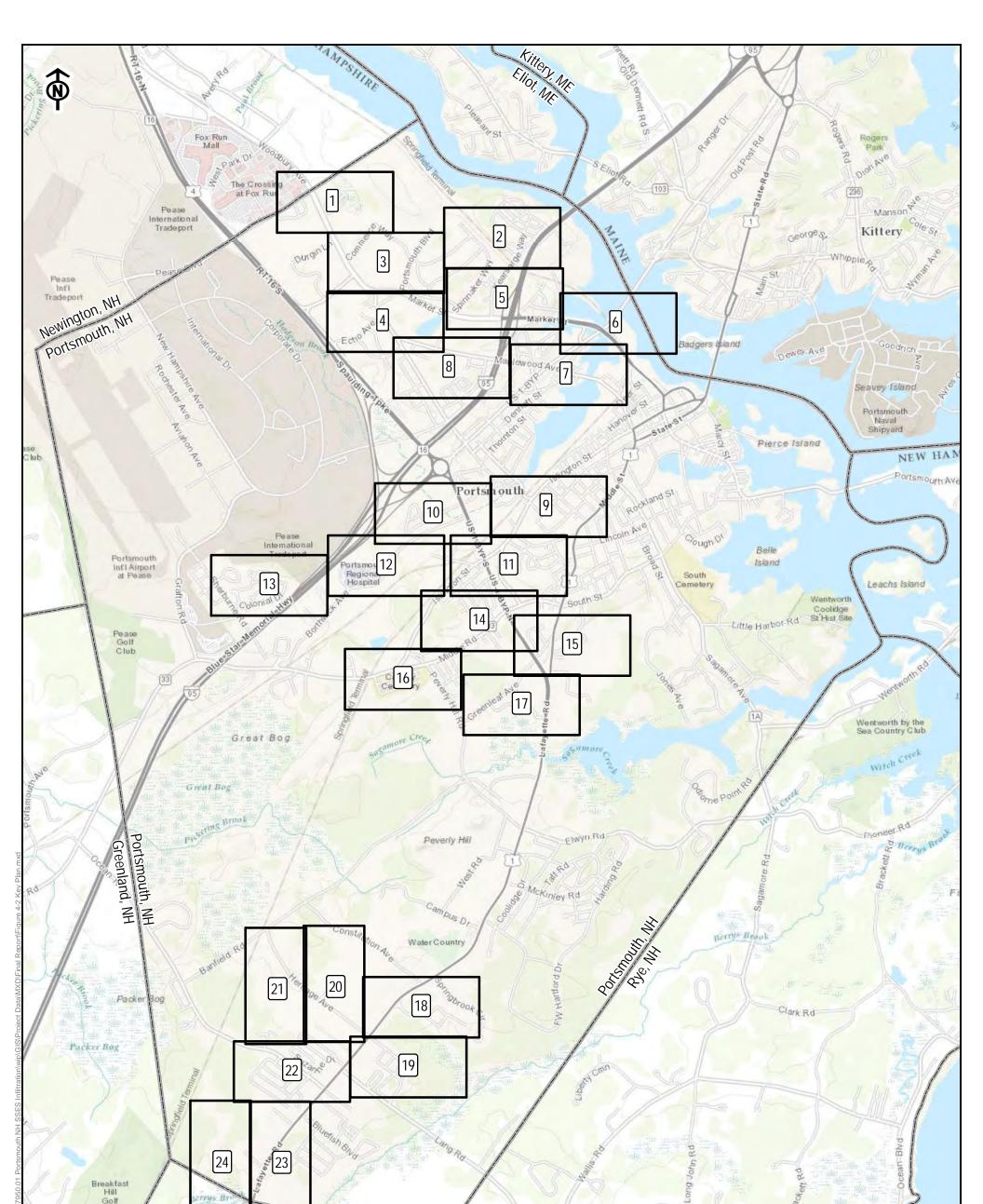
Number Mage: 2237 601 - 593 - 594 - 595 - 596 - 597 - 598 - 597 - 597 - 597 - 597 - 598 - 586 - 588 - 2211 - 563 - 5477 - 5477 - 5477 - 5477 - 5578 - 1384 - 580 - 581 -	HS15 HS15 HS15 HS15 HS15 HS15	Street Larry Lane Benson Street Essex Avenue Essex Avenue Essex Avenue Essex Avenue Essex Avenue Essex Avenue and Melbourne Street Essex Avenue near easement Hampshire Road Hampshire Road <t< th=""><th>MH Depth (ft) 6 4 12 12 14 12 6 6 7 7 10 8 9</th><th>Manhole Material PRECAST PRECAST BLOCK BLOCK</th><th>Loose bricks in corbel, missing mortar from corbel Missing mortar from corbel. Possible industrial connection/service infiltration. Broken and missing bricks from wall, loose bricks in corbel, no bench or invert, heavy debris buildup No defects Missing mortar from corbel and walls, loose/broken bricks in corbel. Open joint in clay invert. Broken frame, missing mortar from corbel, missing mortar from walls No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar from walls</th><th>Rehabilitation Recommendations Corbel Repair Continue to Monitor Corbel Repair, Rebuild Bench, Grout Manhole, Cementitious Liner Continue to Monitor Corbel Repair, Cementitious Liner Corbel Repair, Cementitious Liner New Frame and Cover, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner Continue to Monitor</th><th>Max Defect Score224132442</th><th>Estimated Infiltration (gpd) 0 720 0 0 0 0 288</th><th>Estimated Infiltration Removal Cost \$0 \$0 \$4,810 \$0 \$0 \$0 \$2,590</th><th>Estimated Structural / O&M Rehab \$1,000 \$0 \$3,200 \$3,200 \$3,550 \$2,860 \$2,200</th><th>Estimated Total Rehab Cost \$1,000 \$0 \$8,010 \$0 \$3,550 \$2,860 \$4,790</th><th>Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed \$0.00 \$0.00 \$6.68 \$0.00 \$0.00 \$0.00</th></t<>	MH Depth (ft) 6 4 12 12 14 12 6 6 7 7 10 8 9	Manhole Material PRECAST PRECAST BLOCK	Loose bricks in corbel, missing mortar from corbel Missing mortar from corbel. Possible industrial connection/service infiltration. Broken and missing bricks from wall, loose bricks in corbel, no bench or invert, heavy debris buildup No defects Missing mortar from corbel and walls, loose/broken bricks in corbel. Open joint in clay invert. Broken frame, missing mortar from corbel, missing mortar from walls No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar from walls	Rehabilitation Recommendations Corbel Repair Continue to Monitor Corbel Repair, Rebuild Bench, Grout Manhole, Cementitious Liner Continue to Monitor Corbel Repair, Cementitious Liner Corbel Repair, Cementitious Liner New Frame and Cover, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner Continue to Monitor	Max Defect Score224132442	Estimated Infiltration (gpd) 0 720 0 0 0 0 288	Estimated Infiltration Removal Cost \$0 \$0 \$4,810 \$0 \$0 \$0 \$2,590	Estimated Structural / O&M Rehab \$1,000 \$0 \$3,200 \$3,200 \$3,550 \$2,860 \$2,200	Estimated Total Rehab Cost \$1,000 \$0 \$8,010 \$0 \$3,550 \$2,860 \$4,790	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed \$0.00 \$0.00 \$6.68 \$0.00 \$0.00 \$0.00
601 593 594 595 596 591 592 584 585 586 587 588 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Benson Street Essex Avenue Essex Avenue Essex Avenue and Melbourne Street Essex Avenue and Middle Road Essex Avenue and Middle Road Essex Avenue near easement Hampshire Road Hampshire Road Hampshir	4 12 12 14 12 6 6 7 7 10	PRECAST BLOCK PRECAST BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK	Missing mortar from corbel. Possible industrial connection/service infiltration. Broken and missing bricks from wall, loose bricks in corbel, no bench or invert, heavy debris buildup No defects Missing mortar from corbel and walls, loose/broken bricks in corbel. Open joint in clay invert. Broken frame, missing mortar from corbel, missing mortar from walls No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar	Continue to Monitor Corbel Repair, Rebuild Bench, Grout Manhole, Cementitious Liner Continue to Monitor Corbel Repair, Cementitious Liner New Frame and Cover, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	2 4 1 3 2 4	0 0 0	\$0 \$4,810 \$0 \$0 \$0 \$0	\$0 \$3,200 \$0 \$3,550 \$2,860	\$0 \$8,010 \$0 \$3,550 \$2,860	\$0.00 \$0.00 \$6.68 \$0.00 \$0.00 \$0.00
593 594 595 596 591 592 584 585 586 587 588 2211 563 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Essex Avenue Essex Avenue Essex Avenue Essex Avenue and Melbourne Street Essex Avenue and Middle Road Essex Avenue near easement Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road R.O.W. Marjorie Street at Middle Road	12 14 12 6 6 7 7 7 7 7 10	BLOCK PRECAST BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK	Broken and missing bricks from wall, loose bricks in corbel, no bench or invert, heavy debris buildup No defects Missing mortar from corbel and walls, loose/broken bricks in corbel. Open joint in clay invert. Broken frame, missing mortar from corbel, missing mortar from walls No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar	Corbel Repair, Rebuild Bench, Grout Manhole, Cementitious Liner Continue to Monitor Corbel Repair, Cementitious Liner New Frame and Cover, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	4 1 3 2 4	0 0 0	\$4,810 \$0 \$0 \$0 \$0	\$3,200 \$0 \$3,550 \$2,860	\$0 \$3,550 \$2,860	\$6.68 \$0.00 \$0.00 \$0.00
594 595 596 591 592 584 585 586 587 588 2211 563 27128 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Essex Avenue Essex Avenue Essex Avenue and Melbourne Street Essex Avenue and Middle Road Essex Avenue near easement Hampshire Road	12 14 12 6 6 7 7 7 7 7 10	PRECAST BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK	debris buildup No defects Missing mortar from corbel and walls, loose/broken bricks in corbel. Open joint in clay invert. Broken frame, missing mortar from corbel, missing mortar from walls No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar	Cementitious Liner Continue to Monitor Corbel Repair, Cementitious Liner New Frame and Cover, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	4	0 0 0	\$0 \$0 \$0	\$0 \$3,550 \$2,860	\$0 \$3,550 \$2,860	\$0.00 \$0.00 \$0.00
594 595 596 591 592 584 585 586 587 588 2211 563 27128 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Essex Avenue Essex Avenue Essex Avenue and Melbourne Street Essex Avenue and Middle Road Essex Avenue near easement Hampshire Road	12 14 12 6 6 7 7 7 7 7 10	PRECAST BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK	No defects Missing mortar from corbel and walls, loose/broken bricks in corbel. Open joint in clay invert. Broken frame, missing mortar from corbel, missing mortar from walls No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup	Continue to Monitor Corbel Repair, Cementitious Liner New Frame and Cover, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	4	0 0 0	\$0 \$0 \$0	\$0 \$3,550 \$2,860	\$0 \$3,550 \$2,860	\$0.00 \$0.00 \$0.00
595 596 591 592 584 585 586 587 588 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Essex Avenue Essex Avenue and Melbourne Street Essex Avenue and Middle Road Essex Avenue near easement Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road R.O.W. Marjorie Street at Middle Road	14 12 6 6 7 7 7 7 7 10	BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK	Missing mortar from corbel and walls, loose/broken bricks in corbel. Open joint in clay invert. Broken frame, missing mortar from corbel, missing mortar from walls No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar	Corbel Repair, Cementitious Liner New Frame and Cover, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	4	0 0 0 288	\$0 \$0 \$0	\$3,550 \$2,860	\$2,860	\$0.00 \$0.00
596 591 592 584 585 586 587 588 2211 563 2728 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Essex Avenue and Melbourne Street Essex Avenue and Middle Road Essex Avenue near easement Hampshire Road R.O.W. Marjorie Street at Middle Road	12 6 7 7 7 7 10	BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK	invert. Broken frame, missing mortar from corbel, missing mortar from walls No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar	New Frame and Cover, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	4	0 0 288	\$0	\$2,860	\$2,860	\$0.00
596 591 592 584 585 586 587 588 2211 563 2728 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Essex Avenue and Melbourne Street Essex Avenue and Middle Road Essex Avenue near easement Hampshire Road R.O.W. Marjorie Street at Middle Road	12 6 7 7 7 7 10	BLOCK BLOCK BLOCK BLOCK BLOCK BLOCK	Broken frame, missing mortar from corbel, missing mortar from walls No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar	New Frame and Cover, Cementitious Liner Rebuild Bench, Grout Manhole, Cementitious Liner	4	000000000000000000000000000000000000000	\$0	\$2,860	\$2,860	\$0.00
591 592 584 585 586 587 588 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Essex Avenue and Middle Road Essex Avenue near easement Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road R.O.W. Marjorie Street at Middle Road	6 6 7 7 7 7 10	BLOCK BLOCK BLOCK BLOCK BLOCK	No bench and invert, active infiltration at wall, missing mortar from wall, heavy debris buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar	Rebuild Bench, Grout Manhole, Cementitious Liner	4	288	¢0			
592 584 585 586 587 588 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Essex Avenue near easement Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road R.O.W. Marjorie Street at Middle Road	7 7 7 7 10	BLOCK BLOCK BLOCK BLOCK	buildup Missing mortar from corbel and walls. Open joint in clay invert. No bench and invert, heavy debris buildup, corbel missing mortar		4	288	\$2,590	\$2,200	¢4 700	'
584 585 586 587 588 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road R.O.W. Marjorie Street at Middle Road	7 7 7 7 10	BLOCK BLOCK BLOCK	No bench and invert, heavy debris buildup, corbel missing mortar	Continue to Monitor	2				\$4,790	\$8.99
585 586 587 588 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Hampshire Road Hampshire Road Hampshire Road Hampshire Road Hampshire Road R.O.W. Marjorie Street at Middle Road	10	BLOCK BLOCK				0	\$0	\$0	\$0	\$0.00
586 587 588 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Hampshire Road Hampshire Road Hampshire Road Hampshire Road R.O.W. Marjorie Street at Middle Road	10	BLOCK	Madarata dahria an hanah, hraksa sud kasa hutuka ing kutuka ing ku	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
587 588 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15 HS15	Hampshire Road Hampshire Road Hampshire Road R.O.W. Marjorie Street at Middle Road	10		Moderate debris on bench, broken and loose bricks in corbel	Clean, Corbel Repair	2	0	\$0	\$1,550	\$1,550	\$0.00
588 2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15 HS15	Hampshire Road Hampshire Road R.O.W. Marjorie Street at Middle Road	10		No bench and invert, heavy debris	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
2211 563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15 HS15	Hampshire Road R.O.W. Marjorie Street at Middle Road	8	BLOCK	Mineral deposits at wall, no bench and invert, heavy debris buildup	Rebuild Bench, Grout Manhole	4	720	\$2,000	\$2,200	\$4,200	\$2.78
563 2728 5401 577 578 1384 580 581	HS15 HS15 HS15 HS15 HS15	Marjorie Street at Middle Road			Can not locate manhole Can not locate manhole	Locate Manhole Locate Manhole	1	0	\$0 \$0	\$100 \$100	\$100 \$100	\$0.00 \$0.00
2728 5401 577 578 1384 580 581	HS15 HS15 HS15	,	0	BLOCK	Heavy debris in bench and invert	Rebuild Bench	1	0	\$0 \$0	\$100	\$2,200	\$0.00
5401 577 578 1384 580 581	HS15 HS15	uvieroouttie Sireer al Sims Avenue	9	BRICK	Missing bricks and mortar from corbel	Continue to Monitor	2	0	\$0 \$0	\$2,200	\$0 \$0	\$0.00
577 578 1384 580 581	HS15	Melbourne Street at Vine Street	5	BRICK	Broken corbel with loose and missing bricks	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
1384 580 581	HS15	Middle Road	8	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
580 581	11515	Middle Road	10	BLOCK	Heavy debris in bench and invert	Rebuild Bench	4	0	\$0	\$2,200	\$2,200	\$0.00
581	HS15	Rt 1 Bypass near Islington Street	12	BLOCK	Deteriorating wall	Cementitious Liner	3	0	\$0	\$2,040	\$2,040	\$0.00
	HS15	Sheffield Road	9	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
582	HS15	Sheffield Road	7	BLOCK	Crack in invert, light debris on bench, broken brick and missing mortar from corbel	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
F07	HS15 HS15	Sheffield Road Sheffield Road	5	BLOCK BLOCK	Broken and loose bricks on corbel	Corbel Repair	2	0	\$0 \$0	\$1,000	\$1,000 \$0	\$0.00 \$0.00
597 5685	HS15 HS15	Sheffield Road	0	BLOCK	No defects Mineral deposits at wall	Continue to Monitor Grout Manhole, Cementitious Liner	3	144	\$0 \$2,590	\$0 \$0	\$0 \$2,590	\$0.00
598	HS15	Sims Avenue	9	BRICK	Heavy debris in bench and invert	Rebuild Bench	4	144	\$2,390 \$0	\$0	\$2,390	\$0.00
00 Duplicate	HS15	Sims Avenue	8	DIGION	Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
599	HS15	Sims Avenue at Benson Street	8	PRECAST	Infiltration at manhole wall	Grout Manhole	2	720	\$1,800	\$0	\$1,800	\$2.50
1423	HS15	Spinney Road	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1383	HS15	US Rt 1 Bypass	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
					Active infiltration at wall, roots in corbel, loose bricks and debris on bench. Collapsed							
1382		US Rt 1 Bypass North	11	BLOCK	pipe connection found during flow isolation. Possible industrial connection/service	Remove and Replace Manhole	4	1,728	\$13,100	\$0	\$13,100	\$7.58
2367		Albacore Museum Access Pump Station	16	PRECAST	Cracked and missing mortar from corbel	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
2368 1017	LD1 LD1	Albacore Museum Access Pump Station Chase Drive at Michael Succi Drive	18	PRECAST PRECAST	Light infiltration stains at walls No defects	Grout Manhole, Cementitious Liner Continue to Monitor	3	720	\$6,660 \$0	\$0 \$0	\$6,660	\$9.25 \$0.00
836	LD1 LD1	Dunlin Way	11	BRICK	Possible industrial connection/service infiltration.	Continue to Monitor	2	0	\$0 \$0	\$0 \$0	ېن ۵۵	\$0.00
2454	LD1	Dunlin Way	14	PRECAST	No bench and invert, debris buildup	Rebuild Bench	4	0	\$0 \$0	\$2,200	\$2,200	\$0.00
2457	LD1	Dunlin Way	13	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
837	LD1	Dunlin Way and Osprey Drive	7	BRICK	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2157	LD1	Dunlin Way R.O.W.	11	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0		\$0.00
2158	LD1	Dunlin Way R.O.W.	13	PRECAST	Missing bricks in invert, moderate debris buildup	Clean	2	0	\$0	\$550	\$550	\$0.00
2362	LD1	Kearsarge Road at Market Street	10	PRECAST	Invert leak. Infiltration at manhole wall.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	1,440	\$3,700	\$2,200	\$5,900	\$2.57
4	LD1	Kearsarge Way R.O.W.	8		Can not locate manhole	Locate Manhole	1	0	\$0 \$0	\$100	\$100	\$0.00 \$0.00
2426 2430	LD1 LD1	Kearsarge Way R.O.W. Kearsarge Way R.O.W.	8	PRECAST	Can not locate manhole No defects	Locate Manhole Continue to Monitor	1	0	\$0 \$0	\$100 \$0	\$100 \$0	\$0.00
2430	LD1 LD1	Kearsarge Way R.O.W.	8	FREGASI	Can not locate manhole	Locate Manhole	1	0	\$0 \$0	\$0 \$100	÷	\$0.00
2440	LD1	Kearsarge Way R.O.W.	8	PRECAST	Roots at wall and bench	Continue to Monitor	2	0	\$0 \$0	\$0	\$0	\$0.00
985		Market Street at Michael Succi Drive	9	PRECAST	Cracked around drop connection, bench separating from base section, rocks on bench		3	0	\$0	\$1,700	\$1,700	\$0.00
2365	LD1	Market Street at Michael Succi Drive	7	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2366	LD1	Market Street at Michael Succi Drive	17	PRECAST	Floor Missing Bricks	Rebuild Bench	3	0	\$0	\$2,200	\$2,200	\$0.00
64		Market Street R.O.W.	8		Cover too large to open	New Frame and Cover	1	0	\$0	\$820	\$820	\$0.00
65		Market Street R.O.W.	8	DDEALOT	Cover too large to open	New Frame and Cover	1	0	\$0	\$820	\$820	\$0.00
1014	LD1	Michael Succi Drive	1	PRECAST	Light debris on bench	Continue to Monitor	2	0	\$0 \$0	\$0 \$0		\$0.00
1015 1016		Michael Succi Drive Michael Succi Drive	0	PRECAST PRECAST	Light infiltration stains at walls Roots coming in at bench, moderate debris buildup on bench.	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0 \$0		\$0.00 \$0.00
2375		Michael Succi Drive	9	PRECAST	Light infiltration stains at walls	Continue to Monitor	2	0	\$0 \$0	\$0 \$0		\$0.00
2410		Michael Succi Drive Railroad Easement	8		Cover too large to open	New Frame and Cover	1	0	\$0 \$0	\$0	\$820	\$0.00
2414		Michael Succi Drive Railroad Easement	8	1	Can not locate manhole	Locate Manhole	1	0	\$0 \$0	\$100		\$0.00
2418		Michael Succi Drive Railroad Easement	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
17	LD1	Portsmouth Boulevard R.O.W.	7	PRECAST	Missing mortar from corbel with roots in corbel. Infiltration at pipe connection.	Corbel Repair, Grout Manhole, Cementitious Liner	2	720	\$2,960	\$1,000	\$3,960	\$4.11
830	LD1	Portsmouth Boulevard R.O.W.	5	BRICK	Light debris in bench and invert, deteriorating corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
			_		Mineral deposits at bench and invert, roots in corbel. Walls weaping during MH							
942 2444		Spinnaker Way Spinnaker Way R.O.W.	9	BRICK PRECAST	Inspection. Active infiltration during flow isolation. No defects	Grout Manhole, Cementitious Liner Continue to Monitor	3	2,880	\$3,330	\$0	\$3,330	\$1.16

					Appendix B.3 - Manhole Rehabilitation Recommendatio	ns - Prioritization Per Basin Per Street	Appendix B.3 - Manhole Rehabilitation Recommendations - Prioritization Per Basin Per Street								
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed			
2448	LD1	Spinnaker Way R.O.W.	12	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0) \$0.00			
2451	LD1	Spinnaker Way R.O.W.			Bricks missing from bench	Continue to Monitor	2	0	\$0	\$0	\$0				
2540	LR3	Denise Street	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0) \$0	φ0.00			
2534	LR3	Mariette Drive			No defects	Continue to Monitor	1	0	\$0	\$0		\$0100			
2538	LR3	Mariette Drive		PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		ψ0.00			
2554	LR3	Mariette Drive		PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		φ0.00			
2556	LR3	Mariette Drive			No defects	Continue to Monitor	1	0	\$0	\$0) \$0.00			
2558	LR3	Mariette Drive			No defects	Continue to Monitor	1	0	\$0	\$0		\$0100			
2536	LR3	Mariette Drive at Nathaniel Drive	9	PRECAST	No defects	Continue to Monitor	1	0	\$0 \$0	\$0		φ0.00			
2560 1647	LR3 LR3	Mariette Drive at Ocean Road Nathaniel Drive	17		No defects No defects	Continue to Monitor	1	0	\$0	\$0 \$0		*****			
1648	LR3	Nathaniel Drive	0	PRECAST	No defects	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	\$0					
1649	LR3	Nathaniel Drive		PRECAST	Light debris buildup	Continue to Monitor	2	0	\$0	\$0					
2466	LR3	Nathaniel Drive			No defects	Continue to Monitor	1	0	\$0	\$0					
1646	LR3	Nathaniel Drive R.O.W.	5	PRECAST	Wall leaks, hole in wall at connection to bench	Grout Manhole, Cementitious Liner	3	2,880	\$1,850	\$0) \$0.64			
2415		Nathaniel Drive R.O.W.	8		No defects	Continue to Monitor	1	0	\$0	\$0) \$0.00			
2419	LR3	Nathaniel Drive R.O.W.			No defects	Continue to Monitor	1	0	\$0	\$0					
2422	LR3	Nathaniel Drive R.O.W.	10	PRECAST	Rocks on bench	Continue to Monitor	2	0	\$0	\$0) \$0) \$0.00			
2427	LR3	Nathaniel Drive R.O.W.	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0) \$() \$0.00			
2431	LR3	Nathaniel Drive R.O.W.		PRECAST	Infiltration staining at wall	Continue to Monitor	2	0	\$0	\$0		\$0100			
2436	LR3	Nathaniel Drive R.O.W.			No defects	Continue to Monitor	1	0	\$0	\$0		÷0100			
2437		Nathaniel Drive R.O.W.	8		No defects	Continue to Monitor	1	0	\$0	\$0		\$0100			
2441	LR3	Nathaniel Drive R.O.W.	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0) \$0.00			
2445	1.02		0	DDECACT	Light infiltration stains at walls, cracked cover	New Frame and Cover, Grout Manhole, Cementitious	2	2 000	¢2.0/0	¢000	¢2,700	¢1.02			
2445	LR3	Nathaniel Drive R.O.W.		PRECAST PRECAST		Liner	3	2,880	\$2,960 \$0	\$820) \$1.03) \$0.00			
2449 2452	LR3 LR3	Nathaniel Drive R.O.W. Nathaniel Drive R.O.W.	5	PRECAST	Loose Frame No defects	Continue to Monitor Continue to Monitor	2 1	0	\$0 \$0	\$0 \$0					
2452	LR3	Nathaniel Drive R.O.W.	7		Active infiltration at walls	Grout Manhole, Cementitious Liner	3	288	÷o	\$0) \$8.99			
2458		Nathaniel Drive R.O.W.			Rocks on bench	New Frame and Cover	4	200	\$2,370	\$820) \$0.00			
2460	LR3	Nathaniel Drive R.O.W.			Rocks on bench	Continue to Monitor	2	0	\$0	\$020) \$0.00			
2462	LR3	Nathaniel Drive R.O.W.			No defects	Continue to Monitor	1	0	\$0	\$0		0 \$0.00			
2464	LR3	Nathaniel Drive R.O.W.			No defects	Continue to Monitor	1	0	\$0	\$0) \$0.00			
2562	LR3	Ocean Road	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100) \$0.00			
2564	LR3	Ocean Road	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100		0 \$0.00			
2566	LR3	Ocean Road	8		Manhole buried behind home	Raise to Surface	1	0	\$0	\$1,100) \$0.00			
2567	LR3	Ocean Road		PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0) \$0.00			
2551	LR3	Pamela Drive	7	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0) \$0.00			
2553	LR3	Pamela Drive	8	PPEQACT	Can not locate manhole	Locate Manhole	1	0	\$0	\$100) \$0.00			
2614	LR3	Simmons Road			No defects	Continue to Monitor	1	0	\$0 \$0	\$0		\$0.00			
<u>2612</u> 2613	LR3 LR3	Simmons Road at Suzanne Drive Simmons Road at Suzanne Drive	5	PRECAST PRECAST	No defects Warped Cover	Continue to Monitor New Frame and Cover	1	0	\$0	\$0 \$820) \$0.00 \$0.00			
2581	LR3	Suranne Drive	6	PRECAST	No defects	Continue to Monitor	2 1	0	\$0	<u>۵۵۷۵</u> ۵۷					
2583	LR3	Suzanne Drive	0		Moderate debris in bench and invert	Olaren	2	0	\$0	\$550		0.00 \$0.00			
2585		Suzanne Drive	8		Moderate debris in bench and invert	Clean	2	0	\$0	\$550	\$550				
2587		Suzanne Drive			No defects	Continue to Monitor	1	0	\$0	\$0 \$0) \$0.00			
2589	LR3	Suzanne Drive			No defects	Continue to Monitor	1	0	\$0	\$0		0.00 \$0.00			
2591	LR3	Suzanne Drive			No defects	Continue to Monitor	2	0	\$0	\$0) \$0	\$0.00			
2593	LR3	Suzanne Drive	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0) \$0.00			
2595	LR3	Suzanne Drive	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0) \$0.00			
2607	LR3	Suzanne Drive			No defects	Continue to Monitor	1	0	\$0	\$0					
2608	LR3	Suzanne Drive			Missing mortar from corbel	Corbel Repair	3	0	\$0	\$1,000					
2609		Suzanne Drive			No defects	Continue to Monitor	1	0	\$0	\$0) \$0.00			
2610	LR3	Suzanne Drive			No defects	Continue to Monitor	1	0	\$0	\$0		φ0.00			
2611	LR3	Suzanne Drive			No defects	Continue to Monitor	1	0	\$0	\$0 ¢0		φ0.00			
2579	LR3	Suzanne Drive near Ocean Drive			No defects	Continue to Monitor	1	0	\$0 \$0	\$0		\$0.00			
2597 2600		Wallis Road Wallis Road			No defects No defects	Continue to Monitor Continue to Monitor	1	0	\$0 \$0	\$0 \$0					
2600		Wallis Road			No defects	Continue to Monitor	1	0	\$0 \$0	\$U \$0					
2001	LKJ		/		Corbel missing bricks and mortar, light debris on bench. 6 gpm leak observed during			0	\$0	۵ ۵	، ۵۱ ۱	.00.00			
397	LR4	Greenleaf Avenue	8	PRECAST	flow isolation.	Corbel Repair, Grout Manhole, Cementitious Liner	3	8,640	\$2,960	\$1,000	\$3,960	\$0.34			
377	LR4	Greenleaf Woods Drive			Mineral deposits at pipe connections (primary in/out) with active infiltration	Grout Manhole, Cementitious Liner	4	17,280		\$1,000) \$0.34) \$0.30			
378	LR4	Greenleaf Woods Drive			Active infiltration from wall	Grout Manhole, Cementitious Liner	4	1,440		\$0					
0.0			10			New Frame and Cover, Grout Manhole, Cementitious	· ·	1,740	<i>40,720</i>	ψŪ	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	ψ (.11			
380	LR4	Greenleaf Woods Drive	14	PRECAST	Chipped frame, Active infiltration with mineral deposits at wall	Liner	3	288	\$5,180	\$820	\$6,000	\$17.99			
396		Greenleaf Woods Drive			Incoming pipe connection leak, voids visible around inlet and outlet pipe connections.	Rebuild Bench, Grout Manhole, Cementitious Liner	3	9,360		\$2,200					
		Greenleaf Woods Drive	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00			
2204	LR4	Greenlear woods Drive	0			Ebeate Mainble		0	ψυ	\$2,200	\$2,200) \$0.00			

	Appendix B.3 - Manhole Rehabilitation Recommendations - Prioritization Per Basin Per Street											
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
556	LR4	Middle Road	9	BLOCK	Heavy debris on bench and invert, missing mortar from corbel	Clean	3	0	\$0	\$550	\$550	\$0.00
557	LR4	Middle Road	8		Missing mortar from walls	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
558	LR4	Middle Road	8		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
559	LR4	Middle Road			No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
961	LR4	Middle Road	<u>6</u> 15		Heavy debris in bench and invert	Rebuild Bench	4	0	\$0 \$0	\$2,200	\$2,200 \$0	\$0.00
2209 2210	LR4 LR4	Middle Road Middle Road	15	PRECAST PRECAST	No defects Possible industrial connection/service infiltration.	Continue to Monitor Continue to Monitor	1	0	\$0	\$0 \$0	*0	\$0.00 \$0.00
560		Middle Road at entrance of The Chase Home	-		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
554	LR4	Middle Road at Leavitt Avenue		BLOCK	No bench and invert, heavy debris buildup, corbel blocks missing/deteriorating	Corbel Repair, Rebuild Bench	4	0	\$0	\$3,200	\$3,200	\$0.00
410		Middle Road at Peverly Hill Road	13		Missing pieces of frame	New Frame and Cover	3	0	\$0	\$820	\$820	\$0.00
2208		Middle Road at The Chase Home	13	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
555	LR4	Middle Road at Woodbury Avenue	8		Heavy debris on bench and invert, moderate roots throughout manhole	Root Treatment	2	0	\$0	\$2,200	\$2,200	\$0.00
406	LR4	Peverly Hill Road	7	PRECAST	Incoming and outgoing pipe connection leaks.	Grout Manhole, Cementitious Liner	3	2,232	\$2,960	\$0	\$2,960	\$1.33
407		Peverly Hill Road at McClintock Avenue	8		Outgoing pipe connection leak.	Grout Manhole, Cementitious Liner	3	1,440		\$0	\$3,330	\$2.31
411	LR4	Plains Avenue at Peverly Hill Road	12	PRECAST	Light debris on bench	Continue to Monitor	2	0	\$0	\$0		\$0.00
381	LR5 LR5	Lafayette Drive	12		No defects Chinand frame, broken bricks in carbol	Continue to Monitor	1	0	\$0 \$0	\$0 \$1,820	\$0 \$1,820	\$0.00 \$0.00
387 1059	LR5 LR5	Lafayette Drive Lafayette Road	9		Chipped frame, broken bricks in corbel No defects	New Frame and Cover, Corbel Repair Continue to Monitor	5 1	0	\$0	\$1,820	¢۵ (820	\$0.00
1059	LR5	Lafayette Road	11	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0 <u>\$</u> 0	\$0.00
1060	LR5	Lafayette Road	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
					Mineral deposits at wall, Exposed aggregate at MH wall due to H2S, moderate debris in			-				
1062	LR5	Lafayette Road	14		bench and invert	Epoxy Liner	3	0	\$0	\$7,000	\$7,000	\$0.00
1064	LR5	Lafayette Road	11	PRECAST	Active infiltration with mineral deposits at wall	Grout Manhole, Cementitious Liner	3	288	\$4,070	\$0	\$4,070	\$14.13
1065	LR5	Lafayette Road	10	PRECAST	Roots at corbel. No channel for pipe connection. Corbel missing brick.	Rebuild Bench	2	0	\$0	\$2,200	\$2,200	\$0.00
1066	LR5	Lafayette Road	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1067	LR5	Lafayette Road	8		Can not locate manhole	Locate Manhole	1	0	\$0	\$100	\$100	\$0.00
1068	LR5	Lafayette Road	÷		No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1071	LR5	Lafayette Road	9		No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1075	LR5	Lafayette Road	9		Moderate debris on bench and roots at wall	Cementitious Liner	3	0	\$0 \$0	\$1,700	\$1,700 \$0	\$0.00 \$0.00
1073 1074	LR5 LR5	Lafayette Road at Andrew Jarvis Drive Lafayette Road at Andrew Jarvis Drive	9	PRECAST PRECAST	No defects Frame and cover below grade	Continue to Monitor Raise to Surface	3	0	\$0 \$0	\$0 \$1,100	\$0 \$1,100	\$0.00
1074	LR5	Lafayette Road at Artwill Avenue	0		No defects	Continue to Monitor	3 1	0	\$0	\$1,100	\$1,100 \$0	\$0.00
1072	LR5	Lafayette Road at Edgewood Drive	10		No defects	Continue to Monitor	1	0	\$0	\$0 \$0	\$0	\$0.00
1069 Duplicate	LR5	Lafayette Road R.O.W.	8	T REGROT	Can not locate manhole	Locate Manhole	1	0	\$0 \$0	\$100		\$0.00
1037	LR5	Ledgewood Drive	7	PRECAST	Missing mortar from corbel, light debris in bench and invert	Clean	2	0	\$0	\$550	\$550	\$0.00
1038	LR5	Ledgewood Drive	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1039	LR5	Ledgewood Drive	5		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
1040	LR5	Ledgewood Drive	9		Missing mortar and bricks from corbel	Corbel Repair	2	0	\$0	\$1,000	\$1,000	\$0.00
1063	LR5	Ledgewood Drive	13	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
1044	LR5	Ledgewood Drive R.O.W.		PRECASI	No bench and invert, heavy debris buildup, active infiltration at wall, frame chipped	New Frame and Cover, Rebuild Bench, Grout Manhole, Cementitious Liner	4	288		\$3,020	\$5,240	\$7.71
1045	LR5	Ledgewood Drive R.O.W.		PRECAST	Infiltration staining and mineral deposits at wall. Active infiltration from wall joints	Grout Manhole, Cementitious Liner	3	288		\$0		\$11.56
1046		Ledgewood Drive R.O.W.		PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
1042		Portsmouth High School fields Portsmouth High School fields	8		Can not locate manhole	Locate Manhole	1	0	\$0 \$0	\$100 \$100		\$0.00 \$0.00
1043 1041		Portsmouth High School Parking lot	ů	PRECAST	Can not locate manhole Frame cracked. Possible industrial connection/service infiltration.	New Frame and Cover	2	0	\$0	\$100	\$100	\$0.00
226	LR6	Constitution Avenue at Lafayette Road			Light debris on bench, corbel missing mortar	Continue to Monitor	2	0	\$0	\$0		\$0.00
136		Heritage Avenue			No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2635	LR6	Heritage Avenue			Active infiltration at wall	Grout Manhole, Cementitious Liner	3	288	\$4,440	\$0		\$15.42
2636	LR6	Heritage Avenue	12	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2637	LR6	Heritage Avenue	10	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2638	LR6	Heritage Avenue	7		No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2639		Heritage Avenue			Chipped frame	Continue to Monitor	2	0	\$0	\$0		\$0.00
2641		Heritage Avenue	5		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2642	LR6	Heritage Avenue	9		Light Infiltration observed at walls, mineral deposits	Grout Manhole, Cementitious Liner	3	1,440	1.1	\$0 \$0		\$2.57
2643	LR6	Heritage Avenue			No defects Percent missing mortan	Continue to Monitor	1	0	\$0 \$0	\$0 \$2,200	\$0 \$2,200	\$0.00 \$0.00
2644 2645	LR6 LR6	Heritage Avenue Heritage Avenue	5		Bench missing mortar Missing mortar from corbel	Rebuild Bench Continue to Monitor	2	0	\$0	\$2,200 \$0		\$0.00
2645		Heritage Avenue at Lafayette Road	11		No defects	Continue to Monitor	2	0	\$0	\$0		\$0.00
132		Heritage Avenue at Post Road			Missing mortar from invert	Continue to Monitor	2	0	\$0 \$0	\$0 \$0		\$0.00
107	LR6	Lafayette Road			Light debris buildup, missing mortar at corbel.	Cementitious Liner	3	0	\$0	\$0		\$0.00
117	LR6	Lafayette Road			Light debris in channel	Clean	2	0	\$0	\$550	\$550	\$0.00
118	LR6	Lafayette Road	9	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0		\$0.00
149	LR6	Lafayette Road	14		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2469	LR6	Lafayette Road	9		Light debris on bench	Continue to Monitor	2	0	\$0	\$0		\$0.00
2471	LR6	Lafayette Road	6	PRECAST	Active infiltration at walls	Grout Manhole, Cementitious Liner	3	720	\$2,590	\$0		\$3.60
2473	LR6	Lafayette Road	6	PRECAST	Roots in corbel	Continue to Monitor	2		\$0	\$0	\$0	\$0.00

	Appendix B.3 - Manhole Rehabilitation Recommendations - Prioritization Per Basin Per Street											
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
2475	LR6	Lafayette Road	7	PRECAST	Moderate debris on bench	Clean	2	0	\$0	\$550	\$550	\$0.00
2477	LR6	Lafayette Road	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2479	LR6	Lafayette Road	6	PRECAST	Manhole cover significantly below grade, roots at bench and wall. Debris on bench	Corbel Repair, Root Treatment, Cementitious Liner, Raise to Surface	2	0	\$0	\$5,490	\$5,490	\$0.00
2479	LR0 LR6	Lafayette Road	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$5,490	\$5,490	\$0.00
2491	LR6	Lafayette Road	8	PRECAST	No defects	Continue to Monitor	1	0	\$0		\$0	\$0.00
2493	LR6	Lafayette Road	7	PRECAST	Light debris on bench	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2495	LR6	Lafayette Road	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2497	LR6	Lafayette Road	7	PRECAST	Light debris in bench and invert	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2400			-	DDFOACT	Brick loose on bench, moderate debris on bench. Possible industrial connection/service		2		**	\$0.000	* 0.000	¢0.00
2499 2505	LR6 LR6	Lafayette Road Lafayette Road	1	PRECAST PRECAST	infiltration. Moderate debris on bench	Rebuild Bench Rebuild Bench	3	0	\$0 \$0	\$2,200 \$2,200	\$2,200 \$2,200	\$0.00 \$0.00
2505	LR0 LR6	Lafayette Road	6	PRECAST	Infiltration at bench/wall connection	Grout Manhole, Cementitious Liner	2	432	\$0	\$2,200	\$2,200	\$0.00
2509	LR6	Lafayette Road	6	PRECAST	Missing mortar from corbel, Light debris on bench	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2617	LR6	Lafayette Road	7	PRECAST	Exposed aggregate at MH wall due to H2S. Missing mortar from bench	Epoxy Liner	3	0	\$0	\$4,000	\$4,000	\$0.00
2618	LR6	Lafayette Road	8	PRECAST	Infiltration staining at wall	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2620	LR6	Lafayette Road	8		Manhole buried	Raise to Surface	1	0	\$0	\$1,100	\$1,100	\$0.00
2622	LR6	Lafayette Road	9	PRECAST	No defects	Continue to Monitor	1	0	\$0	ţ÷	\$0	\$0.00
2623	LR6	Lafayette Road	9	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2625 2626	LR6 LR6	Lafayette Road Lafayette Road	14	PRECAST PRECAST	Cracked frame, bricks missing from bench and invert	New Frame and Cover Continue to Monitor	2	0	\$0 \$0	\$820 \$0	\$820	\$0.00 \$0.00
2626	LR0 LR6	Lafayette Road	8	PRECAST	Corbel missing mortar Infiltration staining on wall	Continue to Monitor	2	0	\$0	\$0 \$0	\$0 \$0	\$0.00
2628	LR6	Lafayette Road	8	PRECAST	Corroded Frame	Continue to Monitor	2	0	\$0	\$0		\$0.00
2629	LR6	Lafayette Road	7	PRECAST	Debris on bench	Continue to Monitor	2	0	\$0	\$0		\$0.00
2630	LR6	Lafayette Road	6	PRECAST	Infiltration staining at wall	Continue to Monitor	2	0	\$0	\$0		\$0.00
2633	LR6	Lafayette Road	8	PRECAST	Possible industrial connection/service infiltration.	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2634	LR6	Lafayette Road	8		Can not locate manhole	Raise to Surface	1	0	\$0	\$1,100	\$1,100	\$0.00
2501	LR6	Lafayette Road at Blue Fish Boulevard	6	PRECAST	Moderate debris on bench, broken cover	New Frame and Cover, Rebuild Bench	4	0	\$0	+=1==	\$3,020	\$0.00
2503	LR6	Lafayette Road at Blue Fish Boulevard	5	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2483	LR6 LR6	Lafayette Road at Coach Road Lafayette Road at Coach Road	8	PRECAST PRECAST	Light infiltration at manhole wall	Grout Manhole Continue to Monitor	2	288	\$1,800 \$0	\$0 \$0	\$1,800	\$6.25 \$0.00
2483 2484	LR0 LR6	Lafayette Road at Coach Road	6	PRECAST	Light debris on bench, invert not fully visible Infiltration staining at wall, frame missing piece	New Frame and Cover	3	0	\$0	\$0	\$0	\$0.00
2485	LR6	Lafayette Road at Coach Road	9	PRECAST	Light debris on bench	Continue to Monitor	2	0	\$0	\$020	\$020	\$0.00
2100	2110				Light debris on bench and invert. Infiltration at bench/wall connection. Possible indust				ţ,	+0	+0	\$0100
2487	LR6	Lafayette Road at Coach Road	8	PRECAST	connection/service infiltration.	Grout Manhole, Cementitious Liner	2	2,520	\$3,330	\$0	\$3,330	\$1.32
2489	LR6	Lafayette Road at Coach Road	6	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2631	LR6	Lafayette Road at Constitution Avenue	8	PRECAST	Broken frame, light debris on bench, bench missing bricks, corbel missing mortar	New Frame and Cover	4	0	\$0	\$820	\$820	\$0.00
2632	LR6	Lafayette Road at Constitution Avenue	9	PRECAST	Broken frame, light debris on bench	New Frame and Cover	4	0	\$0	\$820	\$820	\$0.00
2621	LR6	Lafayette Road at Freedom Circle	9	PRECAST	Missing mortar from corbel. Possible industrial connection/service infiltration.	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2619 2511	LR6 LR6	Lafayette Road at Lang Road Lafayette Road at Longmeadow Road	6	PRECAST PRECAST	Broken invert and bench Moderate debris on bench	Rebuild Bench Rebuild Bench	3	0	\$0 \$0	\$2,200 \$2,200	\$2,200 \$2,200	\$0.00 \$0.00
2578	LR0 LR6	Lafayette Road at Ocean Road	4	PRECAST	Missing mortar from bench	Continue to Monitor	2	0	\$0		\$2,200 \$0	\$0.00
2616	LR6	Lafayette Road at Suzanne Drive	8	PRECAST	No defects	Continue to Monitor	1	0	\$0		\$0	\$0.00
133	LR6	Post Road	5	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2646	LR6	Robert Avenue	6	PRECAST	Mineral deposits at wall and void visible at outgoing pipe connection	Grout Manhole, Cementitious Liner	3	5,040	\$2,220	\$0	\$2,220	\$0.44
150	LR6	Robert Avenue R.O.W.	7	PRECAST	Corroded Frame	Continue to Monitor	2	0	\$0	\$0		\$0.00
2653	LR6	Robert Avenue R.O.W.	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	+ -		\$0.00
2654	LR6	Robert Avenue R.O.W.	8		No defects	Continue to Monitor	1	0	\$0	\$0		\$0.00
2660 2661	LR6 LR6	Springbrook Circle Parking lot Springbrook Circle R.O.W.	13	PRECAST PRECAST	No defects Roots at corbel and wall	Continue to Monitor Root Treatment	2	0	\$0 \$0	ţ÷	\$0	\$0.00 \$0.00
2655	LR0 LR6	White Cedar Boulevard R.O.W.	6	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$2,200	\$2,200	\$0.00
2656	LR6	White Cedar Boulevard R.O.W.	8	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2657	LR6	White Cedar Boulevard R.O.W.	8	PRECAST	Mineral deposits at wall	Grout Manhole, Cementitious Liner	3	360	÷-	\$0		\$9.25
2658	LR6	White Cedar Boulevard R.O.W.	10	PRECAST	Roots at wall	Continue to Monitor	2	0	\$0	\$0		\$0.00
2659	LR6	White Cedar Boulevard R.O.W.	12	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
89	M1	Alder Way	9	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0		\$0.00
94	M1	Cutts Street	7	PRECAST	Light debris on bench, cracked cover	New Frame and Cover	2	0	\$0	\$820	\$820	\$0.00
2792	M1	Cutts Street at Ashland Street	8	DDECAST	Can not locate manhole	Locate Manhole	4	0	\$0 \$0	\$100 \$1,370	\$100 \$1,370	\$0.00 \$0.00
93 2130	M1 M1	Cutts Street at Rt 1 Bypass Edmond Avenue	12	PRECAST PRECAST	Evidence of surcharge, heavy debris blocking flow, cracked cover No defects	Clean, New Frame and Cover Continue to Monitor	4	0	\$0		\$1,370 \$0	\$0.00
2130	M1	Edmond Avenue	12	PRECAST	Missing mortar and bricks from corbel	Corbel Repair	3	0	\$0	1.1	\$0 \$1,000	\$0.00
108	M1	Edmund Avenue near Fairview Avenue	8	PRECAST	Cracked cover	New Frame and Cover, Grout Manhole	2	360		\$820	\$2,620	\$5.00
109	M1	Fairview Avenue	7	PRECAST	No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
110	M1	Fairview Avenue	5	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
111	M1	Fairview Avenue	4	PRECAST	Cracked cover	New Frame and Cover	4	0	\$0	\$820	\$820	\$0.00
759	M1 M1	Fairview Avenue at O'Leary Place	4	PRECAST	Missing mortar from corbel	Continue to Monitor	2	0	\$0		\$0	\$0100
96		Maplewood Avenue	12	PRECAST	Moderate debris on bench	Clean	2	0	\$0	\$550	\$550	\$0.00

	Appendix B.3 - Manhole Rehabilitation Recommendations - Prioritization Per Basin Per Street											
MH Number	Metering Basin	Street	MH Depth (ft)	Manhole Material	Observations	Rehabilitation Recommendations	Max Defect Score	Estimated Infiltration (gpd)	Estimated Infiltration Removal Cost	Estimated Structural / O&M Rehab	Estimated Total Rehab Cost	Infiltration Removal Cost Effectiveness (\$ Spent per Gallon Per Day Removed
97	M1	Maplewood Avenue	9	PRECAST	No defects	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
98	M1	Maplewood Avenue	5	PRECAST	Missing mortar and bricks from corbel	Continue to Monitor	2	0	\$0	÷	\$0	\$0.00
100	M1	Maplewood Avenue	7	PRECAST	Infiltration staining at walls, moderate debris on bench	Clean	2	0	\$0		\$550	\$0.00
101		Maplewood Avenue	5		Missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
102	M1	Maplewood Avenue	10		No defects	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
103	M1	Maplewood Avenue	11	PRECAST PRECAST	Loose bricks in corbel	Continue to Monitor	2	0	\$0 \$0		\$0 \$0	\$0.00 \$0.00
104 105	M1 M1	Maplewood Avenue Maplewood Avenue	8	PRECAST	Loose debris on bench, corbel missing bricks and mortar, loose frame	Continue to Monitor Continue to Monitor	2	0	\$0 \$0	+ -	\$U \$0	\$0.00
105	M1	Maplewood Avenue	9		Infiltration staining at walls Cracked cover, corbel missing bricks	New Frame and Cover	2	0	\$0	+ -	\$0	\$0.00
767	M1	Maplewood Avenue	6	BRICK	No bench and invert, corbel breaking	Corbel Repair, Rebuild Bench	4	0	\$0	\$3,200	\$3,200	\$0.00
769		Maplewood Avenue	8	DIVICK	Can not locate manhole	Locate Manhole	4	0	\$0		\$3,200	\$0.00
2128	M1	Maplewood Avenue	7	PRECAST	Light debris on bench, corbel missing mortar	Continue to Monitor	2	0	\$0	+	081¢ 08	\$0.00
2120	M1	Maplewood Avenue	10		No defects	Continue to Monitor	1	0	\$0	7-	\$0 \$0	\$0.00
2359		Maplewood Avenue	7		Light debris on bench	Continue to Monitor	2	0	\$0	7-	\$0	\$0.00
2360	M1	Maplewood Avenue	5		Evidence of surcharge, bench and invert non-existent	Rebuild Bench	2	0	\$0	+ -	\$2,200	\$0.00
95	M1	Maplewood Avenue at Cutts Street	11	PRECAST	Infiltration staining at walls, missing mortar from corbel	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2794		Maplewood Avenue at Cutts Street	12	PRECAST	Light debris in bench and invert	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2129		Maplewood Avenue at Fairview Avenue	9		Missing mortar from corbel, loose frame	Continue to Monitor	2	0	\$0		\$0	\$0.00
99		Maplewood Avenue near Rt 95 overpass	6		Light debris on bench, loose bricks and missing mortar from corbel	Continue to Monitor	2	0	\$0		\$0	\$0.00
5319		O'Leary Place	6		Light debris in manhole	Continue to Monitor	2	0	\$0		\$0	\$0.00
112		US Rt 1 Bypass	7		Broken and missing bricks in corbel, Light debris in bench and invert	Corbel Repair	3	0	\$0	\$1,000	\$1,000	\$0.00
113	M1	US Rt 1 Bypass	5		Broken and missing bricks in corbel, Light debris in bench and invert, infiltration stains walls	at Corbel Repair	3	0	\$0	\$1,000	\$1,000	\$0.00
115		US Rt 1 Bypass	6	PRECAST	No defects	Continue to Monitor	2	0	\$0	+ -	\$0	\$0.00
116	M1	US Rt 1 Bypass	9	PRECAST	Light infiltration at walls and light debris in invert	Grout Manhole	2	288		\$0	\$2,000	\$6.94
92		US Rt 1 Bypass at Cutts Avenue	8		Broken bricks in corbel, Light infiltration at walls	Corbel Repair, Grout Manhole, Cementitious Liner	3	360	\$2,960	\$1,000	\$3,960	\$8.22
114		US Rt 1 Bypass at Cutts Street	6	PRECAST	Broken and missing bricks in corbel, Light debris throughout manhole	Corbel Repair	3	0	\$0	\$1,000	\$1,000	\$0.00
168	P2A	FW Hartford Drive	8		Can not locate manhole	Continue to Monitor	1	0	\$0	\$100	\$100	\$0.00
279		FW Hartford Drive	10		See Appendix F	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
280		FW Hartford Drive	9		See Appendix F	Continue to Monitor	1	0	\$0	7-	\$0	\$0.00
281	P2A	FW Hartford Drive	7		See Appendix F	Continue to Monitor	1	0	\$0	1.1	\$0	\$0.00
2165	P2A	FW Hartford Drive	6		See Appendix F	Continue to Monitor	2	0	\$0	1.1	\$0	\$0.00
2166	P2A	FW Hartford Drive	9		See Appendix F	Continue to Monitor	2	0	\$0	÷	\$0	\$0.00
2167		FW Hartford Drive	11		See Appendix F	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2170		FW Hartford Drive	12		See Appendix F	Continue to Monitor	2	0	\$0	\$0	\$0	\$0.00
2405		FW Hartford Drive	9		See Appendix F	Continue to Monitor	1	0	\$0	ţ÷	\$0	\$0.00
2412		FW Hartford Drive	/		See Appendix F	Continue to Monitor	1	0	\$0 \$0		\$0 \$0	\$0.00
2416	P2A	FW Hartford Drive	7		See Appendix F	Continue to Monitor	1	0	\$0	+ -	\$0	\$0.00 \$0.00
2420	P2A	FW Hartford Drive	1		See Appendix F	Continue to Monitor	1	0	\$0 \$0	\$0 \$0	\$U \$0	\$0.00
2423 2428	P2A P2A	FW Hartford Drive FW Hartford Drive	7		See Appendix F See Appendix F	Continue to Monitor	1	0	\$0	\$0 \$0	\$0 \$0	\$0.00
2420		FW Hartford Drive	7			Continue to Monitor Continue to Monitor	1	0	\$0		\$0	\$0.00
2432		FW Hartford Drive	0		See Appendix F See Appendix F	Continue to Monitor	1	0	\$0 \$0		\$U	\$0.00
2430		FW Hartford Drive	8		See Appendix F	Continue to Monitor	1	0	\$0	ΨU	\$0	\$0.00
2442		FW Hartford Drive	7		See Appendix F	Continue to Monitor	1	0	\$0		\$0	\$0.00
278	P2A	FW Hartford Drive at TJ Gamester Avenue	10		See Appendix F	Continue to Monitor	1	0	\$0	+ -	\$0 \$0	\$0.00
2168		FW Hartford Drive at TJ Gamester Avenue	-		See Appendix F	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
167		FW Hartford Drive Easement	<u>اک</u>		See Appendix F	Continue to Monitor	1	0	\$0	\$0	\$0	\$0.00
2668		FW Hartford Drive Easement	8		See Appendix F	Continue to Monitor	1	0	\$0		\$0	\$0.00
5850		FW Hartford Road	7		See Appendix F	Continue to Monitor	1	0	\$0		\$0	\$0.00
282	P2A	TJ Gamester Avenue	, 8		Can not locate manhole	Continue to Monitor	1	0	\$0	1.1	\$100	\$0.00
283	P2A	TJ Gamester Avenue	6		See Appendix F	Continue to Monitor	1	0	\$0		\$100	\$0.00
496	P2A	TJ Gamester Avenue			See Appendix F	Continue to Monitor	1	0	\$0	+ -	\$0	\$0.00
	P2A	TJ Gamester Avenue			See Appendix F	Continue to Monitor		9	\$0		\$0	



Greenland, NH City of Portsmouth, NH 2017 SSES Dover Legend FIGURE 4-2: Manhole Rehabilitation Key Plan Portsmouth Manhole Rehabilitation Page Outline Woodard & Curran shall assume no liability for any of the following: 1. Any errors, omissions, or inaccuracies in the information provided regardless of how caused or; 2 Any decision or action taken or not taken by the reader in relance upon any information or data furnished hereunder. Data Sources: ESRI, GRANIT, MEGIS 40 Shattuck Rd, Suite 110 Andover, Massachusetts 01810 866.702.6371 | www.woodardcurran.com COMMITMENT & INTEGRITY DRIVE RESULTS City Boundary WOODARD sri, HERE, DeLorme, Maphyindia, © n OpenStreetMap contributors, and the GIS user community, PROJECT #: 227950.01 SCALE: 1 " = 2,500 ' 1.250 2.500 5.000 DRAWN BY: AM DATE: OCTOBER 2017 Feet

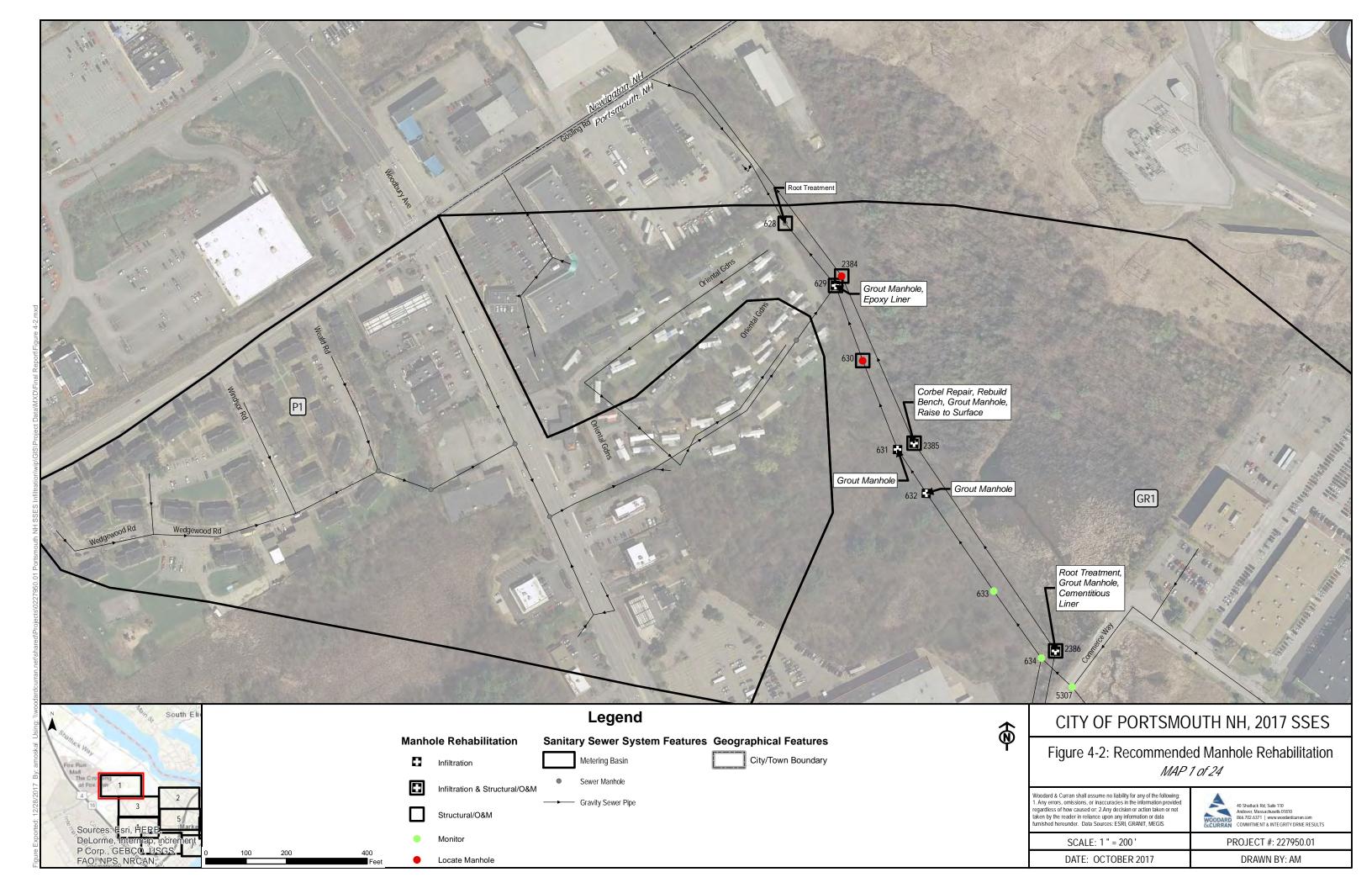
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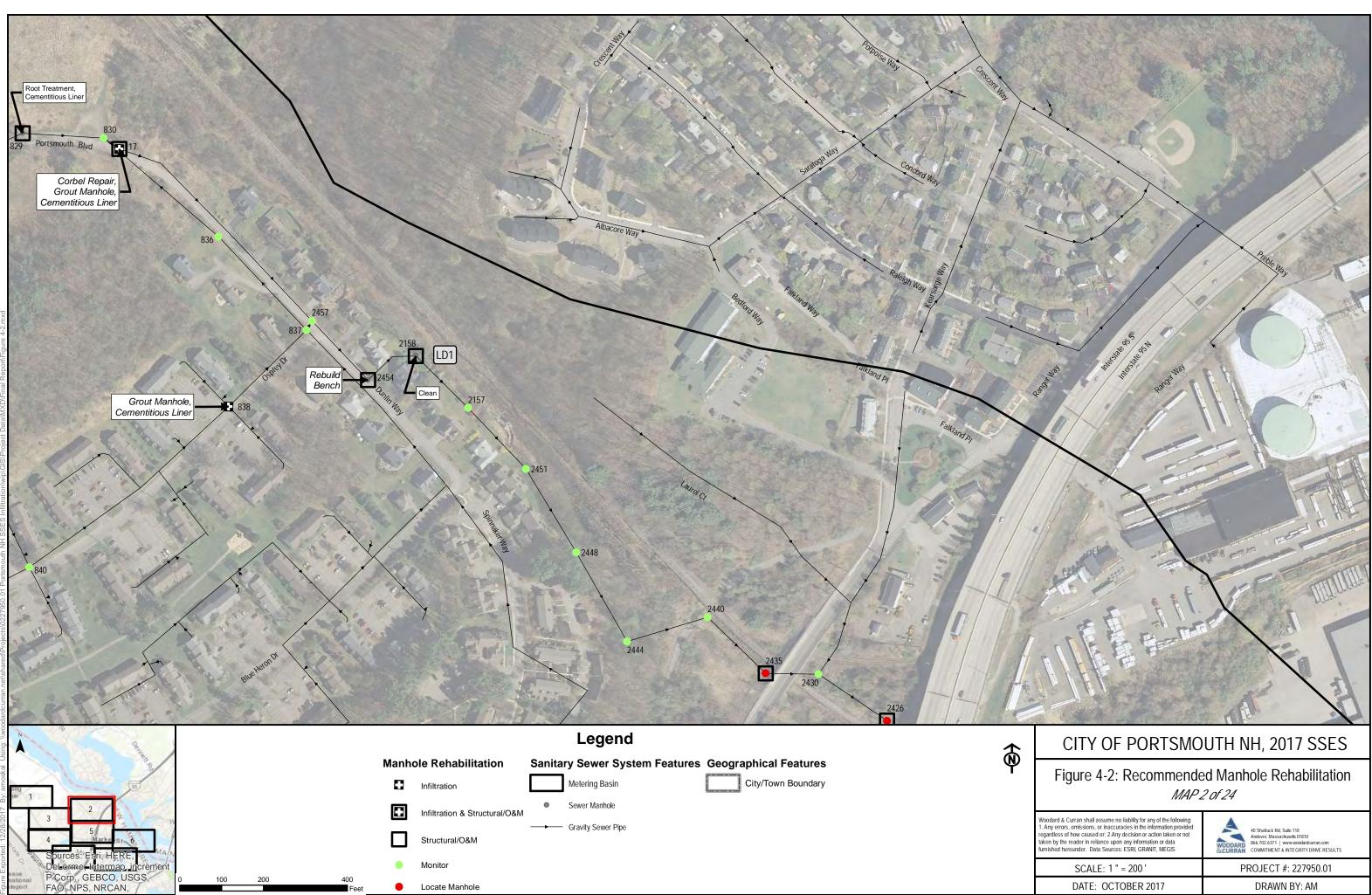
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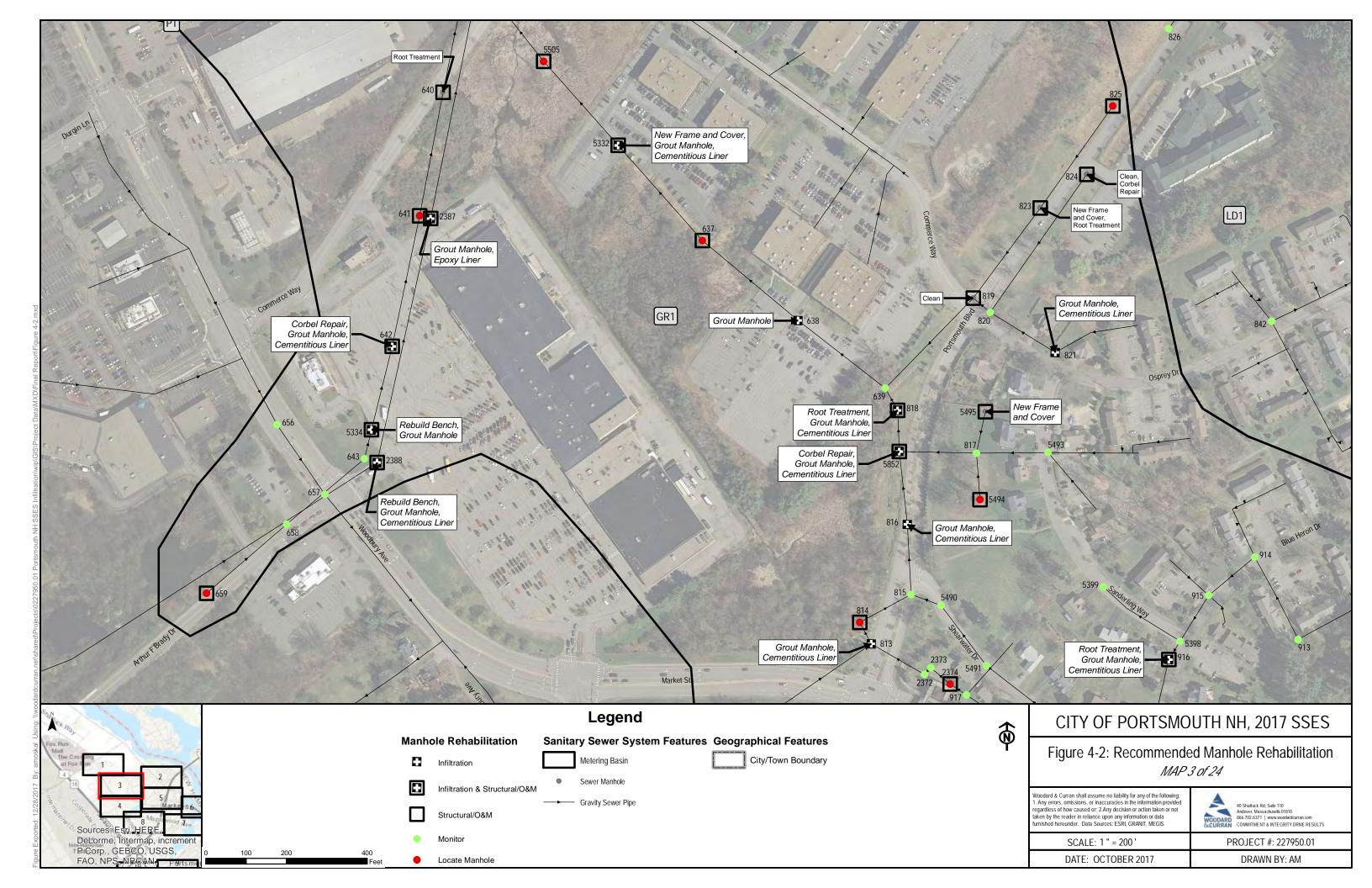
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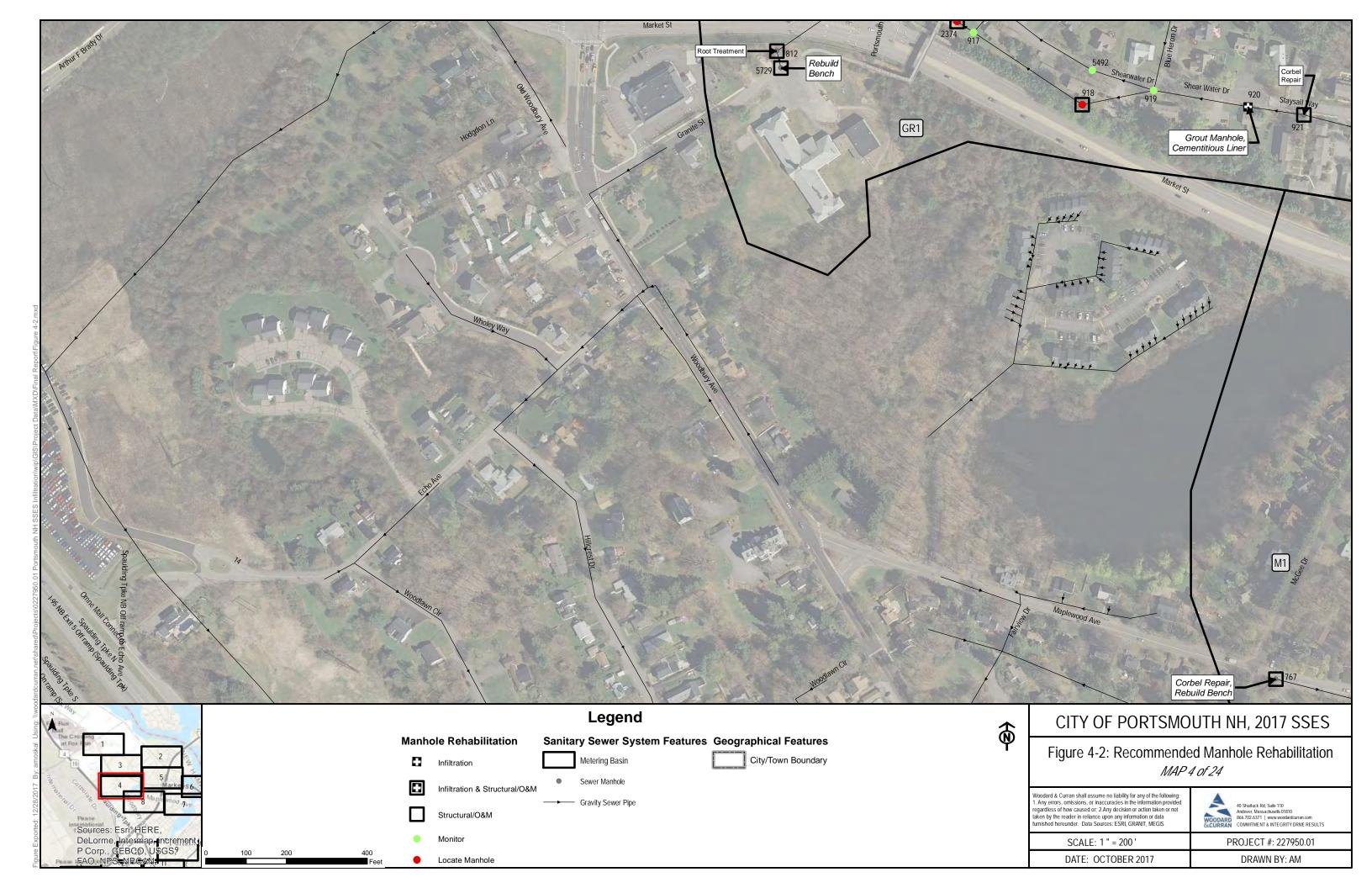
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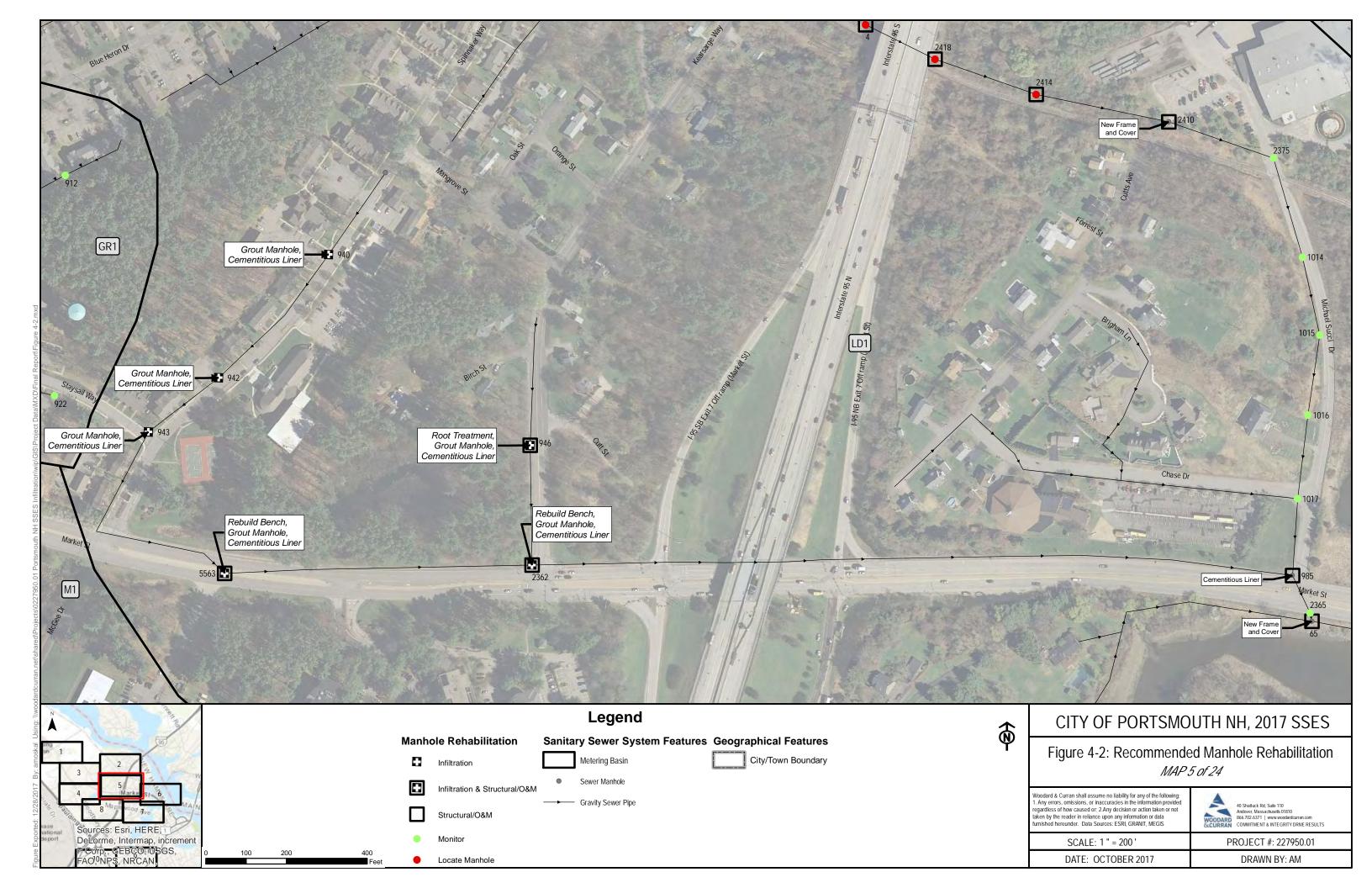


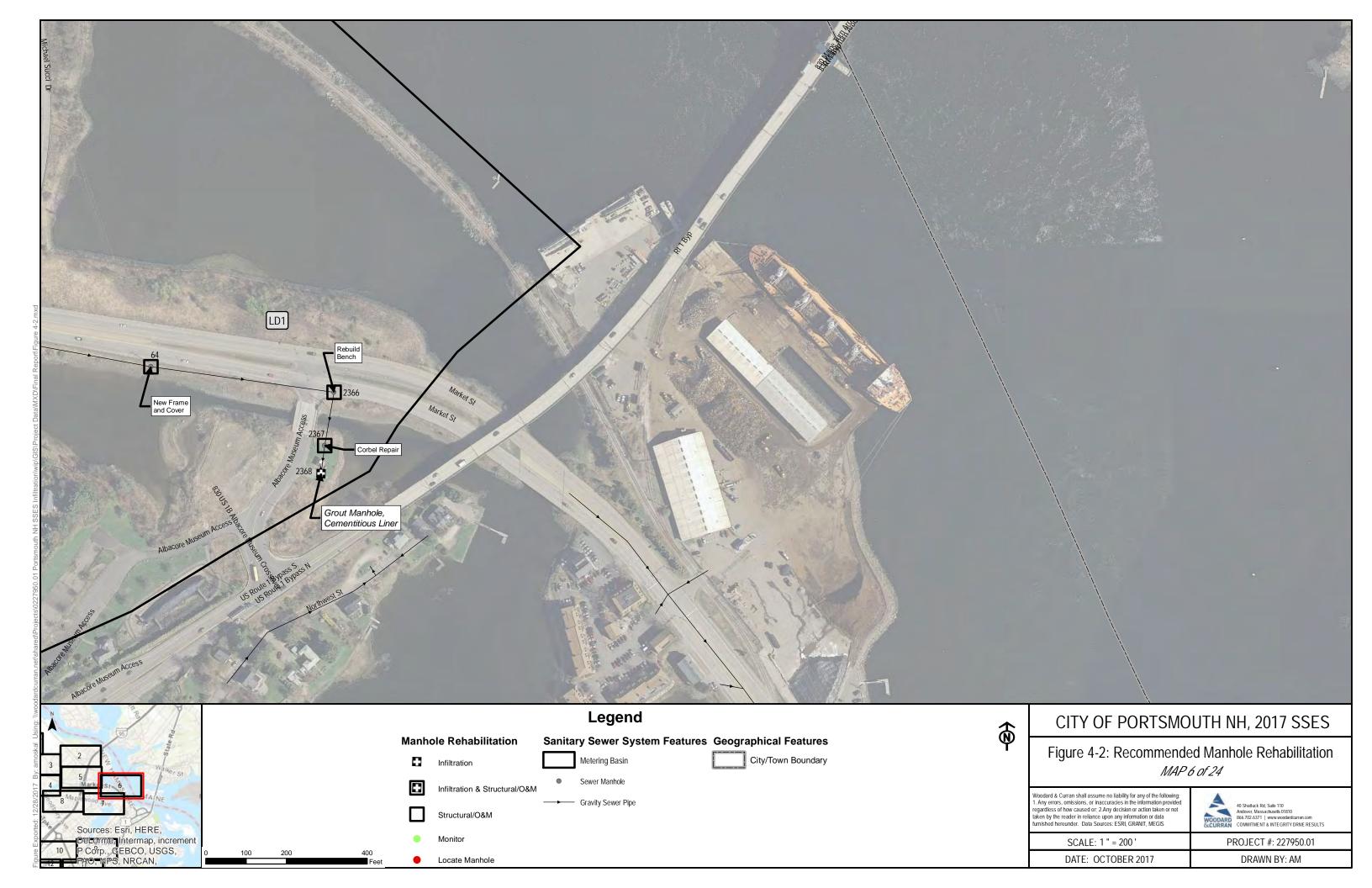


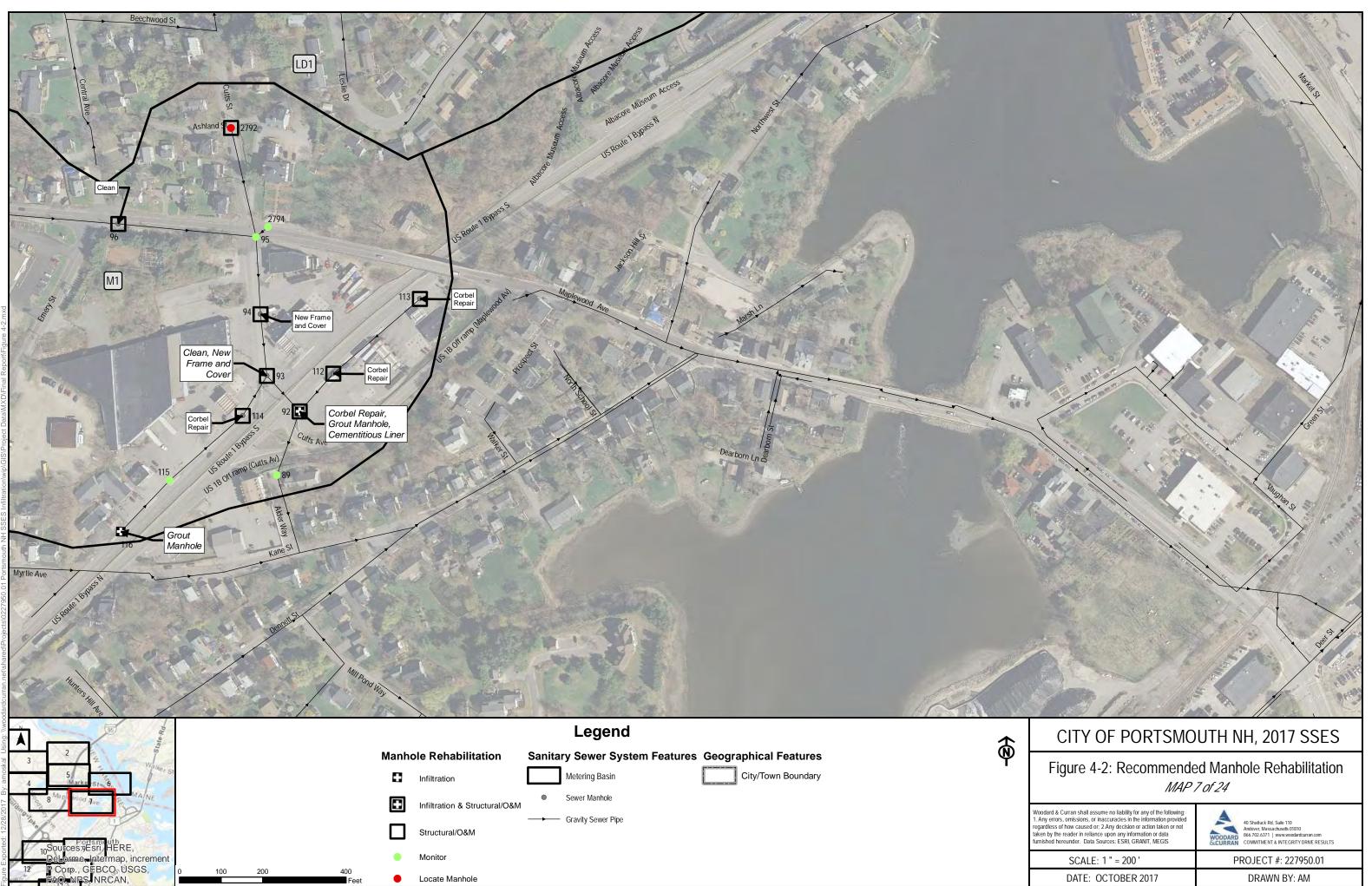
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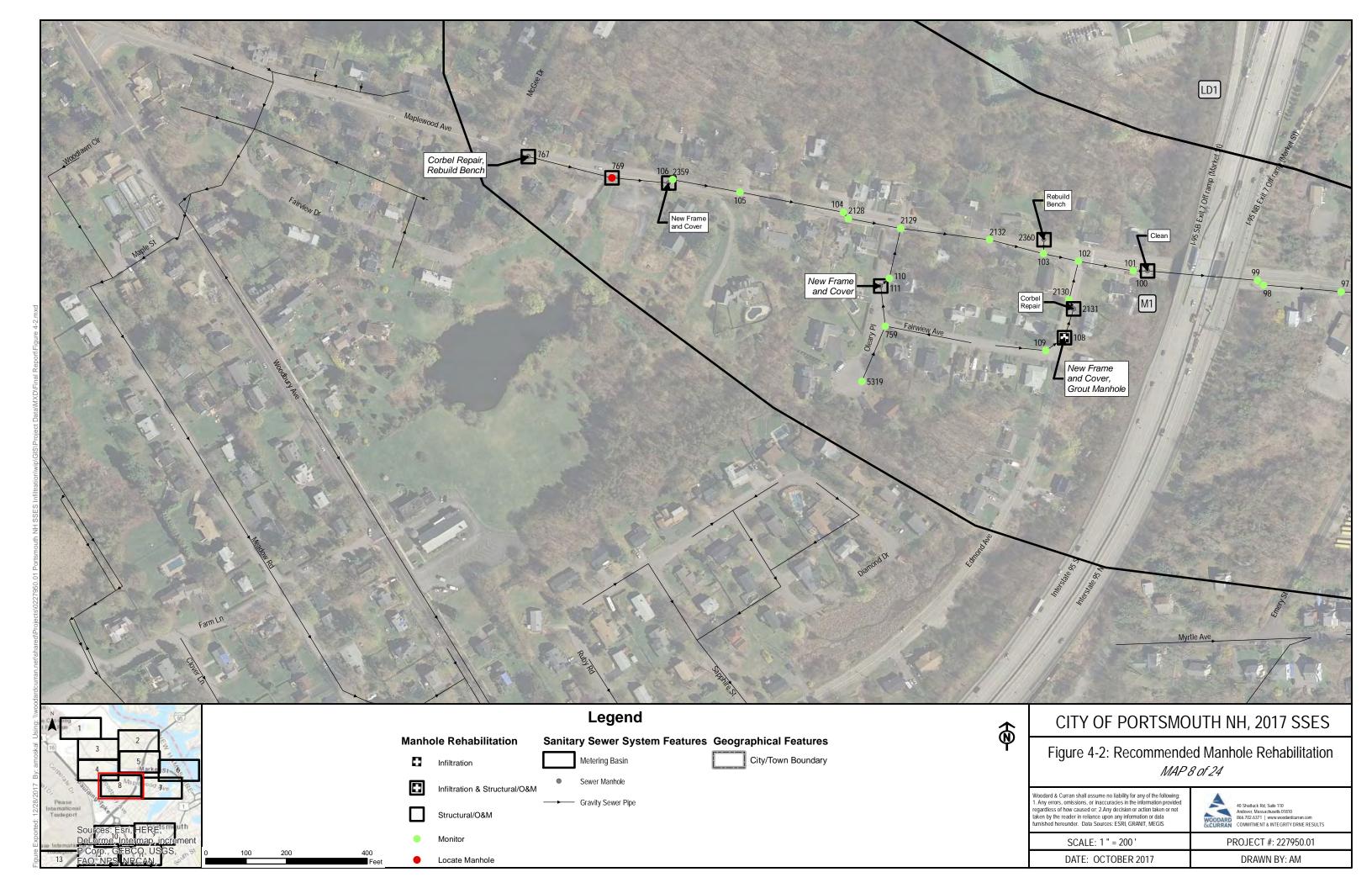


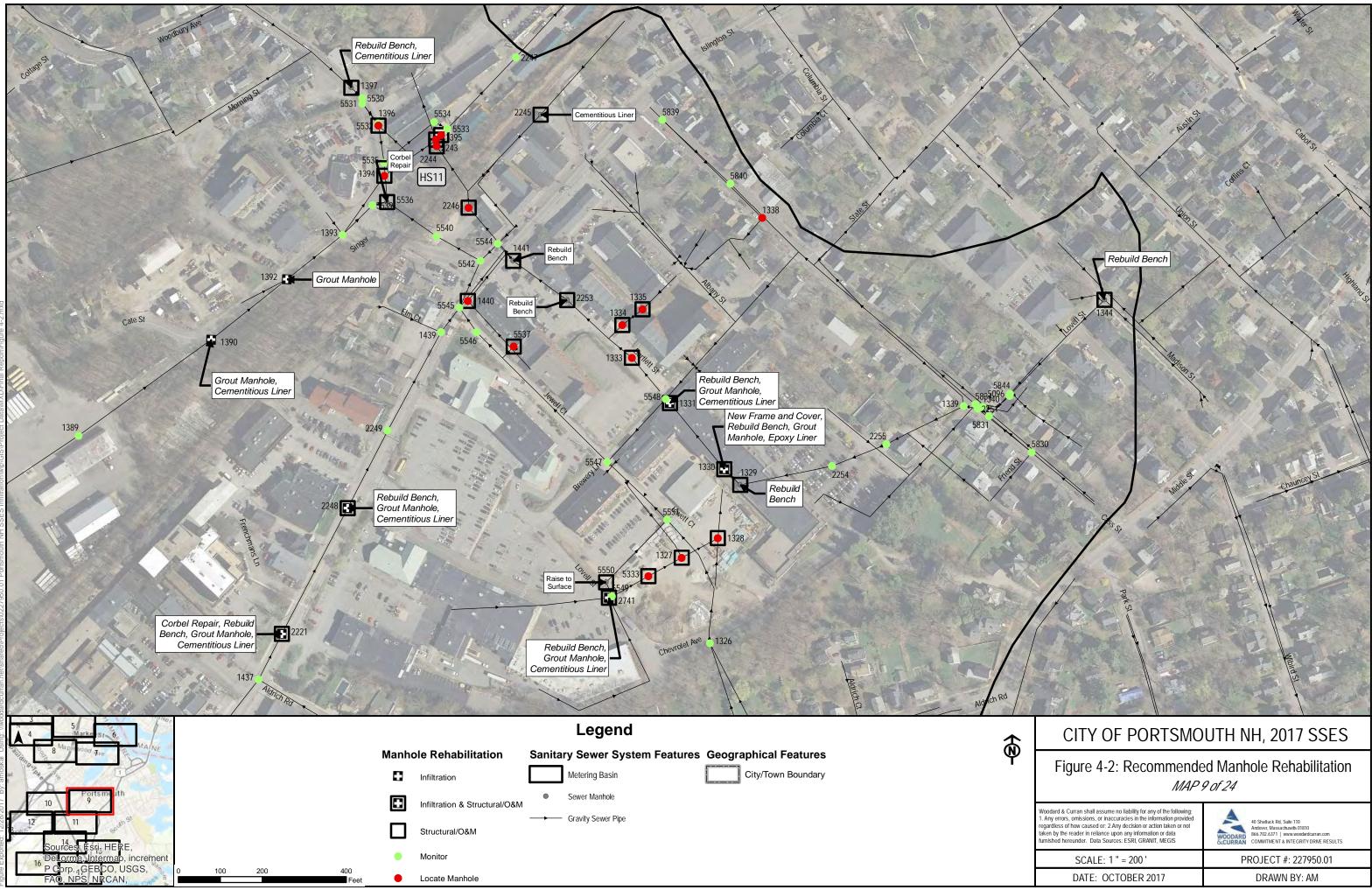




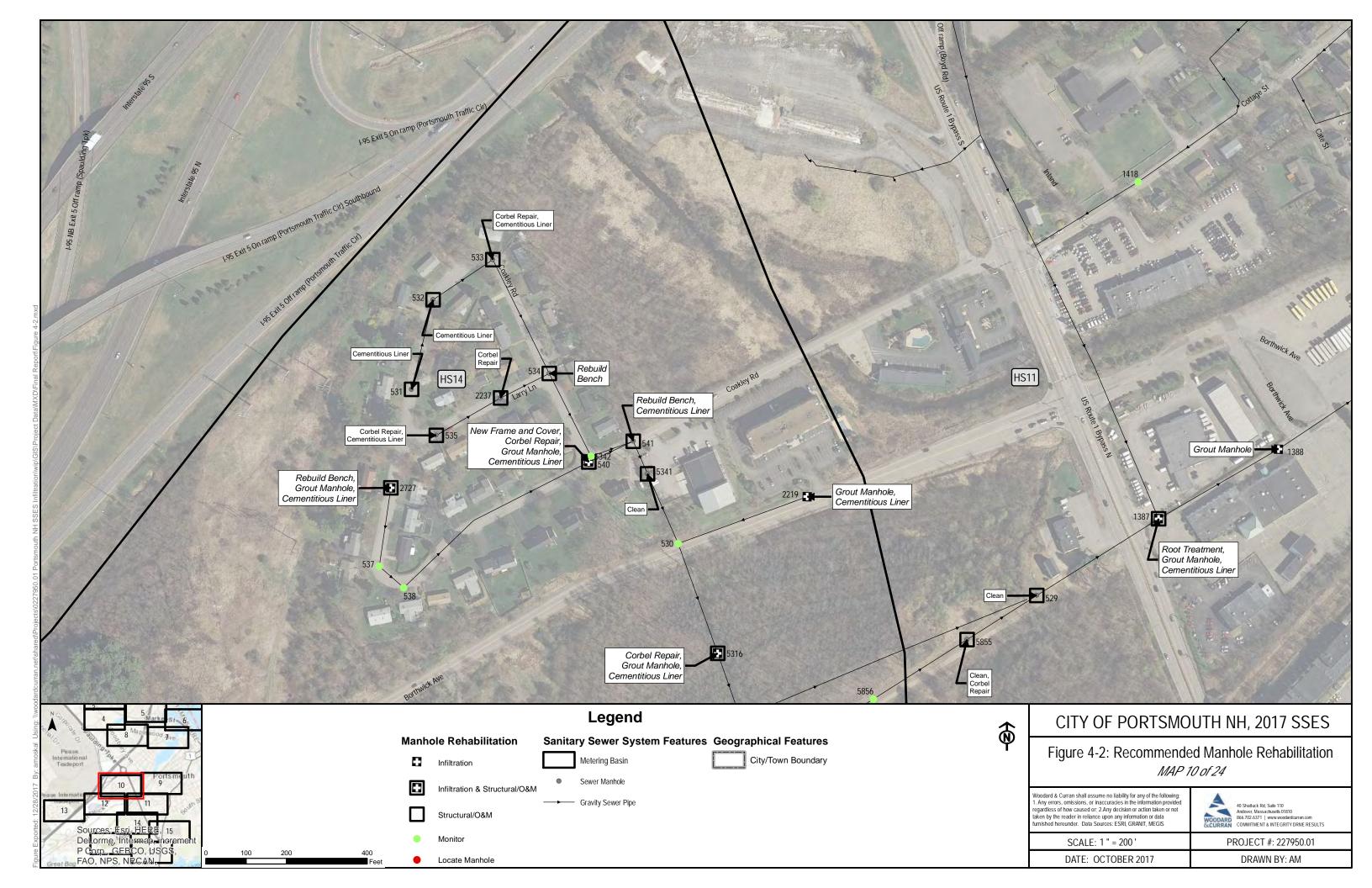


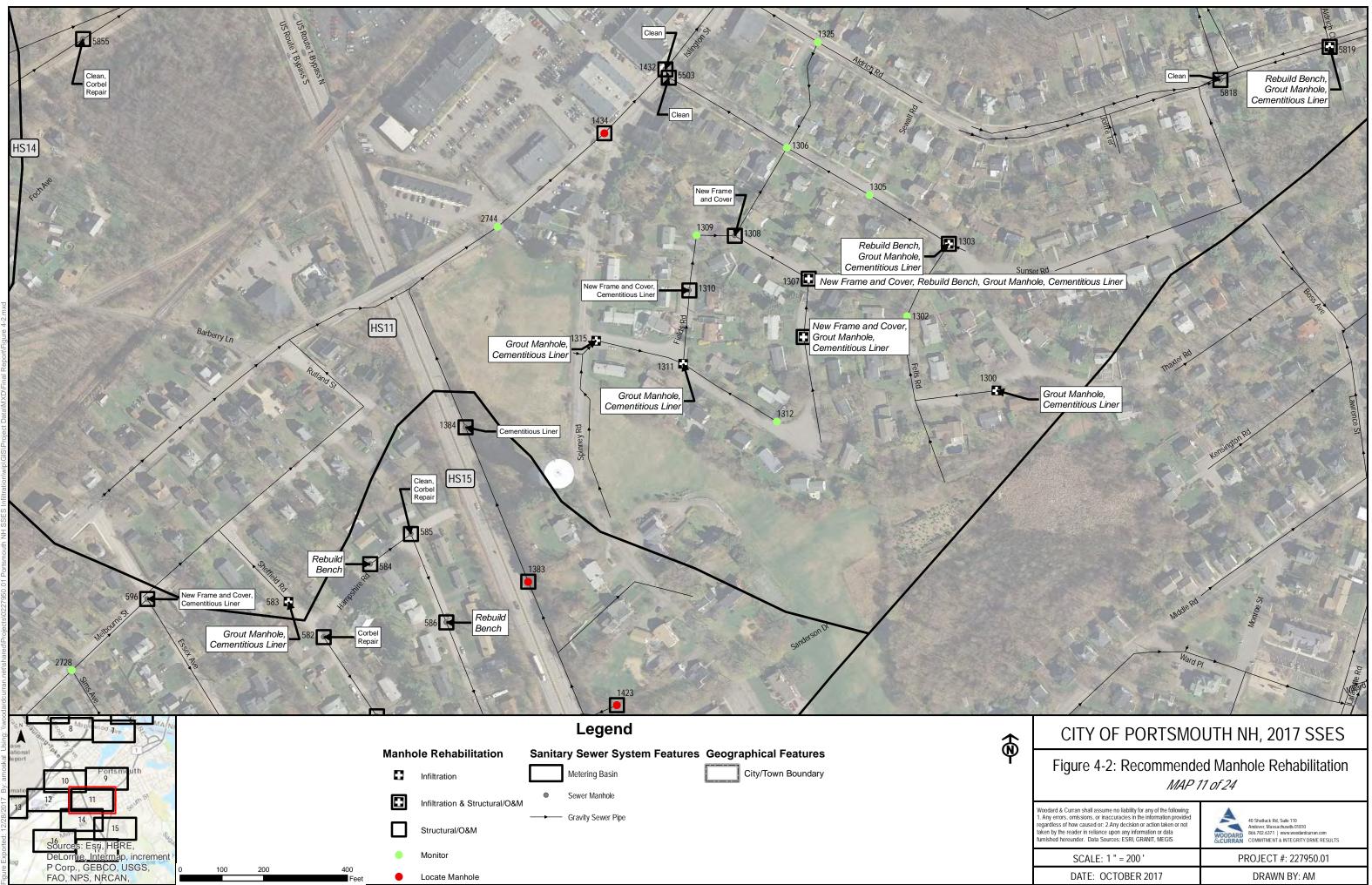
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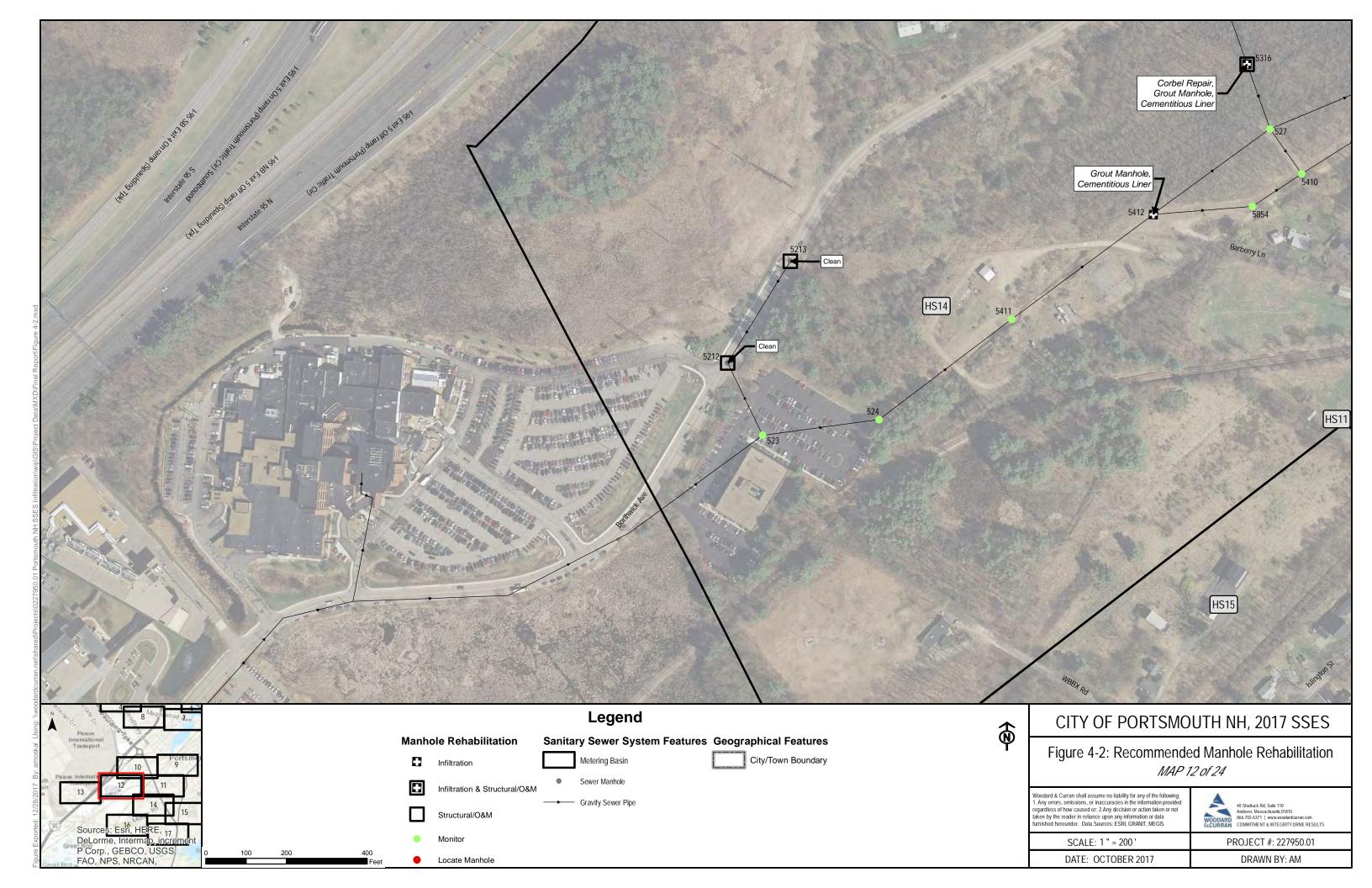


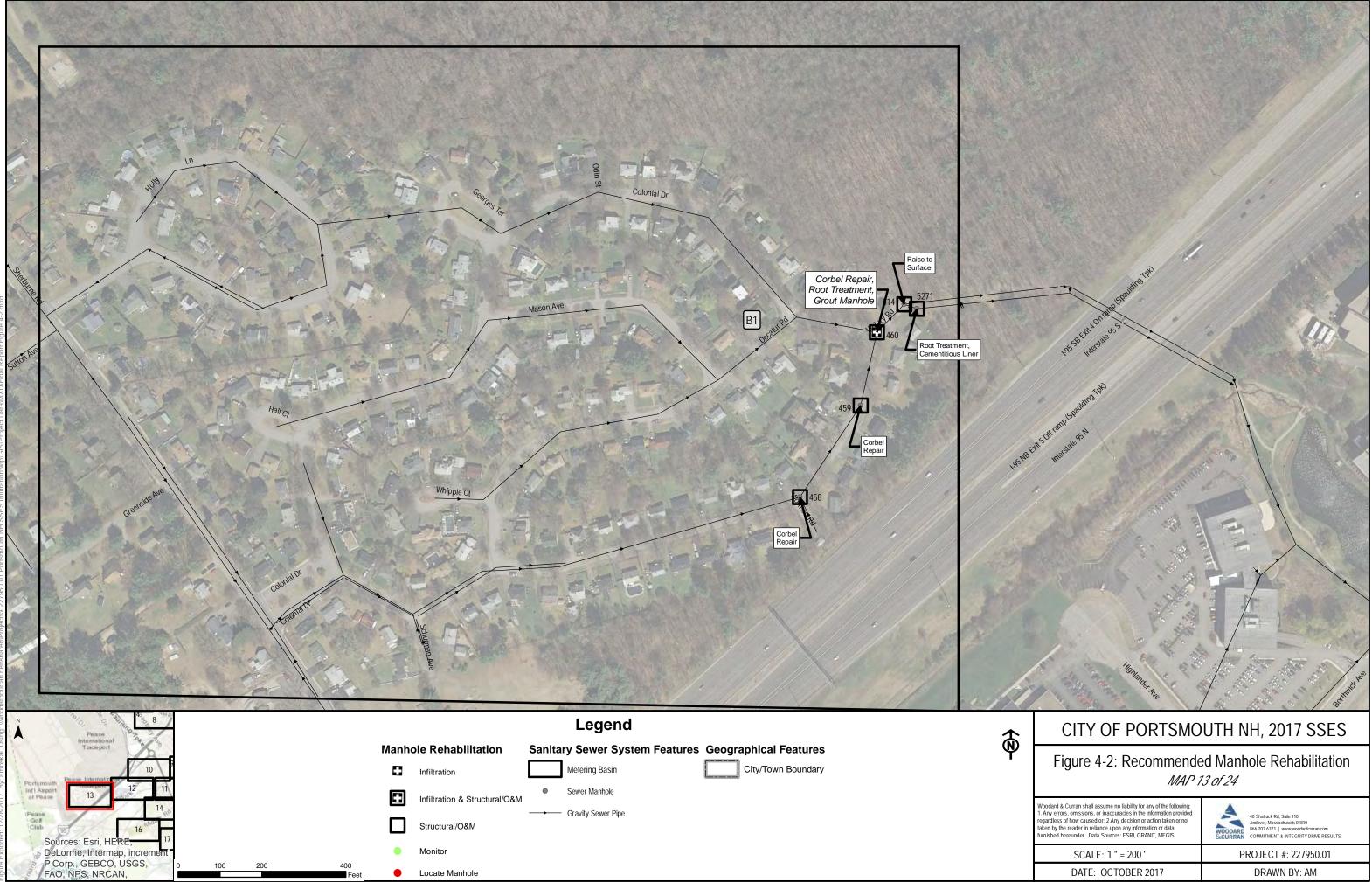
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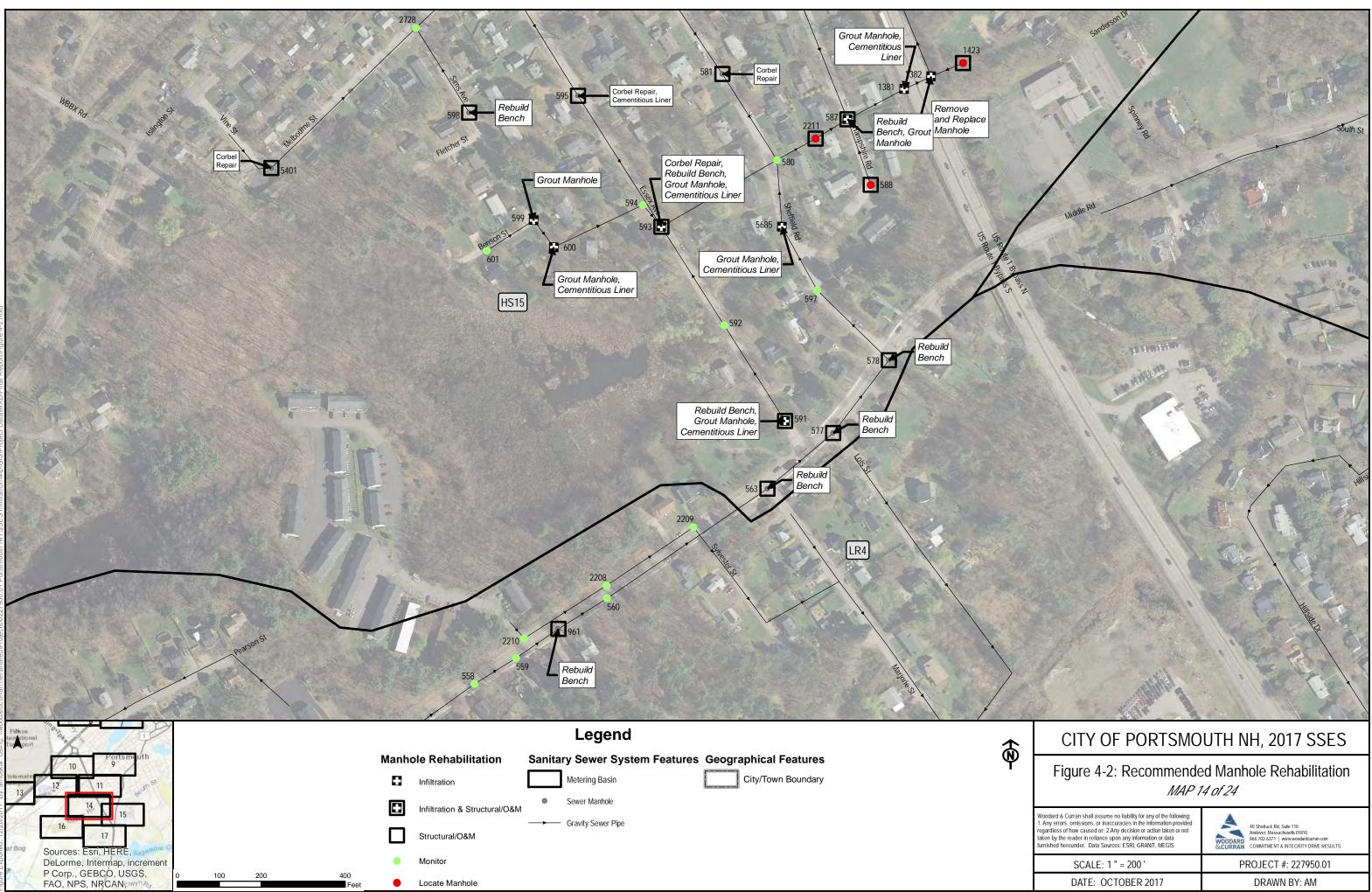


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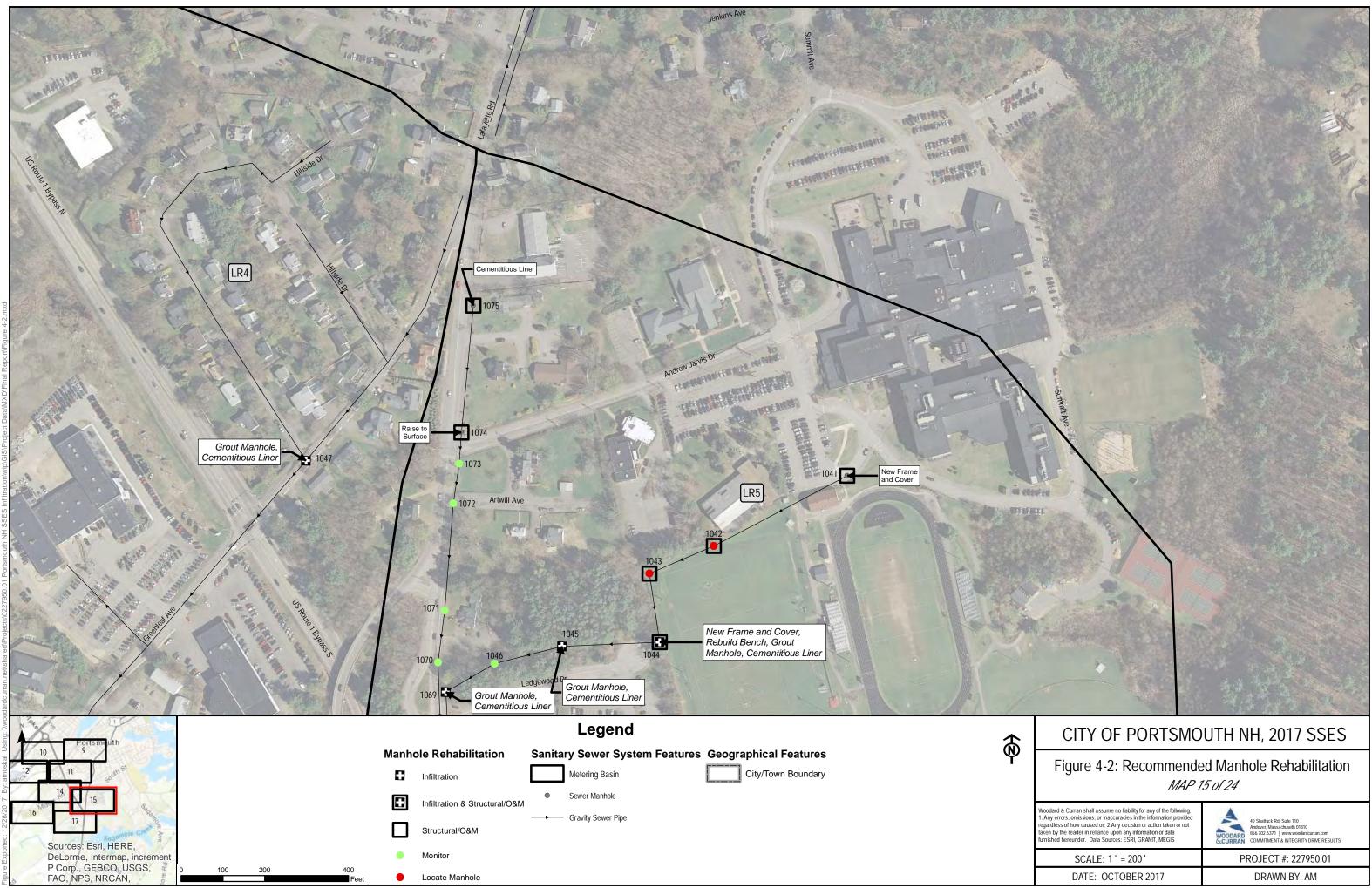




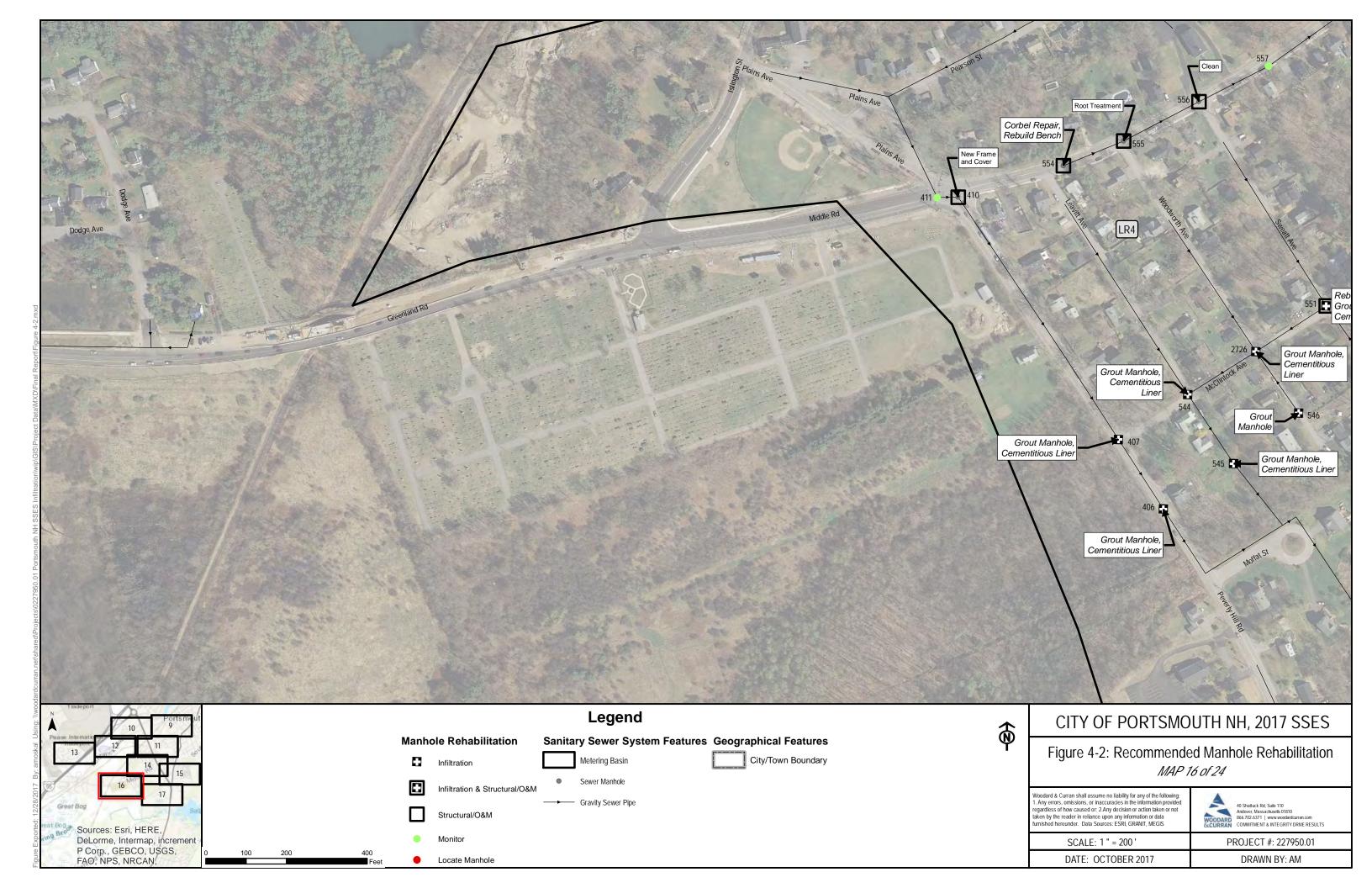
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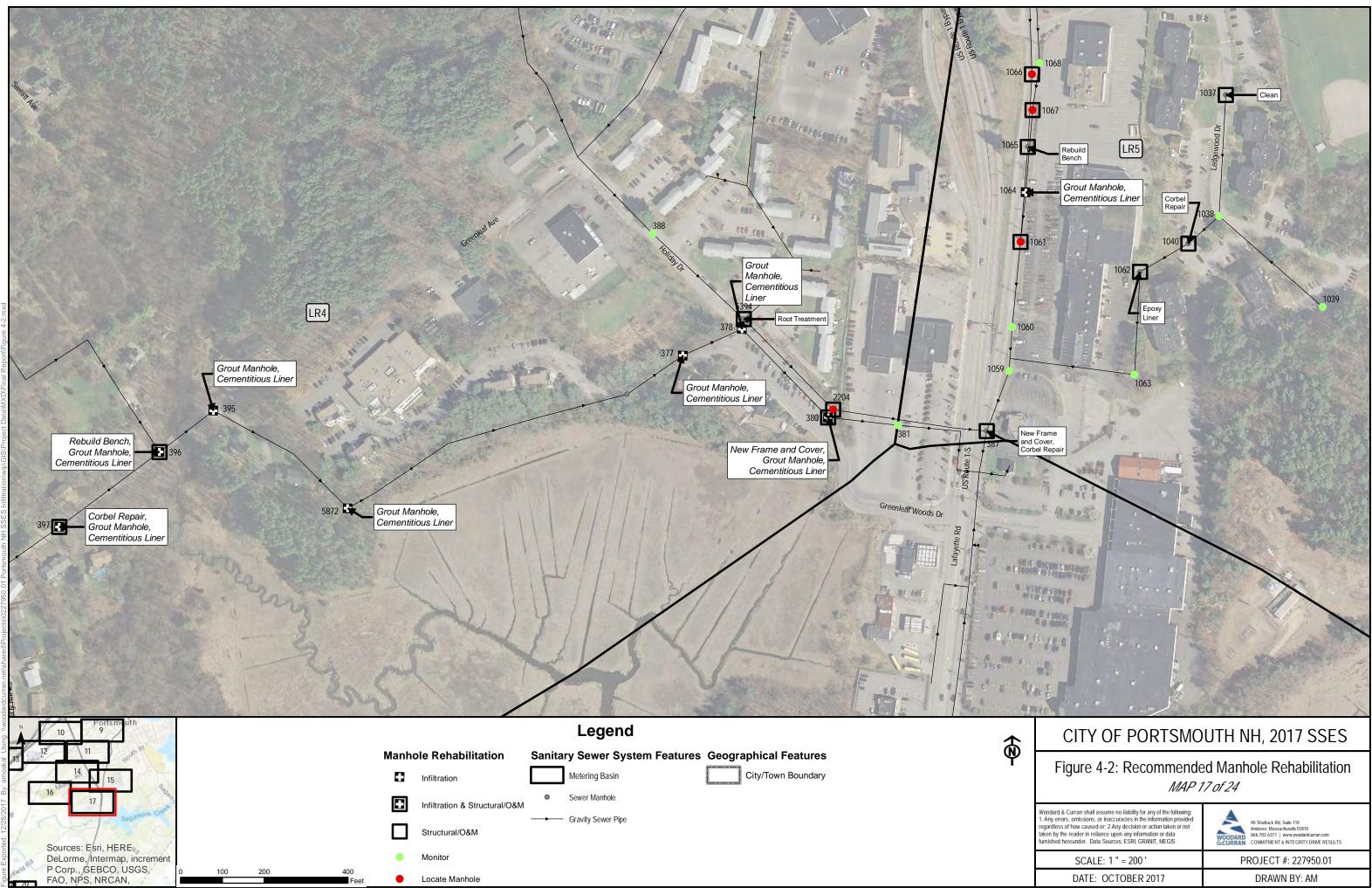


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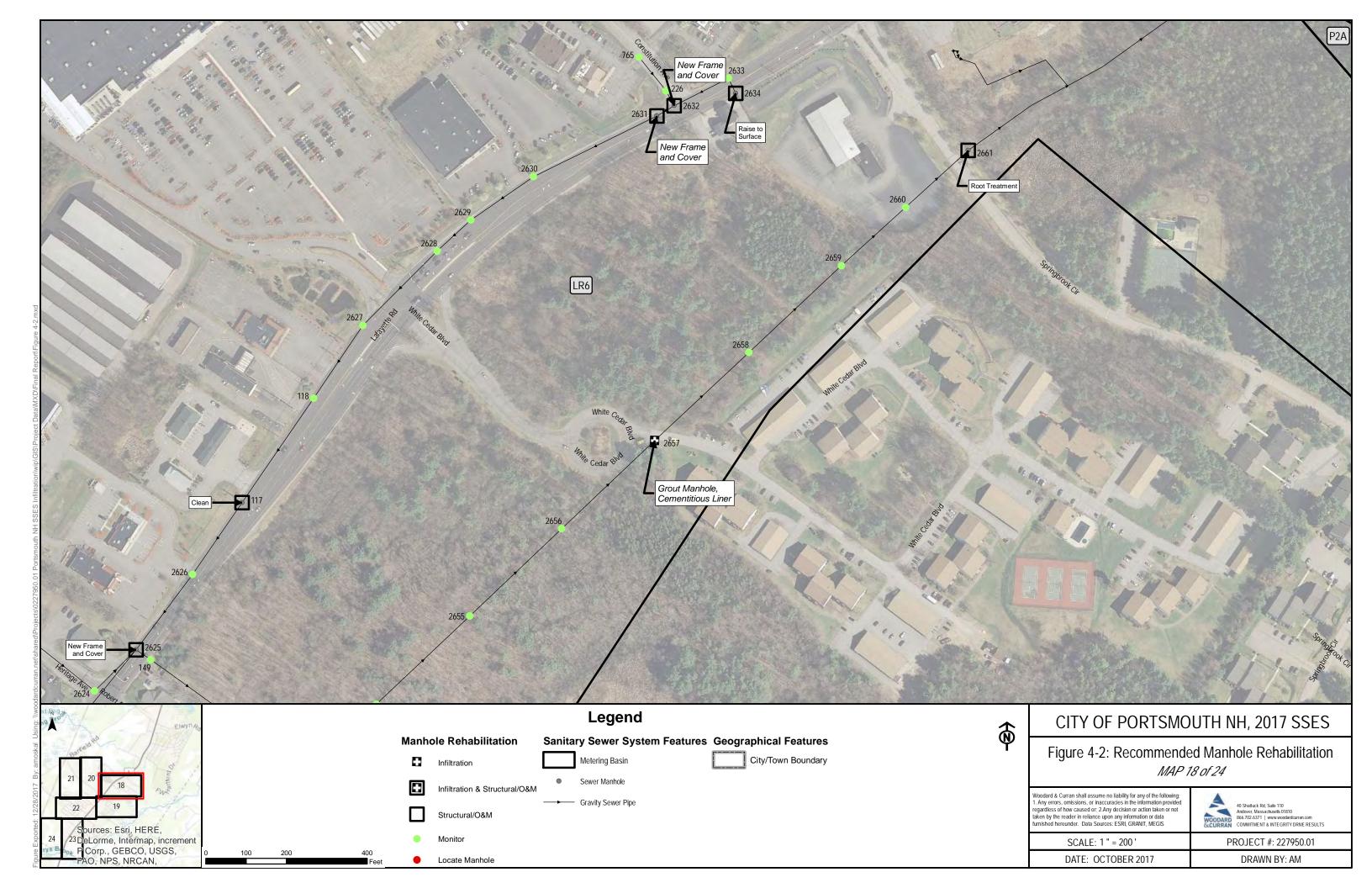


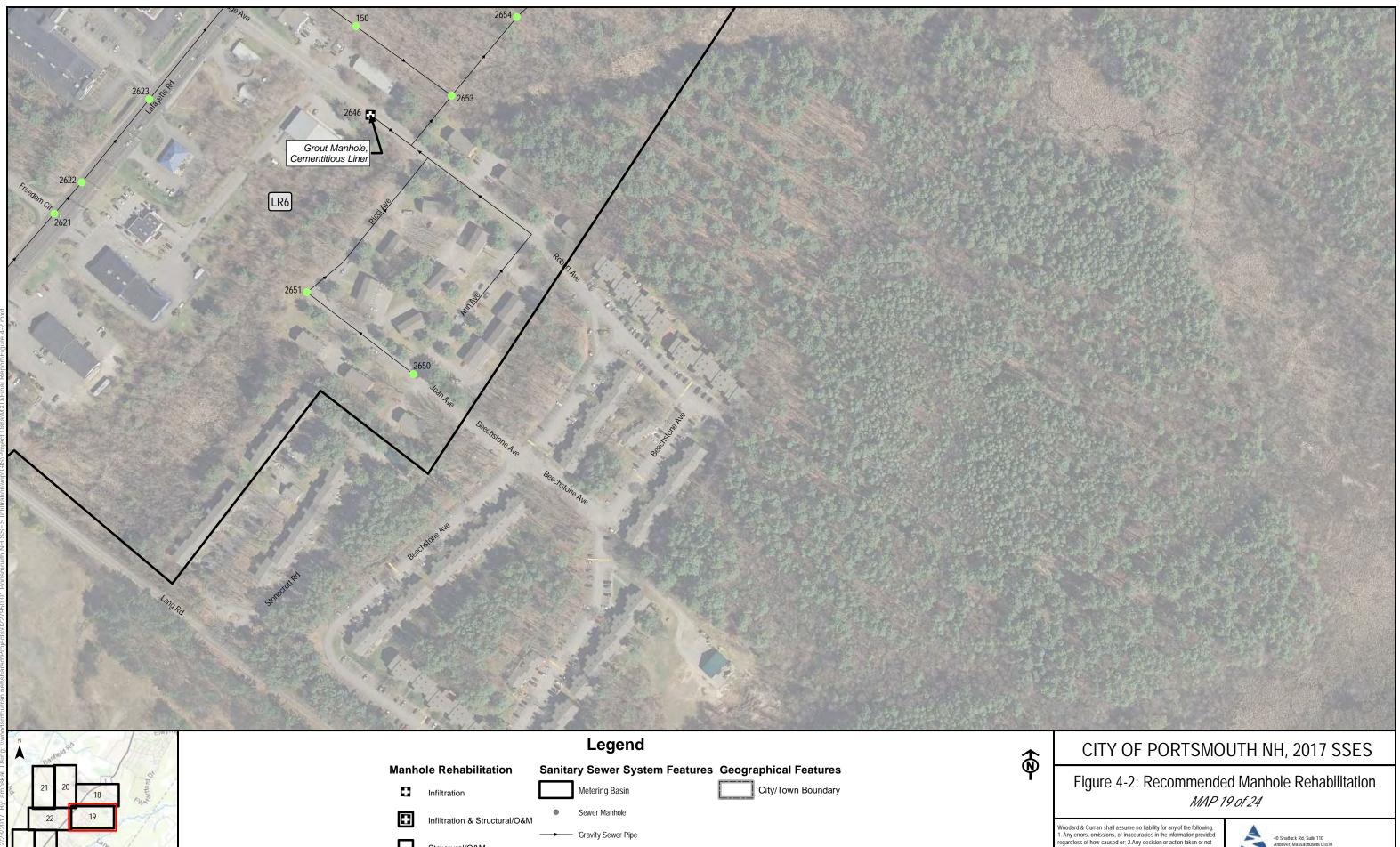
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	Structural/O&M	
٠	Monitor	

Locate Manhole

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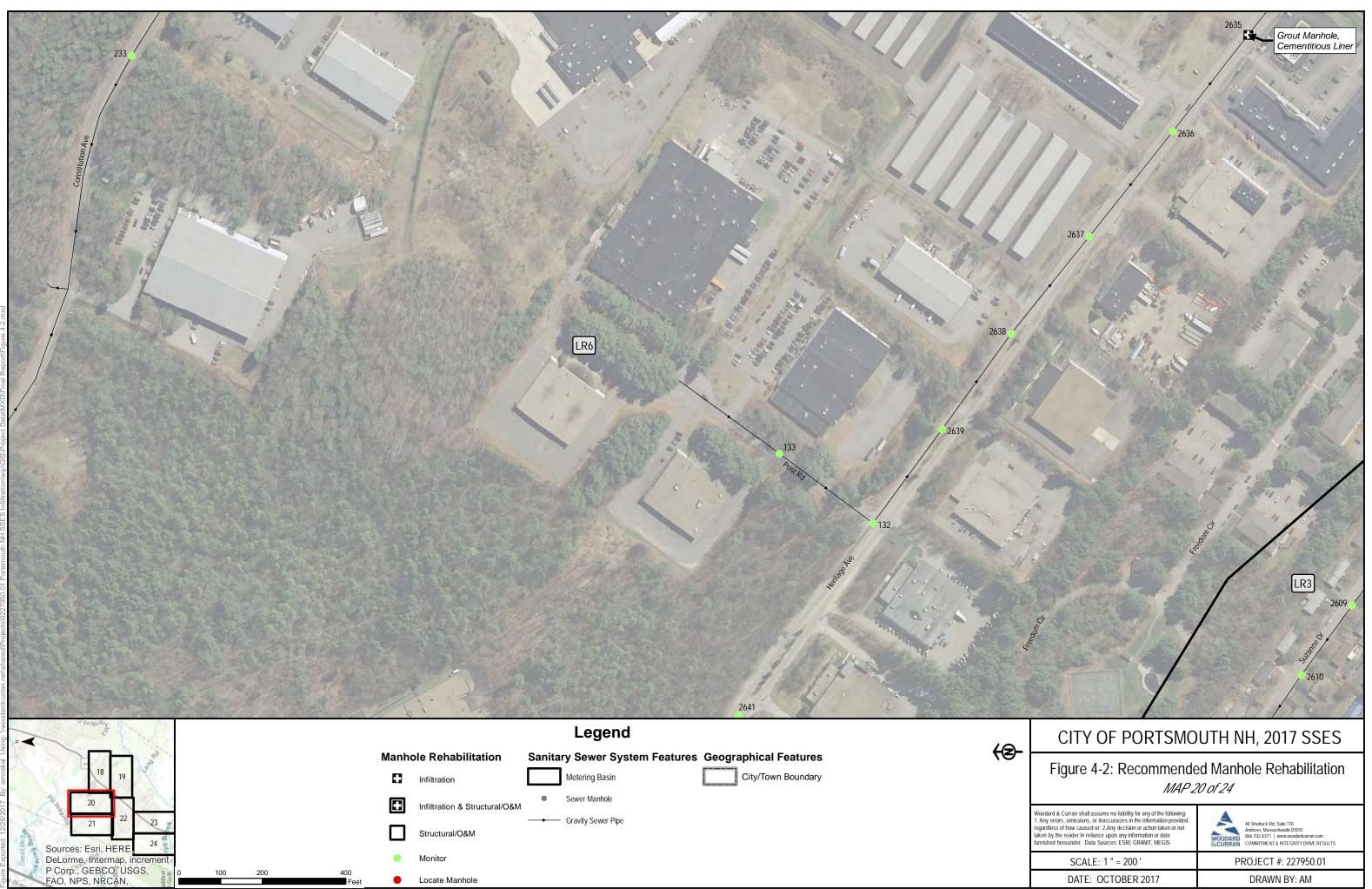
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Monitor

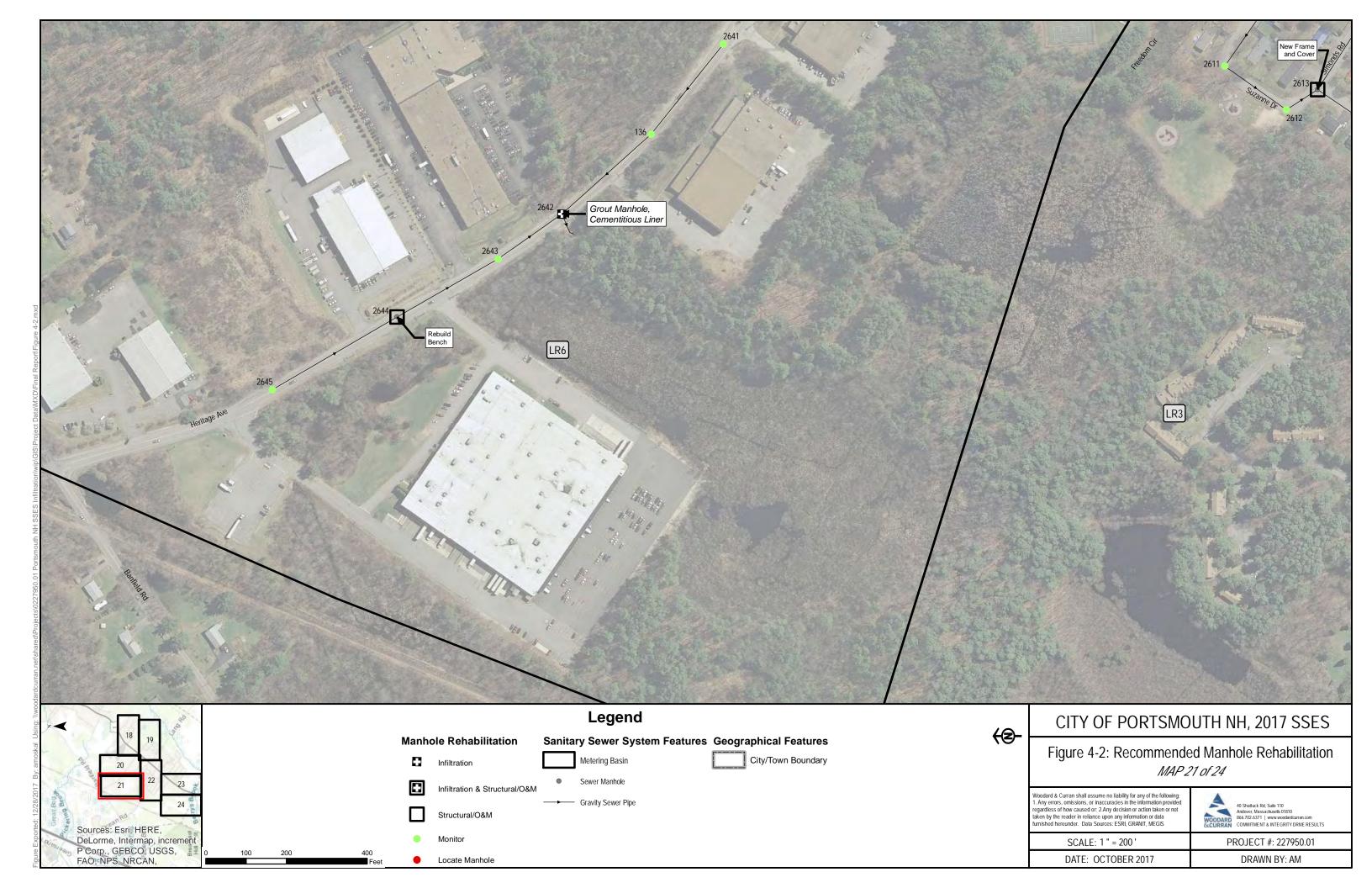
Locate Manhole

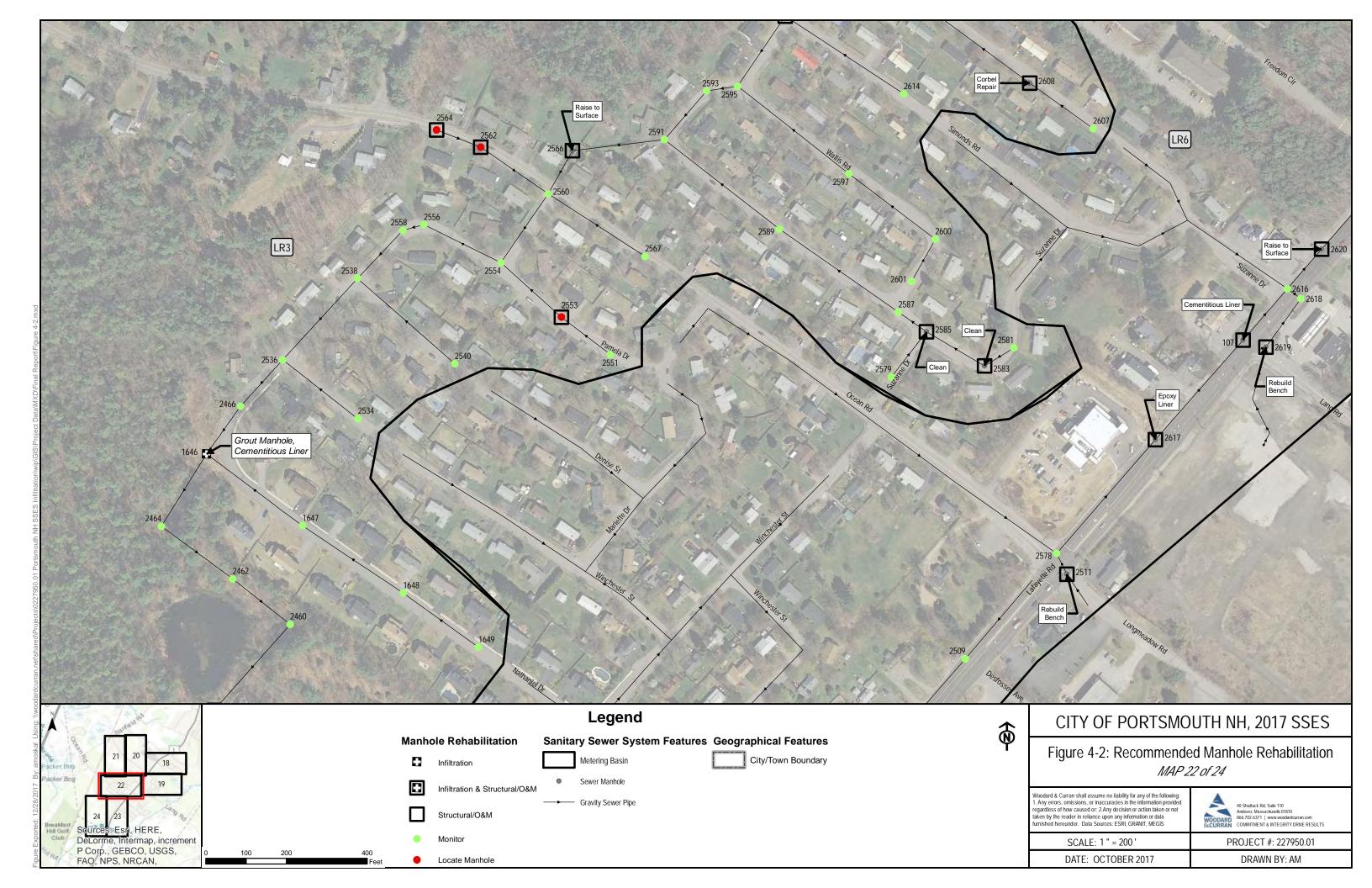
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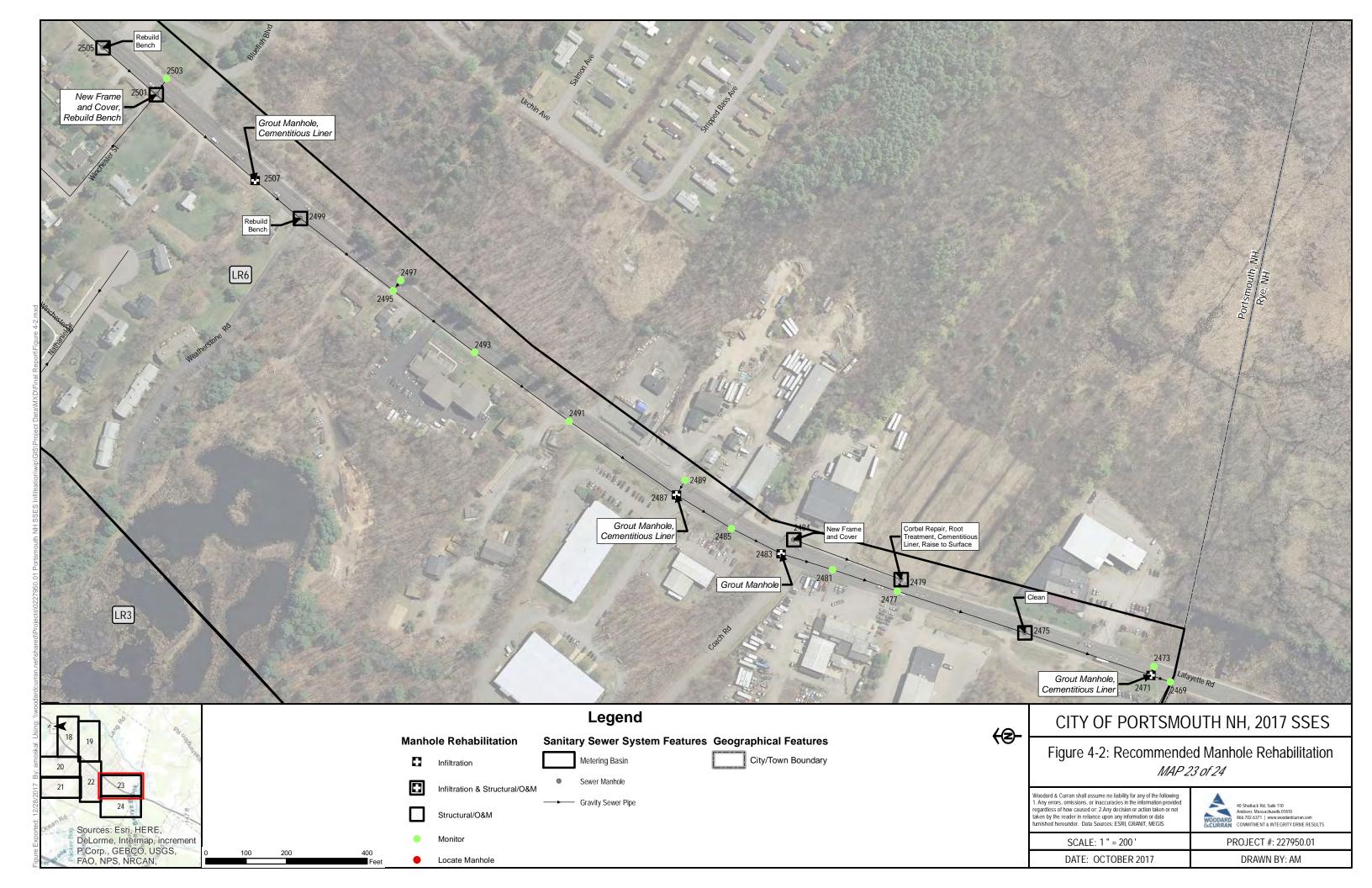
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•	Sewer Manhole	
	Gravity Sewer Pipe	

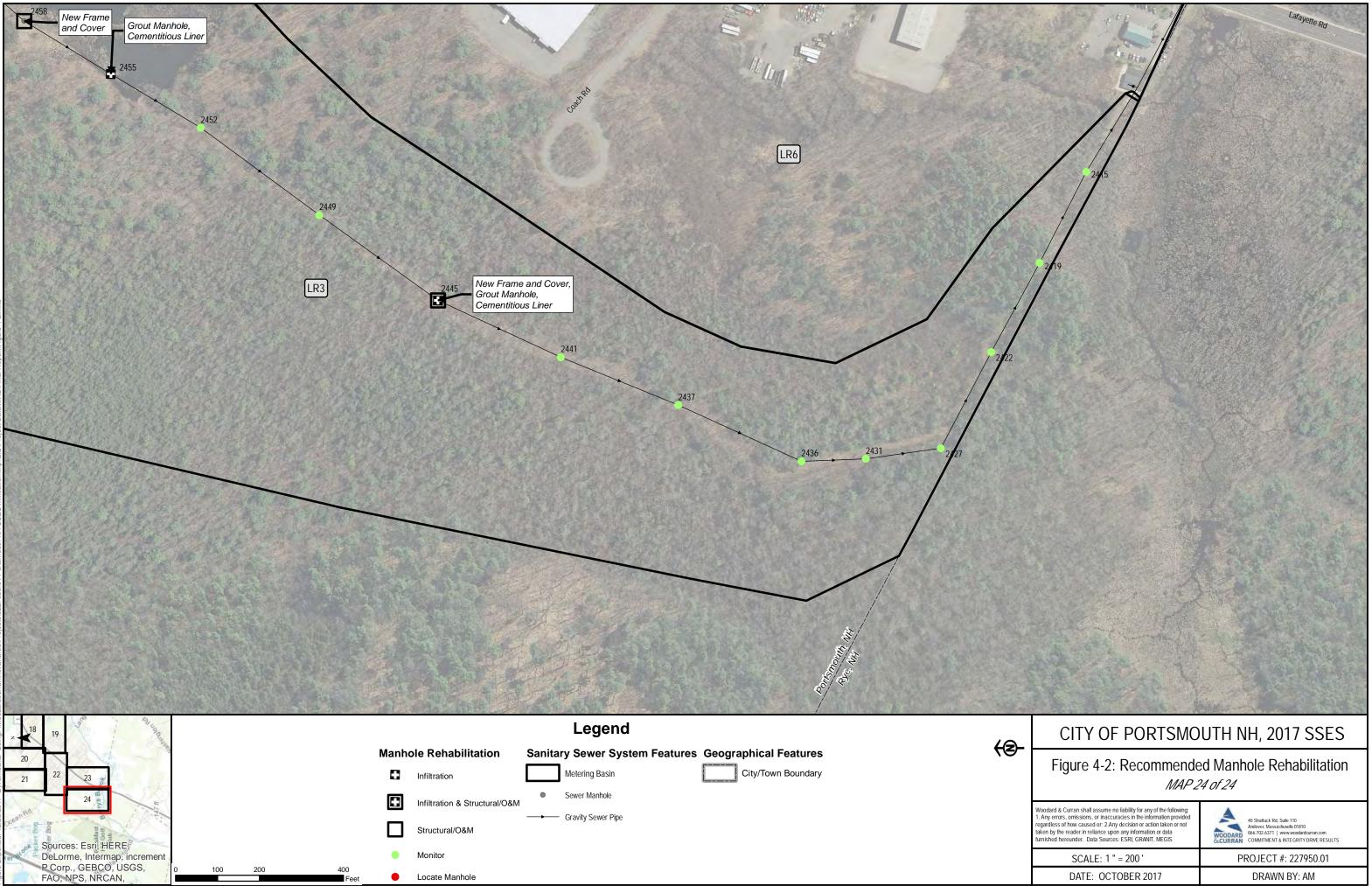
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APPENDIX C: MANHOLE INSPECTIONS AND FLOW ISOLATION DATA (PROVIDED ELECTRONICALLY)



APPENDIX D: CCTV DATA (PROVIDED ELECTRONICALLY)



APPENDIX E: WOODARD & CURRAN TECHNICAL MEMORANDUM (TASK 4), REVIEW OF EXISTING CITY CCTV DATA, JULY 2017

40 Shattuck Road | Suite 110 Andover, Massachusetts 01810 www.woodardcurran.com



CITY OF PORTSMOUTH, NEW HAMPSHIRE

SANITARY SEWER COLLECTION SYSTEM INFILTRATION STUDY

DPW CCTV INSPECTION RESULTS

TECHNICAL MEMORANDUM

Subject: Review of City CCTV Data

Date: July 17, 2017

BACKGROUND

As part of the City's Infiltration and Inflow (I/I) program, the City of Portsmouth performs Closed Circuit Television (CCTV) inspection of gravity sewers throughout the City. These inspection videos were provided to Woodard & Curran for review as part of the Phase 2 Sanitary Sewer Evaluation Survey (SSES) program. Footage of approximately 14,500 linear feet of sanitary sewer pipeline inspection was reviewed to determine the presence of I/I as well as structural defects within the sanitary sewage collection system.

Pursuant to Task 4.0 of the SSES Scope of Work, Woodard & Curran reviewed existing data collected by City crews on manhole to manhole segments of at least 1,000 linear feet that had been investigated during high groundwater conditions. This is typically during the months of March-June following the winter snowmelt. Furthermore, to ensure the relevance of the footage only videos taken after 2010 were utilized in this review.

PROGRAM DEVELOPMENT

The defects, recommended studies, and rehabilitation methods listed in the following tables include several types of work to investigate and/or repair defects. Addressing these defects will assist the City in reducing I/I flows in the sewer system. Removing I/I from the collection system will benefit the City in ways that include but are not limited to: improved collection system performance, reduced treatment and transport costs, assistance in maintaining wastewater discharge at the mandated limits, extending the service life of its sewer assets, and reducing operational costs.

Review of CCTV footage was performed using the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) condition scoring. The PACP scoring is a nationally recognized condition grading system utilized to rank structural and operational/maintenance defects. The video provided to Woodard & Curran by the City was graded in PACP format by City staff. Woodard & Curran supplemented the grading performed by the City of Portsmouth by grading the peak structural and maintenance defects of each pipe. The overall scoring was used to reflect the higher of the two peak scores and develop rehabilitation recommendations. **Table 1** presents a summary of CCTV observations noting defects found and estimated infiltration rate observed.



Using the PACP condition grade and type(s) of defects, recommendations for rehabilitation were made using the 0-5 scale where 0 typically indicates no action required and 5 indicates a priority repair should be made.

Based on the review of the CCTV inspections, recommendations were developed to address any defects found in each pipe segment. The recommended repair method was selected based on the type of defect found and the severity of the defect, as well as the overall condition of the pipe segment. A summary of the types of repairs recommended is presented below. Recommended repair method for each defect can be found in **Table 2**.

CCTV: Pressure water wash is recommended for pipe segments exhibiting significant debris and build-up, and/or pipe segments that could not be fully inspected during the initial SSES fieldwork. Segments recommended for heavy clean are also to be CCTV inspected to identify potential deficiencies.

CCTV Lateral: Closed circuit television inspection is recommended for service laterals that display clear water flowing consistently as this may be evidence of groundwater intruding into the collection system through a deficiency in the lateral.

Clean, Inspect, Test and Seal (CITS): Testing and sealing joints is recommended in pipe segments that are without observable structural deficiencies but exhibit active leaks, separated joints or circumferential cracks that could allow infiltration, and/or lie in areas of high groundwater influence.

Cut Protruding Service: Protruding services not only reduce the cross-sectional area of the pipe and impede the hydraulic conditions at that location but limit the ability to inspect the pipe with a CCTV camera. Such a defect is recommended to be cut from within the pipe to rectify flow.

Root Treatment: Chemical root treatment is recommended in pipe segments that exhibit roots growing through joints and/or defects and often includes segments where the majority of the pipe cross section is restricted by root ball growths.

Short Liner: A varying length cured-in-place-pipe (CIPP) liner is recommended in pipe reaches where identified leaks, cracks, or other defects occur sporadically in pipe segments that are otherwise in sound condition. Short liners include extra strength for pipe segments to provide structural support. The length of the short liner will be based on the size of the individual deficiency observed.

Cured-In-Place-Pipe (CIPP) Liner: A manhole-to-manhole structural CIPP liner is recommended in pipe segments where leaking joints, cracks, or other structural defects are recurring throughout the majority of the pipe segment. A CIPP liner creates a pipe within the existing pipe that reinstates the structural integrity of the pipe and removes infiltration.

Open Cut Repair, Dig and Replace: An open cut repair is recommended in pipe segments that are damaged beyond repair by means of trenchless rehabilitation.

Grout Manhole: Grouting is recommended in manholes where infiltration is observed through cracks and/or other defects in the structure.

Continue to Monitor: In pipe segments where defects are non-existent or minor in significance and no immediate rehabilitation is recommended, continued monitoring is the best practice.



Pump Station Basin Video Date Metering Basin From MH То МН LF Location Observations (in.) Rate Materia (gpm Infiltration Stains GOSLING RD 2 Osprey 55 4/10/17 GR1 820 819 8"VCP Throughout Pipe, Roots 0.3 PS Drive Fine Joint Throughout Pipe 99 Hole Void Visible at 101' GOSLING RD GR1 819 639 Portsmouth 4/10/17 8"VCP DS, Infiltration Gusher at 4.0 335 PS 34' and 101' DS Boulevard Fracture and Infiltration GOSLING RD 5 Osprey Gusher at Unknown GR1 EOP 821 218 4/12/17 6"VCP 0.5 PS Drive Distance in Pipe, assumed to be 1-3' US Infiltration Dripper at 134' GOSLING RD Portsmouth GR1 2372 813 152 4/1/14 10"VCP US, Heavy Debris at 124' 0.4 PS Boulevard US Infiltration Stains in Pipe GOSLING RD Portsmouth and MH 814, Cracks at 27 GR1 813 814 60 4/1/14 10"VCP 0.1 PS Boulevard and 30' DS LESLIE 200 Chase No significant defects LD1 1021 1020 1/22/15 8"AC 44 DRIVE PS Drive observed LESLIE 200 Chase No significant defects 1/22/15 1019 8"AC LD1 1020 243 DRIVE PS Drive observed 200 Chase LESLIE No significant defects LD1 1019 1018 215 1/23/15 8"AC DRIVE PS Drive observed 200 b Chase No significant defects LESHE LD1 1018 1017 1/23/15 8"AC 226 DRIVE PS Street observed LESLIE Michael Succi LD1 2375 1014 255 8/25/16 14"AC Patch Repair at 46' US DRIVE PS Drive LESLIE Michael Succi Roots at DS Manhole I D1 1014 1015 8/25/16 14"AC 198 DRIVE PS Drive Invert Counter not utilized during LESLIE survey. Hole Soil Visible Michael Succi LD1 1015 1016 200 8/31/16 14"AC DRIVE PS Drive and Roots in Joints at Unknown Distances PVC Spot Repair at 36' I ESI IE 1 Michael US, Infiltration Stains from LD1 1016 1017 209 8/25/16 14"AC 89'-143' US, Roots in Joint DRIVE PS Succi Drive at US MH Connection LESLIE Michael Succi No significant defects LD1 1017 8/25/16 14"AC 985 191 DRIVE PS Drive observed Michael Succi LESLIE No significant defects LD1 103 985 2365 8/25/16 15"CI Drive & DRIVE PS observed Market Street Roots Medium Joint MECHANIC Throughout, Broken Pipe LR5 1092 1091 528 Broad Street 5/14/14 8"VCP ST PS at 63' DS, Fractures Throughout Pipe 2458 Deformed Pipe at 0' DS, LAFAYETTE LR6 2630 2629 189 Lafayette 3/30/15 8"AC Intruding Lateral at 156 RD PS DS Road 2458 LAFAYETTE Surface Spalling LR6 2631 2630 3/30/15 8"AC 341 Lafayette RD PS Throughout Pipe Road 2460 LAFAYETTE No significant defects LR6 2629 2628 113 Lafayette 3/30/15 8"AC RD PS observed Road 2460 LAFAYETTE Infiltration Runner at 1' DS LR6 2628 2627 260 Lafayette 3/26/15 12"AC 0.3 RD PS from Fractured Joint Road 2466 Surface Spalling from 88'-LAFAYETTE I R6 2627 118 3/26/15 12"AC 1.0 218 Lafayette 95' DS, Intruding Lateral at RD PS 94' DŠ Road Surface Spalling, 2468 LAFAYETTE Infiltration Stains from 38-LR6 118 117 314 Lafayette 3/26/15 12"AC 1.0 48' DS, Cavity in pipe at 148' DS RD PS Road 2470 LAFAYETTE No significant defects LR6 3/30/15 12"AC 117 2626 216 Lafayette RD PS observed Road

TABLE 1: CCTV OBSERVATIONS

Infiltration



Metering Basin	Pump Station Basin	From MH	To MH	LF	Location	Video Date	Dia. (in.) Material	Observations	Infiltration Rate (gpm)
LR6	LAFAYETTE RD PS	2626	2625	234	2800 Lafayette Road	3/30/15	12"AC	Cracks at 5' and 79' DS, Infiltration Runner at 143' DS	0.3
LR6	LAFAYETTE RD PS	2635	2624	200	Heritage Ave & Lafayette	3/30/15	12"AC	No significant defects observed	
LR6	LAFAYETTE RD PS	2636	2635	294	55 Heritage Avenue	3/30/15	12"AC	No significant defects observed	
LR6	LAFAYETTE RD PS	2638	2637	298	85 Heritage Avenue	3/30/15	12"AC	Broken Lateral Hole Void Visible at 286' US	
LR6	LAFAYETTE RD PS LAFAYETTE	2639	2638	282	112 Heritage Avenue	3/24/15	12"AC	Poor Survey Quality (Steam)	
LR6	RD PS	132	2639	280	145 Heritage Avenue	3/24/15	12"AC	No significant defects observed Separated Joint at 1.5' US,	
M1	DEER ST PS	111	110	28	134 Fairview Avenue	5/20/11	8"PVC	Clear Water Coming from Lateral at 4.5' US	0.3
M1	DEER ST PS	110	2129	127	139 Fairview Avenue	5/20/11	8"PVC	No significant defects observed	
M1	DEER ST PS	100	99	274	I-95 & Maplewood Avenue	5/23/11	10"PVC	No significant defects observed	
M1	DEER ST PS	99	98	19	678 Maplewood Avenue	5/23/11	10"PVC	No significant defects observed	
M1	DEER ST PS	98	97	193	678 Maplewood Avenue	5/23/11	10"PVC	No significant defects observed	
M1	DEER ST PS	102	101	138	768 Maplewood Avenue	5/20/11	10"PVC	Medium grease deposits throughout pipe	
M1	DEER ST PS	103	102	89	791 Maplewood Avenue	5/20/11	8"PVC	No significant defects observed	
M1	DEER ST PS	2128	2129	132	828 Maplewood Avenue	5/20/11	8"PVC	Infiltration Gusher at DS Manhole Connection	0.8
M1	DEER ST PS	2129	2132	223	860 Maplewood Avenue	5/20/11	8"PVC	Infiltration Dripper at 160' DS	0.1
M1	DEER ST PS	105	104	261	940 Maplewood Avenue	5/19/11	8"PVC	Grease Deposits at 250' DS, Clear Water Coming from Lateral at 192' DS	0.3
M1	DEER ST PS	2359	105	169	979 Maplewood Avenue	5/19/11	8"PVC	Clear Water Coming from Lateral at 33' US	0.3
P2A	WOODLANDS 1 PS	2423	2428	342	270 F.W. Hartford Drive	5/5/14	8"PVC	Infiltration Dripper at 100' DS, Sag in Pipe at 140' DS	0.1
P3	WEST RD PS	2188	2187	154	60 West Road	5/11/12	8"PVC	No significant defects observed	0.8
P3	WEST RD PS	2187	2186	424	100 West Road	5/11/12	8"PVC	Sag in pipe at 23' DS, Hole Void Visible at 82' DS, Heavy Grease Deposits at 276' DS	
P3	WEST RD PS	2186	2185	291	140 West Road	5/11/12	8"PVC	Separated Joint at 49' DS, Heavy Debris from 180'- 187' DS	
P3	WEST RD PS	2185	2184	199	155 West Road	5/10/12	8"PVC	Deformed Pipe at 37' US, Offset Joint at 140' US. Survey Abandoned at 132' US	
P3	WEST RD PS	2184	2183	230	170 West Road	5/10/12	8"PVC	No significant defects observed	
P3	WEST RD PS	2183	2182	268	195 West Road	5/9/12	8"PVC	Separated joint at 174' DS, Pipe Sag at 179' DS	
P3	WEST RD PS	2182	2177	349	200 West Road	5/3/16	8"PVC	Infiltration Dripper (Unknown Location)	0.1
P3	WEST RD PS	2177	2176	249	240 West Road	5/9/12	8"PVC	Infiltration Runner at 144' US, Pipe Sag at 159' US	0.8
P3	WEST RD PS	2176	2175	243	270 West Road	12/21/15	8"PVC	Broken Pipe at MH 2175	



Metering Basin	Pump Station Basin	From MH	To MH	LF	Location	Video Date	Dia. (in.) Material	Observations	Infiltration Rate (gpm)
P3	WEST RD PS	2174	5558	314	300 West Road	5/8/12	8"PVC	Debris in Pipe from 5-14' DS, Downstream Manhole Cover Leaking	
P3	WEST RD PS	5558	2175	332	300 West Road	12/17/15	8"PVC	Debris in Pipe at 65' DS	

CCTV PROGRAM RESULTS

Table 2 presents the defect score and recommended Rehabilitation method developed from the review of the CCTV data. Assets listed in Table 1 that are included in one of the Pilot Area Metering Basins (P1, P2, P2A, or P3) were not included in the following table as they are being investigated as part of the larger SSES CCTV inspections and will have recommendations in the final SSES report. For pipes listed in **Table 1** that were found to have no significant defects, it is recommended that the city continue to monitor these pipes to verify that no defects develop as the pipes continue to age.

Completion of the recommended program can reduce infiltration into the sewer system by an estimated 14,000 gpd. In addition to the reduction in wastewater loading, the City should see improved sewer operation following correction of defects such as root intrusion and debris.

Attached to this memorandum is a set of figures displaying the recommended rehabilitation for each pipe segment listed in **Table 2**. For pipes with more than one recommended rehab activity, multiple colors are overlaid on the same pipe segment.

Metering	Pump	From	То			Dia.	Def	iect Score	e	Recommended	Estimated
Basin	Station Basin	MH	MH	LF	Location	(in.) Material	Structural	O&M	Overall	Rehabilitation	Repair Cost (\$)
GR1	GOSLING RD PS	820	819	55	2 Osprey Drive	8" VCP	0	3	3	Root treatment, CITS	1,300
GR1	GOSLING RD PS	819	639	335	99 Portsmouth Boulevard	8" VCP	5	5	5	Open Cut Replace Entire Pipe	164,000
GR1	GOSLING RD PS	EOP	821	218	5 Osprey Drive	6" VCP	2	5	5	Possible 6' Short Liner at Beginning of Pipe	3,000
GR1	GOSLING RD PS	2372	813	152	Portsmouth Boulevard	10" VCP	0	5	5	CITS	2,600
GR1	GOSLING RD PS	813	814	60	Portsmouth Boulevard	10" VCP	2	3	3	Heavy Clean, 6' Short Liner at 27'-30' DS, CITS, Grout Manhole 814	5,500
LD1	LESLIE DRIVE PS	1015	1016	200	Michael Succi Drive	14" AC	5	3	5	Possible 6' Short Liner Once Hole is Located	3,000
LD1	LESLIE DRIVE PS	1016	1017	209	1 Michael Succi Drive	14" AC	3	2	3	CITS	600
LR5	MECHANIC ST PS	1092	1091	528	Broad Street	8" VCP	5	4	5	Root Treatment, MH- MH CIPP	36,200
LR6	LAFAYETTE RD PS	2630	2629	189	2458 Lafayette Road	8" AC	4	2	4	Cut Protruding Service at 156' DS	600
LR6	LAFAYETTE RD PS	2628	2627	260	2460 Lafayette Road	12" AC	0	4	4	CITS, 6' Short Liner at 1' DS	5,100

TABLE 2: DEFECT SCORE AND RECOMMENDED REHABILITATION



Metering	Pump	From	То			Dia.	Def	ect Scor	9	Recommended	Estimated
Basin	Station Basin	MH	MH	LF	Location	(in.) Material	Structural	O&M	Overall	Rehabilitation	Repair Cost (\$)
LR6	LAFAYETTE RD PS	2627	118	218	2466 Lafayette Road	12" AC	2	3	3	Cut Protruding Service at 94' DS	600
LR6	LAFAYETTE RD PS	118	117	314	2468 Lafayette Road	12" AC	2	2	2	6' Short Liner at 148' DS	3,000
LR6	LAFAYETTE RD PS	2626	2625	234	2800 Lafayette Road	12" AC	2	4	4	CITS, 6' Short Liners at 5' and 79' DS	7,900
M1	DEER ST PS	111	110	28	134 Fairview Avenue	8" PVC	2	0	2	Lateral Sealing 4.5' US	300
M1	DEER ST PS	2128	2129	132	828 Maplewood Avenue	8" PVC	0	5	5	Grout Manhole 2129	1,100
M1	DEER ST PS	2129	2132	223	860 Maplewood Avenue	8" PVC	0	2	2	CITS	1,800
M1	DEER ST PS	105	104	261	940 Maplewood Avenue	8" PVC	0	3	3	Heavy Cleaning and Lateral Sealing 192' DS	1,800
M1	DEER ST PS	2359	105	169	979 Maplewood Avenue	8" PVC	0	4	4	Lateral Sealing 33' US	300
										Total	239,000

RECOMMENDED REHABILITATION PROGRAM

The City's wishes to reduce infiltration and inflow in the sanitary sewer collection system, and is developing an implementable action plan to address known defects. While it would be ideal to rehabilitate every collection system defect or I/I source uncovered during the CCTV review, it may be necessary to prioritize repairs based on available funds to perform the work. In general, we recommend a phased sewer system rehabilitation program focused on addressing the most severe defects encountered during the investigations while maintaining a database of the remaining defects for future rehabilitation consideration.

The total program cost not including engineering is estimated at \$239,000. Prices were generated using unit price costs from projects of similar size and scope. Unit price costs referenced from previous projects were inflated 3% from the previous year's value and given a 5% contingency.

Rehabilitation of the 99 Portsmouth Boulevard (MH 819 – MH 639) defect will require open cut excavation to repair a mainline with multiple holes, fractures, and points of observed infiltration. Repair by trenchless means does not seem feasible as there is evidence that the pipe structure is beginning to deform and is experiencing loads that could cause a complete collapse. The existing pipe is beneath a drainage swale and has a sloped ground surface above. To mitigate soil movement during construction, permanent sheeting should be installed uphill of the excavated trench. To protect and repair the drainage swale during construction, stormwater best management practices (BMP's) should be utilized wherever suitable.

Table 3 presents a summary of defects by infiltration from the defect, defect rating, and cost to rehabilitate. It is recommended that the City address the defects by defect rating as funds become available. Defects with a 4 or 5 defect rating are the most serious and should be addressed first. This table summarizes the work which could be included in a sewer rehabilitation contract to address structural and infiltration-related defects noted during the inspections.



Pump Station Dia nfiltration Estimated Recommended Rehabilitation From MH Defect Rating Metering Basin To MH LF Location (in.) Rate Repair Basin Material (gpd) Cost 99 Open Cut GOSI ING GR1 819 639 Portsmouth 8" VCP 5 5,760 335 Replace Entire 164,000 RD PS Boulevard Pipe 828 DEER ST Grout Manhole M1 2128 2129 132 Maplewood 8" PVC 5 1,152 1,100 PS 2129 Avenue Possible 6' GOSLING 5 Osprey Short Liner at GR1 EOP 821 218 6" VCP 5 720 3,000 RD PS Drive Beginning of Pipe GOSLING Portsmouth 10" 2372 152 5 CITS GR1 813 576 2.600 RD PS Boulevard VCP Possible 6' LESLIE Michael Short Liner LD1 1015 1016 200 14" AC 5 0 3,000 Succi Drive DRIVE PS Once Hole is I ocated Root MECHANIC Broad LR5 1092 1091 528 8" VCP 5 0 Treatment, MH-36,200 ST PS Street MH CIPP Defect Rating 5 Subtotal \$ 209,900 2460 LAFAYETTE CITS, 6' Short Lafayette LR6 2628 2627 260 12" AC 4 432 5,100 RD PS Liner at 1' DS Road CITS, 6' Short 2800 LAFAYETTE 12" AC 1 R6 2626 2625 234 Lafayette 4 432 Liners at 5' and 7 900 RD PS Road 79' DS 979 Lateral Sealing DEER ST M1 2359 105 169 Maplewood 8" PVC 4 432 300 33' US PS Avenue Cut Protruding 2458 LAFAYETTE LR6 2630 189 8" AC 4 0 Service at 156' 2629 Lafayette 600 RD PS Road DS Defect Rating 4 Subtotal \$ 13,900 GOSLING 2 Osprey Root treatment, 8" VCP GR1 820 819 55 3 432 1,300 RD PS Drive CITS 2466 Cut Protruding LAFAYETTE LR6 2627 118 218 Lafayette 12" AC 3 1,440 Service at 94 600 RD PS Road DS 940 Heavy Cleaning DEER ST 105 8" PVC 3 432 1.800 M1 104 261 and Lateral Maplewood PS Avenue Sealing 192' DS Heavy Clean, 6' Short Liner at GOSLING Portsmouth 10" GR1 813 814 60 3 144 27'-30' DS, 5,500 RD PS Boulevard VCP CITS, Grout Manhole 814 LESLIE 1 Michael 1016 1017 209 14" AC 3 0 CITS LD1 600 DRIVE PS Succi Drive Defect Rating 3 Subtotal \$ 9,800 2468 LAFAYETTE 6' Short Liner at 12" AC 2 LR6 118 117 314 1.440 3.000 Lafayette RD PS 148' DS Road 134 DEER ST Lateral Sealing M1 111 110 28 Fairview 8" PVC 2 432 300 4.5' US PS Avenue 860 DEER ST 8" PVC M1 2129 2132 223 Maplewood 2 144 CITS 1.800 PS Avenue Defect Rating 2 Subtotal \$ 5,100

TABLE 3: DEFECTS BY RATING



Table 4 summarizes the cost and estimated removable infiltration by defect rating. Defects with a rating of 5 have the highest cost but also result in the most infiltration removed. The total cost of the rating 5 rehabilitation is driven by the high cost to excavate and replace sewer segment 819-639 on Portsmouth Boulevard which is 78% of the total cost for all defect 5 rehabilitation, but accounts for 41% of the total estimated removable infiltration. Other defects which can be repaired in situ have lower rehabilitation costs.

Defect Rating	Cost	Estimated Removable I/I (gpd)
5	\$ 209,900	8,208
4	\$ 13,900	1,296
3	\$ 9,800	2,448
2	\$ 5,100	2,016
1	\$-	0
Total	\$ 239,000	13,968

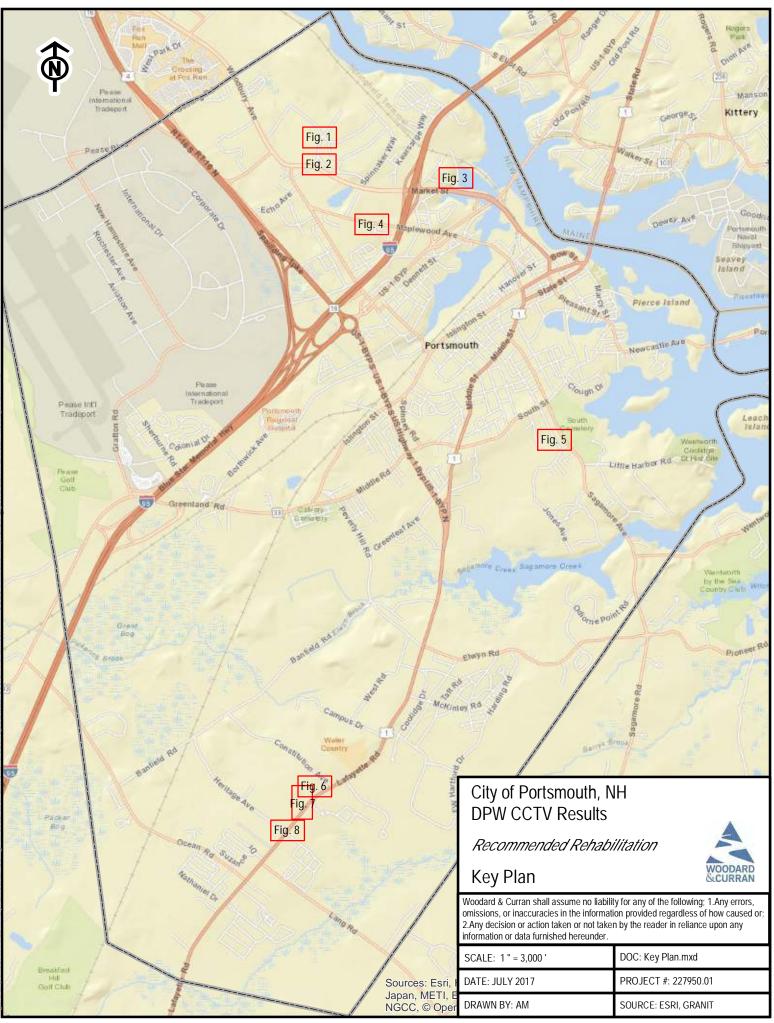
TABLE 4: SUMMARY BY DEFECT RATING

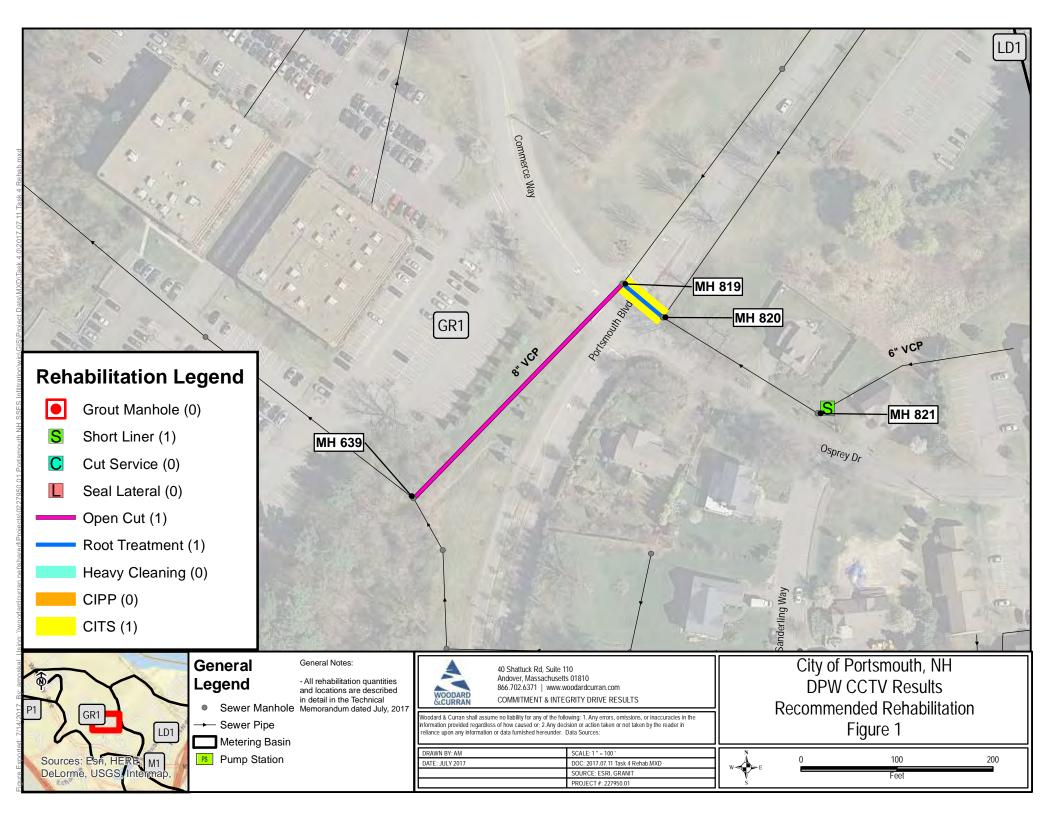
FURTHER INVESTIGATIONS

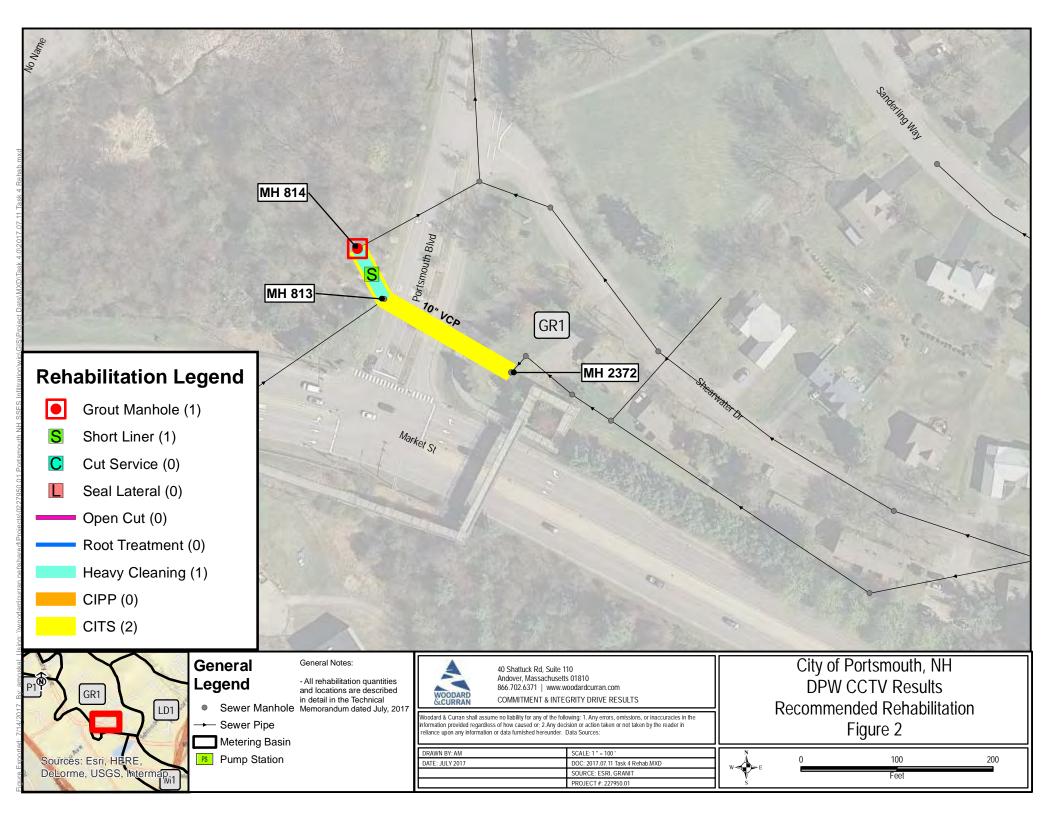
We recommend that the City continue to investigate its collection system to identify and address system defects before they become emergencies as well as to build an electronic database of system conditions. During our review of City CCTV data, some pipe segments revealed clear water running from laterals that should be investigated by lateral inspection during high groundwater periods. Inspections that were incomplete can be inspected by reversal or other means as time and resources are available. Woodard & Curran recommends that the City continue their efforts in monitoring the overall sewer system. A list of specific areas for additional investigation is included in **Table 5**.

Metering Basin	Pump Station Basin	From MH	To MH	LF	Location	Dia. (in.) Material	Description	Estimated Cost (\$)
GR1	GOSLING RD PS	EOP	821	218	5 Osprey Drive	6" VCP	CCTV to Complete Investigation	1,200
GR1	GOSLING RD PS	2372	813	152	Portsmouth Boulevard	10" VCP	CCTV to Complete Investigation	800
LD1	LESLIE DRIVE PS	1015	1016	200	Michael Succi Drive	14" AC	CCTV to Complete Investigation	1,100
LR5	MECHANIC ST PS	1092	1091	528	Broad Street	8" VCP	CCTV to Complete Investigation	2,800
M1	DEER ST PS	111	110	28	134 Fairview Avenue	8" PVC	CCTV Lateral at 4.5' US	200
M1	DEER ST PS	105	104	261	940 Maplewood Avenue	8" PVC	CCTV Lateral at 192' DS	200
M1	DEER ST PS	2359	105	169	979 Maplewood Avenue	8" PVC	CCTV Lateral at 33' US	200
			•	•	•	•	Total	\$ 6,500

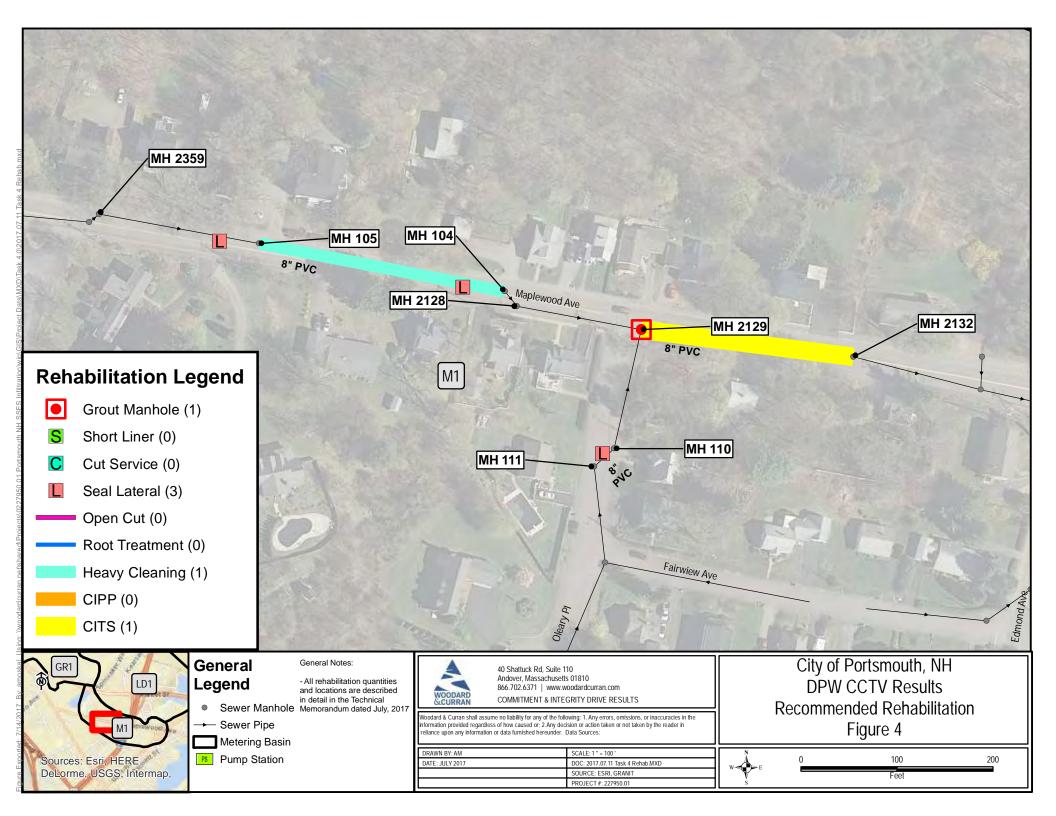
TABLE 5: FUTURE INVESTIGATIONS



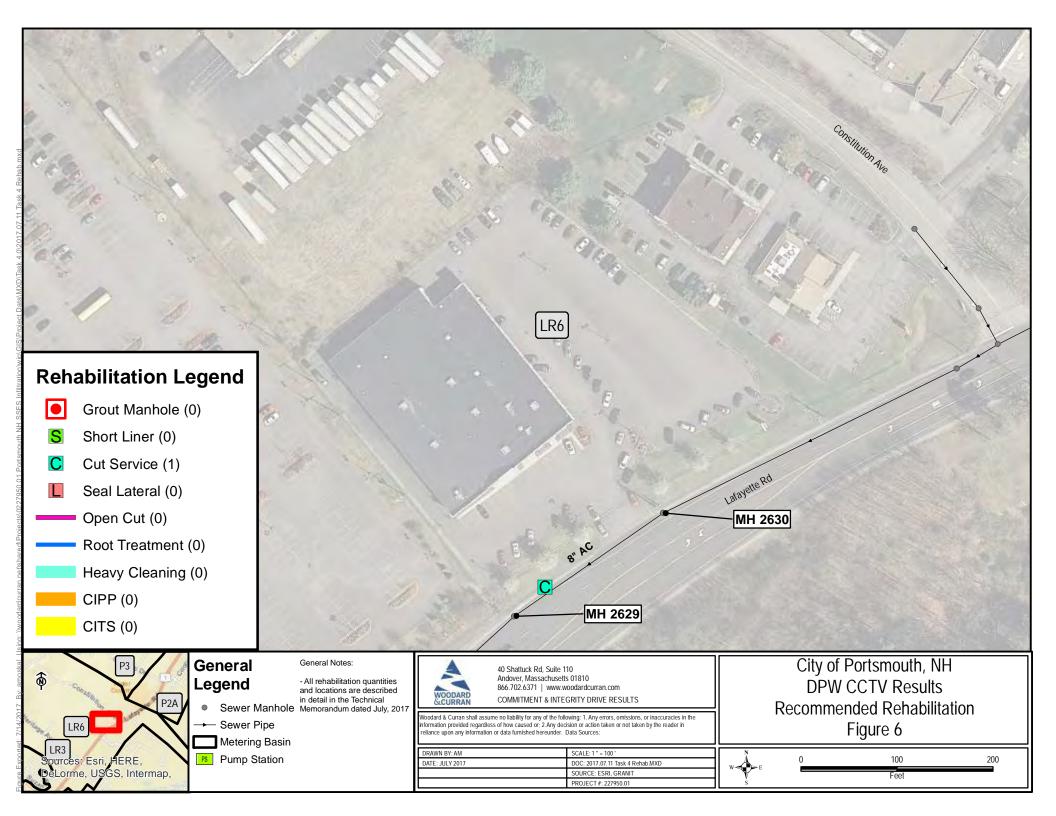


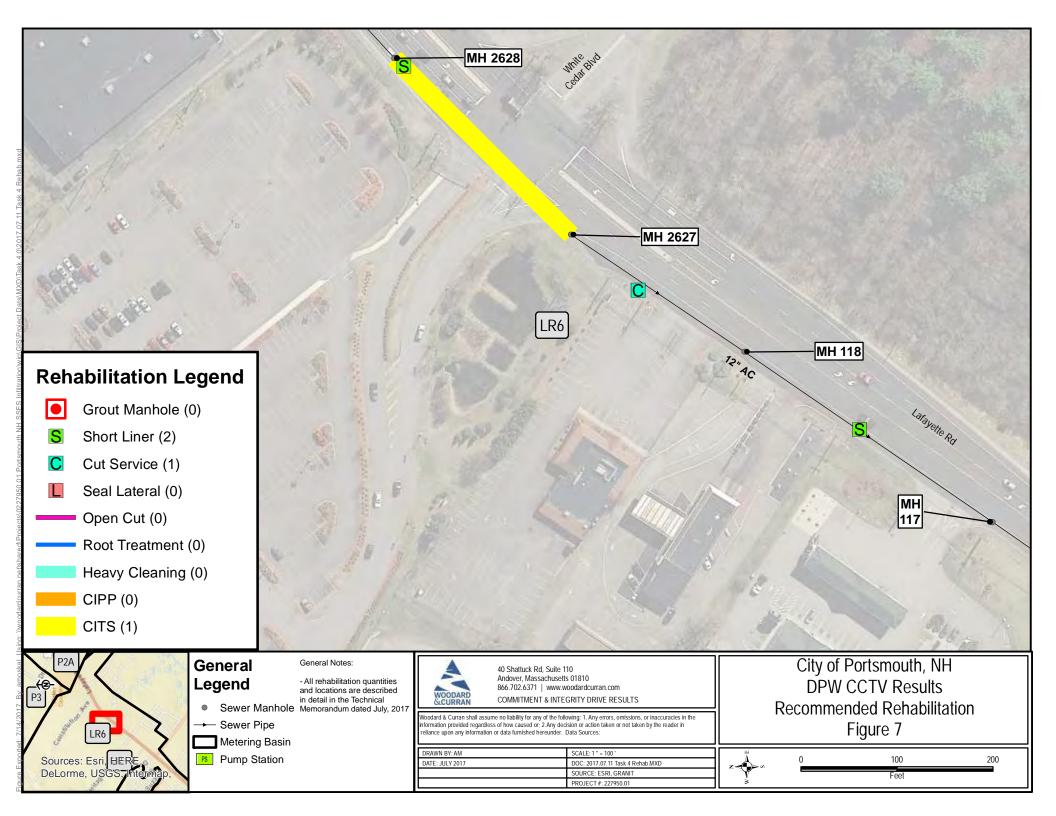


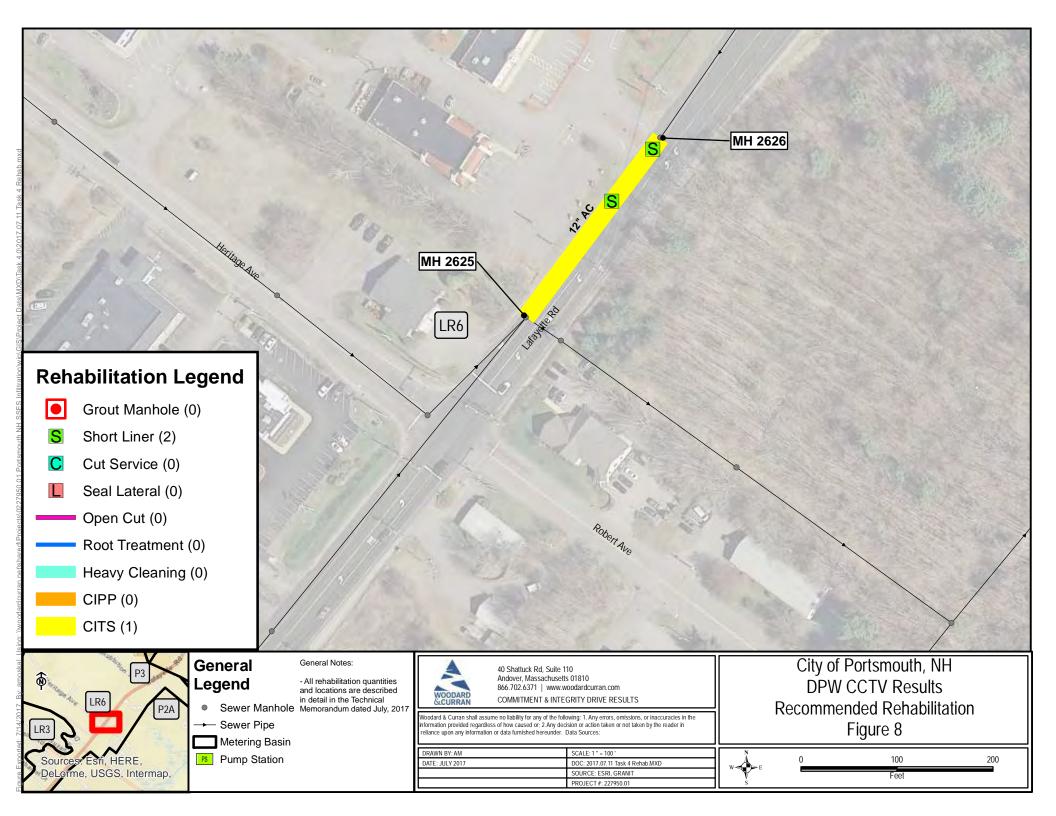














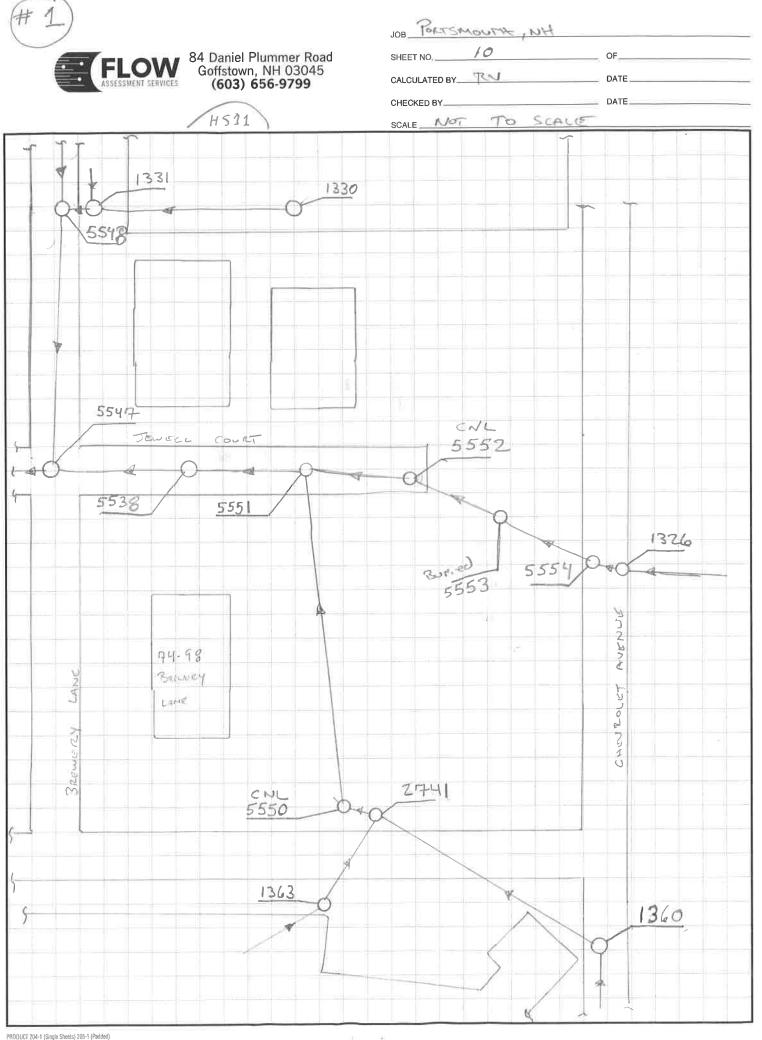
APPENDIX F: UNDERWOOD ENGINEERS PILOT AREA TECHNICAL MEMORANDUM DATED SEPTEMBER 2017 (PROVIDED ELECTRONICALLY)

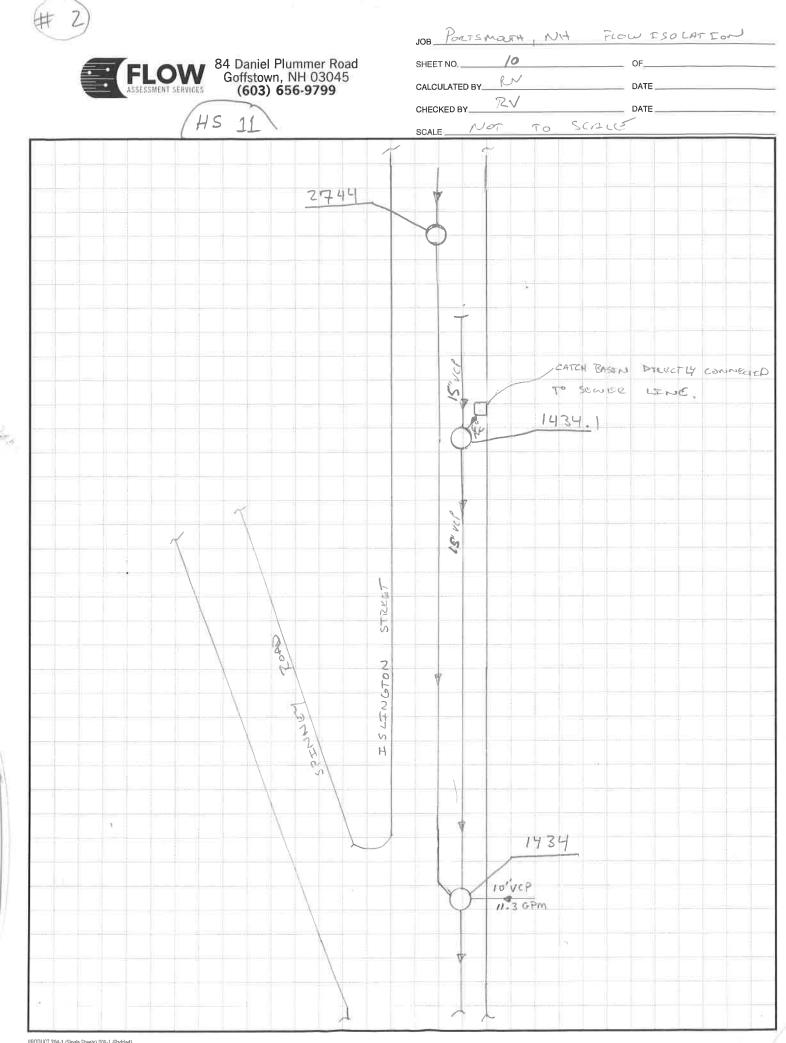


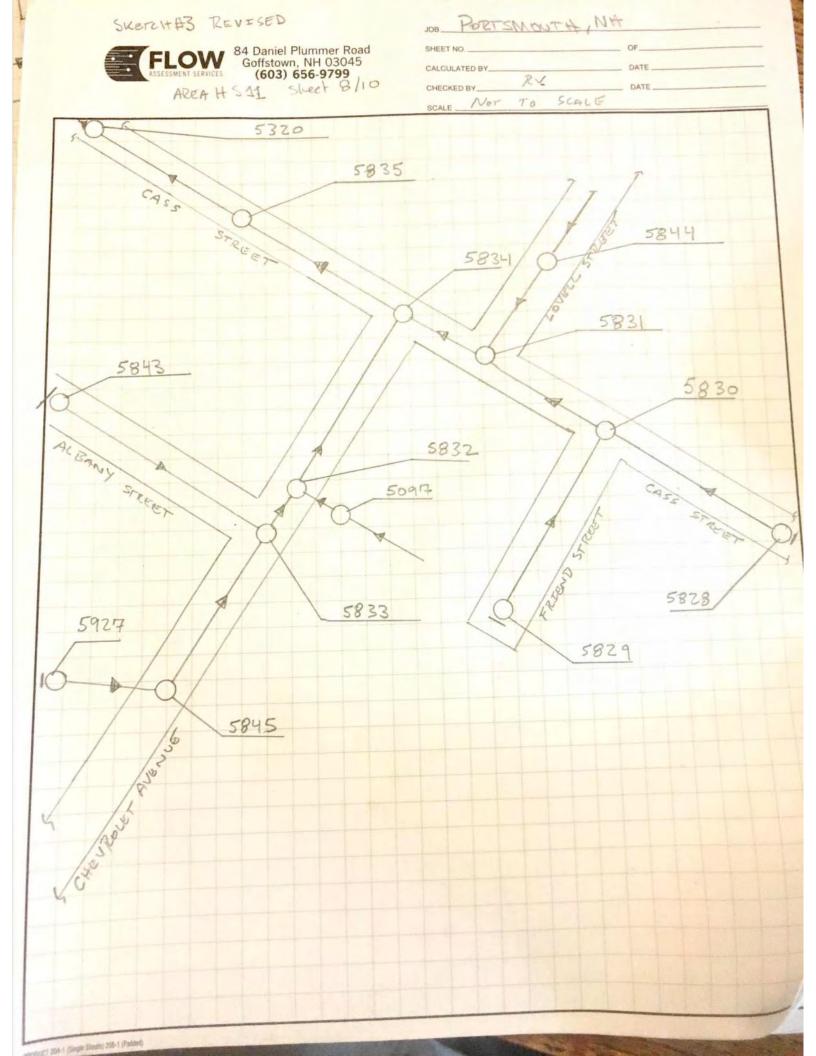
APPENDIX G: UNDERWOOD ENGINEERS PILOT AREA TECHNICAL MEMORANDUM DATED AUGUST 2019 (PROVIDED ELECTRONICALLY)

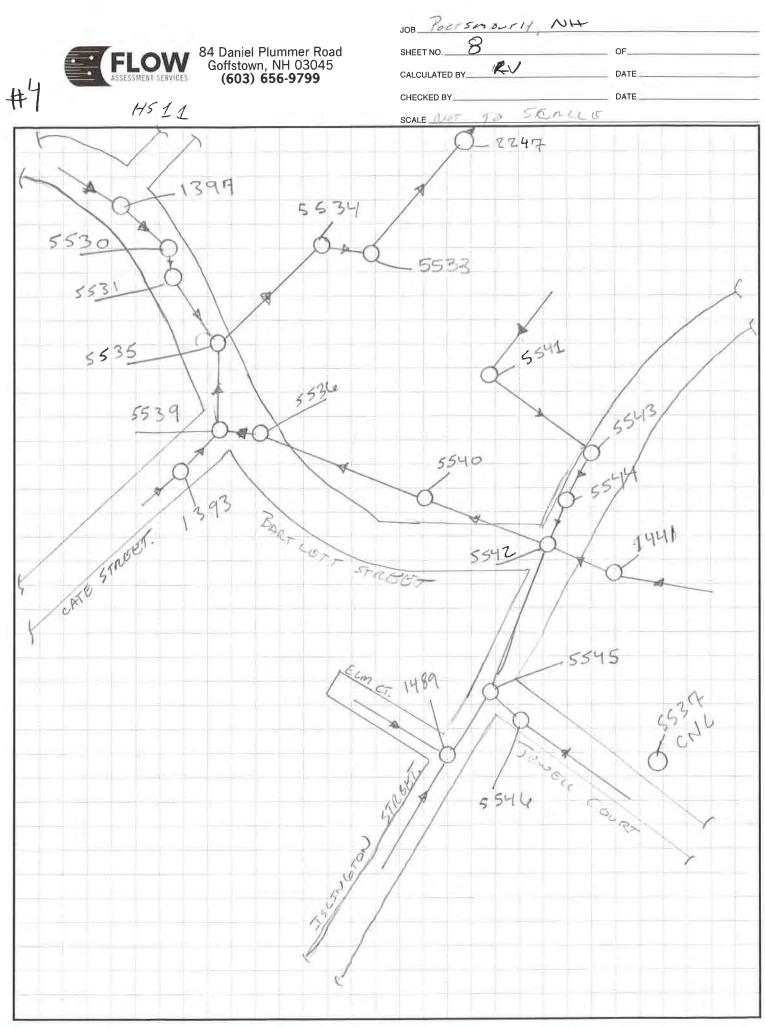


APPENDIX H: SEWER MAP REVISIONS

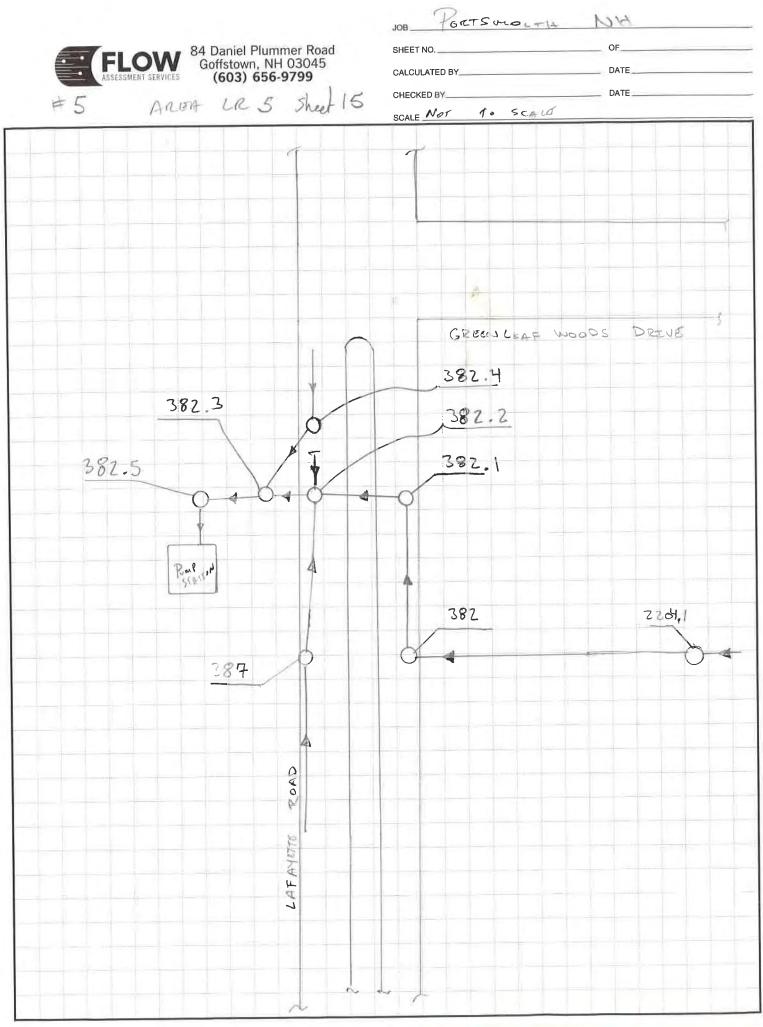




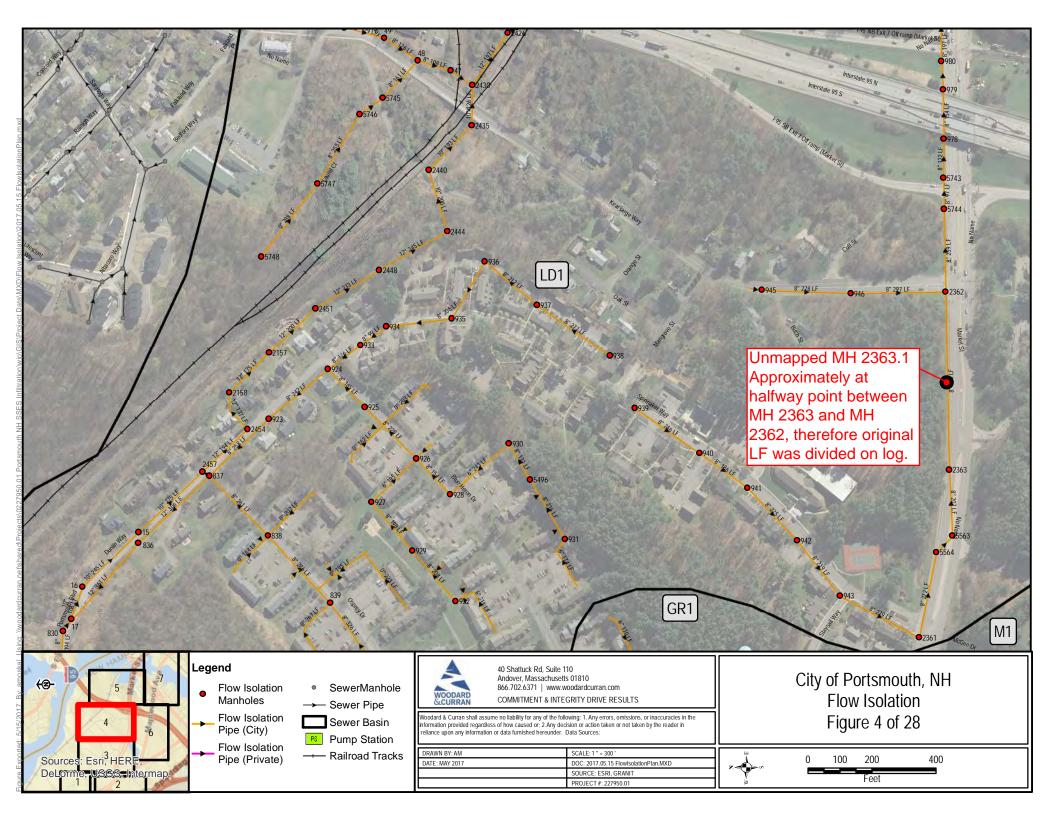


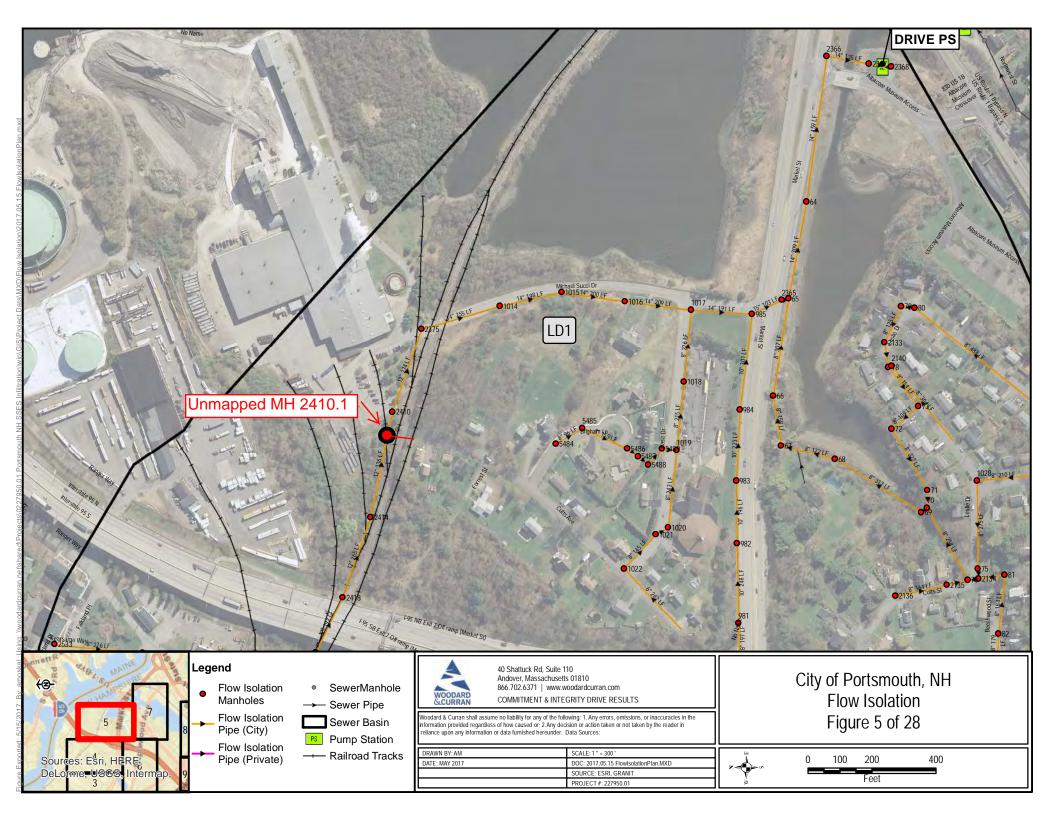


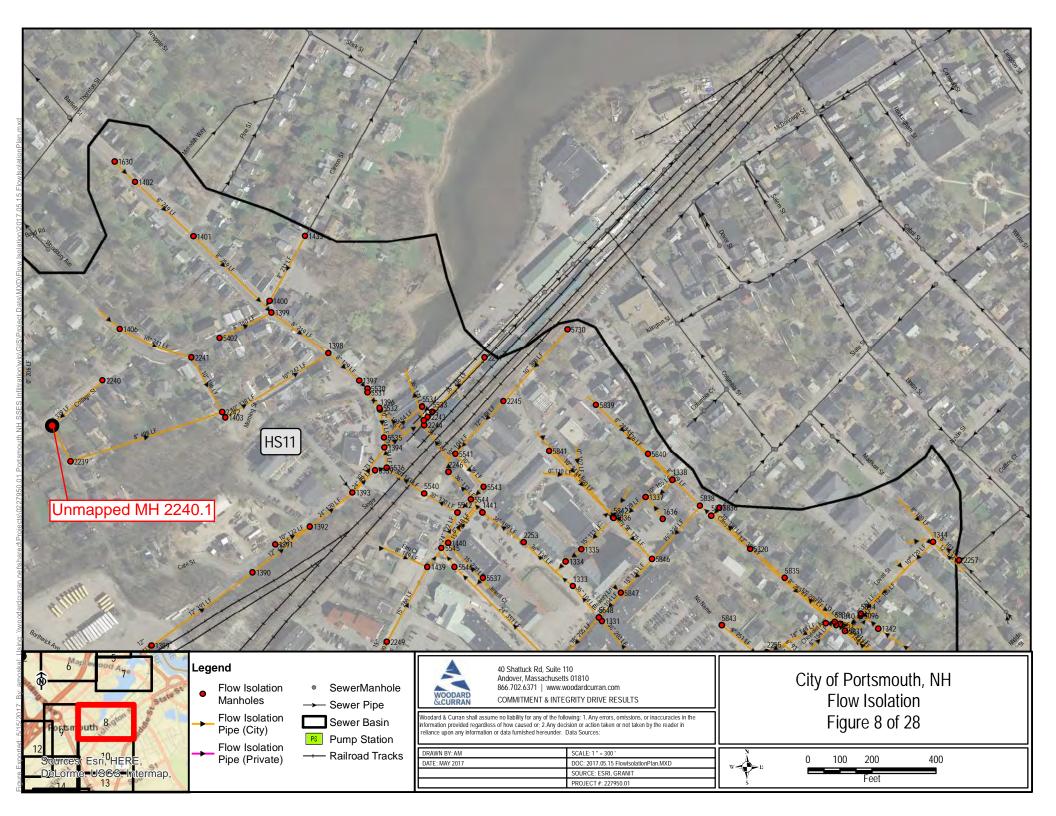
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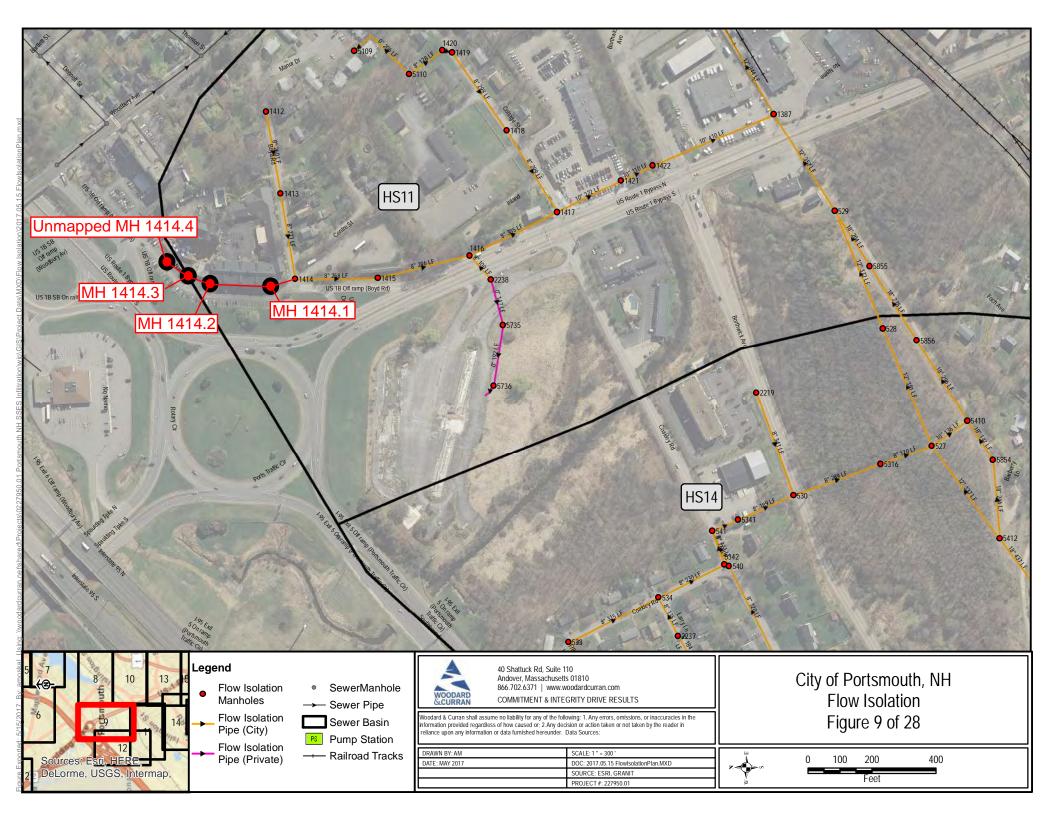


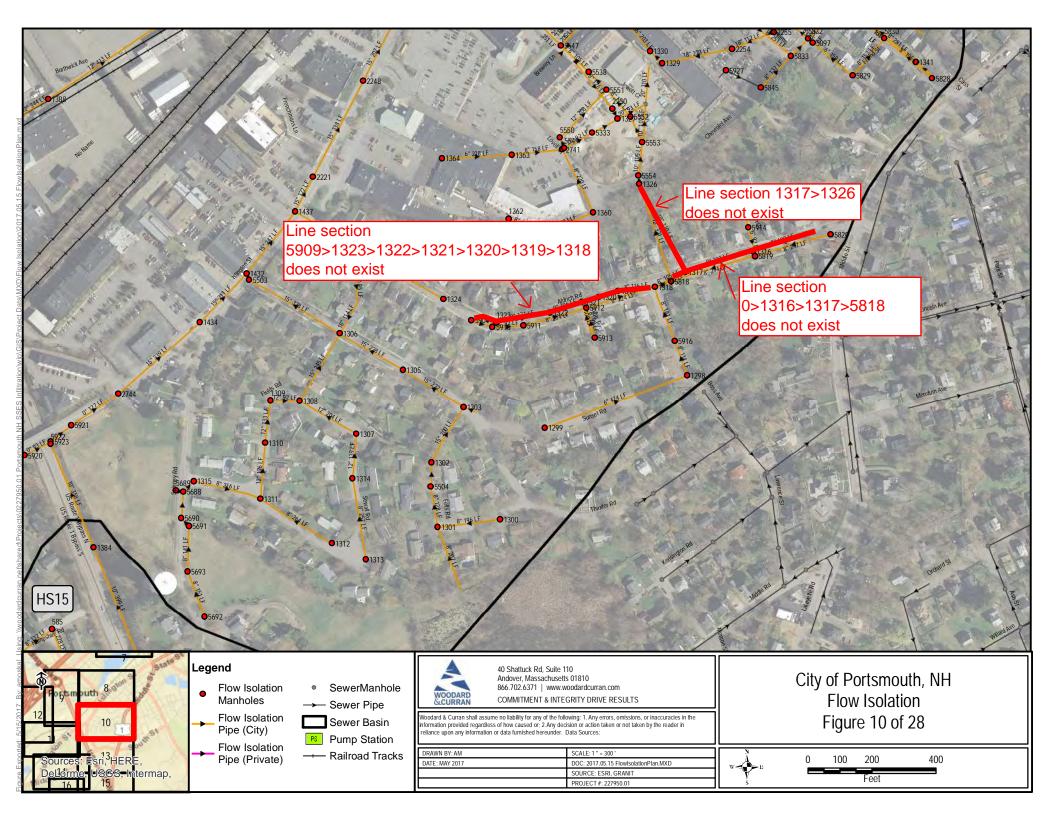
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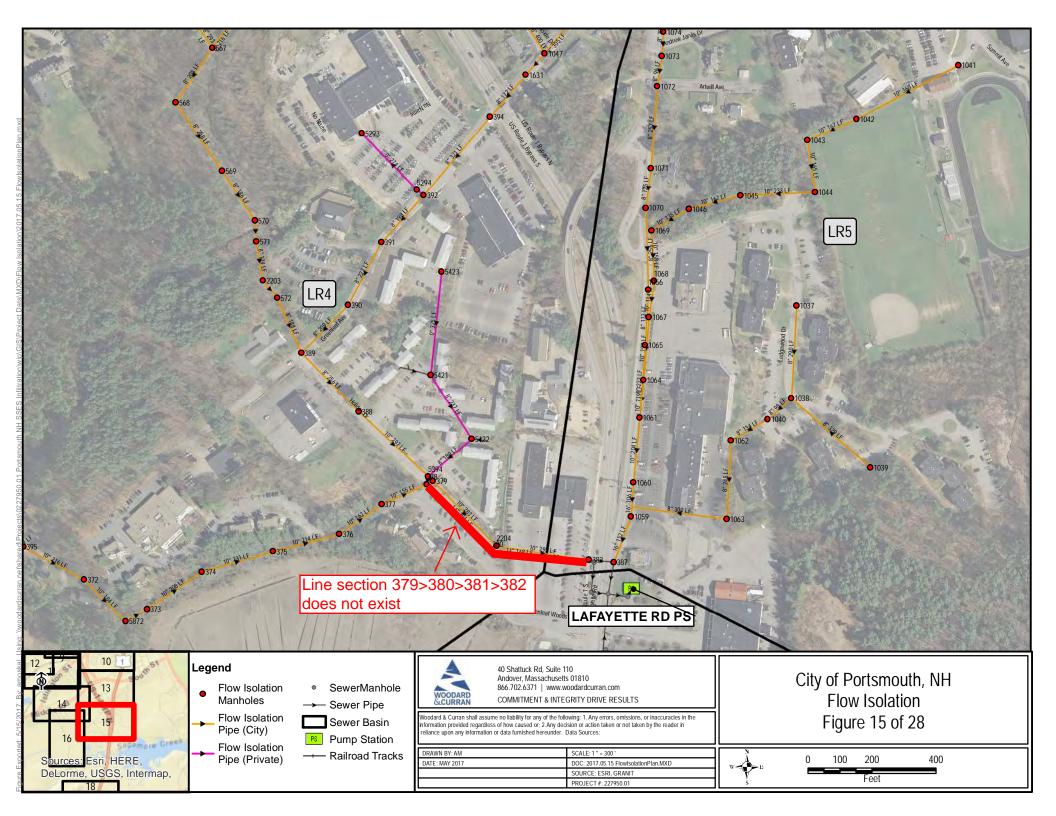














APPENDIX I: SMOKE TESTING RESULTS

Sub-System: B1	Portsmouth, NH Smoke Testing Summary of Findings By Street Address Table 1				Page: 1	
		Drainage	Runoff			
Findings Address	Findings	Area SqFt	Coeff	Photo No.	Sketch No.	Insp. Date
	Could not locate MH 482 - footages combined. Smoke from ground, possibly buried cleanout - direct connection	80	0.3	0304	3	10/09/18
Greenland Road	Heavy smoke from catch basin#2908 - direct connection	3600	0.9	0303	2	10/09/18
700 Greenland Road	Smoke from cleanout 1" below grade, broken cover - direct connection	24	0.3	0328	1	10/09/18

Sub-System: HS11	Portsmouth, NH Smoke Testing Summary of Findings By Street Address Table 1				Page: 1	
Findings Address	Findings	Drainage Area SqFt	Runoff Coeff	Photo No.	Sketch No.	Insp. Date
	Sag in line under bypass	0	0			09/25/18
59 Cass Street	Smoke from roof leader - direct connection. MH 5839.2 unnamed on map - see revised map.	432	0.9	4474	11	09/24/18
Cottage Street	Smoke from catch basin#2179 - direct connection (MH 5109.1 is unmapped manhole - see revised map)	9600	0.9	0289	13	09/25/18
Fields Road	Light smoke from catch basin#1164 - indirect connection	0	0	0281	6	09/24/18
Islington Street	Light smoke from catch basin#1858 - indirect connection	0	0	0278	2	09/24/18
Islington Street	Smoke from catch basin#481 - direct connection	9000	0.9	0277	1	09/24/18
Islington Street	Smoke from catch basin#62 - direct connection	60000	0.9	0274	1	09/24/18
Islington Street	Smoke from catch basin#482 - indirect connection	0	0	0275	1	09/24/18
Islington Street	Light smoke from catch basin#5321 - indirect connection. MH 2221.1 unnamed on map - see revised map.	0	0	0286	10	09/24/18
Islington Street	Light smoke from catch basin#86 - indirect connection. MH 2221.3 unnamed on map - see revised map	0	0	0285	8	09/24/18
Islington Street	Light smoke from catch basin#2387 - indirect connection. MH 5538.4 unnamed on map - see revised map	0	0	4467	8	09/24/18
Islington Street	Footage scaled. Heavy smoke from catch basin#935 - direct connection	400	0.9	4466	5	09/24/18
953 Islington Street	Smoke from driveway drain - direct connection. MH 1305.3 unnamed on map - see revised map.	2100	0.9	4465	5	09/24/18
Morning Street	Heavy smoke from catch basin#833 - direct connection	4400	0.9	0290	14	09/25/18
Morning Street	Light smoke from catch basin#1905 - indirect connection	0	0	0291	14	09/25/18
Route 1 R.O.W.	Light smoke from hole next to MH 1387 - direct connection	8	0.3	0288	12	09/25/18
Route 1 R.O.W.	Smoke from catch basin#1239 - direct connection	400	0.9	4468	9	09/24/18
Route 1 R.O.W.	Smoke from catch basin#1240 - direct connection	400	0.9	4469	9	09/24/18

Sub-System: HS11	Portsmouth, NH Smoke Testing Summary of Findings By Street Address Table 1				Page: 2	
		Drainage	Runoff			
Findings Address	Findings	Area SqFt	Coeff	Photo No.	Sketch No.	Insp. Date
Route 1 R.O.W Frank Jones Center	Heavy smoke from catch basin - direct connection	2800	0.9	0287	12	09/25/18
50 Sunset Road	Heavy smoke from driveway drain - direct connection	3125	0.9	0284	7	09/24/18
Thaxter Road	Light smoke from catch basin#1182 - indirect connection	0	0	0279	3	09/24/18
Thaxter Road	Light smoke from catch basin#1162 - indirect connection. MH 1305.2 unnamed on map - see revised map.	0	0	0280	4	09/24/18
82 Woodbury Avenue	Smoke from catch basin#7218 - direct connection	2400	0.9	0292	15	09/25/18

Sub-System: HS15	Portsmouth, NH Smoke Testing Summary of Findings By Street Address				Page: 1	
	Table 1					
		Drainage	Runoff			
Findings Address	Findings	Area SqFt	Coeff	Photo No.	Sketch No.	Insp. Date
Middle Road	Heavy smoke from catch basin#493 - direct connection	3960	0.9	0273	1	09/21/18

Sub-System: LD1	Portsmouth, NH Smoke Testing Summary of Findings By Street Address Table 1				Page: 1	
		Drainage	Runoff			
Findings Address	Findings	Area SqFt	Coeff	Photo No.	Sketch No.	Insp. Date
	MH 65.1 unnamed on map - see revised map. Smoke from broken concrete outside of MH 65.1 - direct connection	80	0.3	0325	2	10/01/18
Beechwood Street	Light smoke from catch basin#3734 - indirect connection	0	0	0324	1	10/01/18
29 Brigham Lane	Smoke from cleanout 1" below grade, missing cover - direct connection	24	0.3	0294	3	10/01/18
Market Street	Smoke from sidewalk/curb - direct connection	30	0.3	0295	5	10/01/18
Market Street	Smoke from ground near sidewalk - direct connection	48	0.3	0326	4	10/01/18
Market Street	Light smoke from curb - direct connection	32	0.9	0327	4	10/01/18
Portsmouth Boulevard	Smoke from cleanout 1" below grade, missing cover - direct connection (Line abandoned)	750	0.3	0299	7	10/01/18
Spinnaker Way	Light smoke from catch basin#444 - indirect connection	0	0	0297	6	10/01/18

Sub-System: LR1	Portsmouth, NH Smoke Testing Summary of Findings By Street Address Table 1				Page: 1	
		Drainage	Runoff			
Findings Address	Findings	Area SqFt	Coeff	Photo No.	Sketch No.	Insp. Date
6 Elwyn Road	Heavy smoke from yard drain behind home -direct connection	6250	0.3	0260	6	09/07/18
Elwyn Road R.O.W.	Smoke from rockpile near MH 338 - direct connection	150	0.3	0134	4	09/07/18
Elwyn Road R.O.W.	Smoke from around corbel of MH 343 - direct connection	2	0.9	0255		09/07/18
Sagamore Avenue	MH 5858 is in gutterline	150	0.9		2	09/07/18
Sagamore Avenue R.O.W.	Heavy smoke from ground around MH 5857.1 - direct connection. MH 5857.1 unnamed on map - see revised map.	150	0.3	7088	2	09/07/18
Taft Road	Smoke from catch basin#1507 - direct connection	4950	0.9	0258	5	09/07/18
Taft Road	Light smoke from catch basin#1847 - indirect connection	0	0	0251	3	09/07/18
Taylor Lane	Light smoke from catch basin#1573 - indirect connection	0	0	0250	1	09/07/18

Sub-System: LR2	Portsmouth, NH Smoke Testing Summary of Findings By Street Address Table 1		Page: 1			
Findings Address	Findings	Drainage Area SqFt	Runoff Coeff	Photo No.	Sketch No.	Insp. Date
420 Grant Drive	Smoke from cleanout missing cap, at grade - direct connection	15	0.9	0138	1	09/12/18
2021 Lafayette Road	Light smoke from catch basin - indirect connection	0	0	0261	2	09/12/18

Sub-System: LR4	Portsmouth, NH Smoke Testing Summary of Findings By Street Address Table 1				Page: 1	
		Drainage	Runoff			
Findings Address	Findings	Area SqFt	Coeff	Photo No.	Sketch No.	Insp. Date
380 Greenleaf Avenue	Light smoke from drain pipe - indirect connection	0	0	0270	2	09/20/18
Hillside Drive	Light smoke from catch basin#4071 - direct connection	1650	0.9	0272	3	09/20/18
Leavitt Avenue	3 GPM leak from above outgoing line in MH 543	0	0	0268		09/20/18
10 McClintock Avenue	Smoke from ground - direct connection	150	0.3	0269	1	09/20/18

Portsmouth, NH Smoke Testing Summary of Findings By Street Address Table 1				Page: 1	
	Drainage	Runoff			
Findings	Area SqFt	Coeff	Photo No.	Sketch No.	Insp. Date
Smoke from loose cleanout cover 6" above grade - direct connection	0	0	0262		09/14/18
Smoke from cleanout missing cover, 3" above grade - direct connection	0	0	0265	2	09/14/18
Smoke from cleanout missing cover, at grade - direct connection	160	0.3	0264	2	09/14/18
MH 2479 is buried - footages combined. Smoke from ground near approximate location of MH 2479 - direct connection	30	0.3	0267	3	09/14/18
Smoke from metal plates and cracks - direct connection	800	0.9	0263	1	09/14/18
	Smoke Testing Summary of Findings By Street Address Table 1 Findings Smoke from loose cleanout cover 6" above grade - direct connection Smoke from cleanout missing cover, 3" above grade - direct connection Smoke from cleanout missing cover, at grade - direct connection Smoke from cleanout missing cover, at grade - direct connection MH 2479 is buried - footages combined. Smoke from ground near approximate location of MH 2479 - direct connection	Smoke Testing Summary of Findings By Street Address Table 1 Drainage Area SqFt Findings Area SqFt Smoke from loose cleanout cover 6" above grade - direct connection 0 Smoke from cleanout missing cover, 3" above grade - direct connection 0 Smoke from cleanout missing cover, at grade - direct connection 160 MH 2479 is buried - footages combined. Smoke from ground near approximate location of MH 2479 - direct connection 30	Smoke Testing Summary of Findings By Street Address Table 1 Drainage Area SqFt Runoff Coeff Findings Smoke from loose cleanout cover 6" above grade - direct connection 0 0 Smoke from loose cleanout cover 6" above grade - direct connection 0 0 Smoke from cleanout missing cover, 3" above grade - direct connection 0 0 Smoke from cleanout missing cover, at grade - direct connection 0 0.3 MH 2479 is buried - footages combined. Smoke from ground near approximate location of MH 2479 - direct connection 30 0.3	Smoke Testing Summary of Findings By Street Address Table 1Drainage Area SqFtRunoff CoeffPhoto No.FindingsSmoke from loose cleanout cover 6" above grade - direct connection000262Smoke from cleanout missing cover, 3" above grade - direct connection000265Smoke from cleanout missing cover, at grade - direct connection1600.30264MH 2479 is buried - footages combined. Smoke from ground near approximate location of MH 2479 - direct connection300.30267	Smoke Testing Summary of Findings By Street Address Table 1 Drainage Area SqFt Runoff Photo No. Sketch No. Findings Area SqFt Coeff Photo No. Sketch No. Smoke from loose cleanout cover 6" above grade - direct connection 0 0 0262 Smoke from cleanout missing cover, 3" above grade - direct connection 0 0 0265 2 Smoke from cleanout missing cover, at grade - direct connection 160 0.3 0264 2 MH 2479 is buried - footages combined. Smoke from ground near approximate location of MH 2479 - direct connection 30 0.3 0267 3

Municipality: Portsmouth, NH Finding Location:

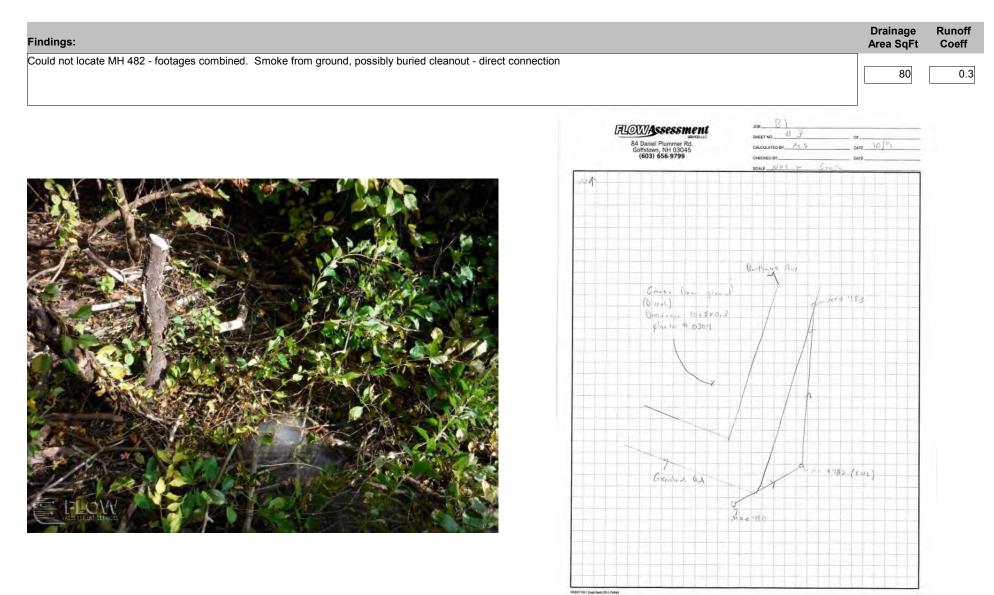
Sub-System: B1

Smoke Testing Log

 Project No:
 18001

 Date:
 10/09/2018

 Inspector:
 MS



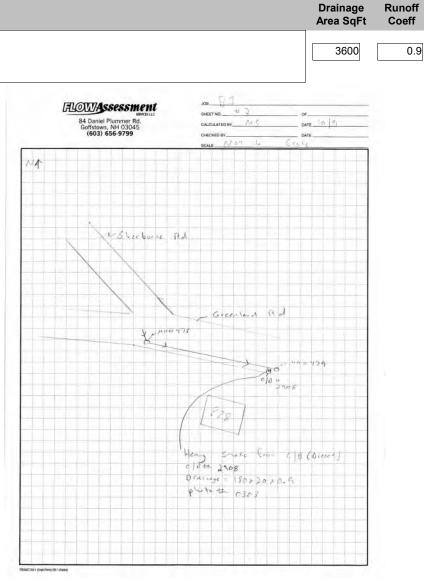
Municipality: Portsmouth, NH Finding Location:

Greenland Road

Findings:

Heavy smoke from catch basin#2908 - direct connection





Smoke Testing Log

MS

10/09/2018

Project No: 18001

Date:

Inspector:

Sketch #: Subarea B1 Sketch#2.tif

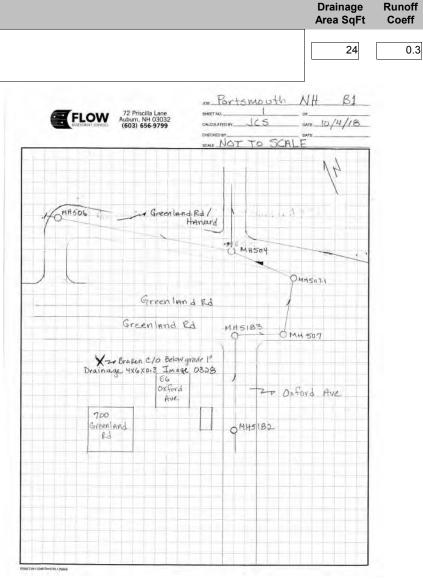
Sub-System: B1

Municipality: Portsmouth, NH Finding Location:

700 Greenland Road

Findings:

Smoke from cleanout 1" below grade, broken cover - direct connection



Smoke Testing Log

MS

10/09/2018

Project No: 18001

Date:

Inspector:

Image #: IMG_0328.JPG

Sketch #: Subarea B1 Sketch#1.tif

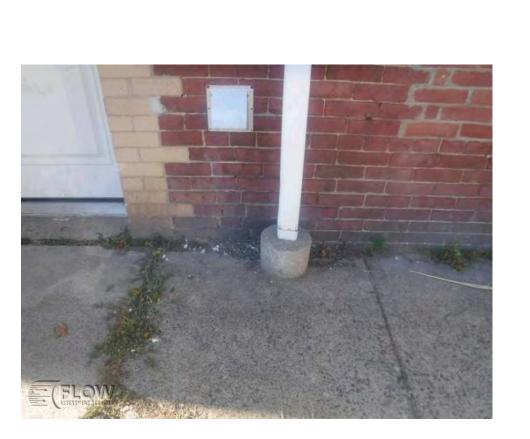
Sub-System: B1

Municipality: Portsmouth, NH Finding Location: 59 Cass Street

55 0455 0110

Findings:

Smoke from roof leader - direct connection



0 Joe Portsmouth 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW SHEET NO DATE 9/24/18 CALCULATED BY TUS CALLE DIECKED BY for cash st 1 N N Alberry 54 ROUT 1 204 1 (South Dents) 255 1 Fishing

Smoke Testing Log

Project No: 18001

09/24/2018

MS

Drainage

Area SqFt

Runoff

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Date:

Inspector:

Image #: DSCF4475.JPG

Sketch #: Subarea HS11 Sketch#11.tif

 Municipality:
 Portsmouth, NH

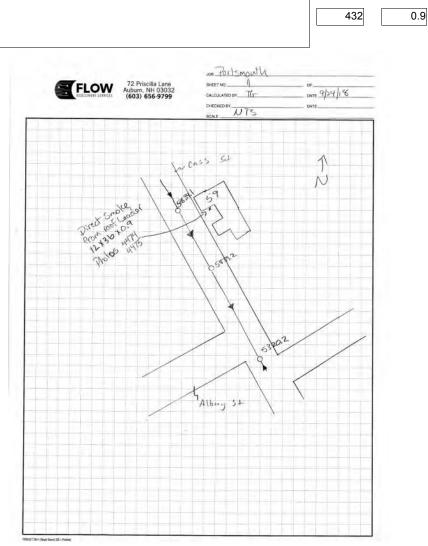
 Finding Location:
 59 Cass Street

55 0455 011

Findings:

Smoke from roof leader - direct connection. MH 5839.2 unnamed on map - see revised map.





Smoke Testing Log

MS

Drainage

Area SqFt

Runoff

Coeff

09/24/2018

Project No: 18001

Date:

Inspector:

Image #: DSCF4474.JPG

Sketch #: Subarea HS11 Sketch#11.tif

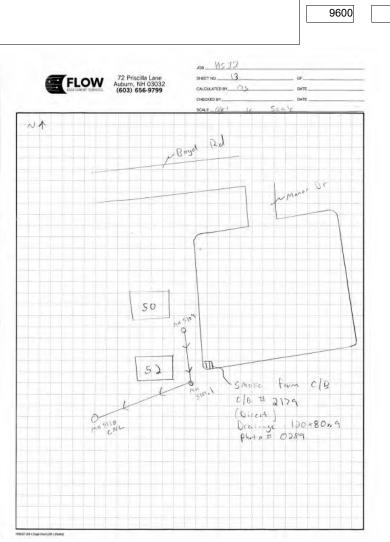
Municipality: Portsmouth, NH Finding Location:

Cottage Street

Findings:

Smoke from catch basin#2179 - direct connection (MH 5109.1 is unmapped manhole - see revised map)





Smoke Testing Log

Drainage

Area SqFt

Runoff

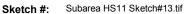
Coeff

0.9

 Project No:
 18001

 Date:
 09/25/2018

 Inspector:
 MS



Municipality: Portsmouth, NH Finding Location: Fields Road

Findings:

Light smoke from catch basin#1164 - indirect connection



Area SqFt Coeff 0 HS 11 100. 6 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW SHEET NO CALCULATED BY MS CHECKED BY_ SCALE NOT to Scale NA Fields 4 11 1300 0 FIL 1360 Light smore from cla C 18# 1164 (Induce)) plute to 028]

Smoke Testing Log

Sub-System: HS11

 Project No:
 18001

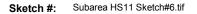
 Date:
 09/24/2018

 Inspector:
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Drainage

Runoff

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Municipality: Portsmouth, NH Finding Location:

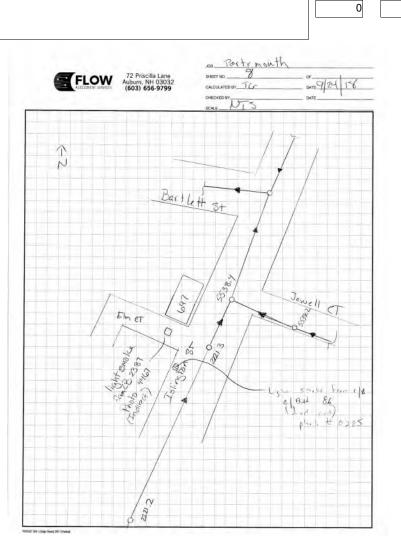
Islington Street

lonington otro

Findings:

Light smoke from catch basin#86 - indirect connection. MH 2221.3 unnamed on map - see revised map





Smoke Testing Log

Drainage

Area SqFt

Runoff

Coeff

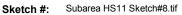
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 Project No:
 18001

 Date:
 09/24/2018

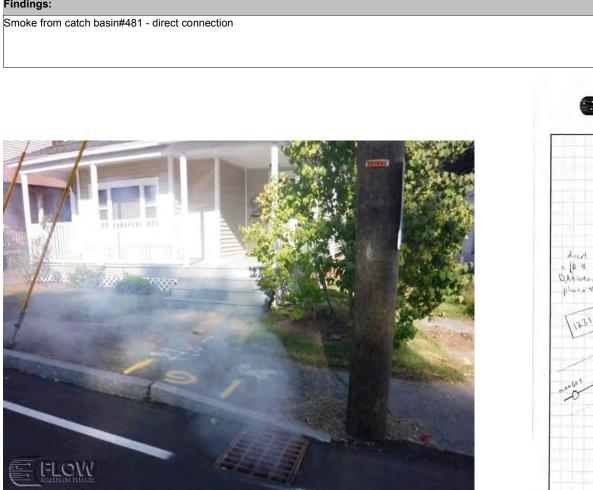
 Inspector:
 MS

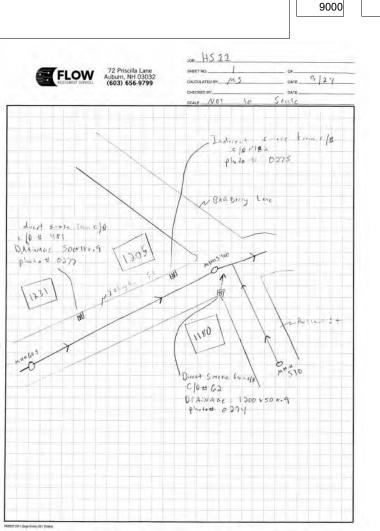
Image #: 0285.JPG



Municipality: Portsmouth, NH Finding Location: Islington Street

Findings:





Smoke Testing Log

MS

Drainage

Area SqFt

Runoff

Coeff

0.9

09/24/2018

Project No: 18001

Date:

Inspector:

Image #: 0277.JPG

Sketch #: Subarea HS11 Sketch#1.tif

Municipality: Portsmouth, NH **Project No: 18001** Sub-System: HS11 Finding Location: Date: 09/24/2018 Islington Street MS Inspector: Drainage Runoff Findings: Area SqFt Coeff Smoke from catch basin#62 - direct connection 60000 0.9 .00 HS 12 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW HETTH 9/21 CALCULATED BY M.S DATE CHECKED BY_ DATE Seale SCALE NOT Indirect since time + 13 c [8 1182 pho 10 1 0275 N BAR Berry Lene direct simple from c/g. LOH 181 DRAWAGE SOUTHERS placte & 0277 2] Rutters 5+ 180 M4590 Direct Smike fonds C/0 # 62 DIAMAGE 1200+50+9 Photom 0274

Smoke Testing Log

Municipality: Portsmouth, NH Finding Location: Islington Street

isington Site

Findings:

Smoke from catch basin#482 - indirect connection



0 Joe HS 12 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW HETTH 9/21 CALCULATED BY M.S DATE CHECKED BY_ DATE Seale SCALE NOT Ladirect since terms 13 c [8 1182 pho 10 1 0275 N BAR Berry Lene diret sinere from c/A LOH 181 DRAWAGE SOUTHERS place & 0277 173 Rutters 5+ 180 M4590 Direct Smike fonds C/0 # 62 DIAMAGE 1200+50+9 Photom 0274 1 (Sept Dorn, 1964 Frank

Smoke Testing Log

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Drainage

Area SqFt

Runoff

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09/24/2018

Project No: 18001

Date:

Inspector:

Sketch #: Subarea HS11 Sketch#1.tif

Municipality: Portsmouth, NH Finding Location:

Islington Street

Drainage Runoff Findings: Area SqFt Coeff Light smoke from catch basin#2387 - indirect connection. MH 5538.4 unnamed on map - see revised map 0 Ports mouth 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW DATE 9/24 ALCULATED BY TL T N Bartlett Jewell Elm et m al Bat 86 ad and) # 6285 W N

2221

Sub-System: HS11

Image #: DSCF4467.JPG

Smoke Testing Log

Project No: 18001 Date: Inspector:

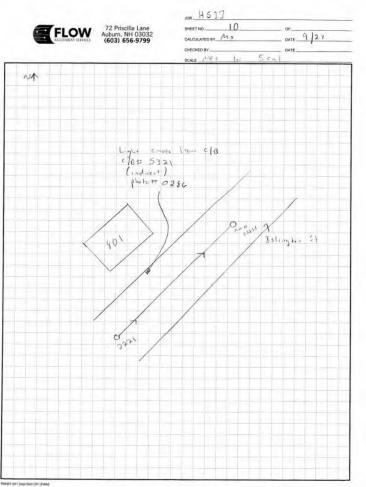
09/24/2018

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MS

Finding Location:

Municipality: Portsmouth, NH **Project No: 18001** Sub-System: HS11 Date: 09/24/2018 Islington Street MS Inspector: Drainage Findings: Area SqFt Light smoke from catch basin#5321 - indirect connection. MH 2221.1 unnamed on map - see revised map. Jon 4517 10 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW SHEET NO. CALCULATED BY MS DATE 9 21 CHECKED BY. C . SCALE /VO . NA HAIR STUDIO Light smoke from 6/8 e/e# 5321 (inducet) phate # 0286 Islington St 401 C 3934



Sketch #: Subarea HS11 Sketch#10.tif

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Runoff

Coeff

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Image #: 0286.JPG

Municipality: Portsmouth, NH Finding Location: Islington Street

Findings:

Footage scaled. Heavy smoke from catch basin#935 - direct connection

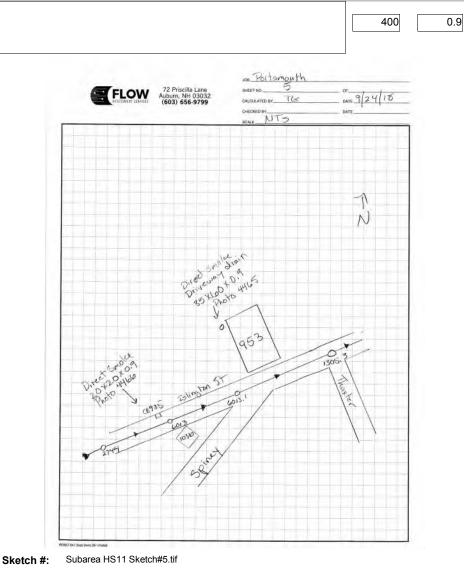
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Sub-System: HS11

 Project No:
 18001

 Date:
 09/24/2018

 Inspector:
 MS





Smoke Testing Log

Drainage

Area SqFt

Runoff

Coeff

Municipality: Portsmouth, NH Finding Location: Islington Street

13ington Out

Findings:

Light smoke from catch basin#1858 - indirect connection



0 HS HS HI 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 1 FLOW CALIFURATED BY DATE 12 W CHECKED BY 14 CALE NA Istayhan 52 0605 Section april Smithe From CID 210 + 1855 (Induce)) 12.10 8 410 H 0278

Smoke Testing Log

09/24/2018

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Drainage

Area SqFt

Runoff

Coeff

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Project No: 18001

Date:

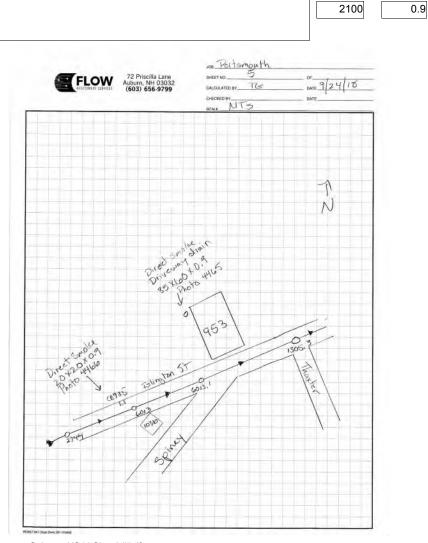
Inspector:

Sketch #: Subarea HS11 Sketch#2.tif

Municipality: Portsmouth, NH Finding Location: 953 Islington Street

Findings:

Smoke from driveway drain - direct connection. MH 1305.3 unnamed on map - see revised map.



Project No: 18001 Date: 09/24/2018

Smoke Testing Log

Drainage

Area SqFt

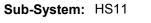
Runoff

Coeff

MS Inspector:

Image #: DSCF4465.JPG

Sketch #: Subarea HS11 Sketch#5.tif



Municipality: Portsmouth, NH Finding Location: Morning Street

Findings:

Heavy smoke from catch basin#833 - direct connection

4400 11211 100 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 11 16 FLOW SHEET N 9115 CALCULATED BY 145 DATE CHECKED BY NA 2-Marning St Heavy Sinks (rom C/B (Direct) C/0H 837 BRAW ope 2200 Nor. 0 philo # 0340 Light simile [4- 0/0 0/04 1965 (Induci+) ph. 10 # 03 51





Smoke Testing Log

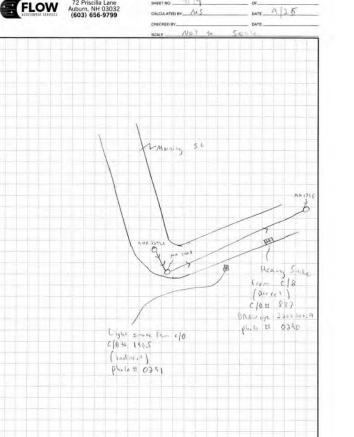
Drainage

Area SqFt

Runoff

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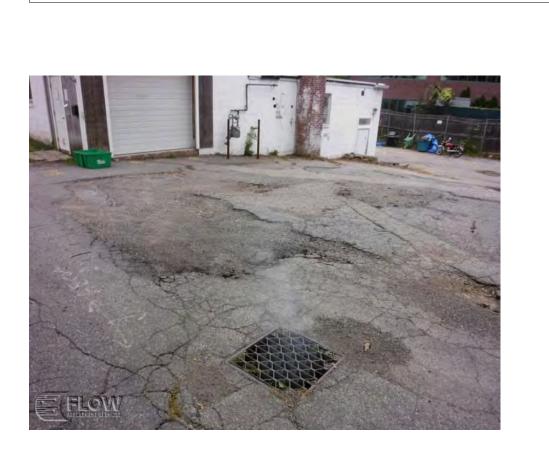


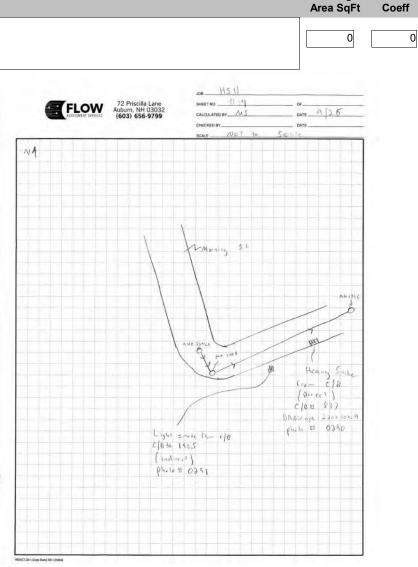
Municipality: Portsmouth, NH Finding Location: Morning Street

morning out

Findings:

Light smoke from catch basin#1905 - indirect connection





Smoke Testing Log

MS

Drainage

Runoff

09/25/2018

Project No: 18001

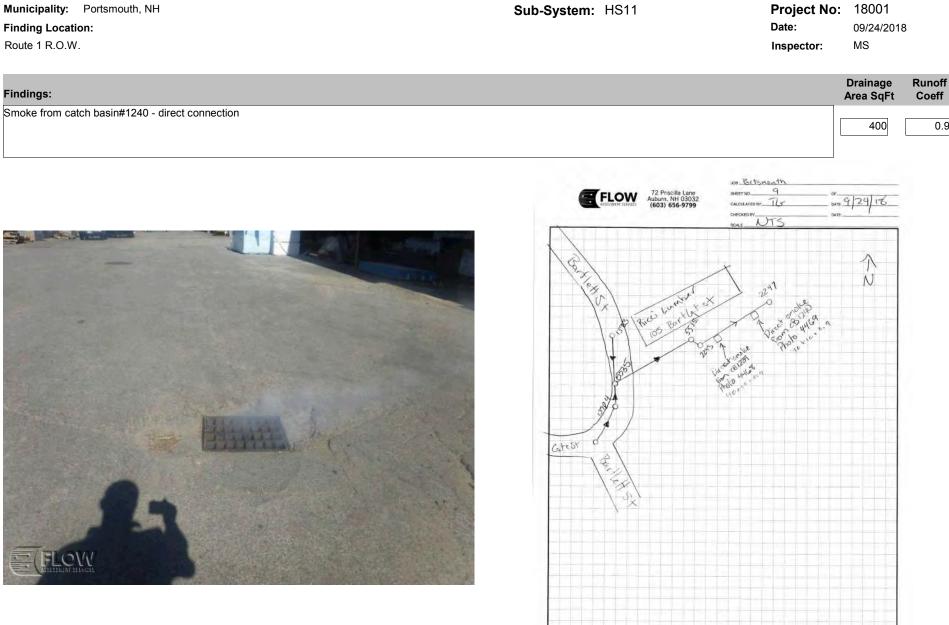
Date:

Inspector:

Image #: 0291.JPG

Sketch #: Subarea HS11 Sketch#14.tif

Municipality: Portsmouth, NH Finding Location:



Smoke Testing Log

0.9

Municipality: Portsmouth, NH Finding Location: Route 1 R.O.W. Sub-System: HS11

 Project No:
 18001

 Date:
 09/25/2018

 Inspector:
 MS

Smoke Testing Log

Findings:		Drainage F Area SqFt	Runo Coef
ight smoke from hole next to MH 1387 - direct connection		8	C
	72 Priscilla Lane Auburn, NH 03032 (603) 656-9799	158 <u>HS12</u> энетню <u>HS12</u> сассалате <u>HS12</u> сассалате <u>HS12</u> онесстрау эсле Лют In Sea 6 эсле Лют In Sea 6	
	NT.		
	us hohit. Bisers at	400 U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Maul U-Mau	
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Sketch #: Subarea HS11 Sketch#12.tif

Image #: 0288.JPG

Smoke from catch basin#1239 - direct connection

Municipality: Portsmouth, NH Finding Location: Route 1 R.O.W.

Findings:

Sub-System: HS11

 Project No:
 18001

 Date:
 09/24/2018

Drainage

Area SqFt

Runoff

Coeff

0.9

Inspector: MS

FLOW 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 tico Lorn Catesr OW

400 108 Portsmouth 9 GADETAN -9/24 CALCULATED BY 115 CHECKED BY LITS N

Sketch #: Subarea HS11 Sketch#9.tif

Flow Assessment Services, L.L.C. Municipality: Portsmouth, NH Sub-System: HS11

Finding Location:

Route 1 R.O.W. - Frank Jones Center

Project No: 18001 Date: 09/25/2018 MS Inspector:

Smoke Testing Log

ndings:			Drainage Area SqFt	Runoff Coeff
eavy smoke from catch basin - direct connection			2800	0.9
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	NT.			
	US Dates I Bise so M	400 Usinaul Lister (orea	Sprate frankale t) 35 - MXJX.3 4 0288	
	щили 529 О		1	
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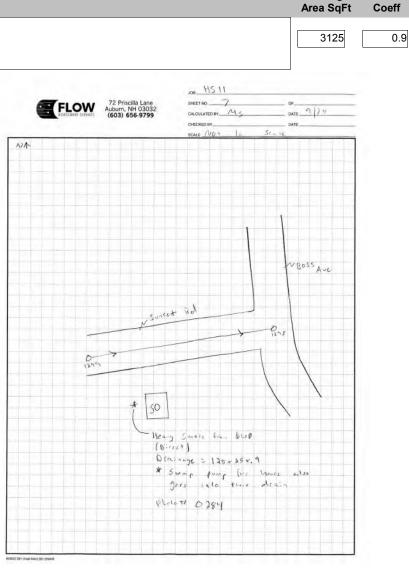
mitolet 1044 plays Texes (705-) platest

Municipality: Portsmouth, NH Finding Location: 50 Sunset Road

Findings:

Heavy smoke from driveway drain - direct connection





Sketch #: Subarea HS11 Sketch#7.tif

Sub-System: HS11

Smoke Testing Log

Date:

Inspector:

Project No: 18001

09/24/2018

MS

Drainage

Runoff

Municipality: Portsmouth, NH

Finding Location:

Image #: 0280.JPG

Thaxter Road

Findings:

Light smoke from catch basin#1162 - indirect connection. MH 1305.2 unnamed on map - see revised map.



0 108_HS11 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW REPET N CALCULATED BY MS 9/21 CHECKED BY 1104 NA Johnghe 5+ "Thester Ad 04 954 C10#1162 +++ +1 0280 Indirect)

Sketch #: Subarea HS11 Sketch#4.tif

Sub-System: HS11

Smoke Testing Log

Drainage

Area SqFt

Runoff

Coeff

0

 Project No:
 18001

 Date:
 09/24/2018

 Inspector:
 MS

Municipality:Portsmouth, NHFinding Location:

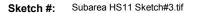
Thaxter Road

Findings:

Light smoke from catch basin#1182 - indirect connection



Area SqFt Coeff 0 HSII .00 3 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW DATE G 21 CALCULATED BY MS CHECKED BY Nor Sente NA Second Ad N That a Ad 0 6 mp cla 122 C & H 1152 (ind reat) philes 0279



Sub-System: HS11

Smoke Testing Log

Project No: 18001

09/24/2018

MS

Drainage

Runoff

0

Date:

Inspector:

Image #: 0279.JPG

Municipality: Portsmouth, NH Finding Location: 82 Woodbury Avenue

Findings:

Smoke from catch basin#7218 - direct connection



Smoke Testing Log

an,

Sketch #: Subarea HS11 Sketch#15.tif

Municipality: Portsmouth, NH Finding Location: Middle Road

Sub-System: HS15

Project No: 18001 Date: 09/21/2018

> OF. DATE 9/2/

DATE .

Drainage

Area SqFt

3960

Runoff

Coeff

0.9

MS Inspector:

.m HS 15 # 1

CALCULATED BY MS CHECKED BY____

SCALE NOT IE

Essex Ave

541

SHEET NO .

FLOOR 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799
Middle Q.J. Mr. a SUS

Heavy smore tranglo tlatygg (Direct) Proto to 0273 # 493 te Lois st PRODUCT 2014 (playle Shored: 2014 1 (Fugeral)

Sketch #: Subarea HS15 Sketch#1.tif

Smoke Testing Log

Municipality: Portsmouth, NH Finding Location:

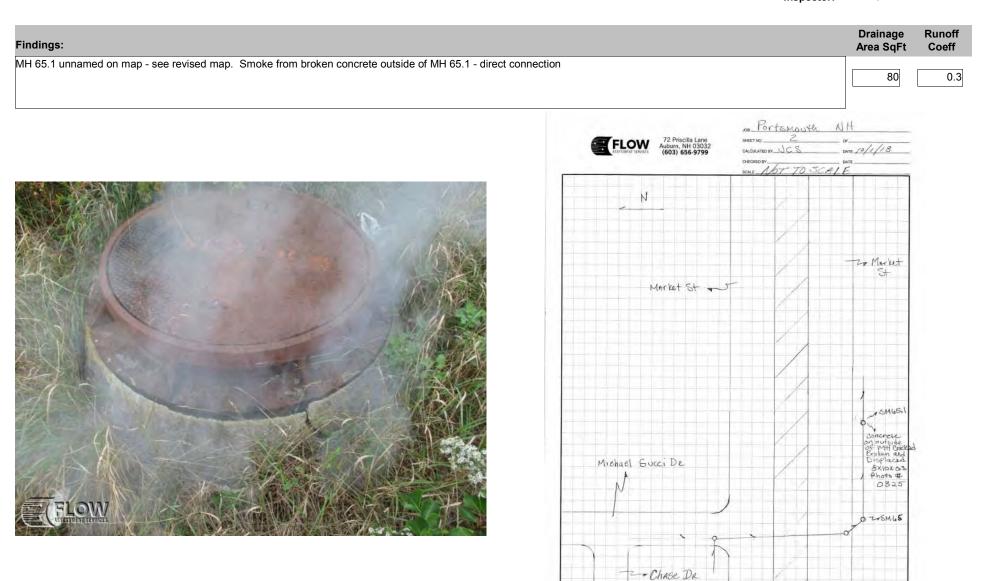
Sub-System: LD1

Smoke Testing Log

 Project No:
 18001

 Date:
 10/01/2018

 Inspector:
 MS



Municipality: Portsmouth, NH Finding Location:

Beechwood Street

Findings:

Light smoke from catch basin#3734 - indirect connection



Area SqFt Coeff 0 DB Portsmouth NH 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW DATE 10/1/18 CALCULATED BY JCS Scale Ala N -2 CUHS St 34 Light Snoke 2 Indirect SMAI C63784 Photott EB 5M83 -Beechwood St 4 Leslie DR

Smoke Testing Log

MS

Drainage

Runoff

0

10/01/2018

Project No: 18001

Date:

Inspector:

Sketch #: Subarea LD1 Sketch#1.tif

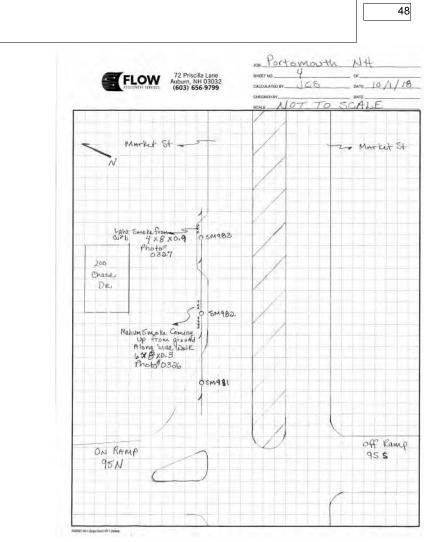
Sub-System: LD1

Municipality: Portsmouth, NH Finding Location:

Market Street

Findings:

Smoke from ground near sidewalk - direct connection





Smoke Testing Log

 Project No:
 18001

 Date:
 10/01/2018

 Inspector:
 MS

Drainage

Area SqFt

Runoff

Coeff

0.3

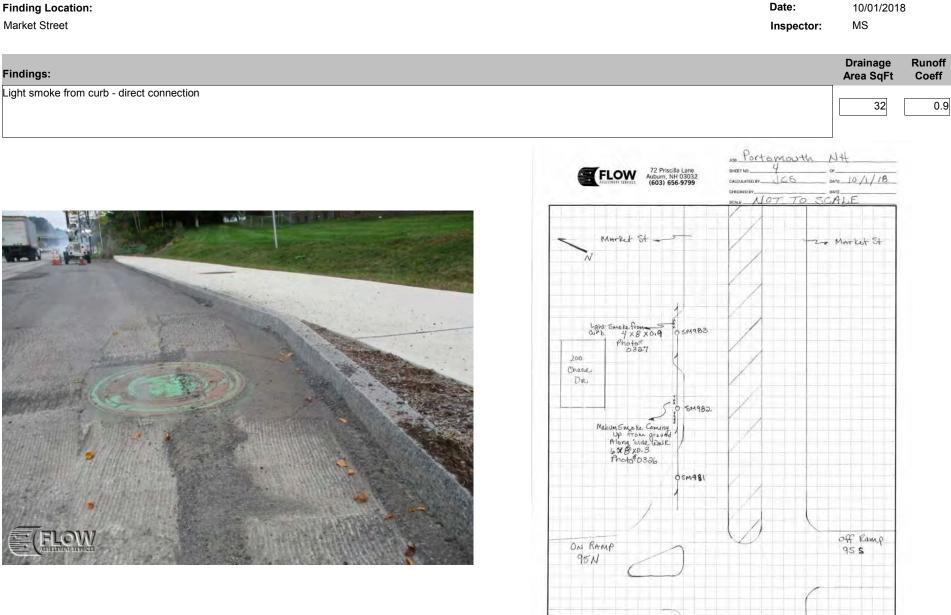
Sketch #: Subarea LD1 Sketch#4.tif

Sub-System: LD1

Municipality: Portsmouth, NH Finding Location:

Findings:

Light smoke from curb - direct connection



Sketch #: Subarea LD1 Sketch#4.tif

Sub-System: LD1

Smoke Testing Log

Project No: 18001

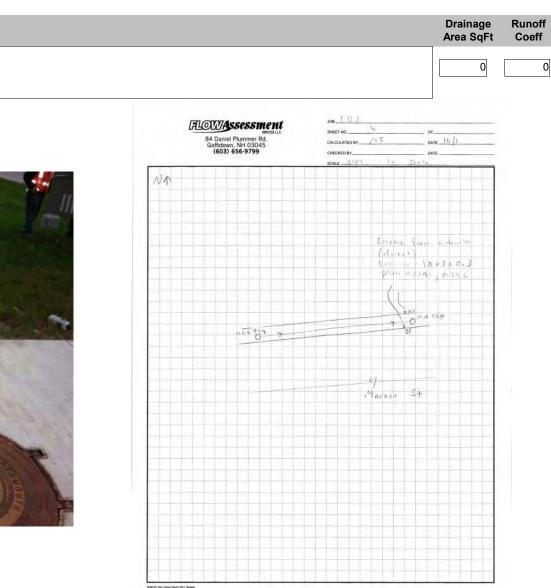
Municipality: Portsmouth, NH Finding Location:

Market Street

Findings:

Image #: 0296.JPG

Smoke from sidewalk/curb - direct connection





Sub-System: LD1

Smoke Testing Log

Project No: 18001 Date: Inspector:

10/01/2018 MS

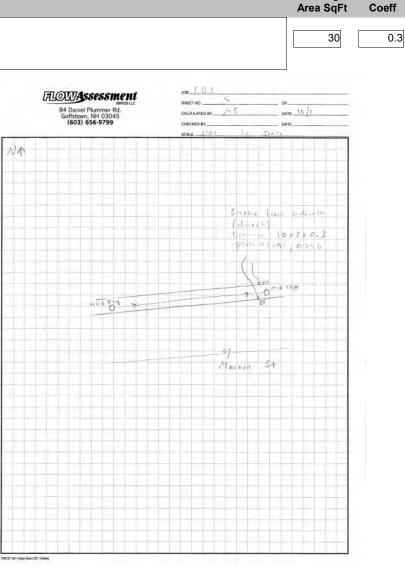
Municipality: Portsmouth, NH Finding Location:

Market Street

Findings:

Smoke from sidewalk/curb - direct connection





Smoke Testing Log

MS

Drainage

Runoff

10/01/2018

Project No: 18001

Date:

Inspector:

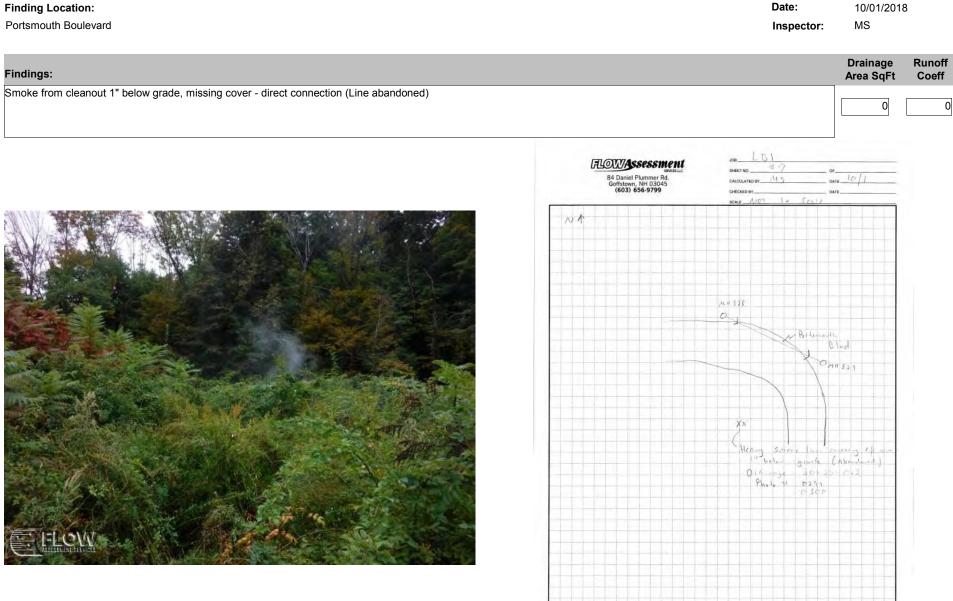
Image #: 0295.JPG

Sketch #: Subarea LD1 Sketch#5.tif

Sub-System: LD1

Municipality: Portsmouth, NH

Finding Location:



Smoke Testing Log

Project No: 18001

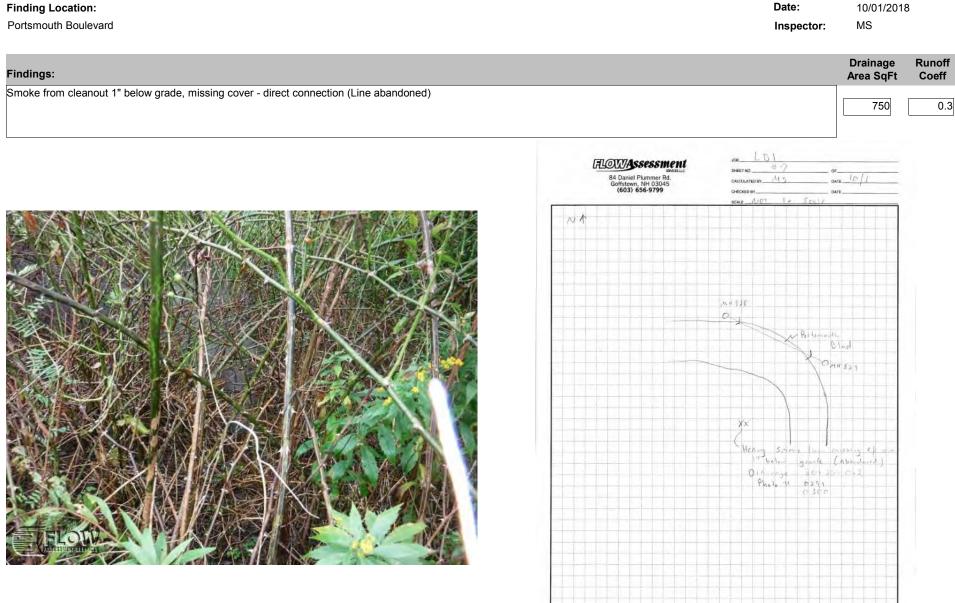
Sketch #: Subarea LD1 Sketch#7.tif

Sub-System: LD1

Image #: 0300.JPG

Municipality: Portsmouth, NH

Finding Location:



Sketch #: Subarea LD1 Sketch#7.tif

Sub-System: LD1

Smoke Testing Log

Project No: 18001

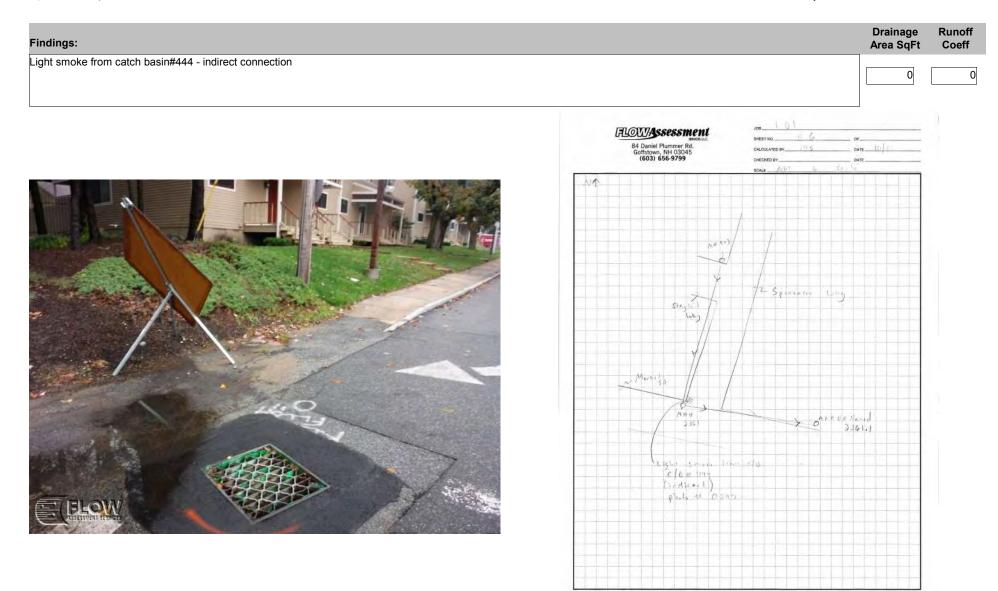
Municipality: Portsmouth, NH Finding Location:

Spinnaker Way

Sub-System: LD1

Smoke Testing Log

Project No: 18001 Date: 10/01/2018 MS Inspector:



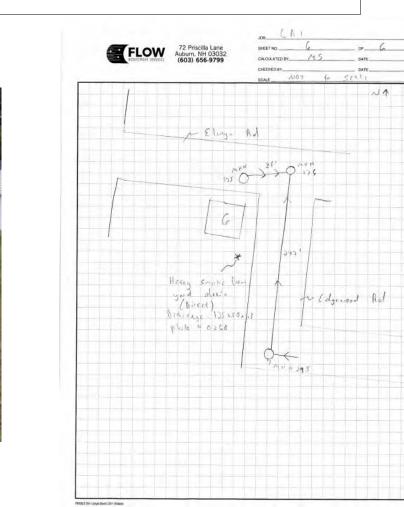
Sketch #: Subarea LD1 Sketch#6.tif

Municipality: Portsmouth, NH Finding Location:

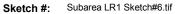
6 Elwyn Road

Findings:

Heavy smoke from yard drain behind home -direct connection







Smoke Testing Log

Drainage

Area SqFt

6250

Runoff

Coeff

0.3

Sub-System: LR1

 Project No:
 18001

 Date:
 09/07/2018

 Inspector:
 MS

Municipality: Portsmouth, NH Finding Location: Elwyn Road R.O.W.	Sub-System: LR1	Project No: Date: Inspector:	18001 09/07/2018 MS	
Findings:			Drainage Area SqFt	Runoff Coeff
Smoke from around corbel of MH 343 - direct connection			0	0



Municipality: Portsmouth, NH Finding Location: Elwyn Road R.O.W.	Sub-System: LR1	Project No: Date: Inspector:	18001 09/07/2018 MS	}
Findings:			Drainage Area SqFt	Runoff Coeff
Smoke from around corbel of MH 343 - direct connection		[0	0



Municipality: Portsmouth, NH Finding Location: Elwyn Road R.O.W.	Sub-System: LR1	Project No: Date: Inspector:	18001 09/07/2018 MS	3
Findings:			Drainage Area SqFt	Runoff Coeff
Smoke from around corbel of MH 343 - direct connection		[2	0.9



Flow Assessment Services, L.L.C. Municipality: Portsmouth, NH Sub-System: LR1

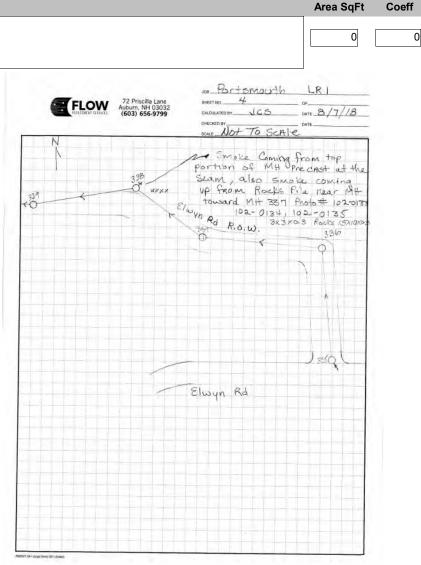
Finding Location:

Elwyn Road R.O.W.

Findings:

Smoke from rock pile near MH 338 - direct connection





Smoke Testing Log

Project No: 18001 Date: Inspector:

09/07/2018

Runoff

MS

Drainage

Municipality: Portsmouth, NH Finding Location:

Elwyn Road R.O.W.

Findings:

Smoke from rockpile near MH 338 - direct connection



150 0.3 108 Portsmouth LR 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 4 CALCULATED BY JCS ATT 8/7/18 Not To Scale 21 Smoke Coming from top portion of MH precast at the Scam, also smoke coming up from Rocks File near 19# 47.2.2 toward MH 337 Photo # 102-013 ETWYA Rd R.O.W. 102-0120 350 R.O.W. 383×0.3 Rocks 15×100 361 R.O.W. 336 Elwyn Rd

Image #: IMG_0134.JPG

Sketch #: Subarea LR1 Sketch#4.tif

Smoke Testing Log

Drainage

Area SqFt

Runoff

Coeff

Sub-System: LR1

 Project No:
 18001

 Date:
 09/07/2018

 Inspector:
 MS

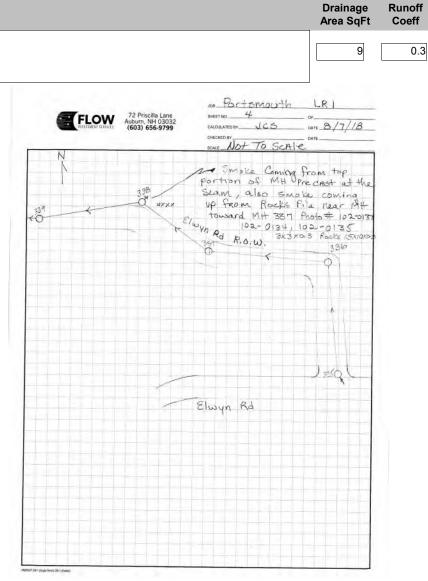
Flow Assessment Services, L.L.C. Municipality: Portsmouth, NH Finding Location:

Elwyn Road R.O.W.

Findings:

Smoke from corbel of MH 338 - direct connection





Smoke Testing Log

MS

09/07/2018

Project No: 18001

Date:

Inspector:

Image #: IMG_0133.JPG

Sketch #: Subarea LR1 Sketch#4.tif

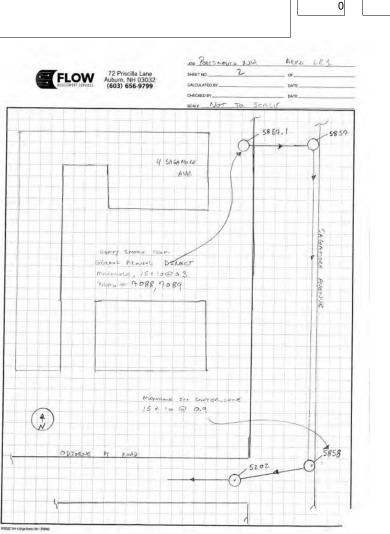
Municipality: Portsmouth, NH **Project No: 18001** Sub-System: LR1 Finding Location: Date: 09/07/2018 Sagamore Avenue MS Inspector: Drainage Runoff Findings: Area SqFt Coeff MH 5858 is in gutterline 150 0.9 100 PORTSMOUTH YUL AREA LRS 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 2 FLOW SHEET CALCULATED B CHECKED B Not To SCALE. 58 59.1 -5859 4 Shigh Ma KE AVE E BARTY SMOKE FRAM-GRANDE ALMONI DEABLE Mainuaue, 151 10@ 0.3 Puero = 4088, 7089 Michailance The Courtist Courts 15 x 10 @ 0.9 4 5858 ODJORNO PT RaAD , 52.02 Sketch #: Subarea LR1 Sketch#2.tif Image #:

Smoke Testing Log

Flow Assessment Services, L.L.C.

Flow Assessment Services, L.L.C. **Smoke Testing Log** Municipality: Portsmouth, NH Sub-System: LR1 **Project No: 18001** Finding Location: Date: 09/07/2018 Sagamore Avenue R.O.W. MS Inspector: Drainage Runoff Findings: Area SqFt Coeff Heavy smoke from ground around MH 5857.1 0 AREA LES 100 PORTSMOUTH MUH 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW 5859.1 -5859

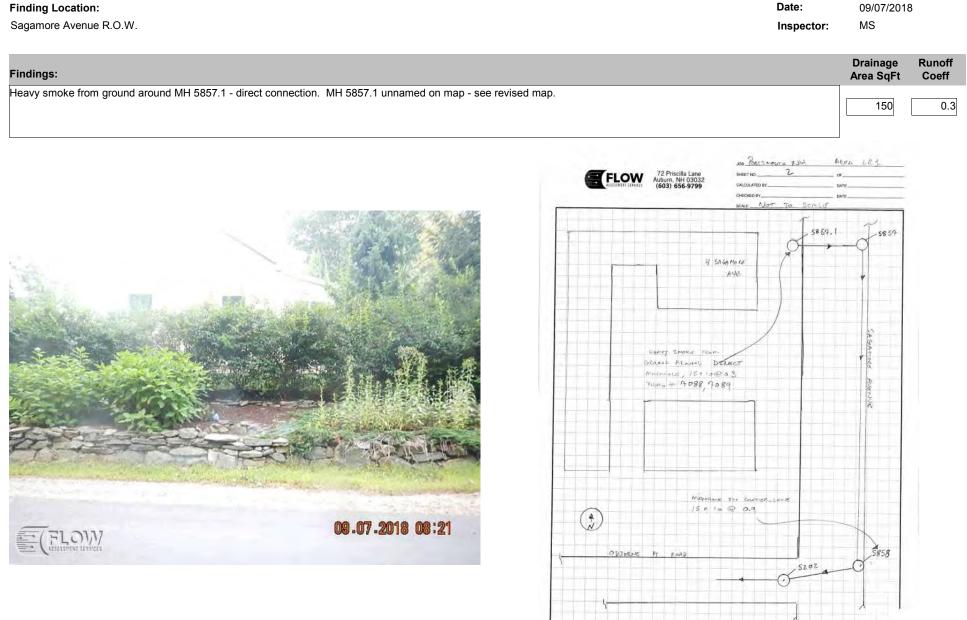




0

Sketch #: Subarea LR1 Sketch#2.tif

Municipality: Portsmouth, NH Finding Location:



Sub-System: LR1

Smoke Testing Log

Project No: 18001

Date:

Image #: DSCN7088.JPG

Municipality: Portsmouth, NH Finding Location:

Taft Road

Findings:

Light smoke from catch basin#1847 - indirect connection



Drainage Runoff Area SqFt Coeff 0 LAI Porto ACR. 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 扭 FLOW 15 CALCULATED BY CHECKED BY DATE CAL . NA 75 Light shore from c/B c/6m 1847 (indirect) TAFT Rol photo 11 0251 /1 PSI 2653 NALLAN Rol

Sub-System: LR1

Project No: 18001 Date: 09/07/2018 MS Inspector:

0

Image #: 0251.JPG

Sketch #: Subarea LR1 Sketch#3.tif

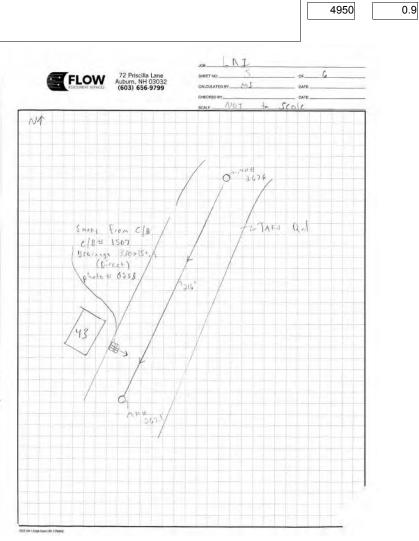
Municipality: Portsmouth, NH Finding Location:

Taft Road

Findings:

Smoke from catch basin#1507 - direct connection





Smoke Testing Log

Drainage

Area SqFt

Runoff

Coeff

Sub-System: LR1

 Project No:
 18001

 Date:
 09/07/2018

 Inspector:
 MS

Municipality: Portsmouth, NH

Finding Location:

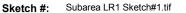
Taylor Lane

Findings:

Light smoke from catch basin#1573 - indirect connection



0 (I.B. De Portsmulle 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW NS CALCULATED BY CHECKED R NOL la. Seel NA notical smoke line 2/8 C/8 + 1573 ph. 1. 11 0200 NET 194 1 (Salah Sharp) 194 1 Public



Smoke Testing Log

Sub-System: LR1

 Project No:
 18001

 Date:
 09/07/2018

 Inspector:
 MS

Drainage

Area SqFt

Runoff

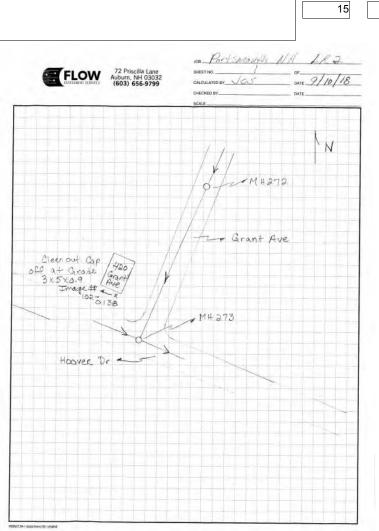
Coeff

0

Municipality: Portsmouth, NH Sub-System: LR2 Finding Location: 420 Grant Drive Findings: Smoke from cleanout missing cap, at grade - direct connection FLOW 102

Project No: 18001 Date: 09/12/2018 Inspector: MS Drainage Runoff Area SqFt Coeff





Smoke Testing Log

0.9

Municipality:Portsmouth, NHFinding Location:2021 Lafayette Road

Sub-System: LR2

Smoke Testing Log Project No: 18001

 Date:
 09/12/2018

 Inspector:
 MS

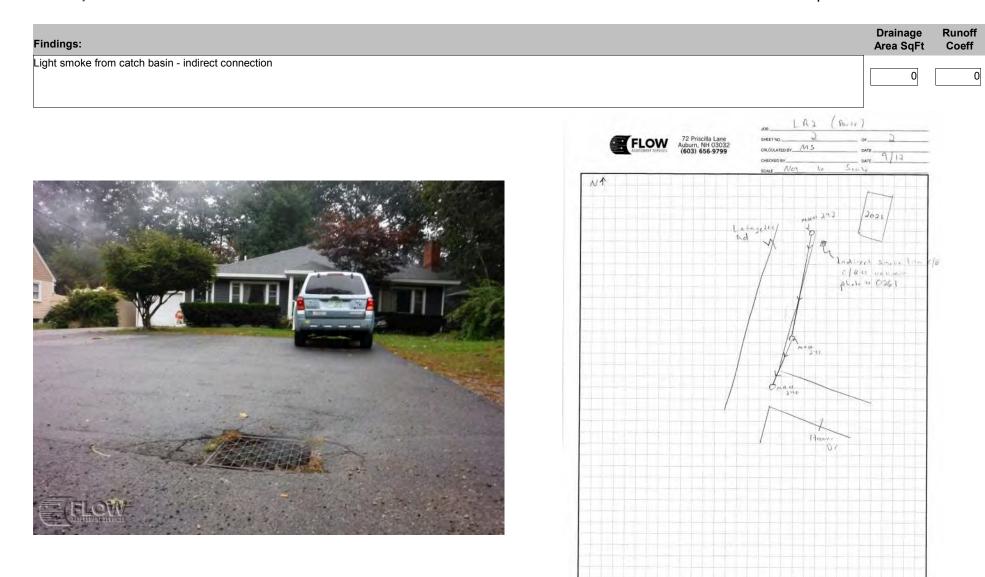


Image #: 0261.JPG

Flow Assessment Services, L.L.C. Sub-System: LR4

Municipality: Portsmouth, NH

Finding Location:

Findings:

380 Greenleaf Avenue

Project No: 18001 Date: 09/20/2018 MS Inspector: Drainage Runoff Area SqFt Coeff Light smoke from drain pipe - direct connection 0 0 LRY ine 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW 7/20 CALCULATED BY 380 AJE Gueraled 0-+X light source has dea. \$ 10 (induced) Photo # 027

Municipality: Portsmouth, NH Finding Location:

380 Greenleaf Avenue

Findings:

Light smoke from drain pipe - indirect connection



0 LRY ine 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW 7/20 CALCULATED BY 380 AJE Gueraled 0-1 +X light small lin dear \$ 10 (induced) Photo # 0271

Sketch #: Subarea LR4 Sketch#2.tif

Sub-System: LR4

Smoke Testing Log Project No: 18001

Date: 09/20 Inspector: MS

09/20/2018

Runoff

Coeff

0

Drainage

Area SqFt

Municipality: Portsmouth, NH Finding Location:

Hillside Drive

Findings:

Light smoke from catch basin#4071 - direct connection

		Date: Inspector:	09/20/2018 MS	5
			Drainage Area SqFt	Runof Coeff
			1650	0.
	72 Priscilla Lane Auburn, NH 0303	208 LR1 2 онетно <u>3</u> соссиляет <u>Ль с</u>	0# DMTE	
			DATE	
min	[179]			
	Light Guern (un 2/B (Burnar) (O inc) V. Dr.A. 1000 15-9 (D) Poota K (D) 200	0-14-1 15-24		
And And And		Hells & Ula		
and the second	1030			
	mbl/241 (pap Serv)264 (paps			

Smoke Testing Log

Project No: 18001

Image #: 0272.JPG

Sketch #: Subarea LR4 Sketch#3.tif

Sub-System: LR4

Municipality: Portsmouth, NH Finding Location: Leavitt Avenue	Sub-System: LR4	Project No: Date: Inspector:	18001 09/20/2018 MS	3
Findings:			Drainage Area SqFt	Runoff Coeff
3 GPM leak from above outgoing line in MH 543		[0	0



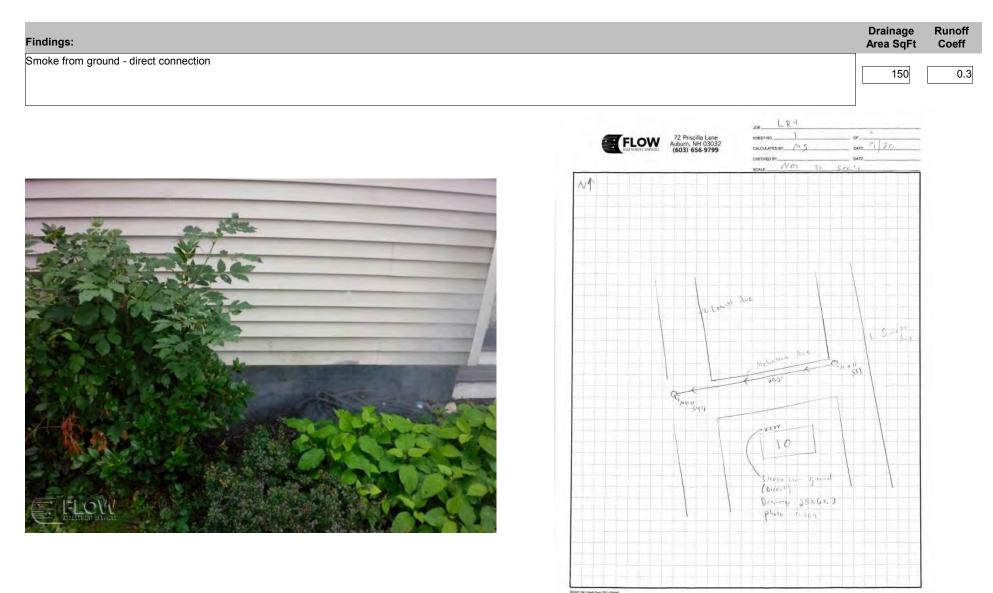
Flow Assessment Services, L.L.C. Sub-System: LR4 Municipality: Portsmouth, NH Finding Location: Sub-System: LR4

Smoke Testing Log

 Project No:
 18001

 Date:
 09/20/2018

 Inspector:
 MS



Sketch #: Subarea LR4 Sketch#1.tif

10 McClintock Avenue

Municipality: Portsmouth, NH Finding Location: 275 Constitution Avenue	Sub-System: LR6	Project No: Date: Inspector:	18001 09/14/2013 MS	8
Findings:			Drainage Area SqFt	Runoff Coeff
Smoke from loose cleanout cover 6" above grade - direct connection		[0	0



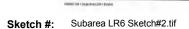
Municipality: Portsmouth, NH Finding Location: 225 Heritage Avenue

Findings:

Smoke from cleanout missing cover, 3" above grade - direct connection

0 LRG 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW DATE 9/1-1 CALCULATED BY 15 CHECKED BY_ BONE NO + NA MH+++ 136 0 SMOKE FAM MINS - 9. Vener Crock At grade Orainge : Horial Photo H 0264 CANT N. Herlinge Ave 2641 4 SMake from ousing changes photo H 0265 225





Sub-System: LR6



Smoke Testing Log

Runoff

Coeff

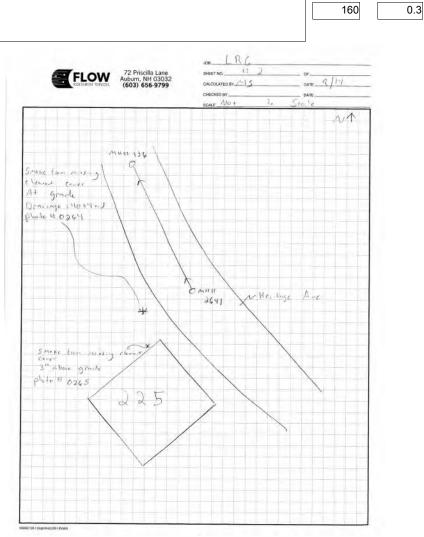
0

Municipality: Portsmouth, NH Finding Location:

225 Heritage Avenue

Findings:

Smoke from cleanout missing cover, at grade - direct connection



MS

Drainage

Area SqFt

Runoff

Coeff

09/14/2018

Project No: 18001

Date:

Inspector:

Sketch #: Subarea LR6 Sketch#2.tif

Sub-System: LR6

Municipality: Portsmouth, NH Finding Location:

Lafayette Road

Drainage Runoff Findings: Area SqFt Coeff MH 2479 is buried - footages combined. Smoke from ground near approximate location of MH 2479 - direct connection 30 0.3 JAJ_ BG (Peris 72 Priscilla Lane Auburn, NH 03032 (603) 656-9799 FLOW SHEET CALCULATED BY CHECKED BY Secle NOL CALE NA Coach Rel 3611 Lafagette Rol ight smake from Ground (brect) MAT DRAinage = 10x3x0.3 1 hate = 0207 2.77 CAL MH 3613 OW



Image #: 0267.JPG

Sub-System: LR6

Municipality:Portsmouth, NHFinding Location:2468 Lafayette Road

Findings:

Smoke from metal plates and cracks - direct connection



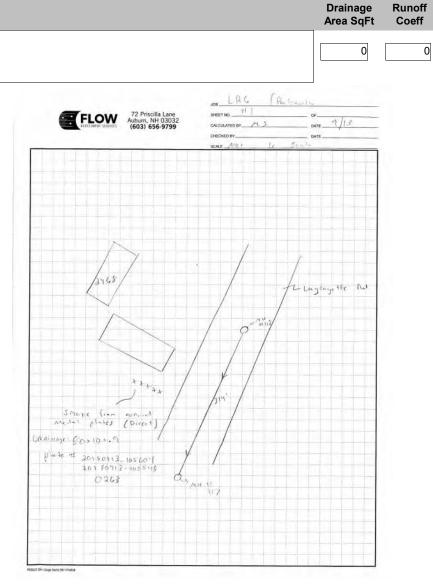
Image #: 20180913_105548.jpg

Sub-System: LR6

 Project No:
 18001

 Date:
 09/14/2018

 Inspector:
 MS



Sketch #: Subarea LR6 Sketch#1.tif

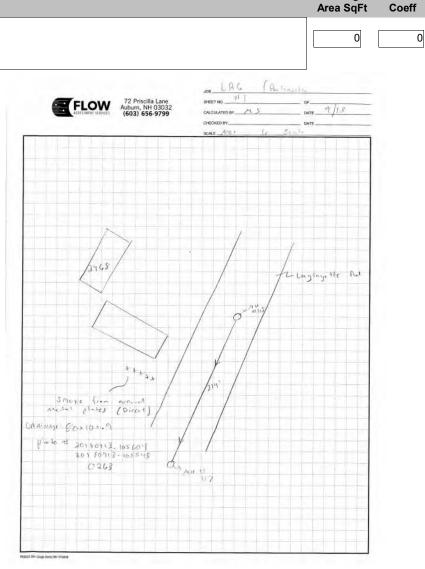
 Municipality:
 Portsmouth, NH

 Finding Location:
 2468 Lafayette Road

Findings:

Smoke from metal plates and cracks - direct connection





Smoke Testing Log

MS

Drainage

Runoff

09/14/2018

Project No: 18001

Date:

Inspector:

Image #: 20180913_105604.jpg

Sketch #: Subarea LR6 Sketch#1.tif

Sub-System: LR6

Smoke from metal plates and cracks - direct connection

Municipality:Portsmouth, NHFinding Location:2468 Lafayette Road

Findings:

Sub-System: LR6

Smoke Testing Log

Drainage

Area SqFt

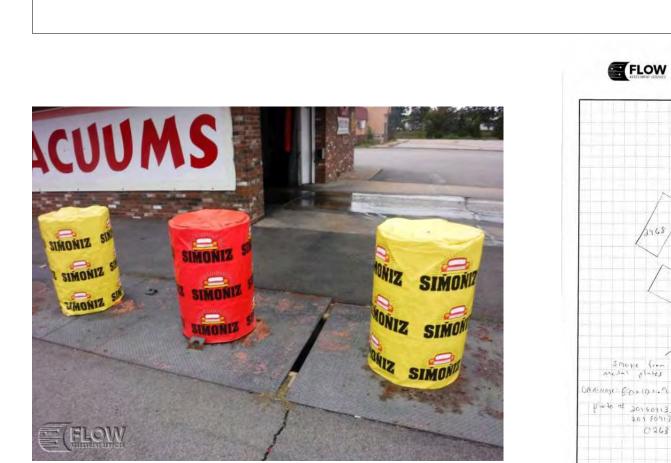
Runoff

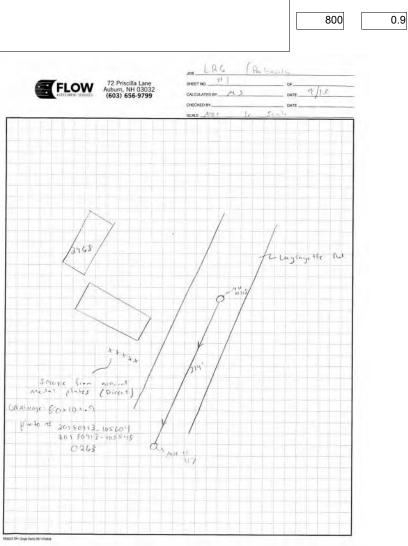
Coeff

 Project No:
 18001

 Date:
 09/14/2018

 Inspector:
 MS





Sketch #: Subarea LR6 Sketch#1.tif



Woodardcurran.com