



MEMORANDUM

TO: John Struzziery, P.E.
CC: Frank Cavaleri
FROM: Peter Lyons
DATE: July 19, 2017
RE: Gunrock Area Sanitary Sewer Rehabilitation Recommendations

1. Background

The Town of Hull, MA requested Woodard & Curran complete a condition assessment and preliminary rehabilitation plan for the Gunrock Area, utilizing Closed Circuit Television (CCTV) pipe inspection and manhole (MH) inspection completed during the Spring of 2017. The Gunrock Area sewer is generally 6-10-inch vitrified clay or asbestos cement sanitary sewer pipe that transports separated sewer flow to Pump Station 1. The sewered area upstream of Pump Station 1 experiences both excessive I/I and occasional sanitary sewer overflow. Recent sanitary sewer overflows have occurred at 205 Atlantic Avenue 76 Atlantic Avenue.

This memo provides a detailed condition assessment of the sanitary sewer in the Gunrock Area and recommends rehabilitation and probable costs that address structural and operational defects in the area. Figure 1 shows the pipes and manholes that were inspected during the Spring of 2017.

2. CCTV Review and Sewer Pipe Condition Assessment

CCTV inspection completed by Wind River Environmental during the Spring of 2017 (March 21st – March 29th) utilized National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) inspection protocol and located numerous structural and operational defects including sources of infiltration and inflow (I/I). Wind River completed inspection of approximately 5,200 LF of an estimated 6,200 LF based on the Town's GIS. Inspections were not completed on Stony Beach Road or portions of Summit Avenue (approximately 1,300 LF of 6-8" sewer pipe).

A count of the type and severity of point defects located in the Gunrock area are summarized in Table 1. These defects are organized by the type of defect as well as the NASSCO PACP rating. The rating system uses a scale of 1-5, where 5 is the most significant defect and may require immediate rehabilitation.

TABLE 1 – GUNROCK AREA NASSCO PACP SCORES

Type of Defect	NASSCO PACP Rating				
	Minor	Minor to Moderate	Moderate	Significant	Most Significant
	1	2	3	4	5
Structural	11	47	37	19	21
O&M	77	1	6	14	0
I/I	67	0	7	4	3
Total	155	48	50	37	24



Defects that have a PACP rating of greater than or equal to 4 should be considered for rehabilitation. The Gunrock area has a total of 61 defects that are significant enough to be spur rehabilitation recommendations. Specifically, the inspections located 21 structural defects that were graded as a 5, these defects include broken pipes/holes in the pipe where voids exist, or soil is visibly entering the pipe. There were no O&M related defects that identified that were a 5, however significant root defects were located along the easement off Atlantic Avenue between the Summit Avenue entry and exit roadways. There were three I/I defects that were rated as a 5; these include infiltration gushers – or locations of infiltration that appear to be under pressure and “gush” into the pipe segment. W&C estimated I/I to contribute approximately 75 gallons per minute or 108,000 gallons per day. For comparison, this is approximately 10% of the maximum month I/I flow estimate for the year 2016.

Defect types are described below with example photos from the Spring 2017 inspection.

Significant Structural Defects

Structural defects are characterized by cracks, fractures, breaks, and holes in the sewer pipe that cause structural instability. This type of defect can cause sewer collapse, backup, and sinkholes. These defects also lead to the introduction of extraneous groundwater and rain-induced infiltration. Structural defects can lead to costly emergency repairs that cause social, economic, and environmental damage. Through the rehabilitation recommendations made in the following sections, these structural defects can be repaired via trenchless methods (i.e. without excavation) which leads to quicker and less noticeable construction.

BROKEN PIPE ON ATLANTIC AVENUE, GRADE 5



Pipe Segment 20957-20958 (Intersection of Stony Beach Rd. and Atlantic Ave.)



HOLE WITH VOIDS VISIBLE ON GUNROCK AVENUE, GRADE 5



Pipe Segment 20966-20969 (Approximately #18 Gunrock Ave.)

Significant O&M Defects

These types of defects are characterized by roots, grease, and debris build up. This type of defect can cause sewer backup, increased maintenance costs, and lead to extraneous groundwater and rain-induced infiltration. These defects can lead to costly emergency repairs that cause social, economic, and environmental damage. Through the rehabilitation recommendations made in the following sections, these defects can be repaired via trenchless methods (i.e. without excavation) which leads to quicker and less noticeable construction.

ROOT BALL LARGE OFF ATLANTIC AVENUE EASEMENT, GRADE 4



Pipe Segment 30008-20979 (Approximately #40 Atlantic Ave.)



DEPOSITS ATTACHED GREASE ON ATLANTIC AVENUE, GRADE 3



Pipe Segment 20967-20965 (Approximately #146 Atlantic Ave.)

DEPOSITS ATTACHED ENCRUSTATION ON SUMMIT AVENUE, GRADE 4



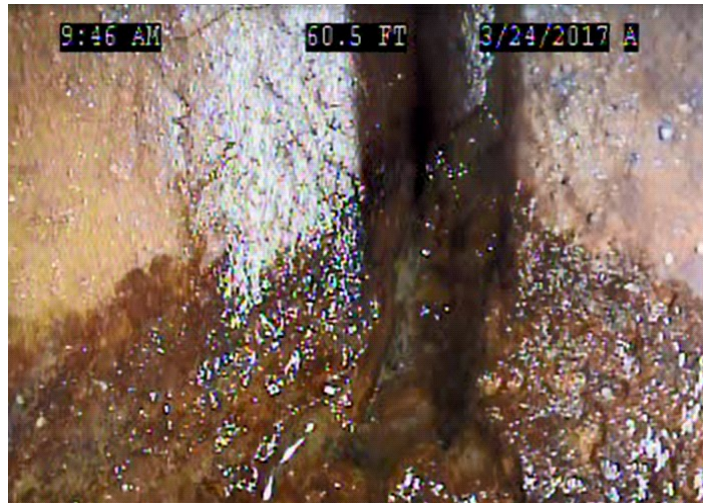
Pipe Segment 20982-20985 (Approximately #18 Summit Ave.)

Significant I/I Defects

These types of defects are characterized by varying levels of observed infiltration. These defects record both active infiltration, such as infiltration gushers, and inactive infiltration such as infiltration staining. These defects add extraneous flow to the sewer system increasing treatment costs as well as maintenance on mechanical assets. Infiltration also contributes to the migration of surrounding soil fines into the collection system which over time can lead to subsurface voids under roadways. Through the rehabilitation recommendations made in the following sections, these defects can be repaired via trenchless methods (i.e. without excavation) which leads to quicker and less noticeable construction.



INFILTRATION RUNNER AND STAINING, GRADE 4



Pipe Segment 20964-20966 (Approximately #22 Gunrock Ave.)

INFILTRATION GUSHER, GRADE 5



Pipe Segment 20971-20970 (Approximately #120 Atlantic Ave.)

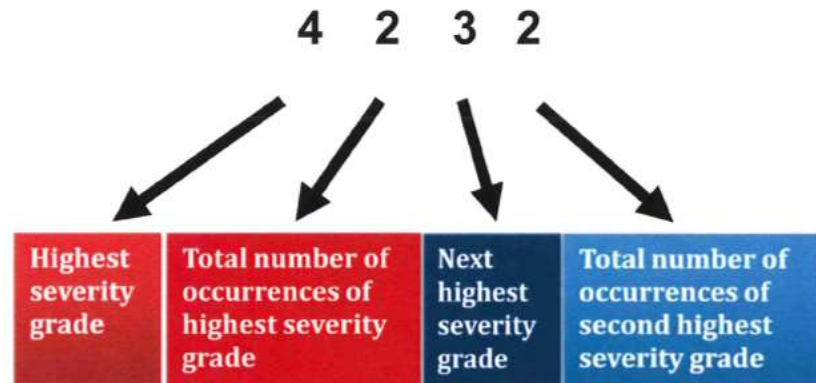
Pipe Inspection Summary and Recommended Rehabilitation

Based on the type of defects located above and utilizing NASSCO PACP coding system, W&C calculated quick overall ratings (QOR) for each pipe inspected. Using the calculated QOR for each inspection, a likelihood of failure of any inspected pipe is equal to the peak defect score located during the inspection. The method to calculate quick ratings is describe in detail below.

Using NASSCO's guidance on pipe rating methods, pipe segments can be rated on a scale of 1-5 as calculated by the defects located during inspection. Using a method called "quick overall rating" or QOR, each pipe is given an overall rating that is equal to the number and severity of the two most sever defects located during the inspection. For example, if a pipe had two "root ball large" (PACP rating = 4) defects



and two infiltration drippers (PACP rating = 3), the pipe would have a QOR of 4232. The figure below explains the quick rating system graphically.



Using the QOR scores and likelihood of failure scoring, rehabilitation priority was set for all pipe sections. For pipe sections with high rehabilitation priority, W&C reviewed the CCTV inspections and recommended rehabilitation to address the defects located during inspection. Table 2 includes W&C comments that summarizes specific defects, recommended rehabilitation, and associated cost for each recommendation. W&C utilized recent construction costs for similar work in Massachusetts to estimate unit costs for the recommended rehabilitation. Table 2 summarizes the estimated unit costs used for the basis of rehabilitation construction estimating. These costs include estimated installation costs. Table 3 summarizes each pipe inspection, recommended rehabilitation and associated cost.

TABLE 2 – PIPE REHABILITATION UNIT COSTS

Item	Unit	Diameter	
		6-8" per unit	10"-12" per unit
CIPP (MH-MH)	LF	\$60	\$80
Clean, Inspect, Test & Seal	Per Joint	\$30	\$30
Clean, Inspect, Test & Seal Service	Per Joint	\$150	\$150
Cut Service	EA	\$2,580	\$250
Heavy Clean and Inspect	LF	\$10	\$10
Lateral Inspection	EA	\$1,000	\$1,000
Lateral Line (5-feet)	EA	\$4,200	\$5,300
Open Cut	LF	\$250	\$250
Root Treatment	LF	\$10	\$10
Short Liner	LF	\$430	\$450



TABLE 3 - CCTV INSPECTION FINDINGS AND RECOMMENDED REHABILITATION

Pipe ID	Street	Size	Material	Length	QSR	QMR	QOR	Overall LOF	Observed Infiltration (gpm)	Comments	Recommended Rehabilitation	Cost
20950-20953	Atlantic Ave.	8	VCP	176	5121	0	5121	5	2	IS THROUGHOUT. DROP CONNECTION TO MH20953 BROKEN SHOULD BE FIXED. LATERAL LINE ONE SERVICE	Lateral Line, CIPP	\$14,750
20953-30007	Atlantic Ave.	8	VCP	268	513B	4132	5141	5	1	HEAVY ROOTS. BROKEN PIPE MAY NOT BE ABLE TO LINE THROUGH. SWITCHES TO DI @ 0+60 DUE TO DEPTH.	CIPP, Open Cut	\$18,580
20956-20957	Atlantic Ave.	8	VCP	132	5131	3129	5132	5	1	FRACTURES THROUGHOUT. BSV. IS	CIPP	\$7,930
20957-20958	Atlantic Ave.	8	VCP	126	5132	4223	5142	5	0	FRACTURES THROUGHOUT. BROKEN PIPE AT MH20957 WILL NEED TO BE REMOVED BEFORE LINING.	CIPP, Open Cut	\$10,032
20958-30006	Atlantic Ave.	8	PVC	157	0	2300	2300	2	0.5	NO DEFECTS. PVC	Monitor	\$0
20959-20962	Atlantic Ave.	8	VCP	269	3221	5142	5142	5	0.5	FRACTURES. HSV. HEAVY DEBRIS. REVERSAL ATTEMPTED NOT COMPLETED. MINIMAL INFILTRATION	Cut Service, Heavy Clean, CIPP	\$19,091
20965-20963	Atlantic Ave.	10	VCP	209	5242	5412	5642	5	4	HEAVY INFILTRATION. BSV.	CIPP	\$16,716
20968-20967	Atlantic Ave.	6	VCP	22	0	1100	1100	1	1	INFILTRATION STAINING THROUGHOUT. POSSIBLE HOLES AT JOINTS. LATERAL LINE ONE SERVICE. NO REASON FOR MSA.	Lateral Line, CIPP	\$5,520
20967-20965	Atlantic Ave	10	VCP	267	2100	4121	4122	4	4	IS THROUGHOUT. HEAVY GREASE. BROKEN LATERALS AT 0+70,0+95, 1+28. HEAVY DEBRIS AND ROCKS. LATERAL LINE TWO SERVICES.	Lateral Line, CIPP, Open Cut	\$36,931
20970-20967	Atlantic Ave.	10	VCP	195	0	4111	4111	4	5	IFILTRATION STAINS THROUGHOUT. LATERAL LINE FOUR SERVICES. SERVICE AT 0+12.5 APPEARS TO BE LEAKING WITH HEAVY DEPOSITS AND 0+59, 1+31 - OPEN CUT SERVICE CONNECTIONS.	Lateral Line, CIPP, Open Cut	\$41,806
20971-20970	Atlantic Ave.	10	VCP	373	4112	5143	5144	5	3	SMALL HOLES. FM. IG. LATERAL LINE TWO SERVICES.	Lateral Line, CIPP	\$40,449
20972-20971	Atlantic Ave.	10	VCP	250	443C	4136	453D	4	4	FRACTURES ENTIRE LENGTH. IR ENTIRE LENGTH. FH3. LATERAL LINE FIVE SERVICES.	Lateral Line, CIPP	\$46,480
20973-20972	Atlantic Ave.	10	VCP	462	413A	0	413A	4	1	POTENTIAL MISSING MANHOLE IN GIS - INSPECTION IS COMPLETE, BUT ID 200+ FEET SHORTER THAN GIS. FRACTURES ENTIRE LENGTH	CIPP	\$36,979
20974-20973	Atlantic Ave.	10	VCP	251	3322	411G	4133	4	2	IS ENTIRE LENGTH. HEAVY DEPOSITS IN LATERAL AT 0+41. LATERAL LINE ONE SERVICE.	Lateral Line, CIPP	\$30,649
20976-20974	Atlantic Ave.	10	VCP	220	2100	1G00	211G	2	1	MH20974 ROOTS BENCH. INFILTRATION STAINING. RFJ. LATERAL LINE TWO SERVICES.	Lateral Line, CIPP	\$28,225
20979-20976	Atlantic Ave.	10	VCP	219	0	211D	211D	2	1	RFJ AT MOST JOINTS. INFILTRATION STAINS MOST LENGTH.	Root Treatment, CIPP	\$19,689
20979-20980	Atlantic Ave.	8	AC	39	0	0	0	0	0	NO DEFECTS.	Monitor	\$0



Pipe ID	Street	Size	Material	Length	QSR	QMR	QOR	Overall LOF	Observed Infiltration (gpm)	Comments	Recommended Rehabilitation	Cost
20979-lake	Atlantic Ave.	10	VCP	0	0	0	0	0	0.5	PIPE HEADING TOWARDS LAKE. HEAVY DEPOSITS. SHOULD BE FILLED IN WITH CONCRETE.	Monitor	\$0
20979-unlabeled 6" pipe in MH	Atlantic Ave.	6	VCP	0	0	0	0	0	0.5	PIPE IS A HISTORIC OUTFALL. PLUGGED UP PER 1974 CONTRACT 8, SHEET 17.	Monitor	\$0
20983-30008	Atlantic Ave.	8	VCP	129	0	4300	4300	4	1	HEAVY ROOTS. ROOTS COMPRIMISING PIPE INTEGRITY.	Root Treatment, CIPP	\$9,042
30006-20959	Atlantic Ave.	8	PVC	53	0	2300	2300	2	0.5	NO DEFECTS. PVC	Monitor	\$0
30007-20956	Atlantic Ave	8	DIP	124	513B	4132	5141	5	1	BEGINS WITH DI AND SWITCHES TO VCP. IR. FRACTURES THROUGHOUT. DAGS.	Cut Service, CIPP	\$7,690
30008-20979	Atlantic Ave.	8	VCP	256	421C	5241	5243	5	1	HEAVY ROOTS. ROOTS COMPRIMISING PIPE INTEGRITY.	Root Treatment, CIPP	\$17,925
20961-20960	Damon Park Rd.	8	AC	81	3100	0	3100	3	0.5	JSM. NO DEFECTS	Monitor	\$0
20961-20962	Gunrock Ave.	8	AC	263	3126	1300	3126	3	1	INFILTRATION STAINING. OFFSET PIPE AT 0+95, FLOW GOES BELOW PIPE. SURFACE SPALLING NEAR DROP CONNECTION TO MH20962	CIPP	\$15,788
20964-20961	Gunrock Ave.	6	VCP	142	4127	5341	5342	5	2	FM THROUGHOUT. HSV. SERVICES BROKEN. OPEN CUT APPROX 15-FEET CONNECTION TO MH20961. LATERAL LINE ONE SERVICE.	Cut Service, Lateral Line, CIPP, Open Cut	\$16,699
20964-20966	Gunrock Ave.	6	VCP	123	3122	5241	5241	5	3	INTRUDING TAP. HSV. FM THROUGHOUT. LATERAL LINE TWO SERVICES	Cut Service, Lateral Line, CIPP	\$16,280
20966-20969	Gunrock Ave.	6	VCP	360	4131	5200	5241	5	3	20966 BENCH TO BE PARGED. MOST JOINTS LEAKING. 2 PROTUDING SERVICES. FM THROUGHOUT. LATERAL LINE TWO SERVICES	Cut Service, Lateral Line, CIPP	\$30,500
20969-20968	Gunrock Ave.	6	VCP	116	0	0	0	0	0	NO DEFECTS.	Monitor	\$0
20982-20985	Summit Ave.	6	VCP	296	2200	4124	4126	4	2	FRACTURES MOST LENGTH. HOLES. DAE.	CIPP	\$17,766
20984-20987	Summit Ave.	6	VCP	188	0	4122	4122	4	1	20984 REBUILD BENCH. DAE. HEAVY ROOTS. MSA DUE TO ROOTS	Root Treatment, CIPP	\$13,182
20985-20984	Summit Ave.	6	VCP	70	1100	2112	2113	2	1	RFJ. CRACKS	Root Treatment, CIPP	\$4,927
20987-20988	Summit Ave.	6	VCP	138	2100	2111	2211	2	1	FL. IS THROUGHOUT.	Root Treatment, CIPP	\$9,665
20988-20986	Summit Ave.	6	VCP	141	3100	5141	5141	5	2	FRACTURES THROUGHOUT. RMJ THROUGHOUT	Root Treatment, CIPP	\$9,849
Total Construction Cost:												\$543,141



3. MH Inspection Review and Condition Assessment

In order to address the known I/I considerations that are located in the Gunrock area, Woodard & Curran also inspected all of the manholes in the project area, 40 manholes, via NASSCO MACP (Manhole Assessment Certification Program) Level 1 protocol. The purpose of the NASSCO Level 1 inspection is to complete a basic inventory of manhole parts and condition. The inspection is a surface inspection and does not require confined space entry. During the inspection, photos of the manhole frame and cover as well as the inside of the manhole were taken. Utilizing W&C staff to complete the manhole inspection and reviewing the photos taken, a set of rehabilitation recommendations were compiled with the aim of addressing significant structural concerns and infiltration and inflow. One concern for the Town is surface inflow (entering through the pick holes of manhole covers) during storm surge events in low lying areas and therefore the manholes were inspected for evidence of inflow staining.

In general, the Town's manholes in this area are composed of either brick or precast concrete and in good condition. The manholes in the Gunrock area are in much better condition than the sewer pipes and only minimal rehabilitation is being recommended in this memo – much of the recommendations aim at replacing frames and covers to eliminate surface inflow or parging missing mortar in the manhole chimney and walls. The following table summarizes the defects found during the Spring 2017 manhole inspection program.

Defect	Count
Rim Inflow Probable	11
Damaged Frame and Cover	6
Chimney Defective	11
Wall Defective	13
Bench/Channel Defective	5
Debris	2

Surface inspection of manholes in the Gunrock area revealed that almost all manholes (except the manhole upstream of PS 1) are structurally stable. No significant defects were recorded. Approximately 10,000 gallons per day of infiltration was estimated to be contributed from MH defects. Many of the manholes have covers with two pick holes that allow surface water inflow to enter the collection system. Thirteen manholes show defective walls that have light to moderate infiltration. Four of the manholes have defective bench or channels which may lead to increased maintenance and/or infiltration. Photos below show examples of common defects found during the Spring 2017 inspection program, specific defects are highlighted using red circles.

It should be noted that manhole inflow dishes were considered for this analysis, however were not recommended. Many of the manhole frames would not accept inflow dishes due to the lack of a bottom lip and therefore the inflow dishes would have to sit on the top lip of the frame. In W&C's experience, this causes the manhole rim to not sit flush with the existing pavement and therefore is not a suitable rehabilitation method. Hence, replacement of manhole frames and/or covers was selected as the



appropriate rehabilitation method and although this may require light excavation it serves as a better long-term solution.

MANHOLE RIM WITH PICKHOLES LEADING TO SURFACE INFLOW



MH 20970 (Approximately #134 Atlantic Ave.)

DAMAGED FRAME AND COVER



MH 30006 (Intersection of Atlantic Ave and Montana Ave.)

DEFECTIVE CHIMNEY



MH 20976 (Approximately #76 Atlantic Ave.)



MH20962 (US OF PS 1) WITH AGGREGATE SHOWING



MH 20962 (Intersection of Atlantic Ave and Montana Ave.)

WALL DEFECTIVE (LIGHT INFILTRATION)



MH 20967 (Intersection of Atlantic Ave and Gunrock Ave.)

MH WALL DEFECTIVE (LIGHT INFILTRATION, ROOTS)



MH 30008 (Approximately #38 Atlantic Ave.)



MH WITH DEFECTIVE BENCH & DEBRIS



MH 20957 (Intersection of Atlantic Ave and Stony Beach Rd.)

As evidence of the photos above, many of the manhole defects were not significant, do not require immediate attention, but may be more cost-effective to rehabilitate while performing sewer pipe rehabilitation as well.

To determine rehabilitation costs for manholes in the Gunrock Area, unit costs were developed for recent and similar construction projects in Massachusetts. The table below summarizes the unit costs for each of the recommended rehabilitation methods. These costs include estimated installation costs.

Item	Unit	Cost per unit
Clean	EA	\$500
New Watertight Cover	EA	\$600
New Watertight Frame and Cover	EA	\$750
Rebuild Bench & Channel	EA	\$2,000
Chemical Root Treatment	EA	\$2,000
Cementitious Liner	VF	\$150
Epoxy Liner	VF	\$450
Remove & Replace	EA	\$12,000

The table below summarizes general inventory of MH parts, defects located, recommended rehabilitation and estimated costs.



GIS ID	Location	Depth (ft)	Material	LOF	Observed Infiltration (gpm)	Comments	Recommended Rehabilitation	Cost
20962	Atlantic Avenue	9.8	Precast Concrete	4	1.00	PS1 manhole. Agg showing. Inflow cover inserted. Manhole some infiltration. Recommend epoxy line.	Rebuild Bench & Channel, Epoxy Liner	\$6,500
20963	Atlantic Avenue	9.6	Brick	4	0.75	Upstream of PS1 MH. Rim inflow. Some mortar missing	Rebuild Bench & Channel, Epoxy Liner	\$6,500
20967	Atlantic Avenue	6.6	Brick	3	0.50	Missing mortar in chimney. Rim inflow. Infiltration at wall/bench.	Cementitious Liner	\$1,050
20972	Atlantic Avenue	9.8	Brick	3	0.75	Rim inflow. Wall and pipe connections leaking.	New Watertight Cover, Cementitious Liner	\$2,100
20976	Atlantic Avenue	5.6	Brick	3		Missing motor thru out chimney. Pick holes will cause inflow. Recommend new frame and cover.	New Watertight Cover	\$600
20979	Atlantic Avenue	5.6	Brick	3		Missing mortar at chimney. Connection from 20980	New Watertight Cover	\$600
20986	Atlantic Avenue	3.6	Brick	3	0.25	Very shallow manhole. Some roots entering at wall/bench connection.	Chemical Root Treatment, Cementitious Liner	\$2,600
20987	Summit Avenue	4.3	Brick	3	0.25	Some missing mortar in chimney. Some debris. Light Infiltration	Cementitious Liner	\$750
20985	Summit Avenue	4.10	Brick	3	0.25	Some debris in manhole. Light infiltration at MH walls.	Cementitious Liner	\$750
20950	Atlantic Avenue	5.2	Brick	3		MH Insert failed. Good Condition.	New Watertight Cover	\$600
30008	Easement Off Atlantic Avenue	3.8	Brick	3	0.50	Roots at walls and infiltration at walls and bench.	New Watertight Cover, Chemical Root Treatment, Cementitious Liner	\$3,200
20988	Summit Avenue	4.7	Brick	2		Some missing mortar in chimney. Some debris. No major defects.	Continue to Monitor	\$0
20968	Atlantic Avenue	5.8	Brick	2		Manhole in good condition. Rim inflow possible.	Continue to Monitor	\$0
20969	Gun Rock Avenue	5.0	Concrete Block	2		Appears to be in good condition.	Continue to Monitor	\$0
20966	Gun Rock Avenue	5.8	Brick	2		Manhole in good condition.	Continue to Monitor	\$0
20964	Gun Rock Avenue	4.2	Brick	2		Some missing mortar in chimney.	Continue to Monitor	\$0
20961	Gun Rock Avenue	8.2	Clay Tile	2	0.50	Rim Inflow. Frame inflow. Replace the frame infiltration coming through bottom of frame. Source of water could be nearby water gate valves.	New Frame & Cover	\$750
20960	Damon Park Road	7.8	Precast Concrete	2		Rim inflow possible. Good manhole no infiltration	Continue to Monitor	\$0
20970	Atlantic Avenue	6.7	Brick	2		Rim inflow. No infiltration	New Watertight Cover	\$600
20971	Atlantic Avenue	8.4	Brick	2	0.75	Rim inflow. Infiltration at pipe connections and wall/bench.	New Watertight Cover, Cementitious Liner	\$1,950
20973	Atlantic Avenue	9.9	Brick	2	0.50	Pickholes inflow. Light Infiltration at MH walls.	New Watertight Cover, Cementitious Liner	\$2,100
20974	Atlantic Avenue	5.7	Brick	2		Frame and cover inflow due to pick holes	New Watertight Cover	\$600
20983	Atlantic Avenue	8.0	Unknown	2	0.50	Located in the woods, buried under brush. Assume that manhole has roots and infiltration as well as surface inflow.	Chemical Root Treatment	\$2,000



GIS ID	Location	Depth (ft)	Material	LOF	Observed Infiltration (gpm)	Comments	Recommended Rehabilitation	Cost
20984	Summit Avenue	3.10	Brick	2	0.25	Some debris in manhole. Light infiltration at MH walls.	Clean, Cementitious Liner	\$1,100
20965	Atlantic Avenue	7.7	Brick	2	0.25	Rim inflow. Light infiltration at wall.	Cementitious Liner	\$1,200
20959	Atlantic Avenue	8.3	Brick	2		Rim inflow possible. Good condition no infiltration	Continue to Monitor	\$0
20958	Atlantic Avenue	8.5	Brick	2		Good manhole no infiltration. Rim inflow possible.	Continue to Monitor	\$0
20957	Atlantic Avenue	8.2	Brick	2		Remove cover on manhole bench. Rebuild bench for connection.	Clean, New Frame & Cover, Rebuild Bench & Channel	\$3,250
20955	Stony Beach Road	6.6	Precast Concrete	2		Rim Inflow. Chimney missing mortar. Good condition.	Continue to Monitor	\$0
20956	Atlantic Avenue	3.6	Concrete Block	2		Damaged rim and grease buildup in channel. New rim needed. Corroded.	New Frame & Cover	\$750
20953	Atlantic Avenue	8.6	Brick	2	0.25	Manhole insert is fine, no bar. Some infiltration at the MH wall and bench.	New Watertight Cover, Cementitious Liner	\$1,950
20980	Summit Avenue	4.5	Precast Concrete	2		Some missing mortar in chimney.	New Watertight Cover	\$600
20977	Summit Avenue	6.0	Precast Concrete	2		Good condition some debris build up. No rehab. Low pressure sewer discharge needs a channel built.	Rebuild Bench & Channel, Continue to Monitor	\$2,000
20978	Summit Avenue	1.9	Precast Concrete	2		Deep manhole in good condition. No recommended rehab	Continue to Monitor	\$0
20975	Summit Avenue	2.4	Concrete Block	2		Shallow manhole. Good condition. No rehab.	Continue to Monitor	\$0
20982	Summit Avenue	3.10	Brick	2		Missing mortar in brick channel. Some debris on bench.	Rebuild Bench & Channel	\$2,000
20981	Reef Point	6.3	Precast Concrete	2		Some missing mortar in chimney. Good condition.	Continue to Monitor	\$0
20954	Stony Beach Road	5.6	Concrete Block	2		Manhole in good condition. Rim inflow possible	Continue to Monitor	\$0
30006	Atlantic Avenue	9.5	Precast Concrete	2		New construction good no issues rim inflow possible.	New Frame & Cover	\$750
30007	Atlantic Avenue	2.2	Brick	2		Needs new frame. Very shallow. Good condition otherwise.	New Frame & Cover	\$750
Total Construction Cost:								\$47,600



4. Summary of Recommendations and Next Steps

The recommendations above are aimed at reducing the Town's risk of sewer failure in the Gunrock Area by eliminating significant structural defects and reducing infiltration and inflow. This will lead to reduction of emergency repair costs and costs associated with treatment and transport of extraneous wastewater flows. Please find Figure 1 attached to this memorandum which shows assets selected for rehabilitation in the Gunrock Area.

The recommendations above should be considered as preliminary design and more detailed design will be necessary for proper bidding and construction. The table below is a summary of the rehabilitation costs outlined in this memorandum with contingency, construction, engineering design, permitting, and construction administration.

Item	Unit	Quantity	Estimated Cost
Gravity Sewer Rehabilitation	LF	6,115	\$500,000
Sewer Manhole Rehabilitation	EA	27	\$50,000
Subtotal			\$550,000
Contingency (30%)			\$170,000
Total Construction Cost			\$720,000
Engineering Design, Permitting, and Construction Administration (25%)			\$180,000
Total			\$900,000

It is likely that the Town may want to consider using the State's Clean Water State Revolving Fund (CWSRF) as funding source for this project. The CWSRF has a set of deadlines the Town must meet to be eligible for the funding with the goal of bidding the project in the Spring of 2019. The necessary steps and associated deadlines are as follows:

Item	Anticipated Date
Complete Project Evaluation Form	8/11/2017
Intended Use Plan Released	1/1/2018
Spring Town Meeting Approval	6/30/2018
Final Design to MassDEP	10/15/2018
Bidding & Award	1/1/2019
Start of Construction	4/1/2019
End of Construction	8/1/2019