Using SL-RAT to Reduce SSOs

Daniel R. Murphy, P.E.
Lindsey L. Donbavand

November 17, 2016

CDM Smith

Presentation Outline

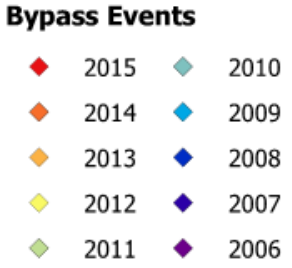
- Background
- Overview of Acoustic Inspection
- Approach
- Results
- Conclusion

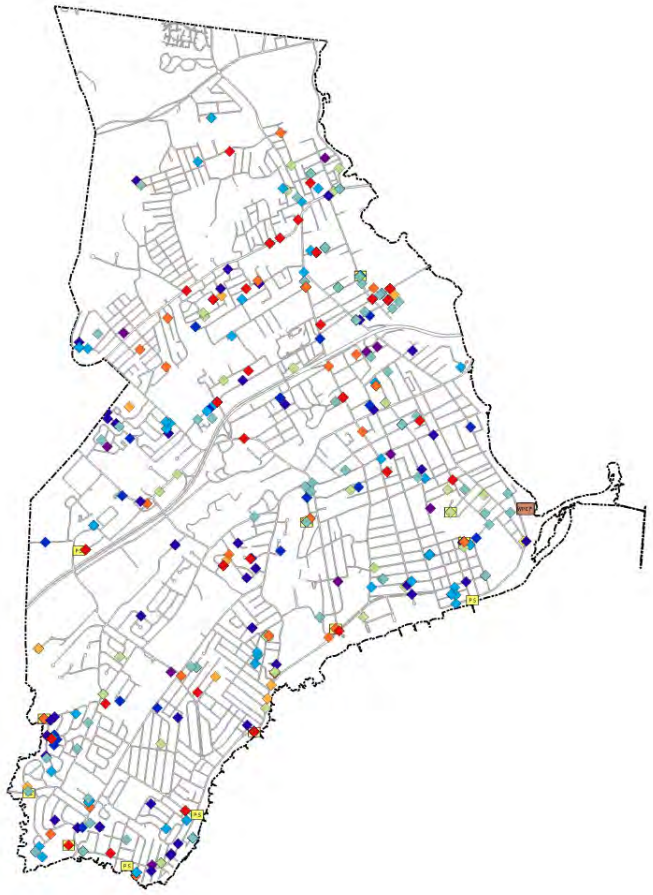
Background

- Sanitary (separated) sewer system
- 145 miles of gravity sewer pipe
- 13 pumping stations
- Dry weather overflows
- Limited cleaning and CCTV resources

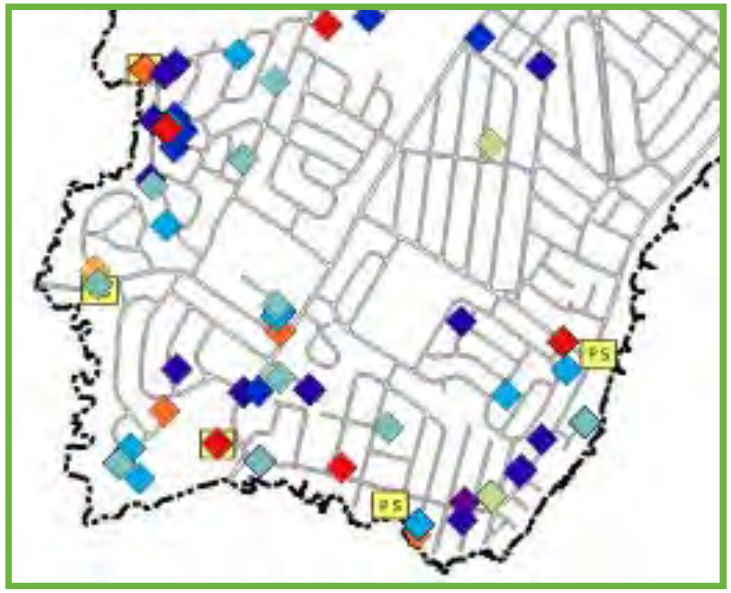
Overflows – A Symptom of the Problem

- Problem dispersed throughout the City





Overflows – A Symptom of the Problem



- Majority of overflows caused by blockages
- >80% of overflows during dry weather
- Majority of pipes less than 12” diameter
- A need to prioritize cleaning resources

Previous Identification Methods

SSO Call-ins

CCTV Inspections

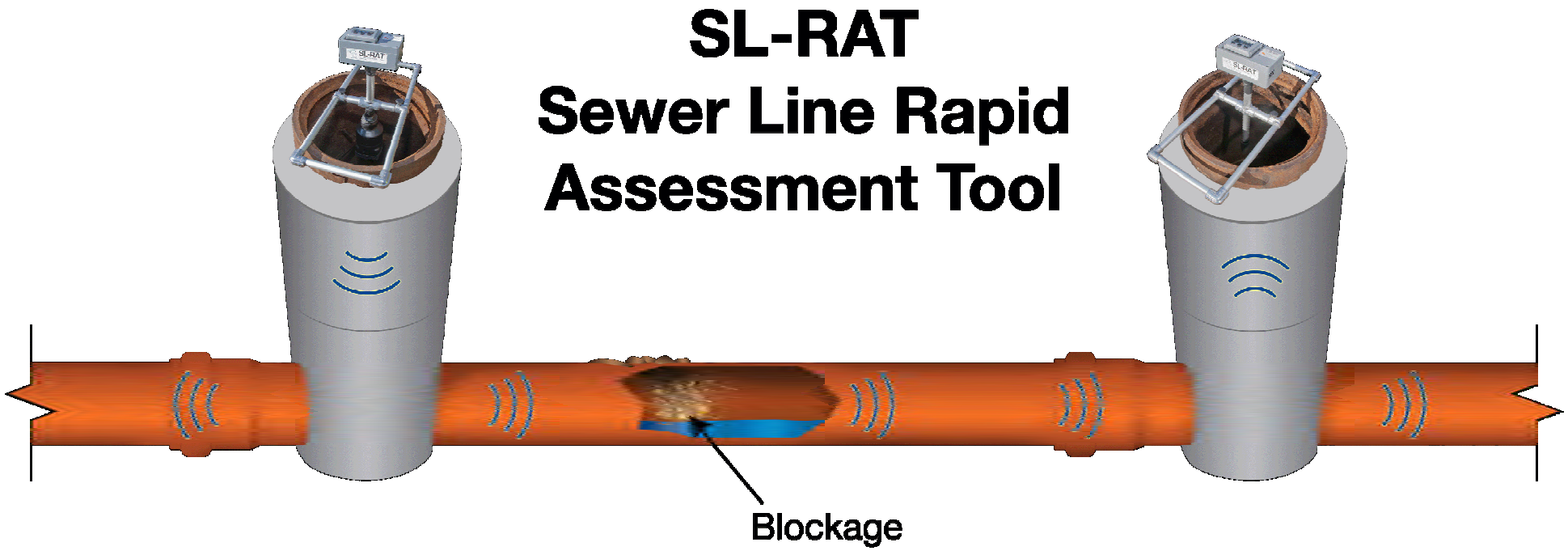
Manhole Inspections

Acoustic Inspections

What is SL-RAT?

- SL-RAT = Sewer Line Rapid Assessment Tool
- Used on gravity sewers
- Effective on pipes 6 to 12-inch in diameter
- Identifies obstructed pipes
- **Rapid assessment helps focus cleaning resources**

How Does it Work?

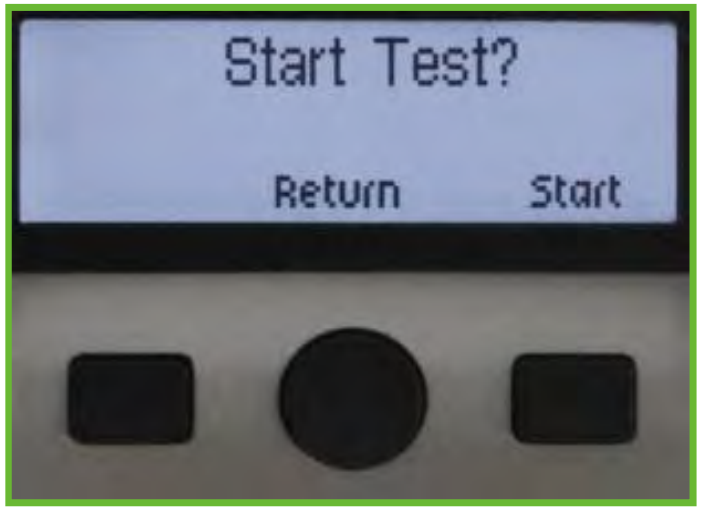


Performing Inspections

- Place RX and TX units over a manhole

Performing Inspections

- Prepare units for pipe inspection

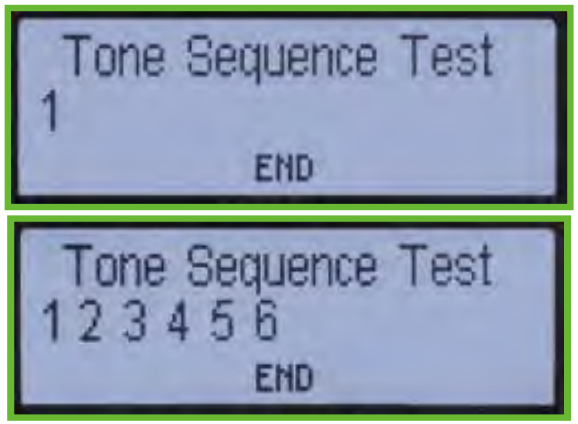


Transmitter (TX)

Receiver (RX)

Performing Inspections

- Run test (1.5 to 3 minutes)

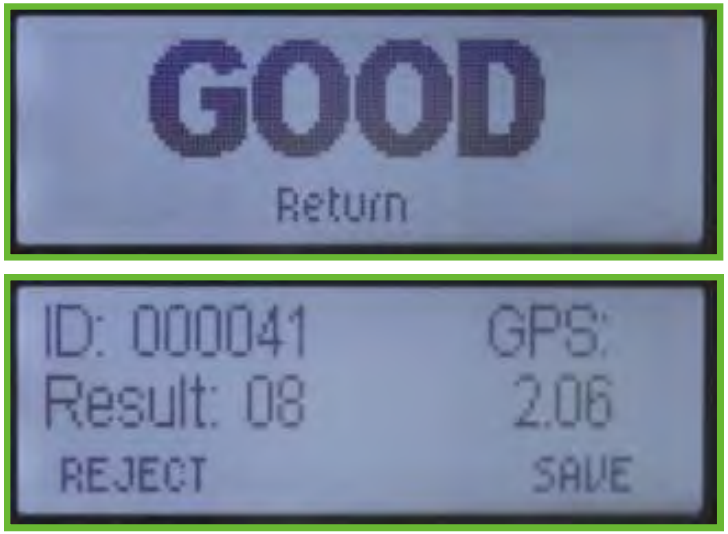


Transmitter (TX)

Receiver (RX)

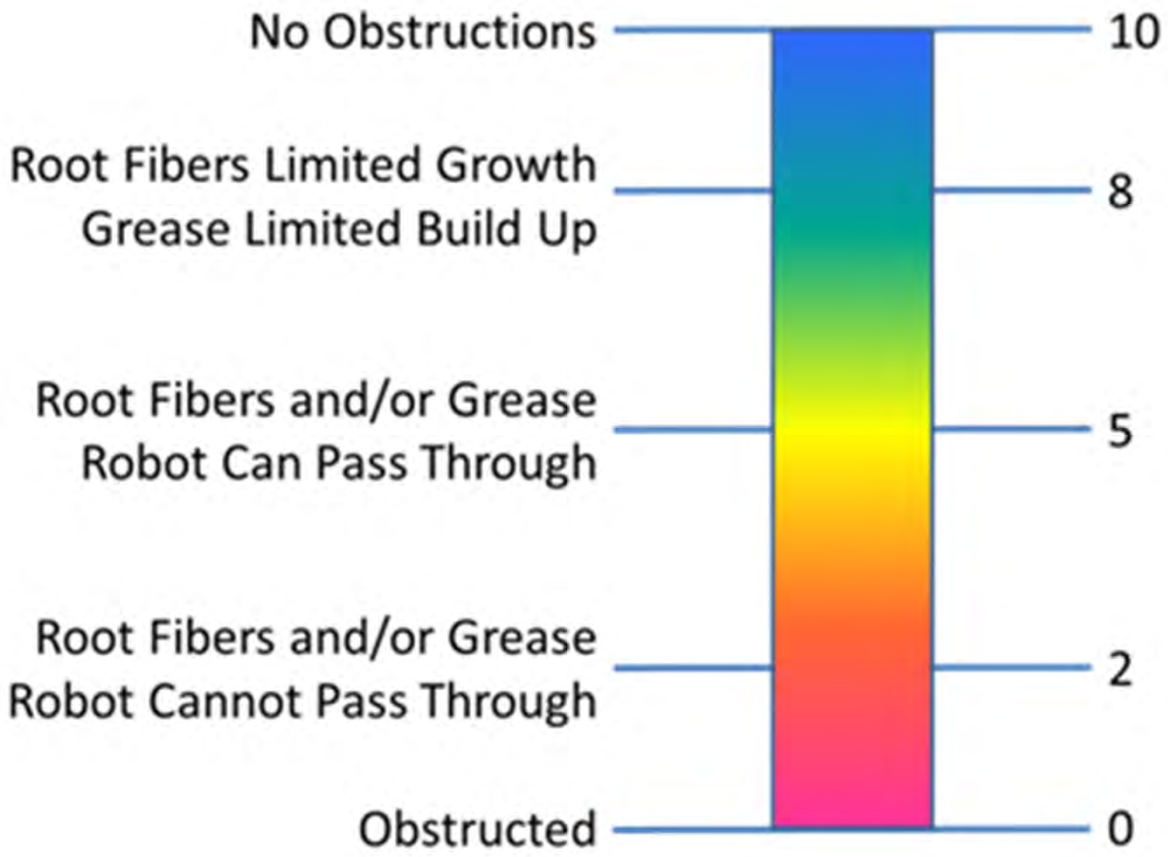
Performing Inspections

- Record Results



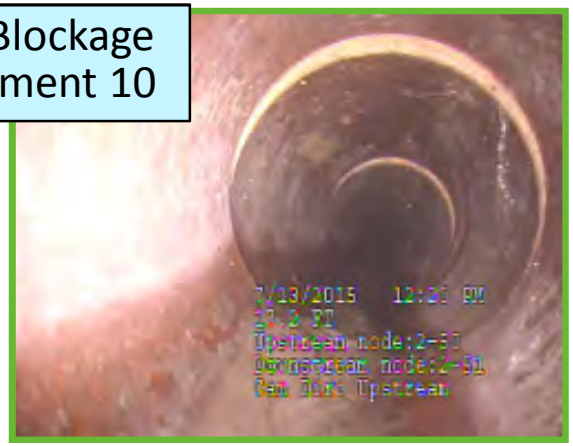
Receiver (RX)

Rating System

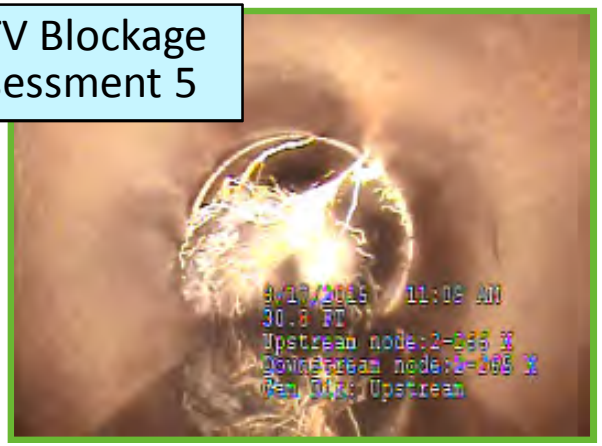


Rating System

CCTV Blockage Assessment 10



CCTV Blockage Assessment 5



CCTV Blockage Assessment 7

CCTV Blockage Assessment 2

Downloading Data

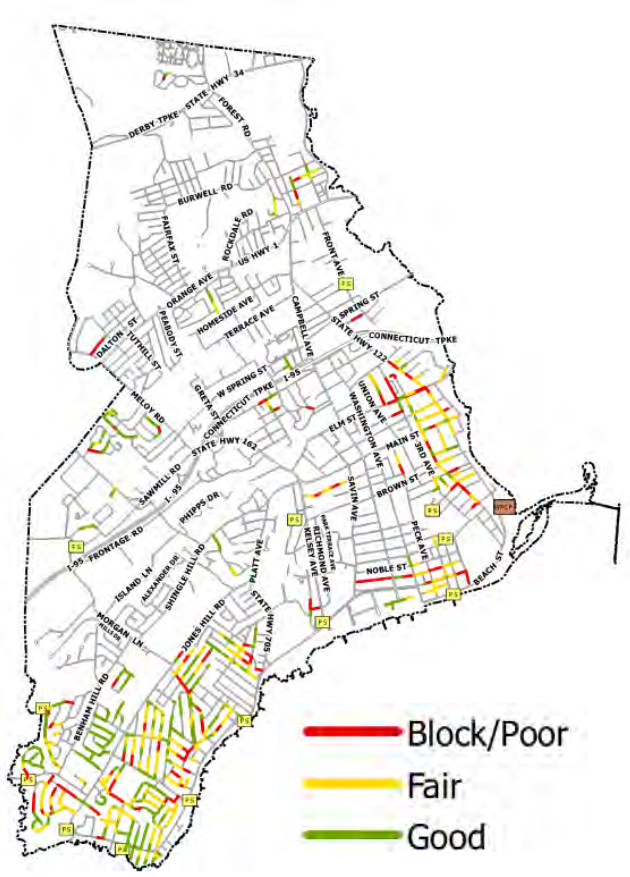
- Connect SL-RAT to a PC using the USB connection
- Outputs CSV file

Key Features of SL-RAT

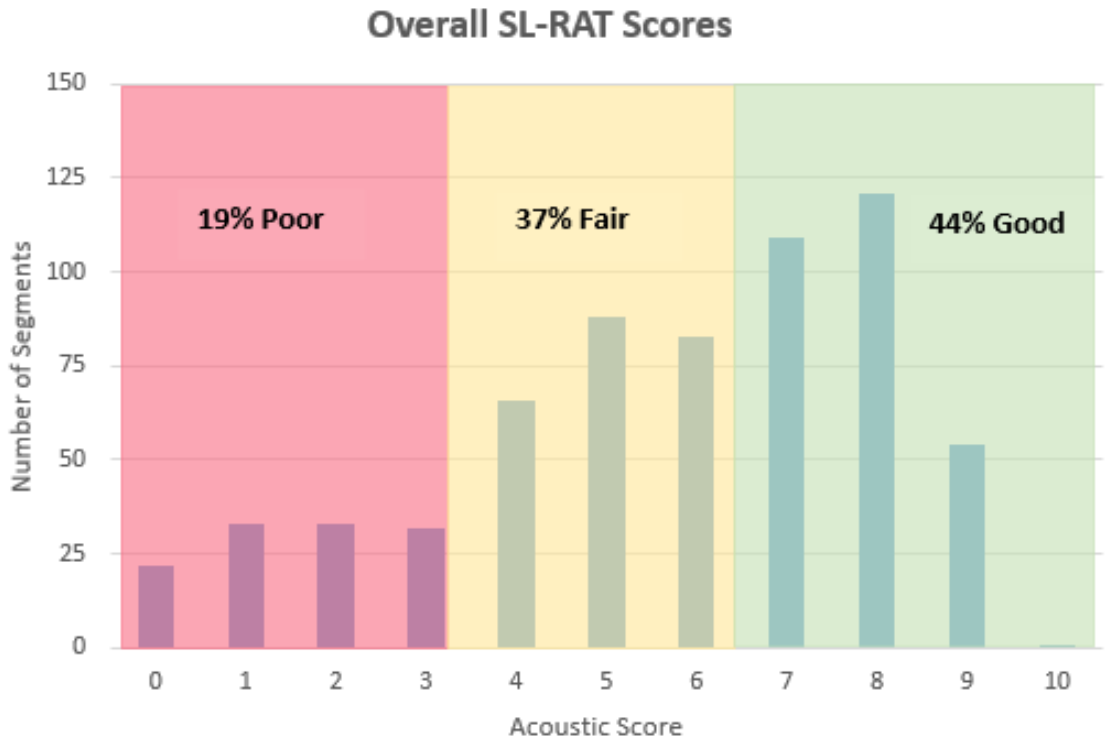
- No flow contact
- No confined space entry
- Simple to use
- Low Cost
- Rapid results – under 5 minutes per segment
- Portable <30lbs.
- GPS-enabled
- Archives data

Proactive Approach

- Mapped ten years of SSO data
- SL-RAT inspect near previous SSOs
- Prioritize City's cleaning efforts
- Deployed crew to lowest scoring areas



Histogram of Overall Acoustic Scores



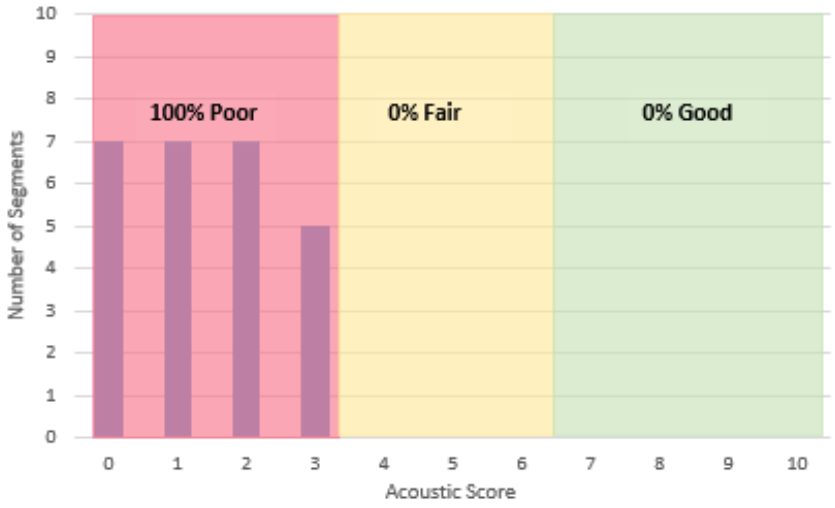
Pilot Study and Results

- Reviewed pipe segments with poor ratings (0-3)
- Chose 26 segments to clean and CCTV inspect
- SL-RAT inspected as a follow-up

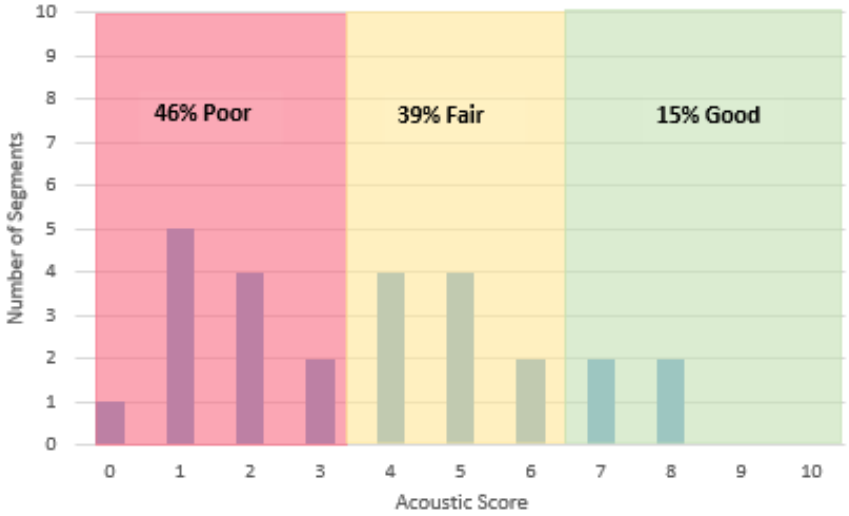
Upstream MH	Downstream MH	Score Prior to Cleaning	Score After Cleaning
11-108	11-110	0	0
5-120	5-118	0	3
11-154	11-161	0	4
2-318	2-319	0	4
11-156	11-155	0	5
2-299	2-300	0	5
9-64	9-44	0	7
10-203	11-50	1	1
2-233	2-234	1	1
4-223	2-242	1	1
11-106	11-107	1	2
4-247	4-246	1	6
9-14	9-15	1	8
9-15	9-16	1	8
9-84	9-85	2	1
11-107	11-108	2	2
7-203	7-204	2	2
11-46	11-11	2	3
2-300	2-293	2	4
2-336	2-337	2	5
2-265	2-266	2	6
3-37	3-36	3	1
7-206	7-207	3	2
7-31	7-30	3	4
2-324	2-343	3	5
5-111	5-110	3	7

Pilot Study Histogram of Acoustic Scores

Prior to Cleaning



After Cleaning



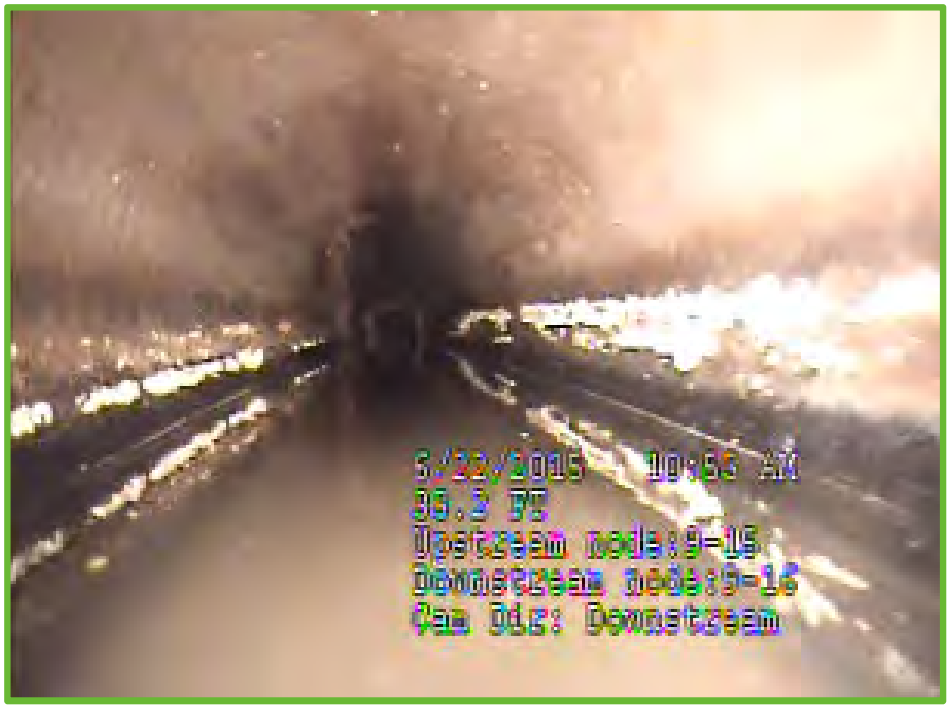
Pilot Study and Results

- CCTV inspections used to visualize the score
- Five pipe segments chosen as examples

Upstream MH	Downstream MH	Score Prior to Cleaning	Score After Cleaning
11-108	11-110	0	0
5-120	5-118	0	3
11-154	11-161	0	4
2-318	2-319	0	4
11-156	11-155	0	5
2-299	2-300	0	5
9-64	9-44	0	7
10-203	11-50	1	1
2-233	2-234	1	1
4-223	2-242	1	1
11-106	11-107	1	2
4-247	4-246	1	6
9-14	9-15	1	8
9-15	9-16	1	8
9-84	9-85	2	1
11-107	11-108	2	2
7-203	7-204	2	2
11-46	11-11	2	3
2-300	2-293	2	4
2-336	2-337	2	5
2-265	2-266	2	6
3-37	3-36	3	1
7-206	7-207	3	2
7-31	7-30	3	4
2-324	2-343	3	5
5-111	5-110	3	7

Previous Grease Buildup

- MH 9-15 to MH 9-16
- Pre-cleaning score = 1
- Post-cleaning score = 8
- Grease buildup removed

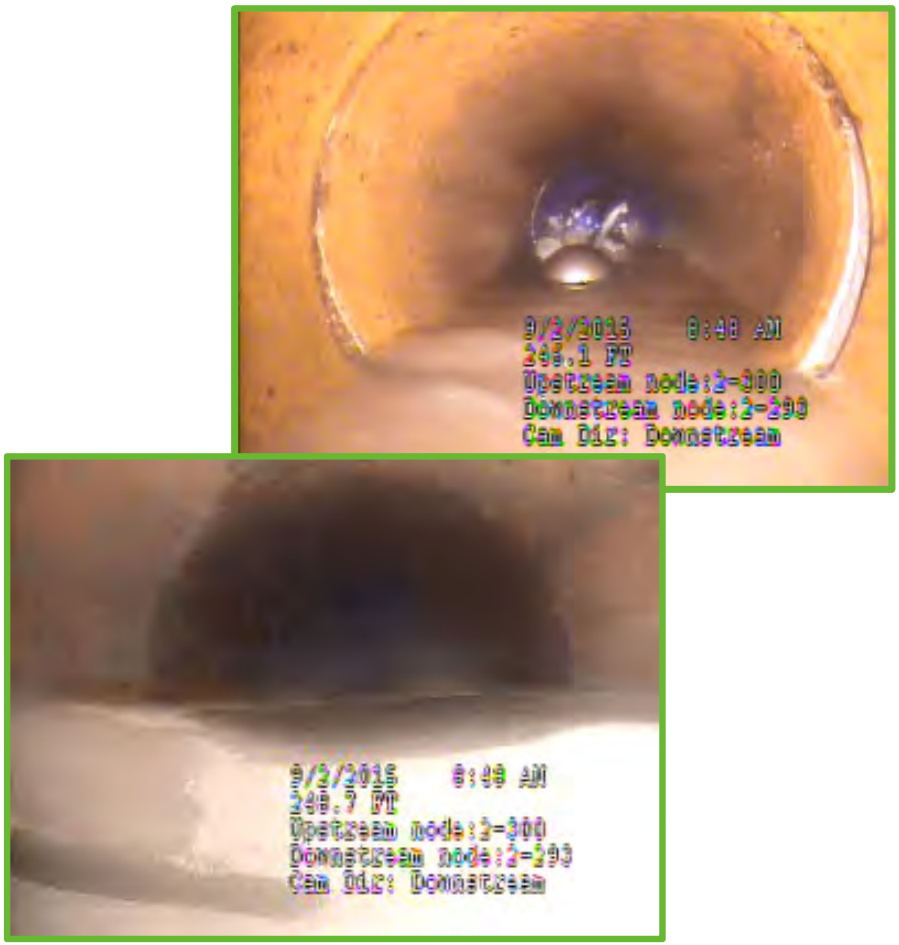


Partially Removed Grease Buildup

- MH 11-154 to MH 11-161
- Pre-cleaning score = 0
- Post-cleaning score = 4
- Grease buildup – Score improved but buildup still exists

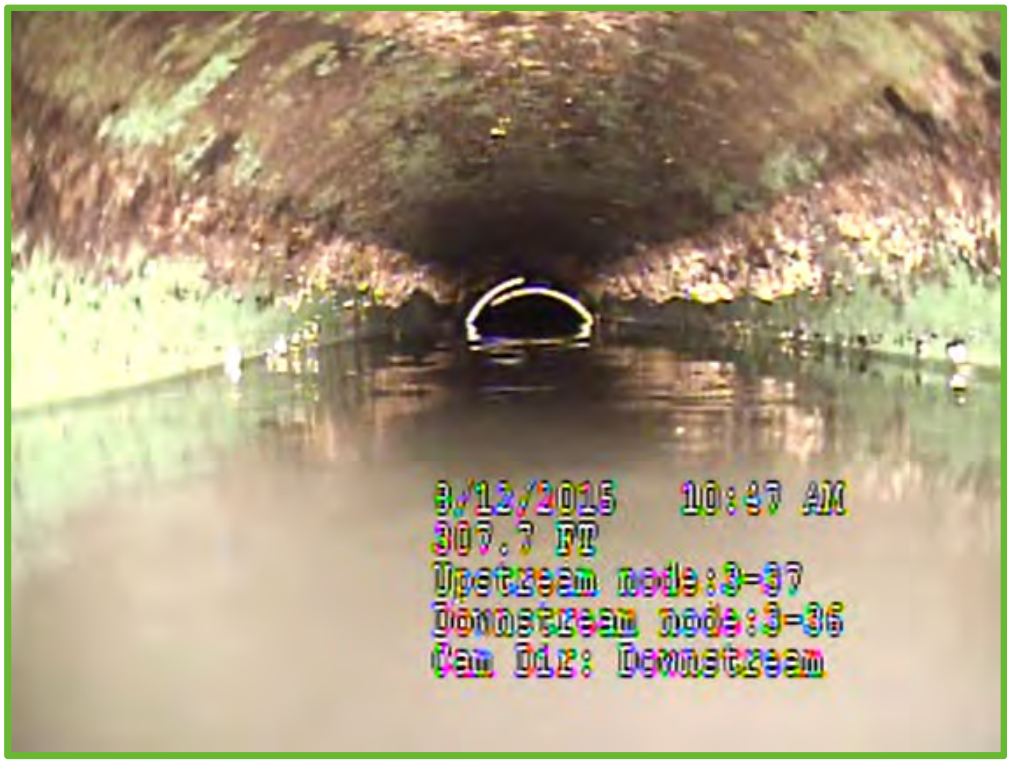
Sag in pipe

- MH 2-300 to MH 2-293
- Pre-cleaning score = 2
- Post-cleaning score = 4
- Sag – Score will not improve until pipe fixed



Collapsing Pipe and Sag

- MH 3-37 to MH 3-36
- Pre-cleaning score = 3
- Post-cleaning score = 1
- Pipe collapsing and sag – condition deteriorating



Pipe Section Missing

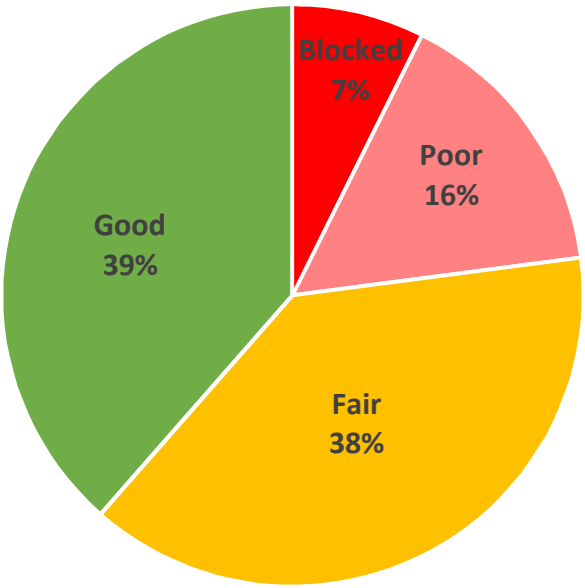
- MH 11-107 to MH 11-108
- Pre-cleaning score = 2
- Post-cleaning score = 2
- Pipe section missing

Prioritizing Cleaning Efforts

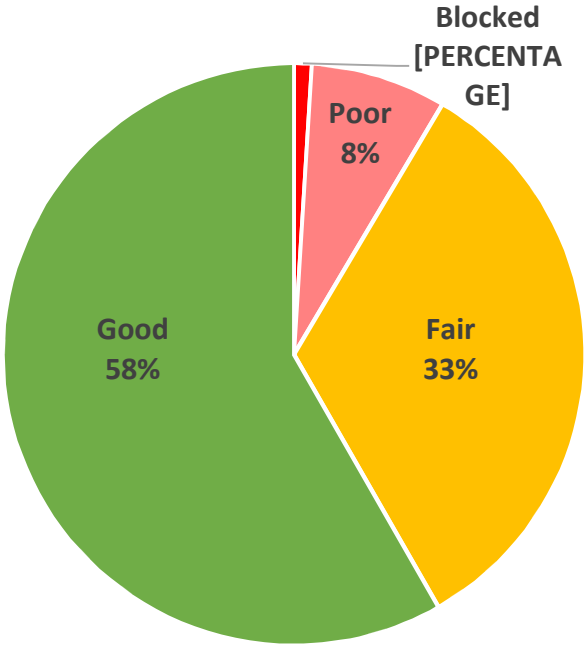
- Two other communities with frequent cleaning lists
  - Segments are historically cleaned every 1, 2, or 6 months
  - SL-RAT inspected before cleaning
  - Results determine cleaning reoccurrence needed

Prioritizing Cleaning Efforts

Results of frequent cleaning lists for two other communities



Community 1



Community 2

Conclusion

- Acoustic inspection does not replace cleaning and detailed inspection
- Focus on cleaning the lowest rated pipes
- Quickly assess large areas of collection system
  - Quick
  - Easy
  - Cost-Effective

Questions and Answers