Appendix B

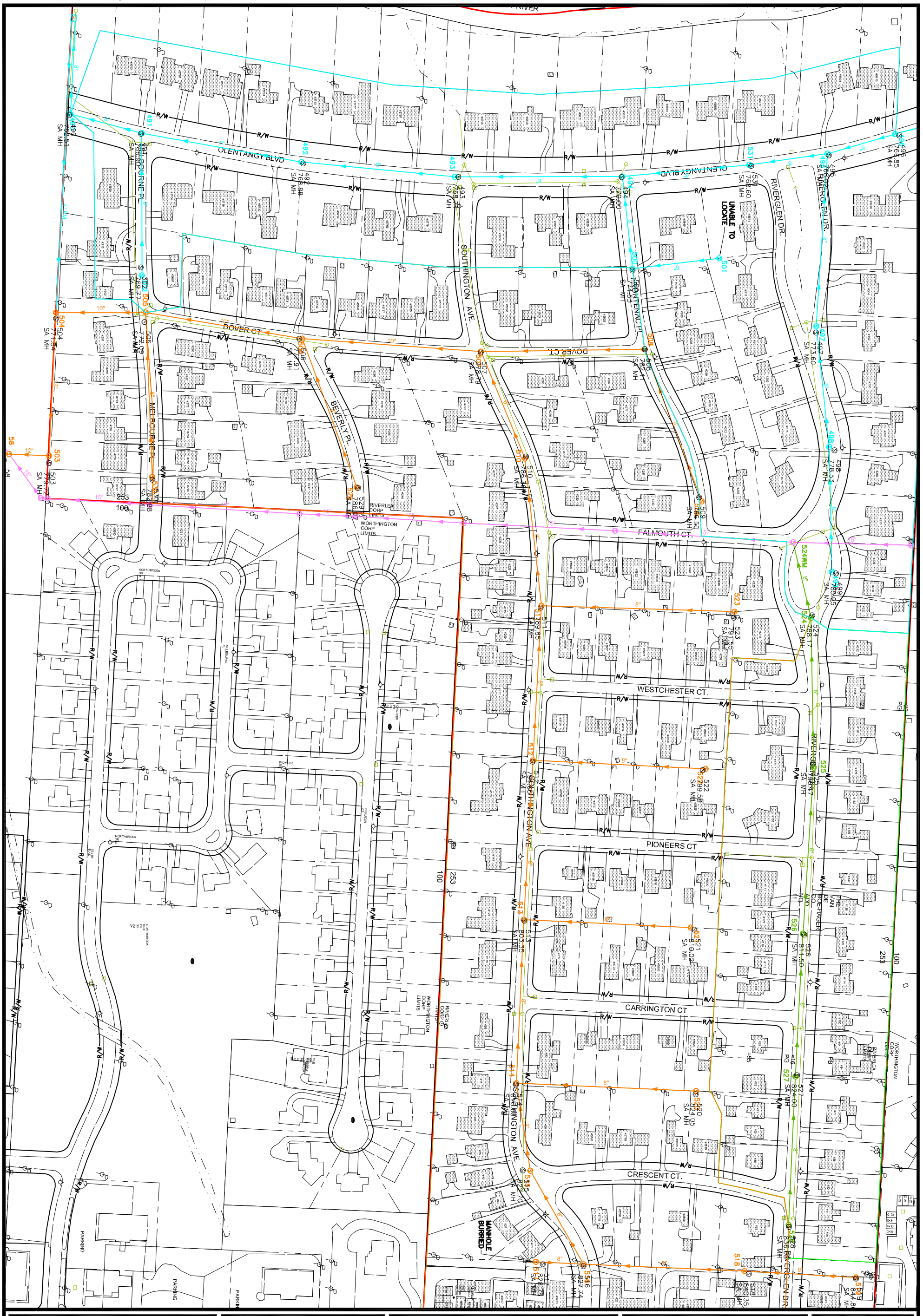
Project Objective

The Village of Riverlea has completed internal inspection of the sanitary sewer system and visual inspection (non-entry) of the sanitary manholes in accordance with Year 2 of the Ohio Environmental Protection Agency (OEPA)-approved Sanitary Sewer Evaluation Study (SSES) Schedule for the Village of Riverlea dated August 2009. The findings of this investigation will be incorporated into the final SSES report scheduled for submission to OEPA in 2013. The project limits are defined as all existing sanitary sewers and manholes within the Corporation limits of the Village except for the City of Worthington sewer that extends south from Falmouth Court to the Southeast corner of the Village, and the 4" force main located at the southwestern edge of the Village. The collection system is comprised of approximately 13,300 linear feet (lf) of sanitary sewer ranging in size from 4" to 12" and 43 sanitary manholes, a majority of which are located in residential streets. Refer to Exhibit A for an overall site map. The evaluation of the Village's sanitary collection system is being conducted to determine if there are any extraneous sources of water entering the collection system (Inflow and Infiltration [I/I]) as well as to determine the overall condition of the pipe. In 2011 flow metering will be conducted in accordance with the approved SSES schedule to establish base and peak flows for comparison with industry accepted values to determine if the collection system is experiencing high I/I. Smoke and dye testing is scheduled for 2012 to further identify and isolate sources of I/I. Necessary system improvements will then be determined based on the results of the field testing for reduction of overall I/I and to facilitate the efficient operation of the sanitary collection system.

Manhole Inspection

Investigations of the manholes within the sanitary collection system consisted of a two-man Burgess & Niple, Inc. (B&N) crew performing ground level inspections of the manholes. The observations and measurements of the manholes were recorded on inspection sheets that list invert depths and material of all incoming and outgoing pipes, wall material and condition, lid and frame measurements, and general observations. Special note was given to infiltration through the manhole wall, root intrusion, mineral deposits, and manhole deterioration. These inspections are included with this report in Appendix A.

The manhole inspections took place on May 18, 2010 and May 25, 2010, during which 35 of the 43 manholes could be inspected. The 8 remaining manholes were buried between 1" and 1' deep, requiring excavation in backyards to allow inspection. After homeowners were contacted by the Village, the B&N crew returned on June 14, 2010 to finish inspection of the 8 remaining manholes, two of which (manholes 501 and 517) could still not be inspected from ground level. Manhole 501 could not be located with a probe and metal detector and manhole 517 had a fence constructed over the lid that prevented access. These manholes were televised from below during the internal inspection of the sanitary line, attaining an adequate level of inspection necessary for determining the overall condition of the manhole.



JOB NO:	PR49001	
DATE:	October 2010	
DESIGNED BY:	JDF	
DRAWN BY:	JDF	
CHECKED BY:	JWS	
APPROVED BY:	JED	
SCALE:	As Shown	
SHEET:	OF	

0 100' 200'

Exhibit A
Site Map

NO.	DESCRIPTION	DATE
REVISIONS		

Village of Riverlea, Ohio
Sanitary Sewer Evaluation Study

BURGESS & NIPLE
5085 REED ROAD
COLUMBUS, OHIO 43220

N

The backyard manholes currently have a typical frame and lid that could be removed with relative ease creating possible operational issues and safety risks. The Village has expressed interest in making the backyard manholes more secure if they are to be raised to the surface. Therefore, it is recommended that the manholes within backyard easements be raised to grade, where applicable, and have the typical frame/lid replaced with a bolt down frame/lid. See the Manhole Summary Table on page 5 for these manholes.

All of the inspected manholes within the village appeared to be in good structural condition with no fracturing/cracking of manhole walls, no missing brick, and no significant mortar deterioration. However, seven of the manholes had signs of I/I near the bottom ranging from mineral deposits to groundwater flowing through the wall of the manhole. See images below:

Manhole 510 – I/I at bottom of manhole with mineral deposits on north bench

Manhole 513 - I/I at bottom of manhole with mineral deposits on the bench

Manhole 517 – Slight I/I through walls at bottom of manhole

MH 520 – I/I through walls towards bottom of manhole with mineral deposits

MH 521 – I/I through walls towards bottom of manhole with mineral deposits

MH 522 – I/I through walls towards bottom of manhole with mineral deposits

MH 527 – I/I through walls towards bottom of manhole with mineral deposits

Manhole Summary Table										
Manhole Number	MH Material	Manhole Rim to Invert (ft)	Existing Lid Diameter (in)	Existing Frame Height (in)	Chimney Length (in)	Depth to MH Lid	Replace Frame and Lid / Adjust to Grade	Replace Frame and Lid	Rehabilitate Manhole	Notes
58	Brick	5.31	22	10	0	At Grade				2" - 3" of grit in the Worthington Main
302	Brick	7.38	22	10	0	At Grade				--
490	Brick	6.70	22	7	0	1" Below Grade	X			--
491	Brick	10.28	22	6	0	At Grade				--
492	Brick	11.28	22	10	0	At Grade				--
493	Brick	10.10	22	7	0	At Grade				--
494	Brick	10.00	22	6	0	At Grade				--
495	Brick	6.88	22	6	0	At Grade				Solids settled in north incoming
496	Brick	5.22	22	6	6	At Grade				--
497	Brick	8.39	22	6	0	At Grade				--
498	Brick	8.12	22	6	10	At Grade				--
499	Brick	9.74	22	6.5	19.5	At Grade				--
500	Brick	8.61	22	10	10	At Grade				--
501	Brick	--	--	--	--	Buried	X			Unable to locate, Mh does not appear to have I/I issue
503	Brick	16.02	21.5	6.5	0	4" Below Grade	X			--
504	Brick	7.50	21.5	6	19	At Grade		X		--
505	Brick	6.90	22	6	0	At Grade				Solids settled in all inverts
506	Brick	11.13	22	6	0	At Grade				--
507	Brick	10.46	22	6	18	At Grade				--
508	Brick	12.50	22	6	0	At Grade				--
509	Brick	7.62	22	6	0	At Grade				--
510	Brick	9.10	22	6	0	At Grade			X	Light infiltration on north side of MH where bench meets MH wall, mineral deposits on north bench
511	Brick	11.16	22	6	0	At Grade				Solids Settled in east invert
512	Brick	9.94	22	10	4	At Grade			X	Infiltration visible 7.5' from top of MH, mineral deposits on bench
513	Brick	10.00	22	6	16	At Grade			X	I/I through MH walls towards bottom of MH with mineral deposits on bench
514	Brick	12.85	22	6	6	At Grade				--
515	Brick	8.22	22	7	8.5	At Grade				Solids settled in invert
516	Brick	10.50	22	6	0	At Grade				--
517	Brick	--	--	--	--	1' Below Grade	X		X	Unable to excavate MH due to fence, slight infiltration through MH walls at bottom of MH with deposits
518	Brick	10.76	21.5	7	0	1" Below Grade	X			--
519	Brick	11.44	21.5	8.5	0	8.5" Below Grade	X			--
520	Brick	11.96	21.5	6	0	9.5" Below Grade	X		X	Infiltration through MH walls towards bottoom of MH with heavy mineral deposits
521	Brick	11.54	21.5	8	0	8" Below Grade	X		X	light infiltration through MH walls towards bottom of MH with light mineral deposits
522	Brick	11.17	22	6	0	1" Below Grade	X		X	Infiltration apparent around walls of MH, ground water appears to be coming from laterals
523	Brick	11.27	21.5	7	0	8.5" Below Grade	X			Mineral deposits on MH walls towards bottom of MH
524	Brick	6.00	22	7	0	At Grade				--
525	Brick	5.26	22	6	0	At Grade				--
526	Brick	7.74	22	7	0	At Grade				--
527	Brick	7.80	22	6	0	At Grade			X	Light infiltration w/ mineral deposits through wall of MH
528	Brick	7.36	22	6	0	At Grade				Debris in invert
529	Brick	7.98	22	6	0	At Grade				--
530	Brick	9.68	22	6	0	At Grade				--
531	Brick	7.98	22	6	0	At Grade				--

Pipe Inspection

The Village of Riverlea's sanitary collection system is comprised of approximately 650 lf of 4" ductile iron force main and 12,650 lf of vitrified clay sewer main with a size breakdown as follows:

Vitrified Clay Sewer Size Breakdown	
Size	Footage
8"	11,280 lf
10"	970 lf
12"	420 lf

The internal inspection of the existing sanitary sewer within the Village of Riverlea was completed by Flowline, LLC. in a two-step process that took place from June 1 to June 11, 2010, during which approximately 12,100 lf of sanitary sewer was cleaned and televised. Another 148 lf of 8" pipe from MH 490 to the pump station was inspected on August 16, 2010. There is 420 lf of 12" sewer main outstanding that was not cleaned and inspected due to access issues and is scheduled to be cleaned and inspected at a later date to be determined. The uninspected lines are 330 lf of 12" pipe from MH 504 to MH 503 and 90' of 12" pipe from MH 503 to MH 58, all located along the south corporation line of the Village.

The first step of the inspection process involved running a high pressure water jet head through each section of pipe for a thorough cleaning. The pipe was cleaned prior to inspection to remove any debris that might prohibit the camera from moving through the section of sewer and to facilitate the detection and identification of each defect within the pipe. As each line was satisfactorily cleaned, a remotely operated closed-circuit television (CCTV) camera was passed through the line recording the entire length. The CCTV camera was operated via a manned control station equipped with PipeTech software that was used by the operator to code all of the defects encountered by the camera. A representative from B&N was present during the entire inspection process to facilitate the proper coding of the pipeline, as well as interact with the residents of the village throughout each phase of the project.

PipeTech software is certified by the National Association of Sewer Service Companies (NASSCO), which has established the Pipeline Assessment and Certification Program (PACP), a uniform code for accurately identifying Structural and Operational/Maintenance (O&M) defects within a section of pipe. As mentioned, the NASSCO pipe coding system breaks all defects into Structural Defects and O&M Defects. Structural defects are related to the overall structural integrity of the pipe. The most common structural defects consist of cracks, fractures (cracks that have visible separation), broken pipe (fractured pipe that has become dislodged), and holes. O&M defects are related to the operational efficiency of the pipe. The most common O&M defects are root intrusion, break-in taps, infiltration, and line sags. A majority of the defects experienced by sewer pipes provide a pathway for extraneous sources of water and surrounding soil to migrate into the line.

Each defect is coded on a scale from 1 to 5, where 1 represents the least severity and 5 represents the greatest severity. Each grade is directly related to the potential for future deterioration or failure of the pipeline. Failure of the sewer is generally defined by either a structural collapse, a severe blockage that causes damaging backups, or major points of infiltration resulting in a significant loss of sewer capacity.

Sewer Failure Timeline Table	
Defect Severity	Time to Failure
1	not likely to fail
2	≥ 20 yrs
3	10 yrs - 20 yrs
4	5 yrs - 10 yrs
5	0 yrs - 5 yrs

Once all of the sanitary sewer runs have been coded, PipeTech generates three pipe ratings as described below representing the Structural, O&M, and Overall condition of each pipeline (these ratings can be seen in the Televised Sanitary Sewer Inspection Report prepared by Flowline in Appendix B).

1. *Overall Pipe Rating* is the number of defect occurrences multiplied by the respective pipe grade. For example if a pipe has two Grade 3 defects and four Grade 4 defects the Segment Grade Score would be 22. If a pipe segment has no defects then that section would have a Score of 0.
2. *PACP Quick Rating* is a quick way of looking at the score of a segment and getting a general idea as to the condition of the pipe. The Quick Rating is a four character score as follows:
    - The first character is the highest grade defect recorded during the inspection.
    - The second character represents the total number of occurrences for the highest grade defect. If the total number exceeds 9 then the following nomenclature is implemented 10 to 14 – A; 15 to 19 – B; 20 to 24 – C; etc.
    - The third character is the next highest grade defect recorded during the inspection.
    - The fourth character represents the total number of occurrences for the section highest grade defect, and is derived using the same methodology as item 2.

    A PACP Quick Rating of "452A" would represent a pipe that had five Grade 4 defects and 10 Grade 2 defects.
3. *Pipe Ratings Index* is a representation of the defect density along the pipeline. The Pipe Ratings Index is calculated by dividing the Pipe Rating by the total number of defects.

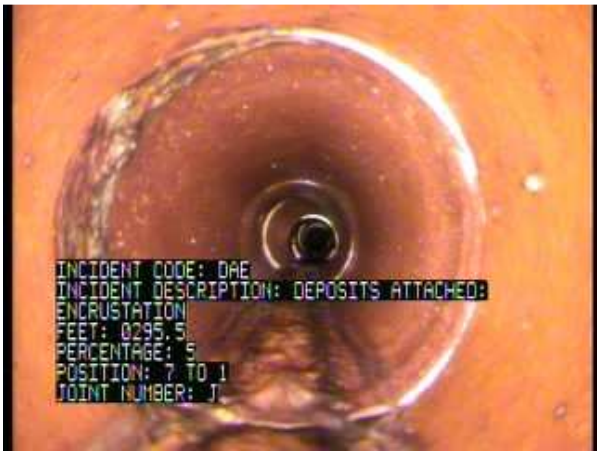
Following is a summary of the general condition of each pipe section internally inspected with preliminary recommendations for future maintenance, repair, and further testing based on the PACP Pipe Ratings Index and interpretation of the defects observed. These results are also summarized in a table at the end of this report. Also included in Appendix B of this report is a copy of all internal inspections on DVD along with written logs of all pipe and manhole inspections.

- **524:524WM** - The sewer inspection for pipe run 524:524WM has shown that the pipe is in good condition with a Structural Score of 0.00, an O&M Score of 1.24, and a Composite Score of 1.24. The only defects coded for during the inspection were O&M, the most severe of which are pictured below. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 2 years. This will ensure that root intrusion is addressed along with continually assessing the Structural and O&M condition of the pipe.

Fine Roots in Joint @ 132.5' (O&M Grade 1)

Medium Roots in Joint @ 142.8' (O&M Grade 2)

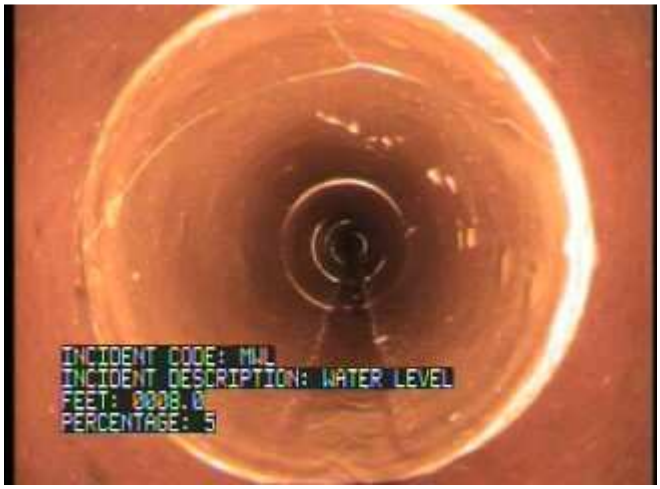
- **525:524** - The sewer inspection for pipe run 525:524 has shown that the pipe is in good condition with a Structural Score of 1.00, an O&M Score of 2.00, and a Composite Score of 1.75. A majority of the defects encountered during the inspection were related to O&M, the most severe of which are pictured below. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure the efficient operation of the pipe, along with continually assessing the structural integrity of the pipe. During the inspection it was noticed that 7 out of 11 laterals were found to have a continual stream of clear water discharging into the sanitary main; these areas may be possible contributors to the I/I of the system. Homes tributary to this line are being recommended for future testing to determine if any I/I contribution exists.



Mineral Deposit @ 295.5' (O&M Grade 2)

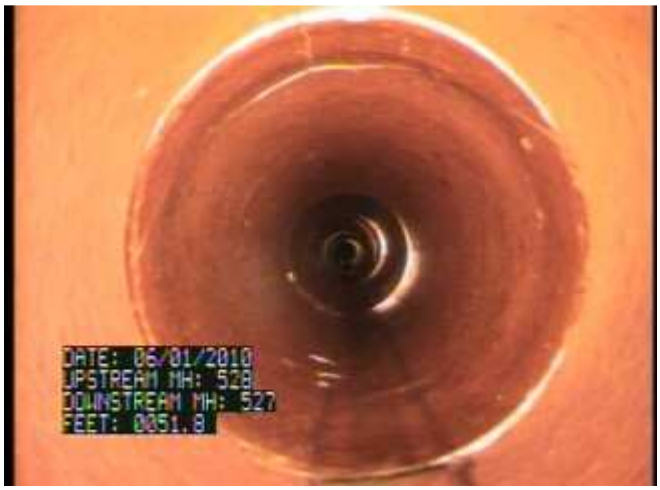
15% Sag @ 328.2' (O&M Grade 2)

- **528:527** - The sewer inspection for pipe run 528:527 has shown that the pipe is in good condition with a Structural Score of 2.43, an O&M Score of 1.00, and a Composite Score of 1.83. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that all O&M defects are addressed in like kind.

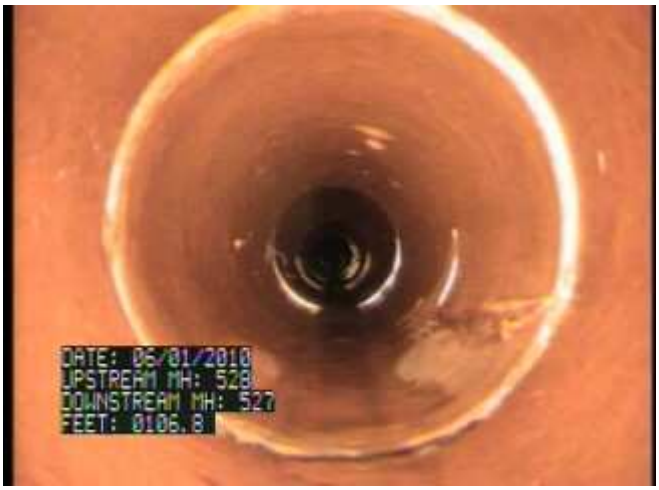


Crack Multiple @ 9.8' (Structural Grade 3)

Fine Roots in Joint @ 98.7' (O&M Grade 1)

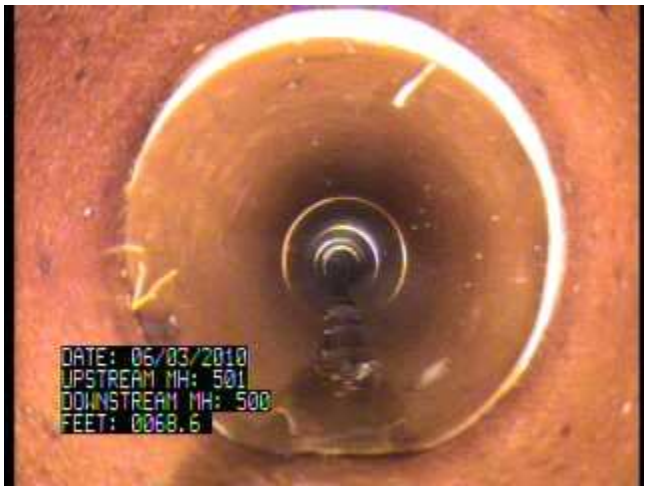


Crack Multiple @ 53.2' (Structural Grade 3)



Fine Roots in Joint @ 108.3' (O&M Grade 1)

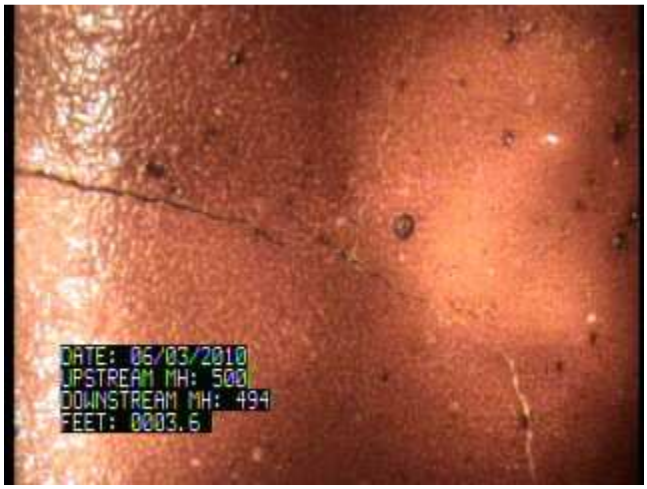
- **501:500** - The sewer inspection for pipe run 501:500 has shown that the pipe is in good condition with a Structural score of 1.00, an O&M score of 2.08, and an Overall score of 1.85. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that all O&M defects are addressed in like kind. This line was identified as having a source of I/I; special attention should be giving during future inspections of this line to note the existing source, as well as to identify any other sources that may develop over time.



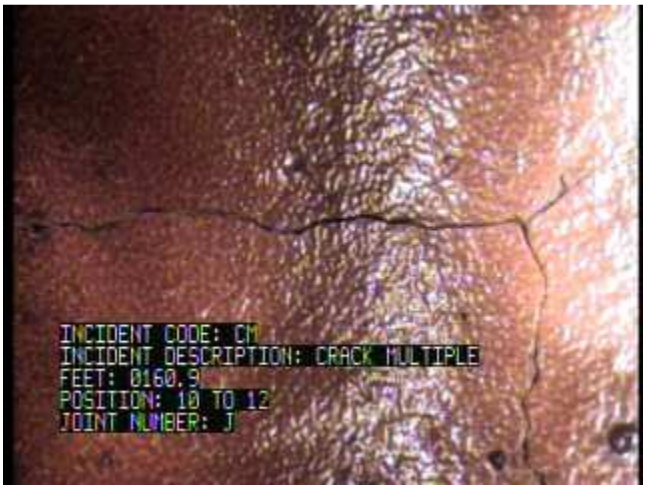
Fine Roots in Joint @ 68.3' (O&M Grade 1)
Infiltration Dripper @ 68.6' (O&M Grade 3)

Fracture Circumferential @ 189.5' (Structural Grade 2)
Fine Roots in Barrel of Pipe (O&M Grade 1)

- **500:494** -The sewer inspection for pipe run 504:494 has shown that the pipe is in good condition with a Structural Score of 1.94, an O&M Score of 1.50, and a Composite Score of 1.89. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that all O&M defects are addressed in like kind. During the inspection, it was noted that all (2) of the laterals were found to have a continual stream of clear water discharging into the sanitary main; these areas may be possible contributors to the I/I of the system. Homes tributary to this line are being recommended for future testing to determine if any I/I contribution exists.

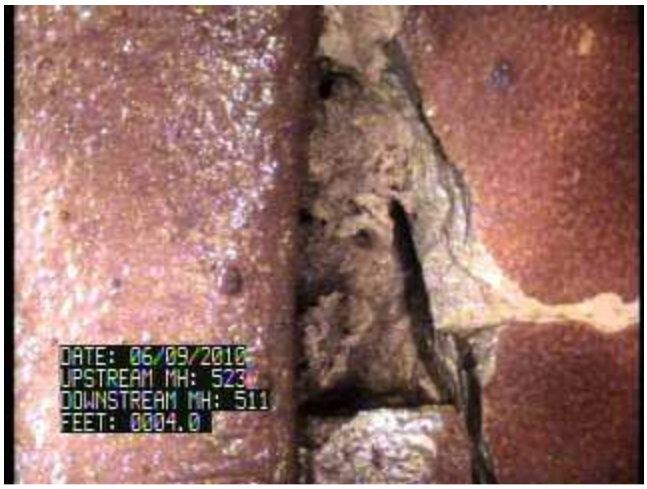


Crack Multiple @ 3.6' (Structural Grade 3)

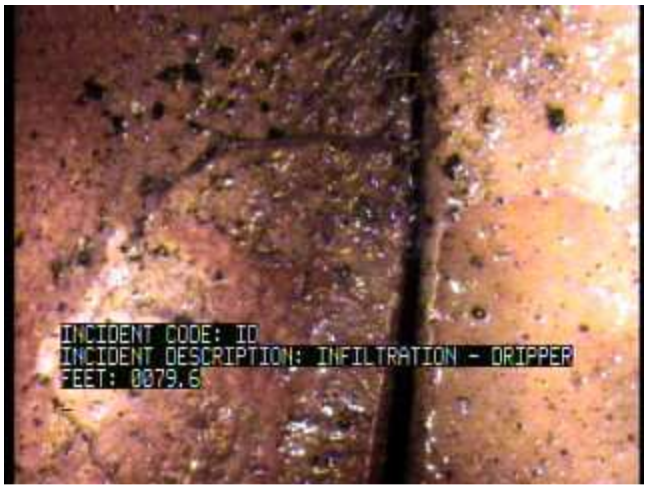


Crack Multiple @ 160.9' (Structural Grade 3)

- **523:511** - The sewer inspection for pipe run 523:511 has shown that the pipe is in good condition with a Structural Score of 2.50, an O&M Score of 1.83, and a Composite Score of 1.92. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 2 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that all O&M defects are addressed in like kind. During the inspection, 10 out 15 of laterals were found to have significant root intrusion and/or a continual stream of clear water discharging into the sanitary main; these areas may be possible contributors to the I/I of the system. Homes tributary to this line are being recommended for future testing to determine if any I/I contribution exists.



Broken Pipe @ 4.0' (Structural Grade 5)



Infiltration Dripper @ 79.6' (O&M Grade 3)

Mineral Deposit @ 16.2' (O&M Grade 2)

Root Ball Requiring Heavy Cleaning @ 117.7'

Mineral Deposit @ 7.0' (O&M Grade 4)

Fracture Multiple @ 142.4' (Structural Grade 4)

- **529:506** - The sewer inspection for pipe run 529:506 has shown that the pipe is in good condition with a Structural Score of 1.78, an O&M Score of 2.00, and a Composite Score of 1.94. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that all mineral deposits and root intrusion significantly affecting the flowable cross-section of the pipe are removed and all other O&M defects are addressed in like kind. This line was identified as having a source of I/I; special attention should be giving during future inspections of this line to note the existing source of I/I, as well as to identify any other sources that may develop over time. During the inspection, all of the (5) laterals were found to have a continual stream of clear water discharging into the sanitary main; these areas may be possible contributors to the I/I of the system. Homes tributary to this line are being recommended for future testing to determine if any I/I contribution exists.

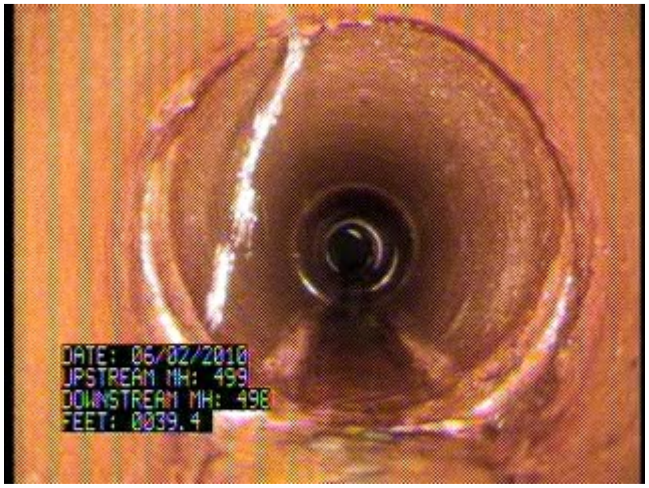
Infiltration Weeper @ 60.8' (O&M Grade 2)

Crack Multiple @ 79.5' (Structural Grade 3)

Mineral Deposit @ 72.4' (O&M Grade 2)

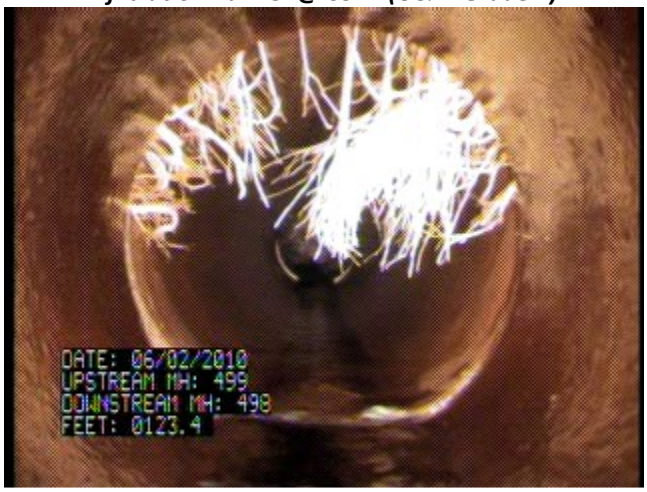
Mineral Deposit @ 125.3' (O&M Grade 2)

- **499:498** - The sewer inspection for pipe run 499:498 has shown that the pipe is in good condition with a Structural Score of 2.18, an O&M Score of 1.88, and a Composite Score of 1.97. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 2 years. This will ensure that the pipe remains in good structural condition and that all mineral deposits and root intrusion significantly affecting the flowable cross-section of the pipe are removed, while all other O&M defects are addressed in like kind. This line was identified as having a source of I/I; special attention should be giving during future inspections of this line to note the existing source of I/I, as well as to identify any other sources that may develop over time. During the inspection 2 out of 3 laterals were found to have a continual stream of clear water discharging into the sanitary main; these areas may be possible contributors to the I/I of the system. Homes tributary to this line are being recommended for future testing to determine if any I/I contribution exists.



Infiltration Runner @ 39.4' (O&M Grade 4)

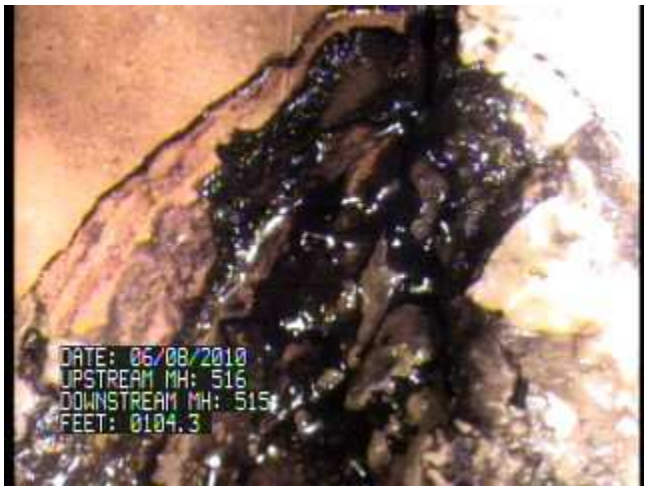
Mineral Deposit @ 75.0' (O&M Grade 2)



Medium Roots in Joint @ 123.4' (O&M Grade 3)

Root Ball in Joint @ 128.2' Requiring Heavy Cleaning

- **516:515** - The sewer inspection for pipe run 516:515 has shown that the pipe is in good condition with a Structural Score of 1.91, an O&M Score of 2.06, and a Composite Score of 2.00. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the pipe remains in good structural condition and that all mineral deposits significantly affecting the flowable cross-section of the pipe are removed, while all other O&M defects are addressed in like kind. This line was identified as having a source of I/I; special attention should be giving during future inspections of this line to note the existing source of I/I, as well as to identify any other sources that may develop over time. During the inspection 2 out of 3 laterals were found to have a continual stream of clear water discharging into the sanitary main; these areas may be possible contributors to the I/I of the system. Homes tributary to this line are being recommended for future testing to determine if any I/I contribution exists.



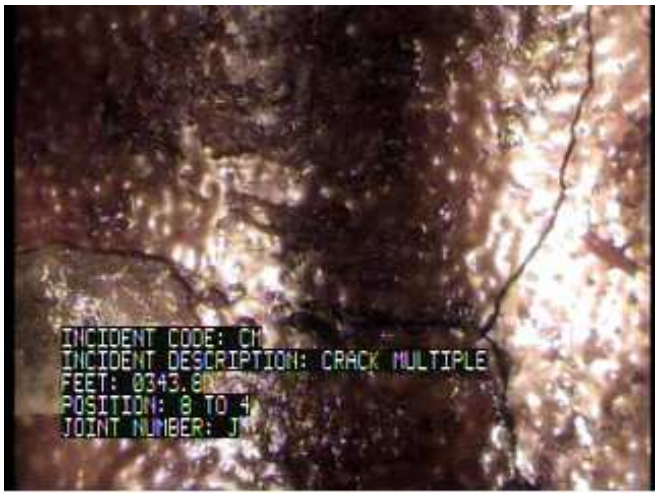
Infiltration Dripper @ 104.3' (O&M Grade 3)

Sag in Line @ 176.9 (O&M Grade 2)

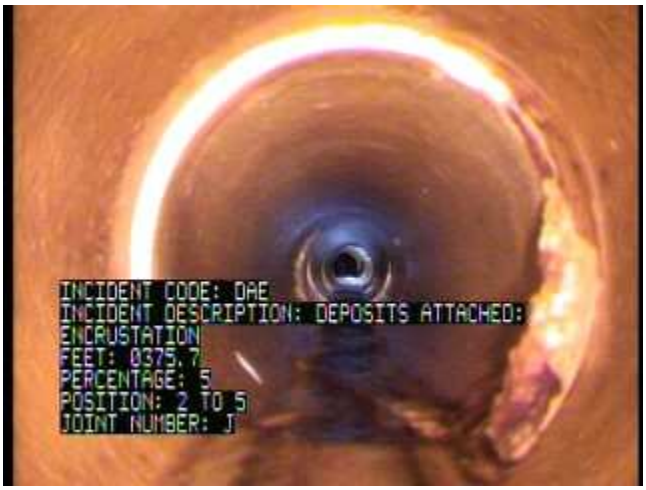
Crack Multiple @ 171.4' (Structural Grade 3)

Mineral Deposit @ 226.2' (O&M Grade 2)

- **526:525** - The sewer inspection for pipe run 526:525 has shown that the pipe is in good condition with a Structural Score of 2.00, an O&M Score of 2.00, and a Composite Score of 2.00. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the pipe remains in good structural condition and that all mineral deposits significantly affecting the flowable cross-section of the pipe are removed, while all other O&M defects are addressed in like kind. During the inspection 6 out of 12 laterals were found to have a continual stream of clear water discharging into the sanitary main; these areas may be possible contributors to the I/I of the system. Homes tributary to this line are being recommended for future testing to determine if any I/I contribution exists.



Crack Multiple @ 343.8 (Structural Grade 3)



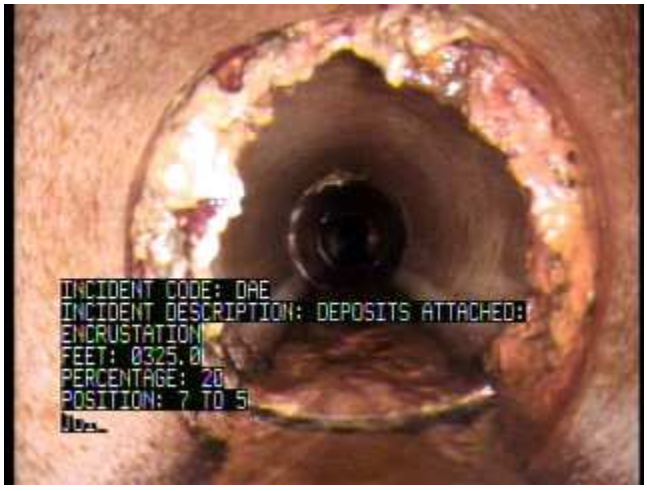
Mineral Deposits @ 375.7' (O&M Grade 2)

- **514:513** - The sewer inspection for pipe run 514:513 has shown that the pipe is in good condition with a Structural Score of 2.00, an O&M Score of 2.02, and a Composite Score of 2.02. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the pipe remains in good structural condition and that all mineral deposits significantly affecting the flowable cross-section of the pipe are removed, while all other O&M defects are addressed in like kind. This line was identified as having 2 sources of I/I; special attention should be giving during future inspections of this line to note the existing sources of I/I, as well as to identify any other sources that may develop over time. During the inspection 2 out of 7 laterals were found to have a continual stream of clear water discharging into the sanitary main; these areas may be possible contributors to the I/I of the system. The remaining laterals had mineral deposits restricting close to 100% of their cross-section. Homes tributary to this line are being recommended for future testing to determine if any I/I contribution exists.

Crack Longitudinal @ 31.7' (Structural Grade 2)

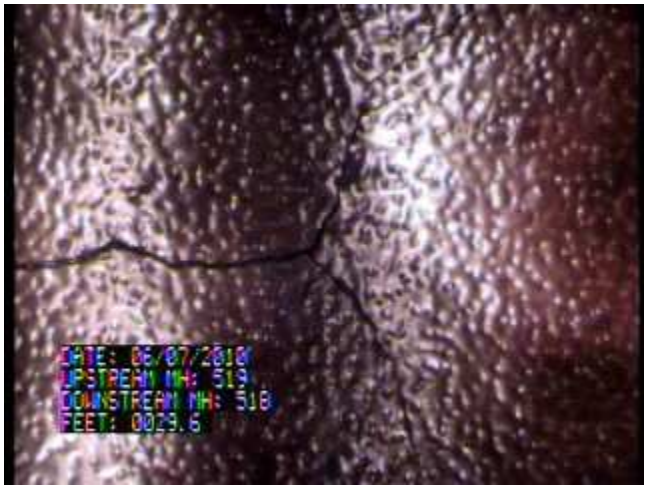
Mineral Deposit @ 236.8' (O&M Grade 2)

Infiltration Weeper @ 267.2' (O&M Grade 2)

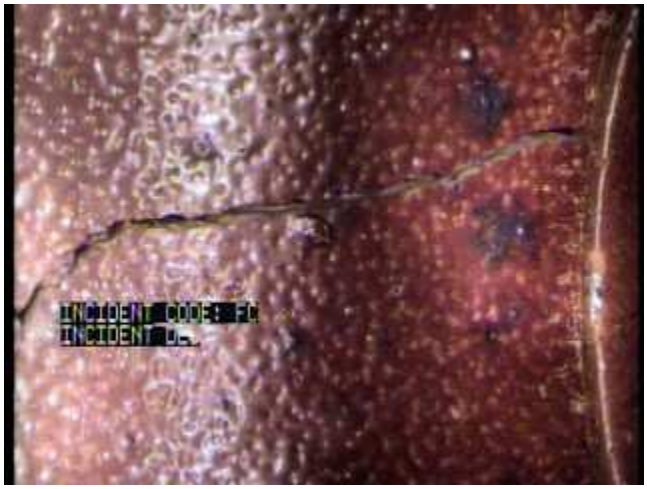


Mineral Deposit @ 325.0'(O&M Grade 3)

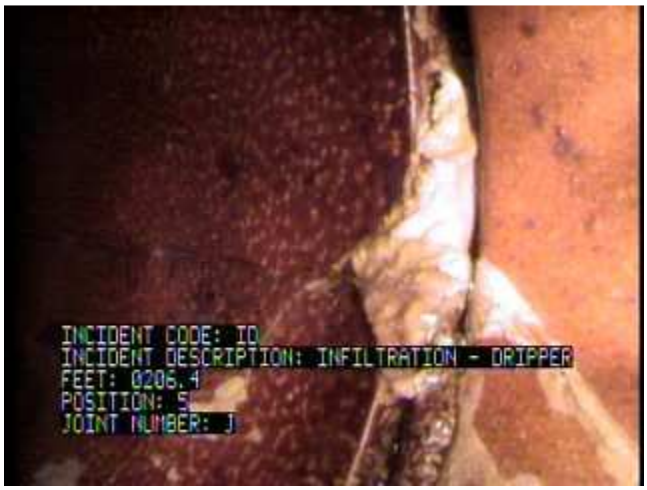
- **519:518** - The sewer inspection for pipe run 519:518 has shown that the pipe is in good condition with a Structural Score of 2.12, an O&M Score of 2.00, and a Composite Score of 2.07. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. There is one area of the pipe that has a Structural Grade 5 defect consisting of a hole in the pipe with soil visible, see picture below, and is being recommended for a point repair. The maintenance program will also ensure that all O&M defects are addressed in like kind. This line was identified as having 1 source of I/I; special attention should be giving during future inspections of this line to note the existing source of I/I, as well as to identify any other sources that may develop over time.



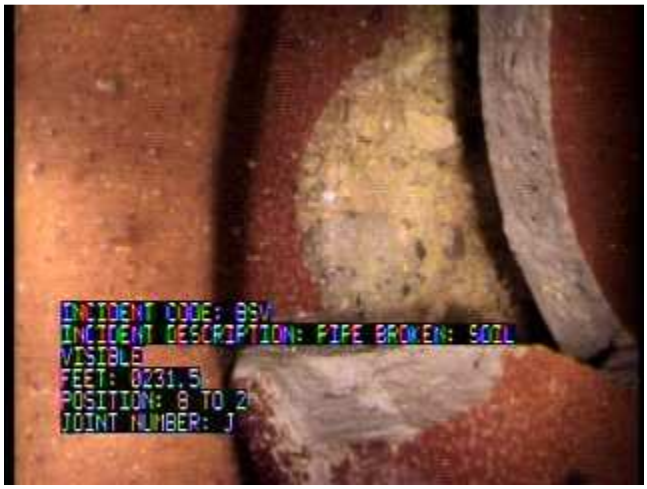
Crack Multiple @ 29.6' (Structural Grade 3)



Fracture Circumferential @ 83.9' (Structural Grade 2)



Infiltration Dripper @ 206.4' (O&M Grade 3)

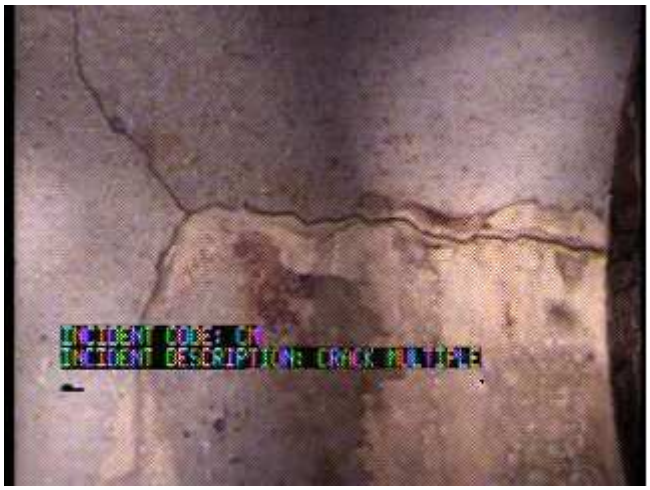


Broken Pipe w/ Soil Visible @ 231.5' (Structural Grade 5)

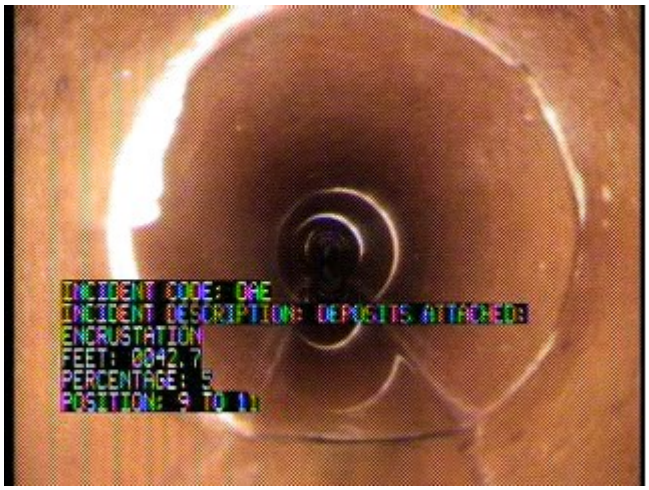
- **517:516** - The sewer inspection for pipe run 517:516 has shown that the pipe is in good condition with a Structural Score of 3.00, an O&M Score of 2.00, and a Composite Score of 2.08. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the pipe remains in good structural condition, the mineral deposits will be continually monitored and removed if necessary, and any debris that may settle in the sags of the pipe is removed. During the inspection the only lateral was found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The home tributary to this line is being recommended for future testing to determine if any I/I contribution exists.

20% Sag @ 3.5' (O&M Grade 2)

Mineral Deposit @ 21.7' (O&M Grade 2)

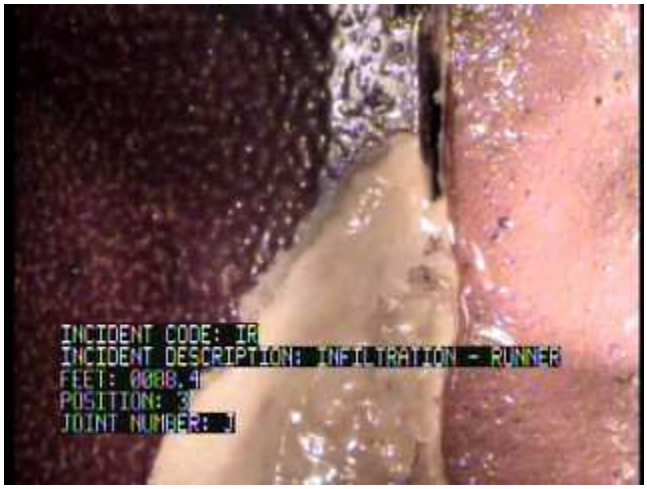


Crack multiple @# 22.8' (Structural Grade 3)

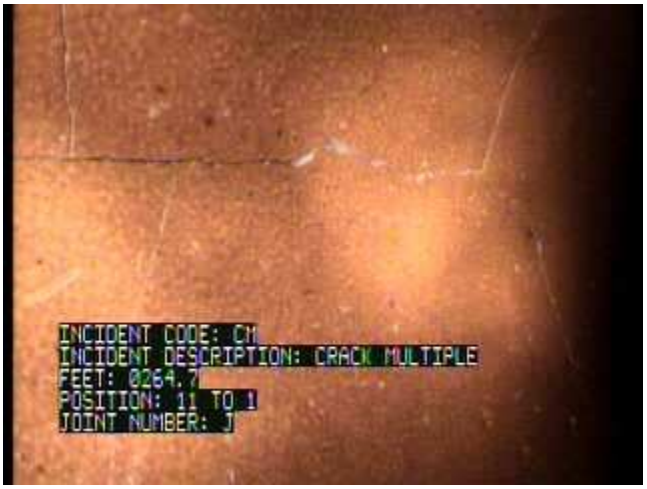


Mineral Deposit @ 42.7 (O&M Grade 2)

- **527:526** - The sewer inspection for pipe run 527:526 has shown that the pipe is in good condition with a Structural Score of 2.29, an O&M Score of 2.05, and a Composite Score of 2.08. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that all O&M defects are addressed in like kind. This line was identified as having one source of I/I; special attention should be giving during future inspections of this line to note the existing source of I/I, as well as to identify any other sources that may develop over time. During the inspection 8 of 11 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.

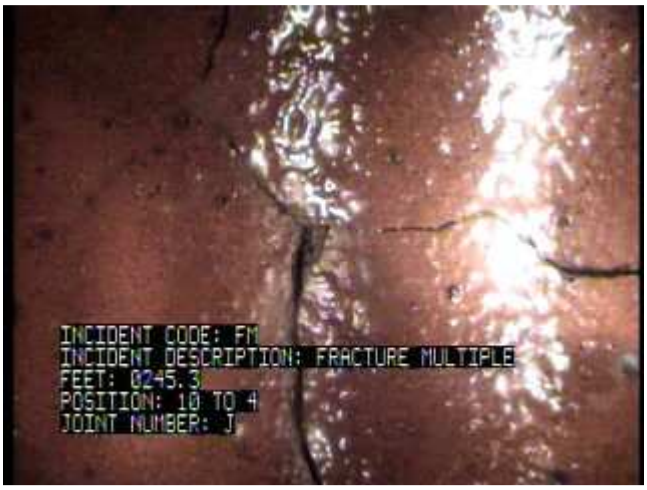


Infiltration Runner @ 88.4' (O&M Grade 4)



Crack Multiple @ 264.7' (Structural Grade 3)

- **507:506** - The sewer inspection for pipe run 507:506 has shown that the pipe is in good condition with a Structural Score of 2.13, an O&M Score of 2.00, and a Composite Score of 2.10. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that any mineral deposits significantly reducing the flowable cross-section are cut out, debris that has settled in a sag is removed, and all other O&M defects are addressed in like kind. During the inspection 6 of 7 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.



Fracture Multiple @ 245.3' (Structural Grade 4)

Fracture Multiple @ 284.1' (Structural Grade 4)

- **506:505** - The sewer inspection for pipe run 506:505 has shown that the pipe is in good condition with a Structural Score of 2.15, an O&M Score of 2.00, and a Composite Score of 2.11. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that any mineral deposits significantly reducing the flowable cross-section are cut out, debris that has settled in a sag is removed, and all other O&M defects are addressed in like kind. During the inspection 6 of 7 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.

15% Sag @ 102.5' (O&M Grade 2)

Mineral Deposit @ 169.4' (O&M Grade 3)

Fracture Multiple @ 211.4' – Structural Grade 4

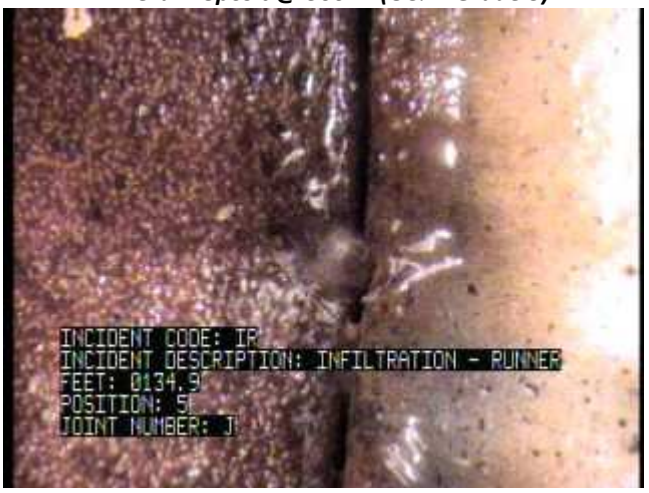
Fracture Multiple @ 261.2 – Structural Grade 4

- **520:514** - The sewer inspection for pipe run 520:514 has shown that the pipe is in good condition with a Structural Score of 2.00, an O&M Score of 2.12, and a Composite Score of 2.11. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the pipe remains in good structural condition; the mineral deposits will be continually monitored and removed if they significantly reduce the flowable cross-section, and any other O&M issues are addressed in like kind. This line was identified as having 2 sources of I/I; special attention should be giving during future inspections of this line to note the existing sources of I/I, as well as to identify any other sources that may develop over time. During the inspection 9 of 13 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.

Infiltration Dripper @ 31.7' (O&M Grade 3)

Mineral Deposit @ 306.2' (O&M Grade 3)

Infiltration Runner @ 283.5' (O&M Grade 4)

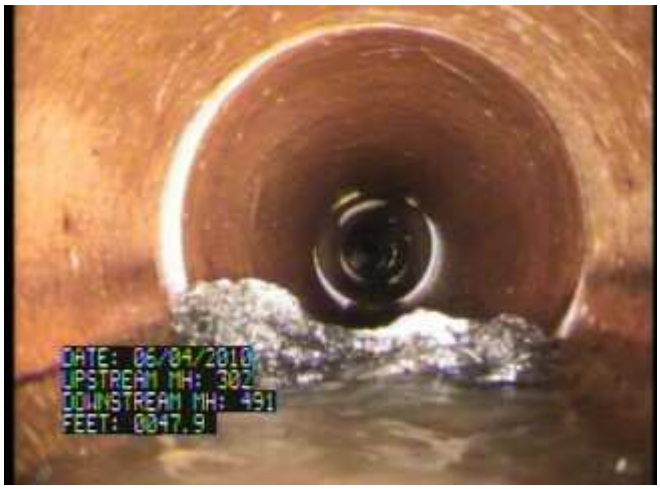


Infiltration Runner @ 134.9' (O&M Grade 4)

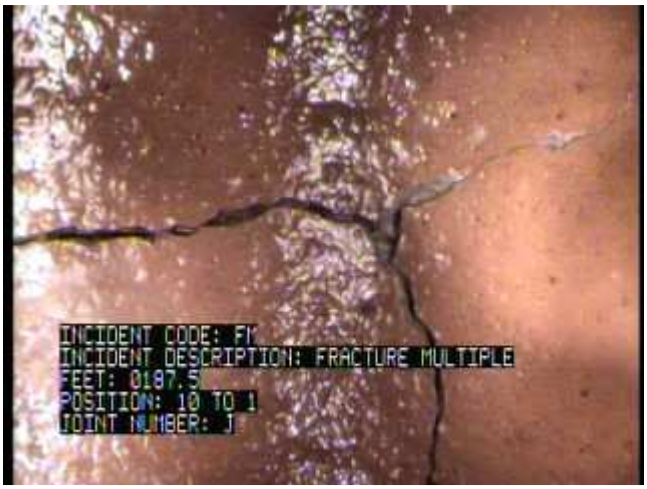
Mineral Deposit @ 289.4' (O&M Grade 2)

Mineral Deposit @ 405.7' (O&M Grade 4)

- **302:491** - The sewer inspection for pipe run 302:491 has shown that the pipe is in good condition with a Structural Score of 2.16, an O&M Score of 2.00, and a Composite Score of 2.12. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that all O&M defects are monitored and addressed as necessary.

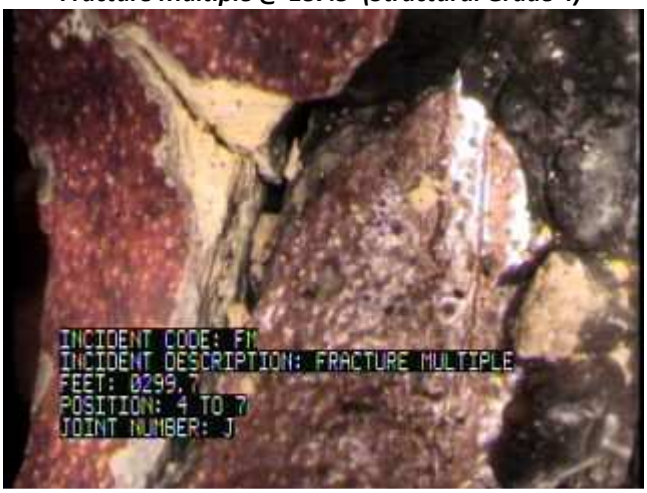


Intruding Sealing Material Requiring Heavy Cleaning @ 47.9'



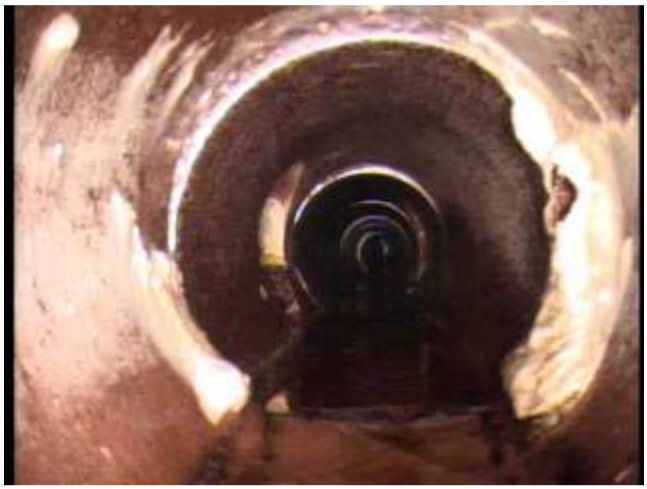
Fracture Multiple @ 187.5' (Structural Grade 4)

Fracture Multiple @ 212.1' (Structural Grade 4)



Fracture Multiple @ 299.7' (Structural Grade 4)

- **521:513** - The sewer inspection for pipe run 521:513 has shown that the pipe is in fair condition with a Structural Score of 2.27, an O&M Score of 2.12, and a Composite Score of 2.15. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time; the broken pipe, as shown below, appears to be held in place by the mortar poured around the joint and does not need to be repaired at this time. The maintenance program will also ensure that all mineral deposits are monitored and removed as necessary, in addition to all other O&M defects. This line was identified as having 2 sources of I/I; special attention should be giving during future inspections of this line to note the existing sources of I/I, as well as to identify any other sources that may develop over time. During the inspection 7 of 12 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.

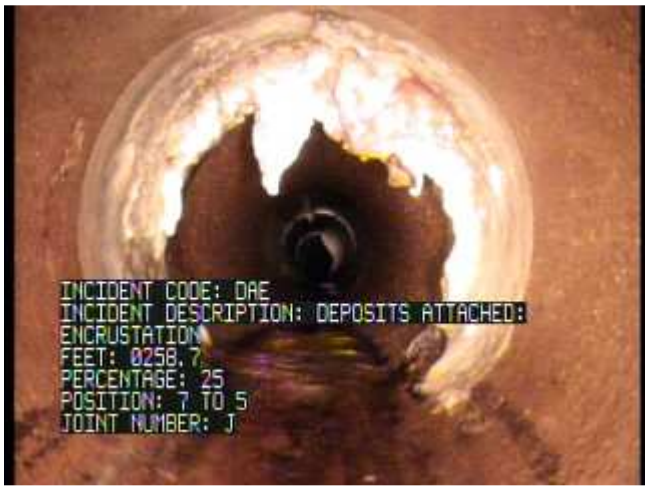


Mineral Deposit @ 27.5' (O&M Grade 2)

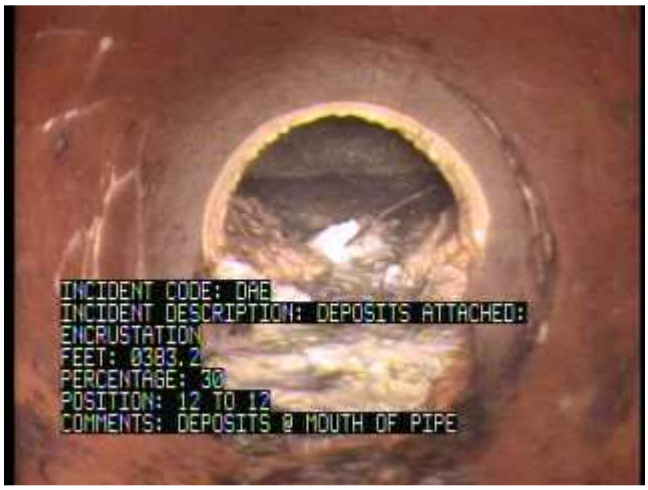
Broken Pipe @ 101.2' (Structural Grade 5)

Large Offset joint @ 166.2' (O&M Grade 2)

Mineral Deposits @ 218.7' (O&M Grade 3)
Infiltration Weeper @ 218.7 (O&M Grade 2)



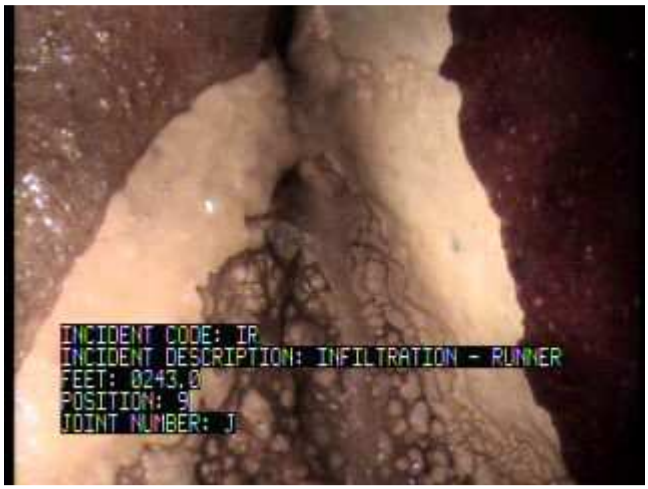
Mineral Deposits @ 258.7' (O&M Grade 4)
Infiltration Dripper @ 258.7' (O&M Grade 3)



Mineral Deposits @ 383.2' (O&M Grade 4)

- **518:516** - The sewer inspection for pipe run 518:516 has shown that the pipe is in fair condition with a Structural Score of 2.38, an O&M Score of 2.11, and a Composite Score of 2.15. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time; after further inspection the hole at 323.2' appears to be an air bubble that was in the clay at the time the pipe was constructed and does not need repaired at this time. The maintenance program will also ensure that all mineral deposits are monitored and removed as necessary, in addition to all other O&M defects. This line was identified as having 2 sources of I/I; special attention should be giving during future inspections of this line to note the existing sources of I/I, as well as to identify any other sources that may develop over time. During the inspection 5 of 6 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.

Mineral Deposits @ 107.3' (O&M Grade 2)



Infiltration Runner @ 243.0' (O&M Grade 4)

Hole in Pipe @ 323.2' (Structural Grade 5)

Infiltration Runner @ 372.5' (O&M Grade 4)

- **497:495** - The sewer inspection for pipe run 497:495 has shown that the is in fair condition with a Structural Score of 2.58, an O&M Score of 1.43, and a Composite Score of 2.17. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that root intrusion, line sags, and all other O&M Defects are addressed in like kind. During the inspection 1 of 4 laterals was found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system.

Fracture Multiple @ 203.7' (Structural Grade 4)

Fracture Multiple @ 336.9' (Structural Grade 4)

Fracture Multiple @ 310.2' (Structural Grade 4)

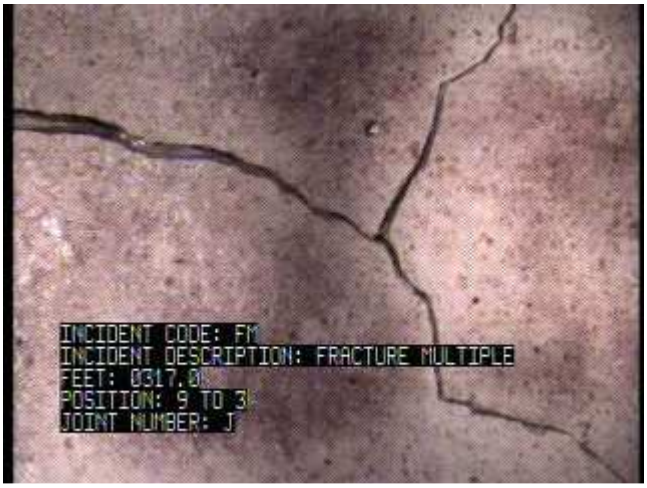
Fracture Multiple @ 300.7' (Structural Grade 4)

10% Sag @ 315.8' (O&M Grade 2)

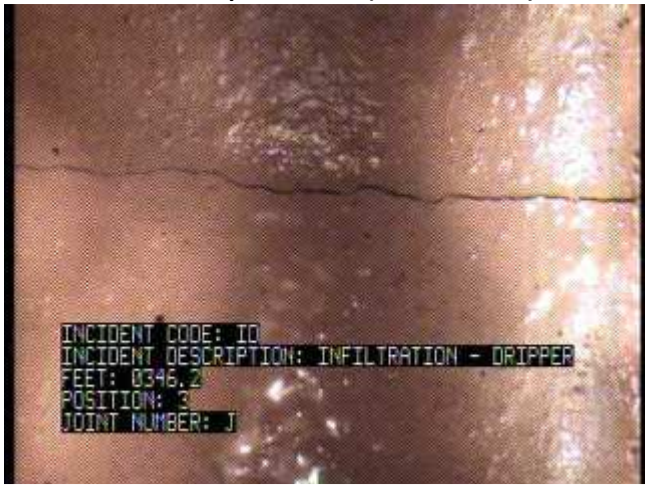
Fine Roots in Joint @ 350.7 (O&M Grade 1)

- **508:507** - The sewer inspection for pipe run 588:507 has shown that the pipe is in fair condition with a Structural Score of 2.00, an O&M Score of 2.06, and a Composite Score of 2.19. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that O&M Defects are monitored and addressed as necessary. This line was identified as having 1 source of I/I; special attention should be giving during future inspections of this line to note the existing sources of I/I, as well as to identify any other sources that may develop over time.

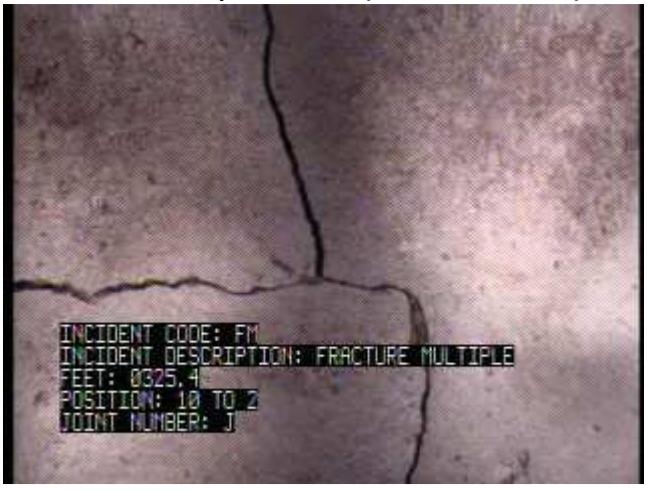
Mineral Deposit @ 9.6' (O&M Grade 2)



Fracture Multiple @ 317.0' (Structural Grade 4)



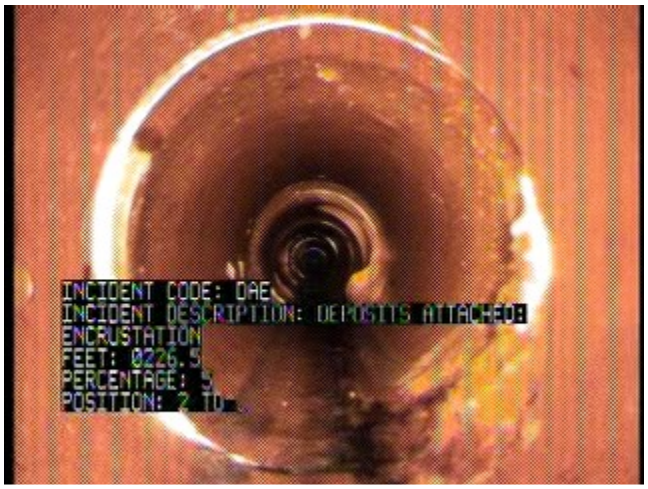
Infiltration Dripper @ 346.2' (O&M Grade 3)



Fracture Multiple @ 325.4' (Structural Grade 4)

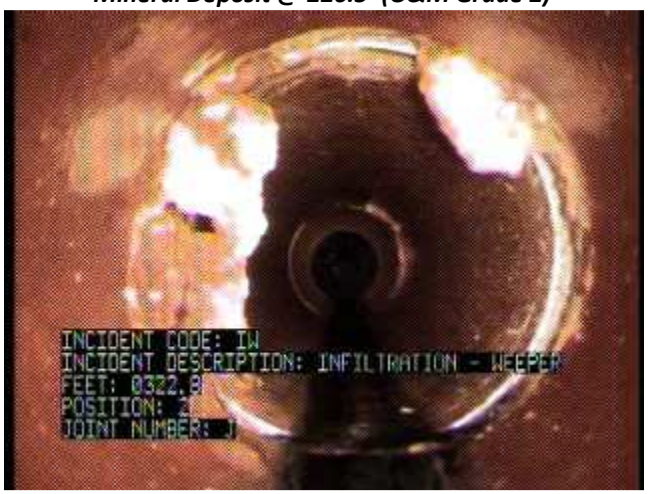
- **509:508** - The sewer inspection for pipe run 509:508 has shown that the pipe is in good condition with a Structural Score of 2.47, an O&M Score of 2.00, and a Composite Score of 2.19. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time; the hole in pipe and broken pipe, as shown below, appear to be reinforced by a cementitious material and do not need to be repaired at this time. The maintenance program will also ensure that all mineral deposits are monitored and removed as necessary, in addition to all other O&M defects. This line was identified as having 1 source of I/I; special attention should be giving during future inspections of this line to note the existing source of I/I, as well as to identify any other sources that may develop over time. During the inspection 1 of 7 laterals was found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system.

Hole in Pipe @ 81.0' (Structural Grade 5)



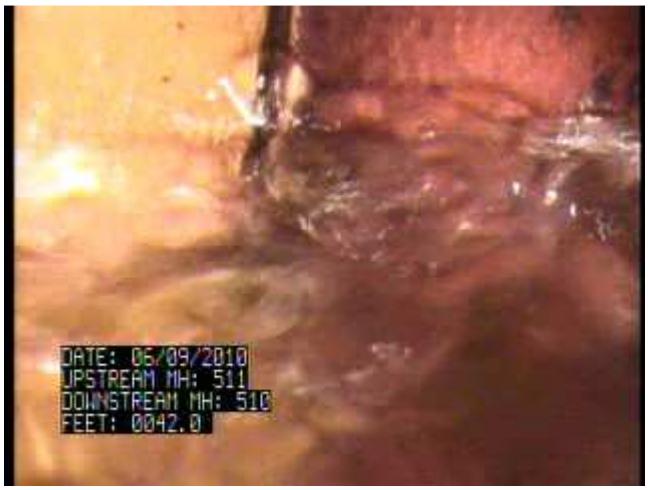
Mineral Deposit @ 226.5' (O&M Grade 2)

Broken Pipe @ 254.4' (Structural Grade 5)



Infiltration Weeper @ 322.8' (O&M Grade 2)
Mineral Deposit @ 322.8' (O&M Grade 3)

- **511:510** - The sewer inspection for pipe run 511:510 has shown that the is in fair condition with a Structural Score of 1.83, an O&M Score of 2.28, and a Composite Score of 2.20. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the pipe remains in good structural condition, while monitoring and removing mineral deposits, debris in line sags, and all other O&M Defects. This line was identified as having 2 sources of I/I; special attention should be giving during future inspections of this line to note the existing sources of I/I, as well as to identify any other sources that may develop over time. During the inspection 6 of 7 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.



Infiltration Runner @ 42.0' – O&M Grade 4

Infiltration Runner @ 52.3' – O&M Grade 4

Mineral Deposit @ 115.8' (O&M Grade 4)

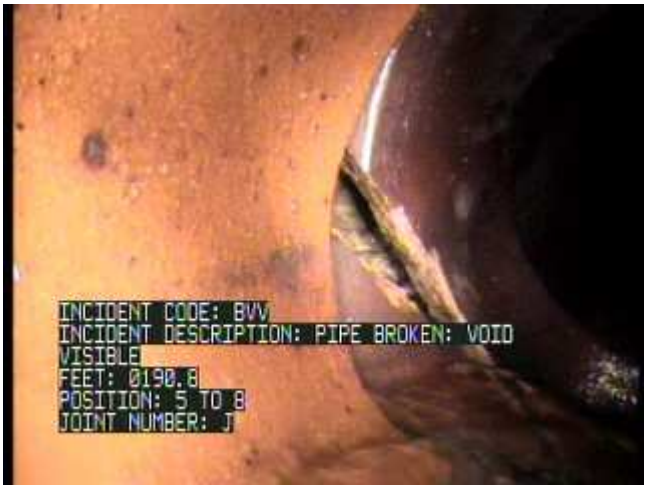
Mineral Deposit @ 232.8 (O&M Grade 2)

- **515:514** - The sewer inspection for pipe run 515:514 has shown that the pipe is in fair condition with a Structural Score of 2.71, an O&M Score of 2.00, and a Composite Score of 2.20. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. It is recommended that the broken pipe at the end of the run, see picture below, be repaired with a 10' Cast In Place Pipe (CIPP) sectional liner. The maintenance program will also ensure that mineral deposits are monitored and removed as necessary and all other O&M defects are addressed in like kind. During the inspection 3 of 4 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.

Mineral Deposit @ 44.7' (O&M Grade 2)

Mineral Deposit @ 68.8' (O&M Grade 2)

Mineral Deposit Requiring Heavy Cleaning @ 147.1'



Broken Pipe w/ Void Visible@ 190.8' (Structural Grade 5)

- **498:497** - The sewer inspection for pipe run 498:497 has shown that the pipe is in fair condition with a Structural Score of 2.50, an O&M Score of 1.67, and a Composite Score of 2.24. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time; the broken pipe, as shown below, appears to be held in place by the mortar poured around the joint and does not need to be repaired at this time. The maintenance program will also ensure that root intrusion and mineral deposits are monitored and removed as necessary, in addition to all other O&M defects. During the inspection 1 of 4 laterals was found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system.

Fracture Multiple @ 184.9' (Structural Grade 4)

Fracture Longitudinal @ 184.3' (Structural Grade 3)

Fine Roots in Joint @ 184.3' (O&M Grade 1)

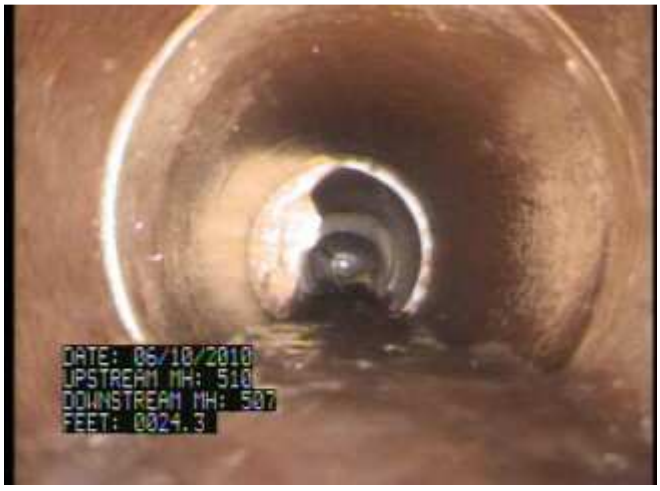
Broken Pipe @ 179.0' (Structural Grade 5)

Fracture Longitudinal @ 1825.3' (Structural Grade 3)

- **510:507** - The sewer inspection for pipe run 511:510 has shown that the is in fair condition with a Structural Score of 2.46, an O&M Score of 2.11, and a Composite Score of 2.25. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the pipe remains in good structural condition, while monitoring and removing mineral deposits and all other O&M Defects. This line was identified as having 3 sources of I/I; special attention should be giving during future inspections of this line to note the existing sources of I/I, as well as to identify any other sources that may develop over time.

Infiltration Weeper @ 18.0' (O&M Grade 2)
Mineral Deposits @ 18.0' (O&M Grade 2)

Infiltration Runner @ 22.4' – O&M Grade 4



Mineral Deposit Requiring Heavy Cleaning @ 24.3'

Infiltration Weeper @ 49.8' (O&M Grade 2)
Mineral Deposits @ 49.8' (O&M Grade 2)

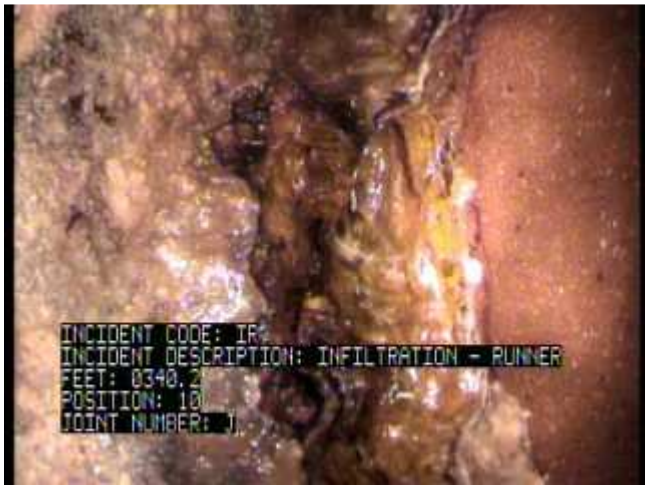
- **522:512** - The sewer inspection for pipe run 522:512 has shown that the pipe is in fair condition with a Structural Score of 0.00, an O&M Score of 2.25, and a Composite Score of 2.25. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the pipe remains in good structural condition, while monitoring and removing mineral deposits and all other O&M Defects. This line was identified as having 5 sources of I/I; special attention should be giving during future inspections of this line to note the existing sources of I/I, as well as to identify any other sources that may develop over time. During the inspection 6 of 13 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists

Mineral Deposits @ 50.6' (O&M Grade 4)
Infiltration Weeper @ 50.6' (O&M Grade 2)

Infiltration Runner @ 53.9' (O&M Grade 4)

Mineral Deposits @ 82.3' (O&M Grade 3)

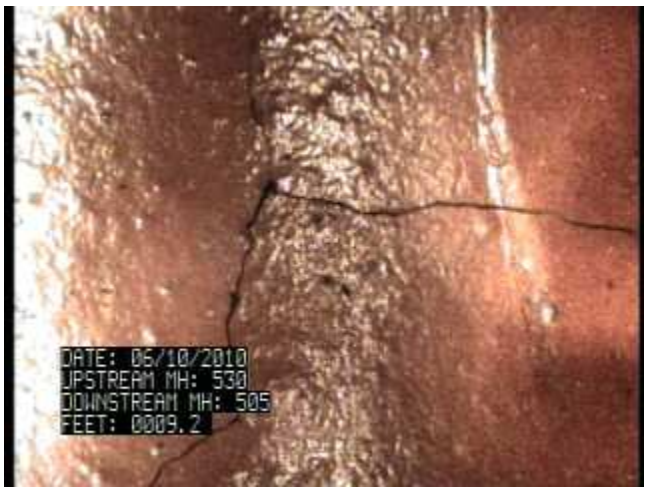
Infiltration Runner @ 159.8' (O&M Grade 4)



Infiltration Runner @ 340.2' (O&M Grade 4)

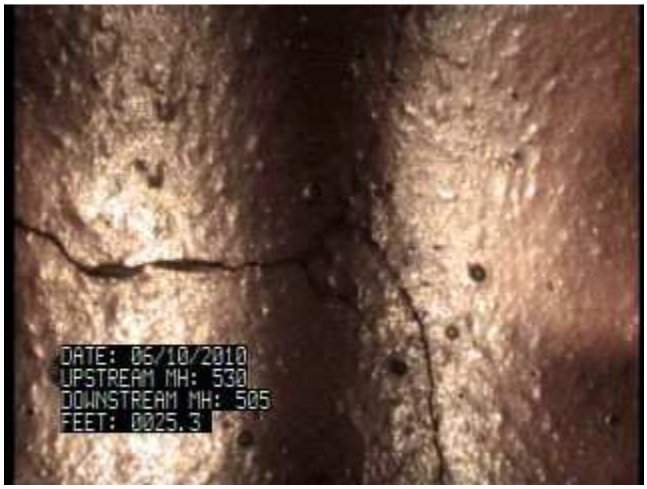
Infiltration Dripper @ 355.6' (O&M Grade 3)

- **530:505** - The sewer inspection for pipe run 530:505 has shown that the pipe is in good condition with a Structural Score of 2.38, an O&M Score of 2.00, and a Composite Score of 2.26. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 10 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that O&M Defects are monitored and addressed as necessary. During the inspection 6 of 8 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.



Crack Multiple @9.2' (Structural Grade 3)

Fracture Multiple @ 118.6' (Structural Grade 4)



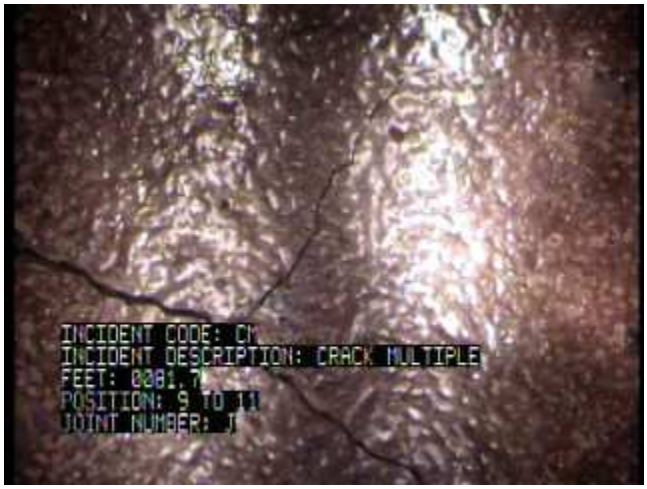
Crack Multiple @ 25.3' (Structural Grade 3)

Mineral Deposit @ 312.6' (O&M Grade 2)

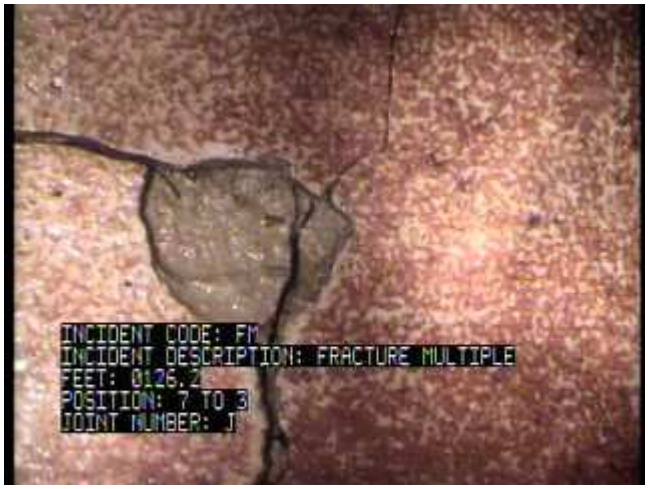
- **505:504** - The sewer inspection for pipe run 505:504 has shown that the pipe is in fair condition with a Structural Score of 2.50, an O&M Score of 1.50, and a Composite Score of 2.38. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 2 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure that root intrusion and line sags are monitored and addressed as necessary, in addition to all other O&M defects. During the inspection 1 of 1 lateral was found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system.

Root Ball in Joint Requiring Heavy Cleaning @ 6.5'

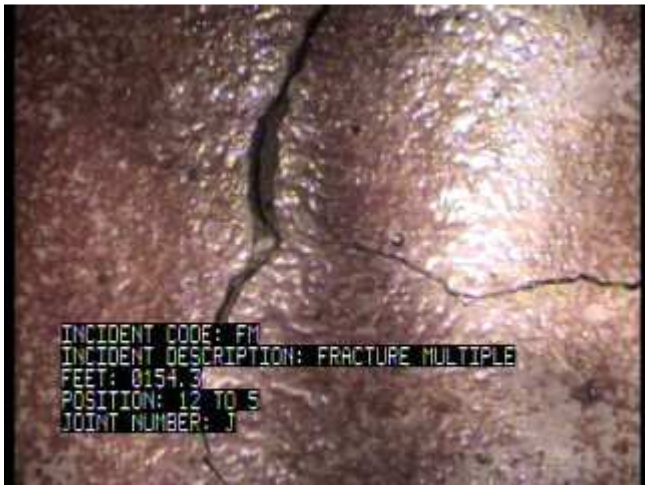
30% Sag @ 15.2' (O&M Grade 2)



Crack Multiple @ 81.7' (Structural Grade 3)



Fracture Multiple @ 126.2' (Structural Grade 4)



Fracture Multiple @ 154.3' (Structural Grade 4)

Fracture Multiple @ 185.5' (Structural Grade 4)

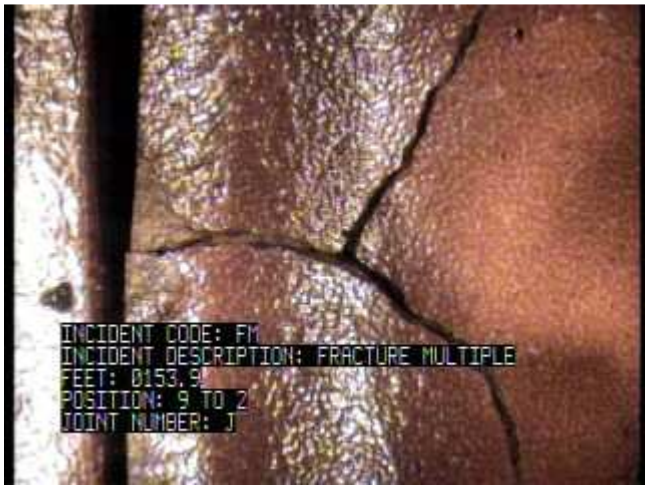
- **496:495** - The sewer inspection for pipe run 496:495 has shown that the pipe is in fair condition with a Structural Score of 2.49, an O&M Score of 2.00, and a Composite Score of 2.46. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be placed on a maintenance program where cleaning and inspection activities are completed once every 5 years. This will ensure that the structural defects are monitored in sufficient fashion that rehabilitation measures can be taken at an appropriate time. The maintenance program will also ensure line sags are monitored and any issues arising are addressed necessary, in addition to all other O&M defects.

Fracture Multiple @ 15.9' (Structural Grade 4)

Fracture Multiple @ 132.4' (Structural Grade 4)

10% Sag @ 128.3' (O&M Grade 2)

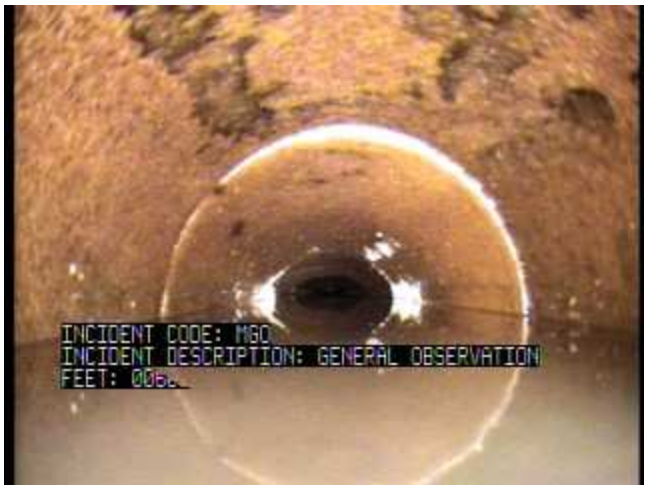
Fracture Multiple @ 150.9' (Structural Grade 4)



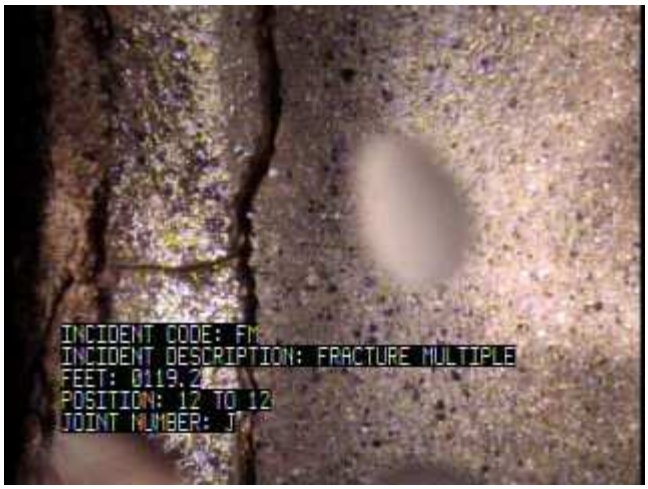
Fracture Multiple (Structural Grade 4)

Fracture Multiple @ 157.0' (Structural Grade 4)

- **495:531** - The sewer inspection for pipe run 495:531 has shown that the pipe is in poor condition with a Structural Score of 2.77, an O&M Score of 1.83, and a Composite Score of 2.61. The images below show some of the most severe defects encountered during the inspection including a deep sag with standing water, severe cracking, and an open hole with a visible void outside the pipe. This line section is being recommended for total replacement due to these conditions. Line replacement will require surveying for design purposes. **SINCE VILLAGE-WIDE SEWER IMPROVEMENTS MAY NOT BE COMPLETED FOR SEVERAL YEARS, THE VILLAGE SHOULD CONSIDER MAKING A POINT REPAIR IN THE NEAR FUTURE AT THE OPEN HOLE TO ELIMINATE THE POSSIBILITY OF A SINK HOLE FORMING ON OLENTANGY BOULEVARD.**



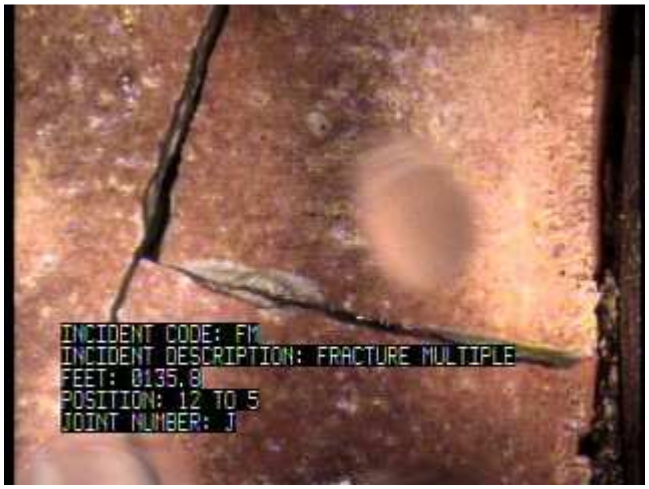
General Observation of 90% Sag @ 60.0'



Fracture Multiple @ 119.2' (Structural Grade 4)

Fracture Multiple @ 115.1' (Structural Grade 4)

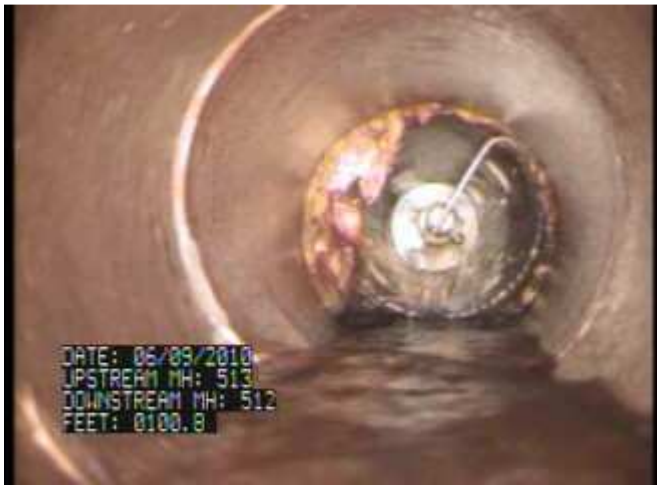
Fracture Multiple @ 161.0' (Structural Grade 4)



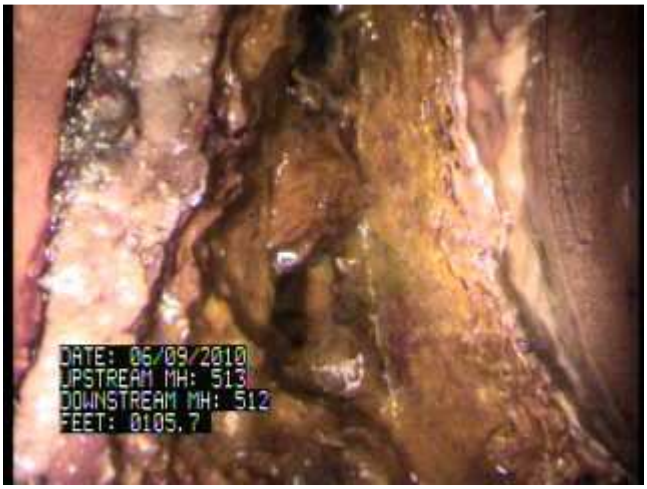
Fracture Multiple @ 135.8' (Structural Grade 4)

Hole in Pipe w/ Void Visible @ 172.6' (Structural Grade 5)

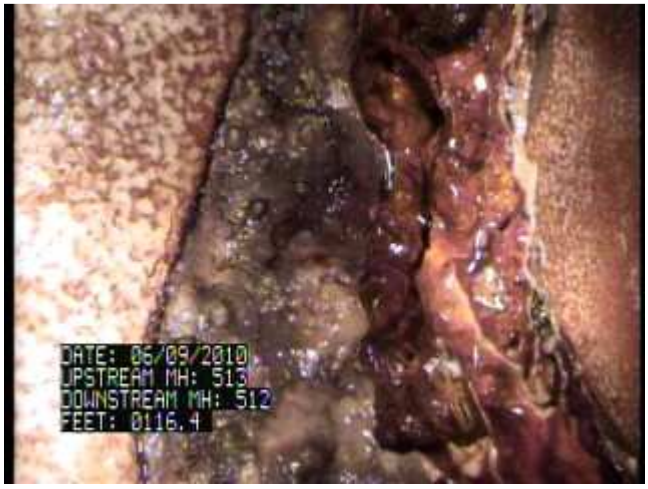
- **513:512** - The sewer inspection for pipe run 513:512 has shown that the pipe is in poor condition with a Structural Score of 2.00, an O&M Score of 2.72, and a Composite Score of 2.65. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be CIPP lined due to the high occurrence of I/I in the line (18 incidences). A CIPP liner will remove all pathways that I/I has of entering the pipe, excluding laterals. The line will also prevent any mineral deposits that may develop as ground water enters via joints and other defects. During the inspection 5 of 6 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system. The homes tributary to this line is being recommended for future testing to determine if any I/I contribution exists.



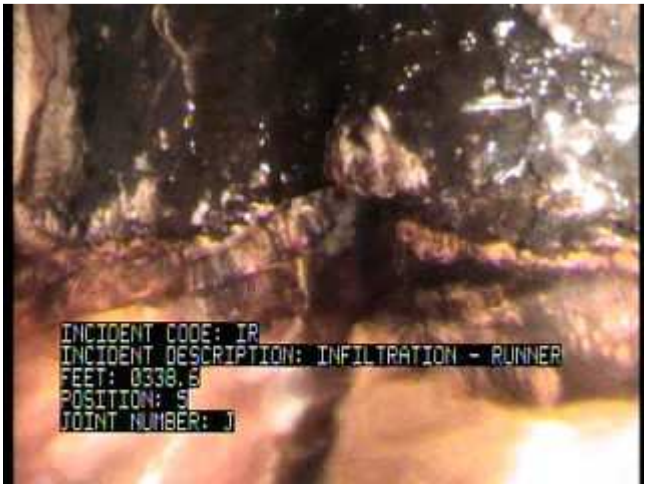
Mineral Deposit Requiring Heavy Cleaning @ 100.8'



Infiltration Runner @ 105.7' (O&M Grade 4)

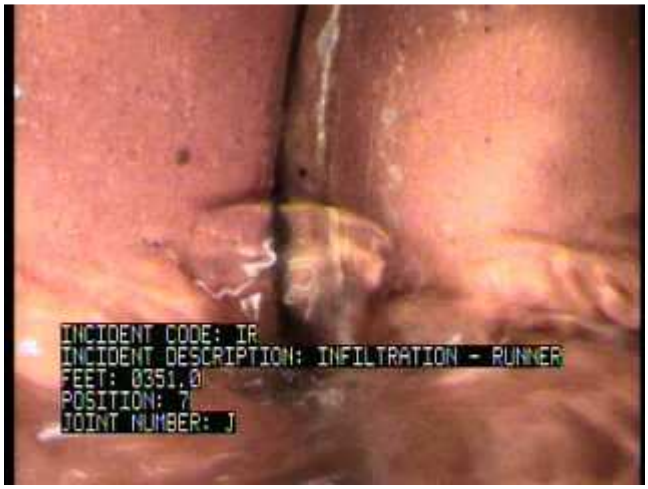


Infiltration Runner @ 116.4 (O&M Grade 4)



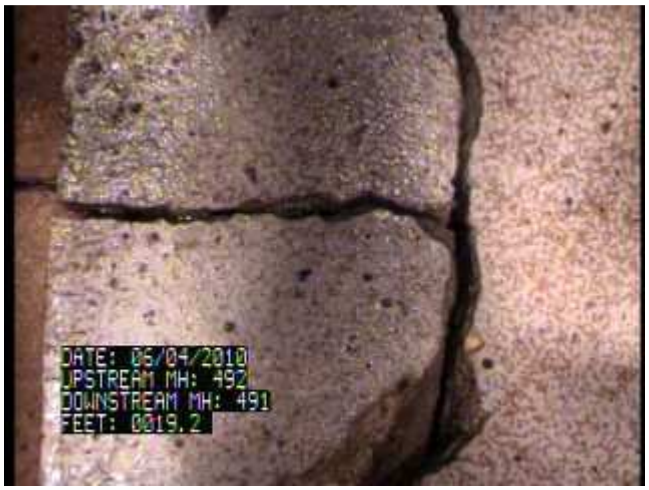
Infiltration Runner @ 338.3' (O&M Grade 4)

Infiltration Runner @ 324.3 (Structural Grade 4)



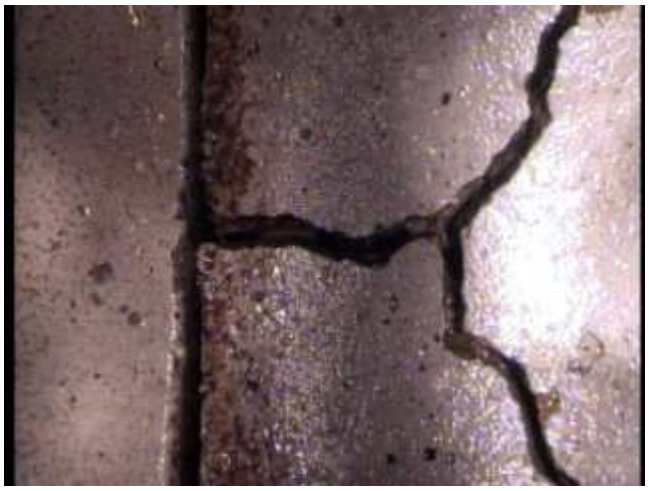
Infiltration Runner @ 351.0' (O&M Grade 4)

- **492:491** - The sewer inspection for pipe run 492:491 has shown that the pipe is in poor condition with a Structural Score of 3.04, an O&M Score of 1.60, and a Composite Score of 2.76. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be CIPP lined due to the high occurrence of Structural Grade 4 defects, as shown below (63 defects). The liner will sufficiently rehabilitate the line and extend the life of the pipe for 50 years, in addition to preventing root intrusion and mineral deposits. During the inspection 2 of 8 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system.

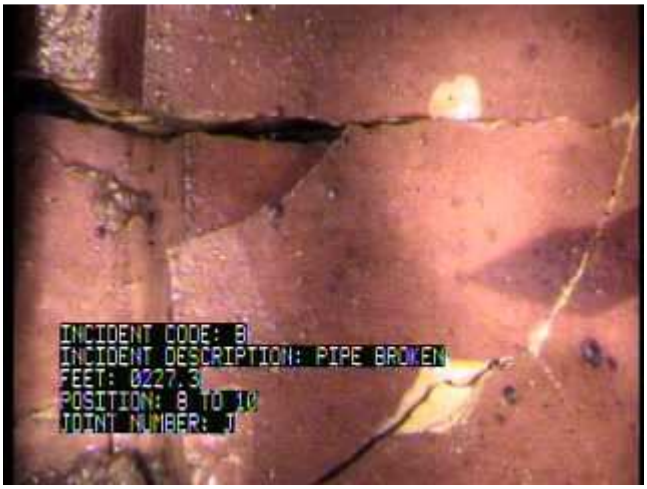


Fracture Multiple @ 19.2' (Structural Grade 4)

Fracture Multiple @ 182.1' (Structural Grade 4)



Fracture Multiple @ 98.2' (Structural Grade 4)



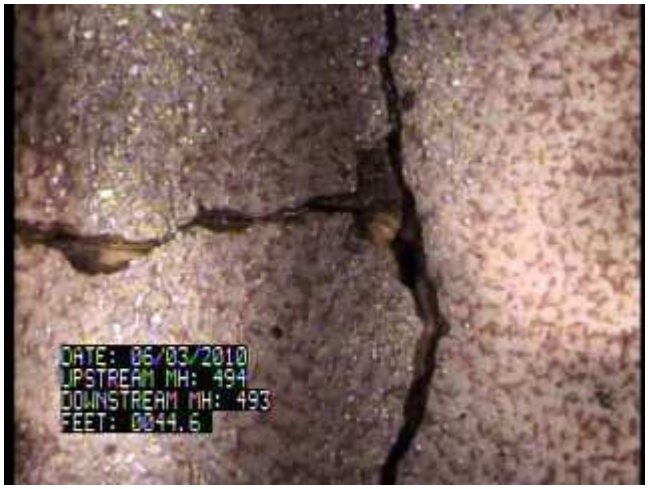
Broken Pipe @ 227.3' (Structural Grade 5)

Fine Roots in Joint @ 321.8' (O&M Grade 1)

15% Sag in Line @336.3 (O&M Grade 2)

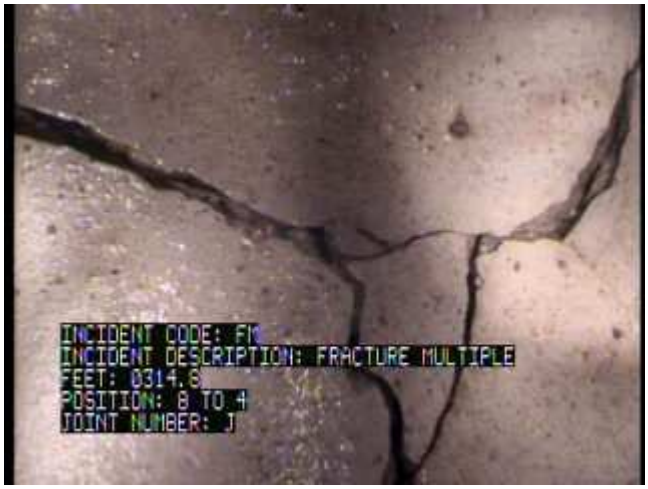
- **494:493** - The sewer inspection for pipe run 492:491 has shown that the pipe is in poor condition with a Structural Score of 3.42, an O&M Score of 1.36, and a Composite Score of 2.86. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be CIPP lined due to the high occurrence of Structural Grade 4 defects, as shown below (72 defects). The liner will sufficiently rehabilitate the line and extend the life of the pipe for 50 years, in addition to preventing root intrusion and mineral deposits. During the inspection 3 of 7 laterals were found to have a continual stream of clear water discharging into the sanitary main; this may be a possible contributor to the I/I of the system.

Fracture Multiple @ 27.1' (Structural Grade 4)

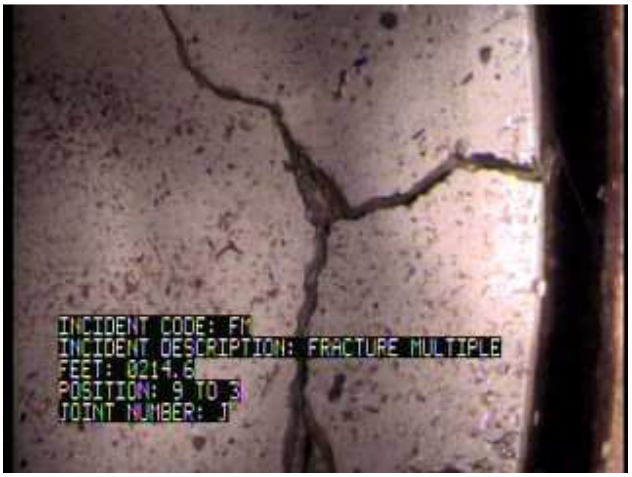


Fracture Multiple @ 44.6' (Structural Grade 4)

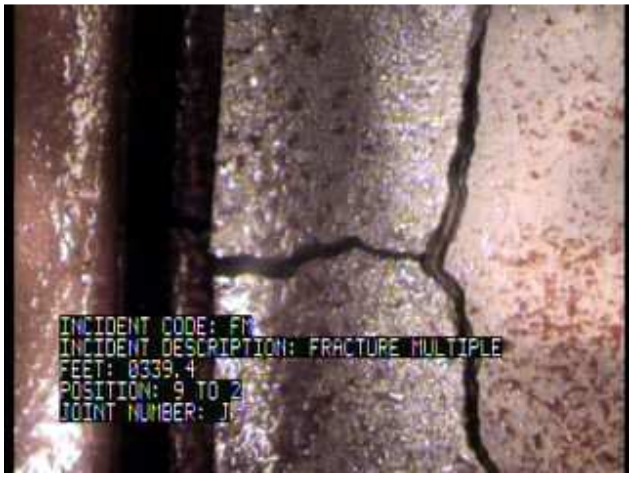
Broken Pipe @ 103.7' (Structural Grade 5)



Fracture Multiple @ 314.8' (Structural Grade 4)



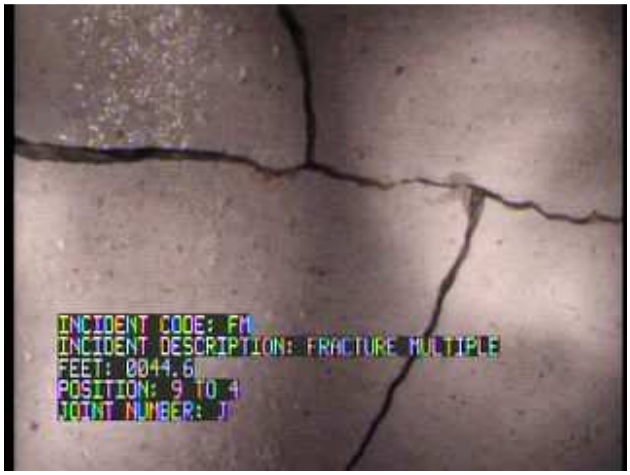
Fracture Multiple @ 214.6' (Structural Grade 4)



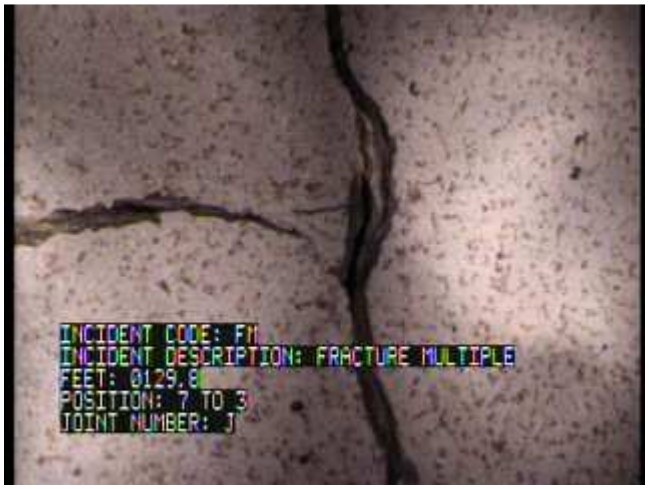
Fracture Multiple @ 339.4' (Structural Grade 4)

- **531:494** - The sewer inspection for pipe run 492:491 has shown that the pipe is in poor condition with a Structural Score of 3.10, an O&M Score of 2.00, and a Composite Score of 2.96. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be CIPP lined due to the high occurrence of Structural Grade 4 defects, as shown below (46 defects). The liner will sufficiently rehabilitate the line and extend the life of the pipe for 50 years, in addition to preventing root intrusion and mineral deposits.

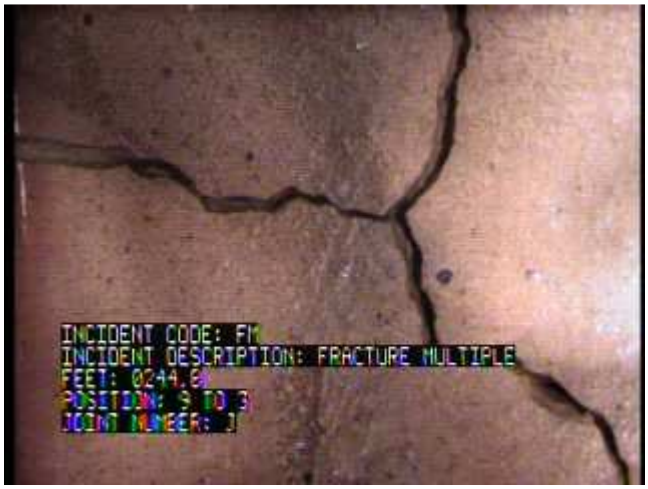
Fracture Multiple @ 18.1' (Structural Grade 4)



Fracture Multiple @ 44.6' (Structural Grade 4)

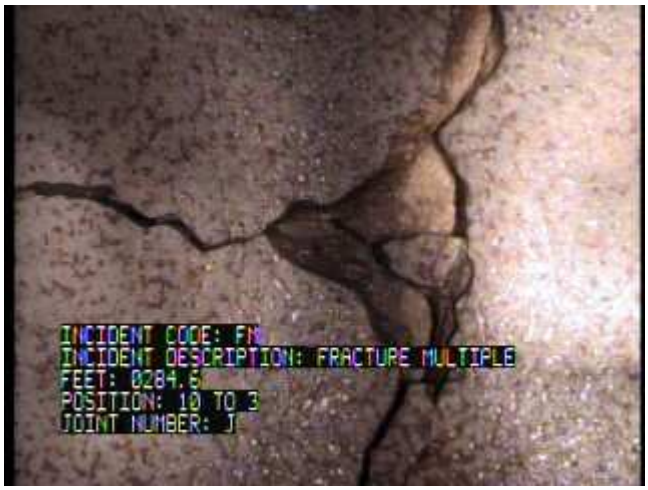


Fracture Multiple @ 129.8' (Structural Grade 4)



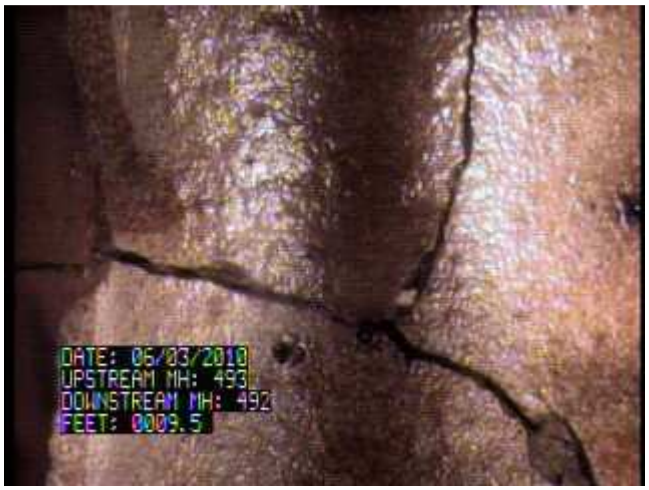
Fracture Multiple @ 244.6' (Structural Grade 4)

Fracture Multiple @ 187.2' (Structural Grade 4)

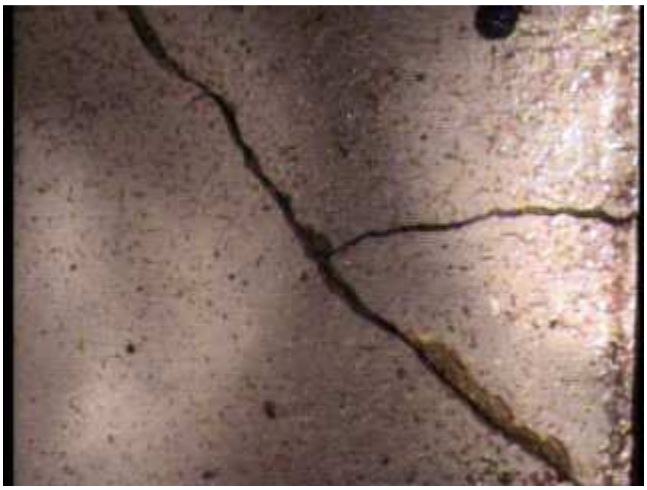


Fracture Multiple @ 284.6' (Structural Grade 4)

- **493:492** - The sewer inspection for pipe run 493:492 has shown that the pipe is in poor condition with a Structural Score of 3.69, an O&M Score of 1.46, and a Composite Score of 3.15. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be CIPP lined due to the high occurrence of Structural Grade 4 defects, as shown below (73 defects). The liner will sufficiently rehabilitate the line and extend the life of the pipe for 50 years, in addition to preventing root intrusion and mineral deposits.



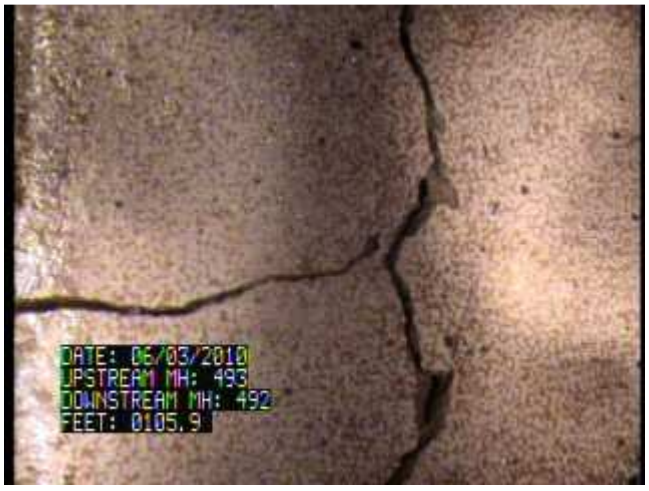
Fracture Multiple @ 9.5' (Structural Grade 4)



Fracture Multiple @ 102.6' (Structural Grade 4)

Fracture Multiple @ 52.6' (Structural Grade 4)

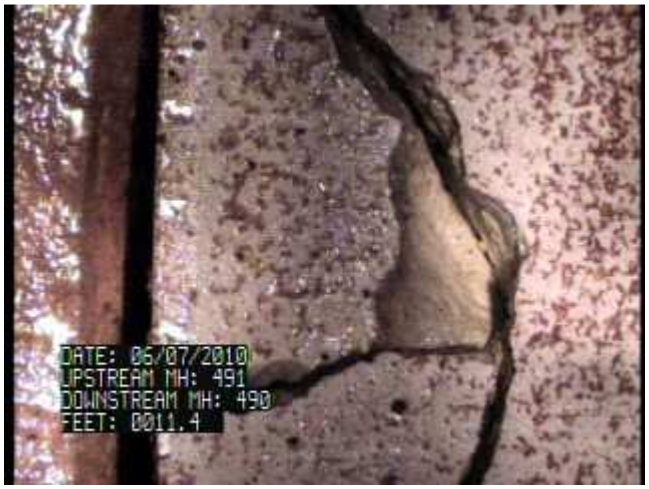
Fracture Multiple @ 178.7' (Structural Grade 4)



Fracture Multiple @ 105.9' (Structural Grade 4)

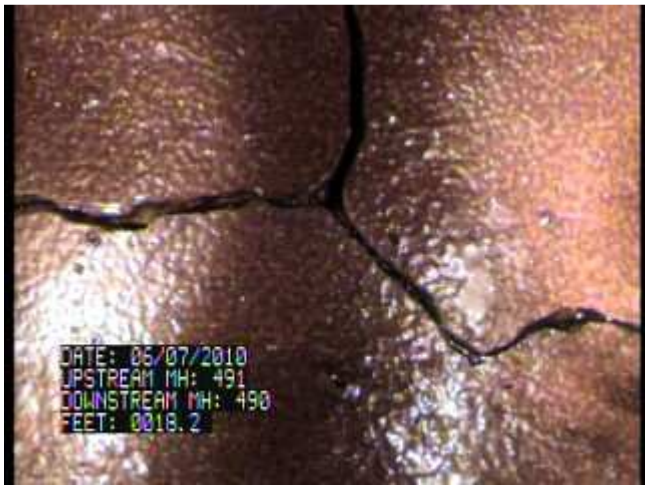
Fracture Multiple @ 220.6' (Structural Grade 4)

- **491:490** - The sewer inspection for pipe run 491:490 has shown that the pipe is in poor condition with a Structural Score of 3.44, an O&M Score of 1.88, and a Composite Score of 3.18. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be CIPP lined due to the high occurrence of Structural Grade 4 defects, as shown below (31 defects). The liner will sufficiently rehabilitate the line and extend the life of the pipe for 50 years, in addition to preventing root intrusion and mineral deposits.

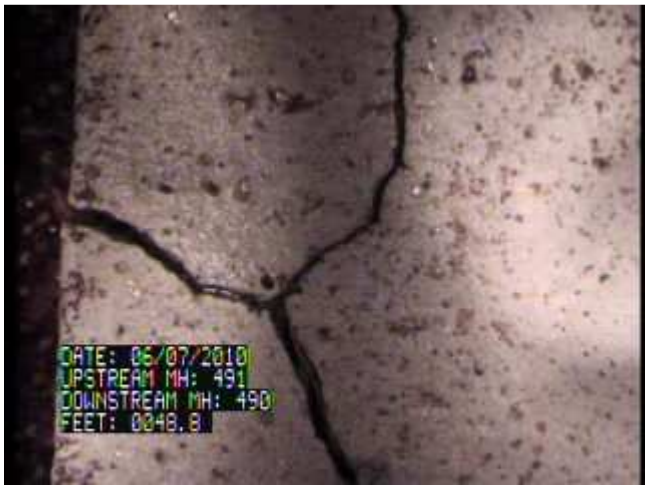


Fracture Multiple @ 11.4' (Structural Grade 4)

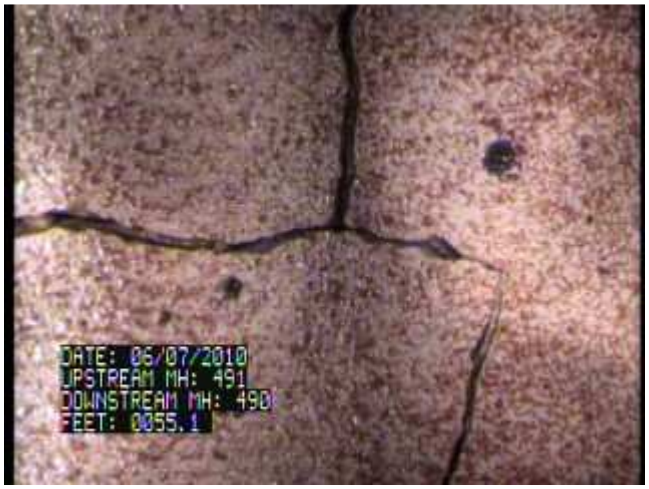
Fracture Multiple @ 18.2' (Structural Grade 4)



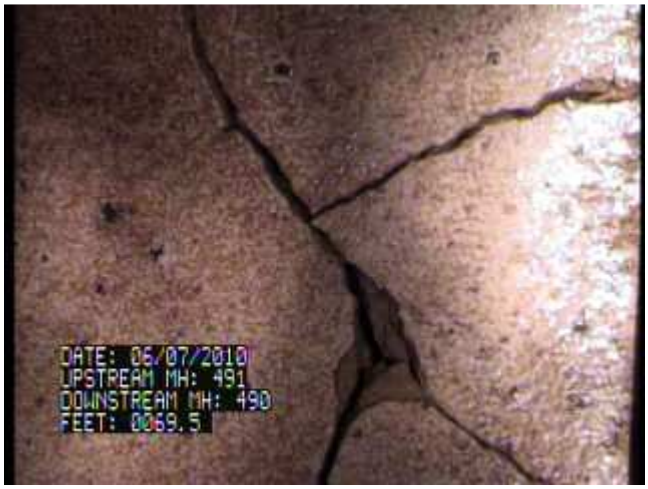
Fracture Multiple @ 18.2' (Structural Grade 4)



Fracture Multiple @ 48.8' (Structural Grade 4)



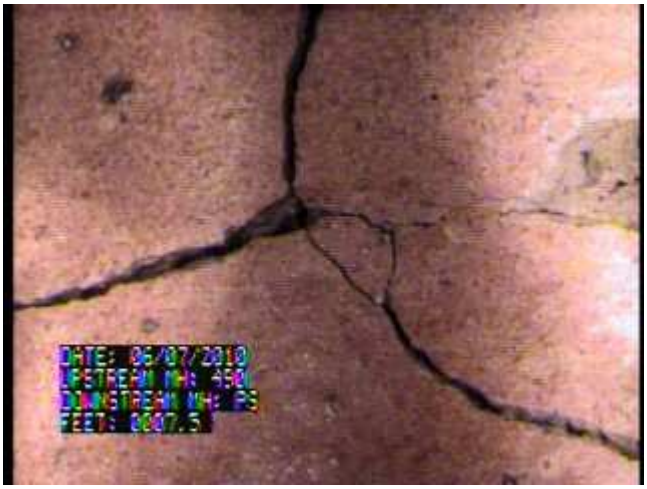
Fracture Multiple @ 55.1' (Structural Grade 4)



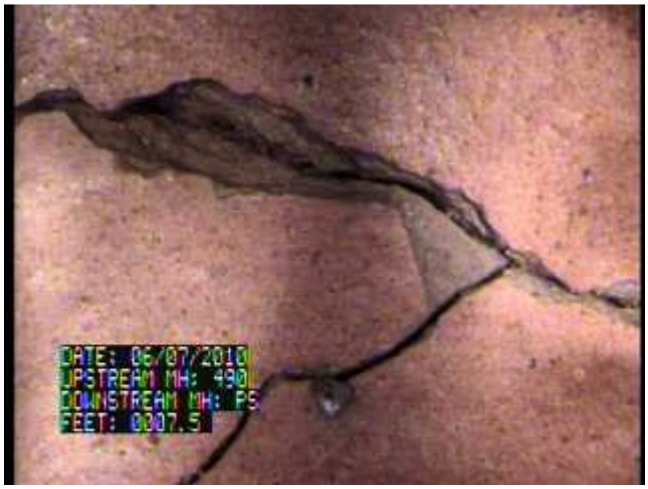
Fracture Multiple @ 69.5' (Structural Grade 4)

- **490:PS** - The sewer inspection for pipe run 490:PS has shown that the pipe is in poor condition with a Structural Score of 3.50, an O&M Score of 1.00, and a Composite Score of 3.30. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be CIPP lined due to the high occurrence of Structural Grade 4 defects, as shown below (46 defects). The liner will sufficiently rehabilitate the line and extend the life of the pipe for 50 years, in addition to preventing root intrusion and mineral deposits.

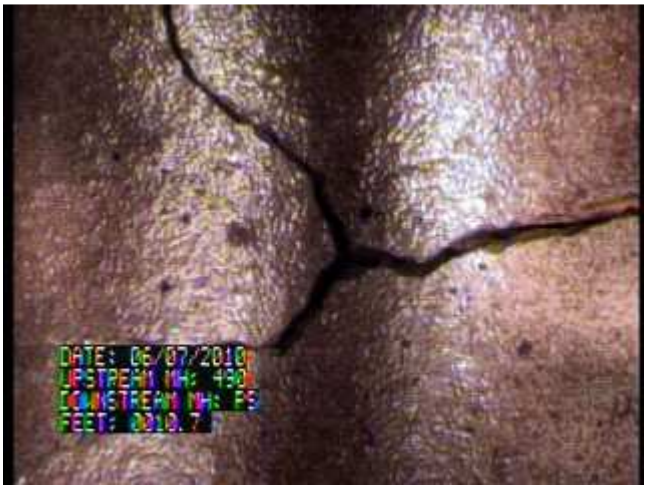
Fracture Multiple @ 2.5' (Structural Grade 4)



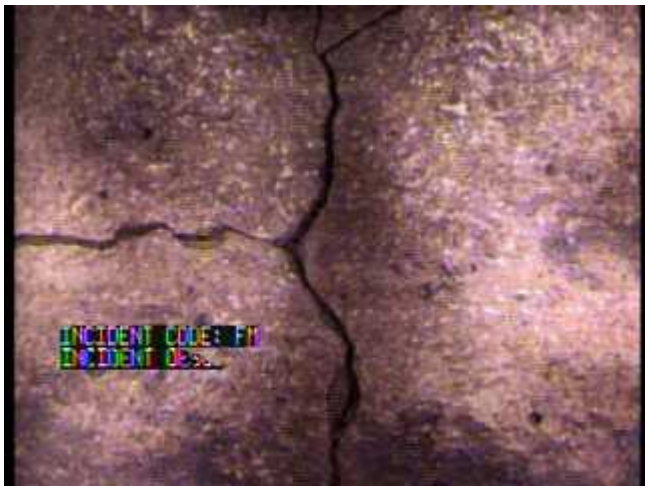
Fracture Multiple @ 7.5' (Structural Grade 4)



Fracture Multiple @ 7.5' (Structural Grade 4)



Fracture Multiple @ 10.7' (Structural Grade 4)



Fracture Multiple @ 41.6' (Structural Grade 4)

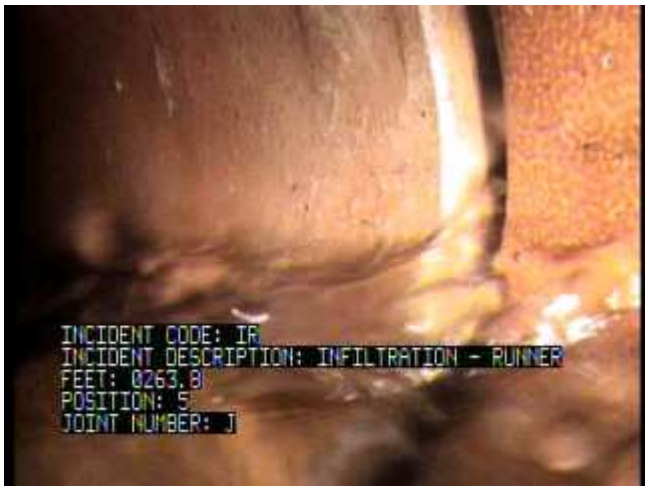
Debris in Pipe Causing End of Inspection @ 81.7'

- **512:511** - The sewer inspection for pipe run 512:511 has shown that the is in poor condition with a Structural Score of 0.00, an O&M Score of 3.69, and a Composite Score of 3.69. The images below show some of the most severe defects encountered during the inspection. This line section is being recommended to be CIPP lined due to the high occurrence of I/I, as shown below (99 occurrences). A CIPP liner will remove all pathways that I/I have of entering the pipe, excluding laterals. The liner will also prevent any mineral deposits that may develop as ground water enters via joints and other defects.

Infiltration Runner @ 42.1' (O&M Grade 4)

Infiltration Runner @ 324.7' (O&M Grade 4)

Infiltration Runner @ 53.9' (O&M Grade 4)



Infiltration Runner @ 263.8' (O&M Grade 4)

Infiltration Runner @ 193.'3 (O&M Grade 4)
Mineral Deposit @ 193.3' (O&M Grade 2)

Infiltration Runner @ 324.7' (O&M Grade 4)

Once all of the sewers were coded, the PipeTech software determined a composite Structural, O&M, and Overall Grade for each sewer segment establishing the general condition of the pipe. The Sanitary Sewer Composite Score Table below shows the cumulative Structural Score, O&M Score, Overall Score, number of defects, and preliminary recommendations for the sanitary sewer pipe:

Sanitary Sewer Composite Score and Preliminary Recommendation Table										
Pipe Segment (US MH:DS MH)	Length Surveyed (ft)	Defect Type	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Score	Composite Score	Recommendations
524:524WM	177.0	Structural	0	0	0	0	0	0.00	1.24	2 yr Maint. Program
		O&M	14	1	1	0	0	1.24		
525:524	338.0	Structural	1	0	0	0	0	1.00	1.75	10 yr Maint. Program
		O&M	0	3	0	0	0	2.00		
528:527	345.0	Structural	2	4	8	0	0	2.43	1.83	10yr Maint. Program
		O&M	10	0	0	0	0	1.00		
501:500	191.0	Structural	0	12	1	0	0	2.08	1.85	10 yr Maint. Program
		O&M	5	1	1	0	0	1.43		
500:494	212.0	Structural	5	8	4	0	0	1.94	1.89	10 yr Maint. Program
		O&M	1	1	0	0	0	1.50		
523:511	440.0	Structural	1	5	0	1	1	2.50	1.92	2 yr Maint. Program
		O&M	12	39	1	1	0	1.83		
529:506	362.5	Structural	4	3	2	0	0	1.78	1.94	10 yr Maint. Program
		O&M	0	23	0	0	0	2.00		
499:498	281.0	Structural	1	7	3	0	0	2.18	1.97	2 yr Maint. Program
		O&M	6	18	1	1	0	1.88		
516:515	258.0	Structural	4	4	3	0	0	1.91	2.00	10 yr Maint. Program
		O&M	0	15	1	0	0	2.06		
526:525	390.0	Structural	1	0	1	0	0	2.00	2.00	10 yr Maint. Program
		O&M	0	18	0	0	0	2.00		
514:513	372.0	Structural	0	8	0	0	0	2.00	2.02	10 yr Maint. Program
		O&M	0	51	1	0	0	2.02		
519:518	243.0	Structural	5	7	4	0	1	2.12	2.07	10 yr Maint. Program and Point Repair
		O&M	1	10	1	0	0	2.00		
517:516	90.0	Structural	0	0	1	0	0	3.00	2.08	10 yr Maint. Program
		O&M	0	12	0	0	0	2.00		
527:526	319.0	Structural	2	1	4	0	0	2.29	2.08	10 yr Maint. Program
		O&M	0	40	0	1	0	2.05		
507:506	412.0	Structural	5	68	12	2	0	2.13	2.10	10 yr Maint. Program
		O&M	0	18	0	0	0	2.00		
506:505	353.0	Structural	14	17	13	4	0	2.15	2.11	10 yr Maint. Program
		O&M	1	16	1	0	0	2.00		
520:514	407.6	Structural	0	7	0	0	0	2.00	2.11	10 yr Maint. Program
		O&M	1	60	3	3	0	2.12		
302:491	302.0	Structural	9	11	8	3	0	2.16	2.12	10 yr Maint. Program
		O&M	0	11	0	0	0	2.00		
521:513	385.0	Structural	1	8	1	0	1	2.27	2.15	5 yr Maint. Program
		O&M	2	35	3	2	0	2.12		
518:516	375.0	Structural	3	1	3	0	1	2.38	2.15	5 yr Maint. Program
		O&M	0	36	0	2	0	2.11		

Sanitary Sewer Composite Score Table										
Pipe Segment (US MH:DS MH)	Length Surveyed (ft)	Defect Type	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Score	Composite Score	Recommendations
497:495	402.0	Structural	2	11	9	4	0	2.58	2.17	5 yr Maint. Program
		O&M	8	6	0	0	0	1.43		
508:507	372.0	Structural	8	47	19	3	0	2.22	2.19	5 yr Maint. Program
		O&M	0	16	1	0	0	2.06		
509:508	357.0	Structural	1	10	2	0	2	2.47	2.19	10 yr Maint. Program
		O&M	1	19	1	0	0	2.00		
511:510	344.0	Structural	1	5	0	0	0	1.83	2.20	5 yr Maint. Program
		O&M	0	24	2	3	0	2.28		
515:514	194.0	Structural	0	4	2	0	1	2.71	2.20	5 yr Maint. Program and CIPP Sectional Liner
		O&M	0	18	0	0	0	2.00		
498:497	272.0	Structural	2	9	7	1	1	2.50	2.24	5 yr Maint. Program
		O&M	3	6	0	0	0	1.67		
510:507	257.0	Structural	1	5	7	0	0	2.46	2.25	5 yr Maint. Program
		O&M	0	18	0	1	0	2.11		
522:512	388.0	Structural	0	0	0	0	0	0.00	2.25	5 yr Maint. Program
		O&M	0	34	2	4	0	2.25		
530:505	356.0	Structural	2	5	5	1	0	2.38	2.26	10 yr Maint. Program
		O&M	0	6	0	0	0	2.00		
505:504	199.0	Structural	10	16	22	8	0	2.50	2.38	2 yr Maint. Program
		O&M	4	4	0	0	0	1.50		
496:495	165.0	Structural	6	21	20	6	0	2.49	2.46	5 yr Maint. Program
		O&M	0	4	0	0	0	2.00		
495:531	178.0	Structural	3	10	9	7	1	2.77	2.61	Pipe Replacement
		O&M	1	5	0	0	0	1.83		
513:512	361.0	Structural	0	5	0	0	0	2.00	2.65	Full Length CIPP Liner
		O&M	0	32	0	18	0	2.72		
492:491	374.0	Structural	6	47	25	63	1	3.04	2.76	Full Length CIPP Liner
		O&M	17	15	3	0	0	1.60		
494:493	371.0	Structural	3	24	6	72	1	3.42	2.86	Full Length CIPP Liner
		O&M	25	14	0	0	0	1.36		
531:494	295.0	Structural	5	26	22	46	0	3.10	2.96	Full Length CIPP Liner
		O&M	0	14	0	0	0	2.00		
493:492	354.0	Structural	2	8	6	73	0	3.69	3.15	Full Length CIPP Liner
		O&M	15	13	0	0	0	1.46		
491:490	167.0	Structural	4	5	1	31	0	3.44	3.18	Full Length CIPP Liner
		O&M	1	7	0	0	0	1.88		
490:PS	230.0	Structural	1	14	0	46	0	3.50	3.30	Full Length CIPP Liner
		O&M	5	0	0	0	0	1.00		
512:511	350.0	Structural	0	0	0	0	0	0.00	3.69	Full Length CIPP Liner
		O&M	0	18	1	99	0	3.69		
504:503	330.0	Structural	--	--	--	--	--	--	--	To be Determined
		O&M	--	--	--	--	--	--		
503:58	90.0	Structural	--	--	--	--	--	--	--	To be Determined
		O&M	--	--	--	--	--	--		