

CASE STUDY

# A Midwest Municipal Sewer Agency

## 5,500 LF Project

Pre-Rehabilitation Survey Nov 11 & 12, 2015

Post-Rehabilitation Survey Apr 5 & 6, 2016

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### Pre-Rehabilitation Assessment, Nov 11 & 12, 2015



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Quantities displayed in Gallons per Minute (GPM).

# Pre- and Post-CIPP Comparison

11/11 to 11/12/2015

4/5 to 4/6/2016

113 Days

	BEFORE CIPP	AFTER CIPP	% Change
Small Defects	948	36	- 96%
Medium Defects	304	21	- 93%
Large Defects	180	40	- 78%
Total # of Defects	1,432	97	- 93%
Gallons Per Day	1,708,171	434,823	- 78%

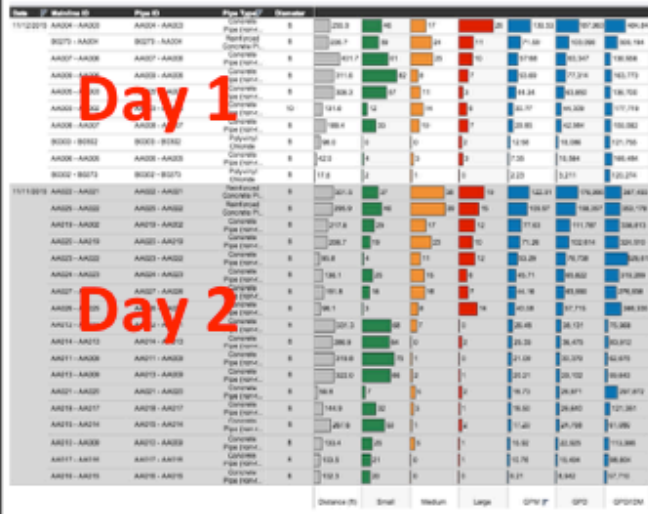
1. All Data Available and Summarized within 10 Minutes After the Final Scan.
2. Post-CIPP Results are prior to Contractor's Repairs.

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## Pre-Rehabilitation

November 11-12, 2015

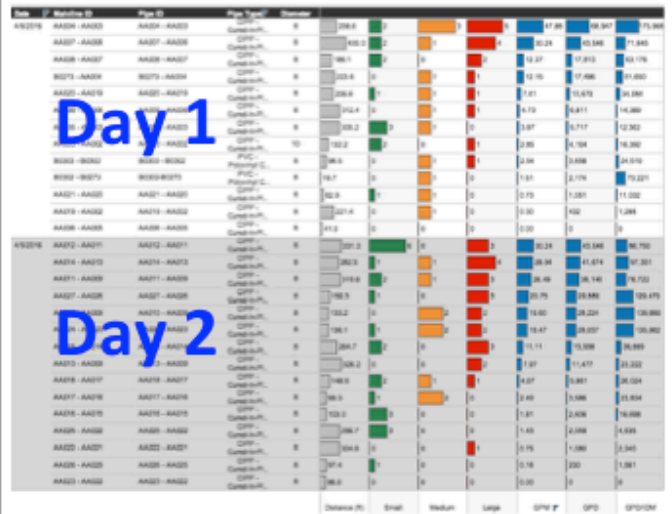
Total Feet: 5,559      1,708,171 GPD  
 Total Segments: 28




## Post-Rehabilitation

April 5-6, 2016

Total Feet: 5,563      434,822 GPD  
 Total Segments: 28



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THE  
GOOD  
THE  
BAD  
AND THE  
UGLY

## Post-Rehabilitation

April 5-6, 2016

Total Feet: 5,563      434,822 GPD


Total Segments: 28

Line #	Mainline ID	Pipe ID	Pipe Type	Diameter	Length	Small	Med	Large	Total	GPD
492276	AA04-AA03	AA04-AA03	CP	8	29.6	0	0	0	0	17.46
492277	AA07-AA06	AA07-AA06	CP	8	102.4	0	0	0	0	59.947
492278	AA08-AA07	AA08-AA07	CP	8	102.4	0	0	0	0	11.845
492279	AA09-AA08	AA09-AA08	CP	8	102.4	0	0	0	0	17.453
492280	AA10-AA09	AA10-AA09	CP	8	102.4	0	0	0	0	11.876
492281	AA11-AA10	AA11-AA10	CP	8	102.4	0	0	0	0	17.456
492282	AA12-AA11	AA12-AA11	CP	8	102.4	0	0	0	0	11.880
492283	AA13-AA12	AA13-AA12	CP	8	102.4	0	0	0	0	17.456
492284	AA14-AA13	AA14-AA13	CP	8	102.4	0	0	0	0	11.876
492285	AA15-AA14	AA15-AA14	CP	8	102.4	0	0	0	0	17.456
492286	AA16-AA15	AA16-AA15	CP	8	102.4	0	0	0	0	11.876
492287	AA17-AA16	AA17-AA16	CP	8	102.4	0	0	0	0	17.456
492288	AA18-AA17	AA18-AA17	CP	8	102.4	0	0	0	0	11.876
492289	AA19-AA18	AA19-AA18	CP	8	102.4	0	0	0	0	17.456
492290	AA20-AA19	AA20-AA19	CP	8	102.4	0	0	0	0	11.876
492291	AA21-AA20	AA21-AA20	CP	8	102.4	0	0	0	0	17.456
492292	AA22-AA21	AA22-AA21	CP	8	102.4	0	0	0	0	11.876
492293	AA23-AA22	AA23-AA22	CP	8	102.4	0	0	0	0	17.456
492294	AA24-AA23	AA24-AA23	CP	8	102.4	0	0	0	0	11.876
492295	AA25-AA24	AA25-AA24	CP	8	102.4	0	0	0	0	17.456
492296	AA26-AA25	AA26-AA25	CP	8	102.4	0	0	0	0	11.876
492297	AA27-AA26	AA27-AA26	CP	8	102.4	0	0	0	0	17.456
492298	AA28-AA27	AA28-AA27	CP	8	102.4	0	0	0	0	11.876
492299	AA29-AA28	AA29-AA28	CP	8	102.4	0	0	0	0	17.456
492300	AA30-AA29	AA30-AA29	CP	8	102.4	0	0	0	0	11.876
492301	AA31-AA30	AA31-AA30	CP	8	102.4	0	0	0	0	17.456
492302	AA32-AA31	AA32-AA31	CP	8	102.4	0	0	0	0	11.876
492303	AA33-AA32	AA33-AA32	CP	8	102.4	0	0	0	0	17.456
492304	AA34-AA33	AA34-AA33	CP	8	102.4	0	0	0	0	11.876
492305	AA35-AA34	AA35-AA34	CP	8	102.4	0	0	0	0	17.456
492306	AA36-AA35	AA36-AA35	CP	8	102.4	0	0	0	0	11.876
492307	AA37-AA36	AA37-AA36	CP	8	102.4	0	0	0	0	17.456
492308	AA38-AA37	AA38-AA37	CP	8	102.4	0	0	0	0	11.876
492309	AA39-AA38	AA39-AA38	CP	8	102.4	0	0	0	0	17.456
492310	AA40-AA39	AA40-AA39	CP	8	102.4	0	0	0	0	11.876
492311	AA41-AA40	AA41-AA40	CP	8	102.4	0	0	0	0	17.456
492312	AA42-AA41	AA42-AA41	CP	8	102.4	0	0	0	0	11.876
492313	AA43-AA42	AA43-AA42	CP	8	102.4	0	0	0	0	17.456
492314	AA44-AA43	AA44-AA43	CP	8	102.4	0	0	0	0	11.876
492315	AA45-AA44	AA45-AA44	CP	8	102.4	0	0	0	0	17.456
492316	AA46-AA45	AA46-AA45	CP	8	102.4	0	0	0	0	11.876
492317	AA47-AA46	AA47-AA46	CP	8	102.4	0	0	0	0	17.456
492318	AA48-AA47	AA48-AA47	CP	8	102.4	0	0	0	0	11.876
492319	AA49-AA48	AA49-AA48	CP	8	102.4	0	0	0	0	17.456
492320	AA50-AA49	AA50-AA49	CP	8	102.4	0	0	0	0	11.876
492321	AA51-AA50	AA51-AA50	CP	8	102.4	0	0	0	0	17.456
492322	AA52-AA51	AA52-AA51	CP	8	102.4	0	0	0	0	11.876
492323	AA53-AA52	AA53-AA52	CP	8	102.4	0	0	0	0	17.456
492324	AA54-AA53	AA54-AA53	CP	8	102.4	0	0	0	0	11.876
492325	AA55-AA54	AA55-AA54	CP	8	102.4	0	0	0	0	17.456
492326	AA56-AA55	AA56-AA55	CP	8	102.4	0	0	0	0	11.876
492327	AA57-AA56	AA57-AA56	CP	8	102.4	0	0	0	0	17.456
492328	AA58-AA57	AA58-AA57	CP	8	102.4	0	0	0	0	11.876
492329	AA59-AA58	AA59-AA58	CP	8	102.4	0	0	0	0	17.456
492330	AA60-AA59	AA60-AA59	CP	8	102.4	0	0	0	0	11.876


Distance (ft)    Small    Medium    Large    GPD    GPD    GPD

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# THE GOOD



## Pre-CIPP



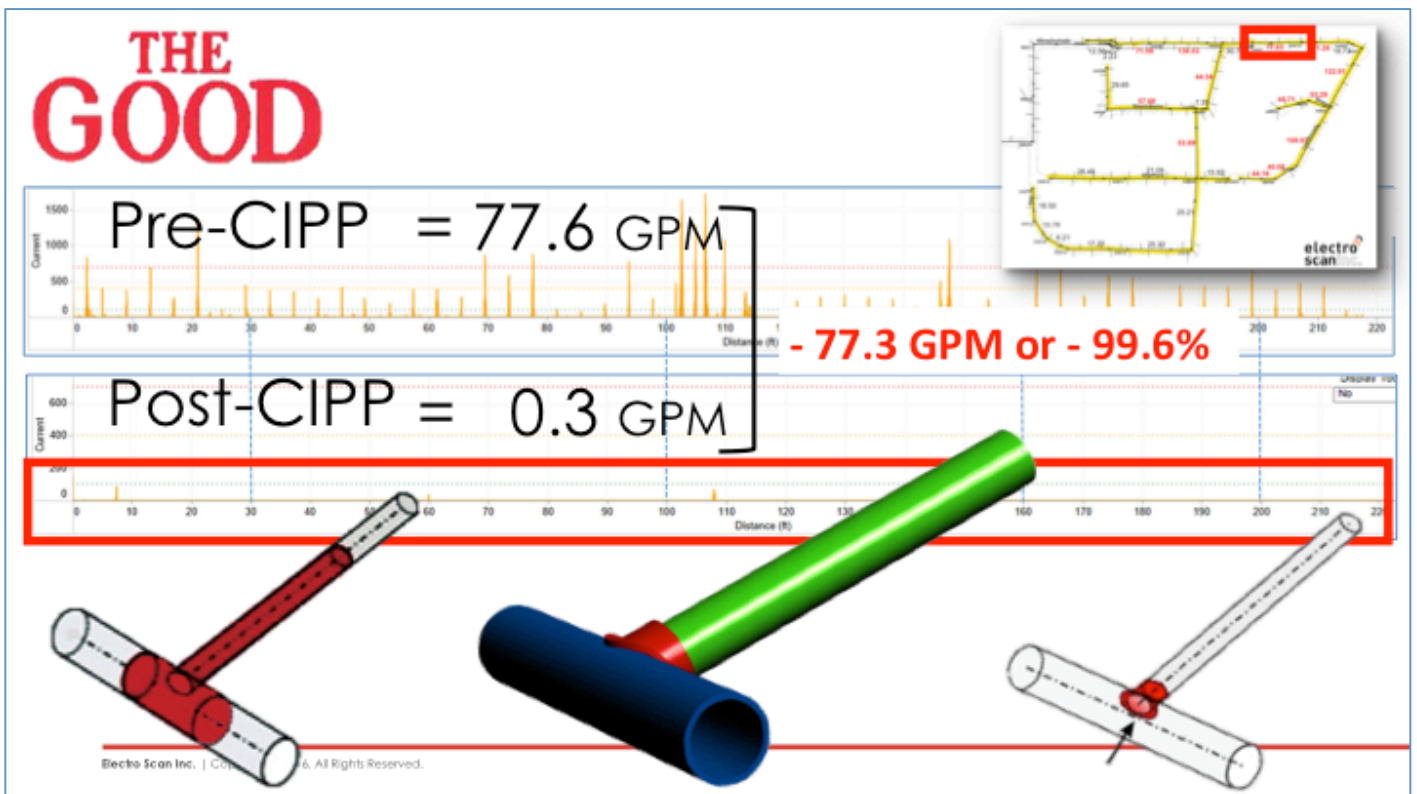
## Post-CIPP

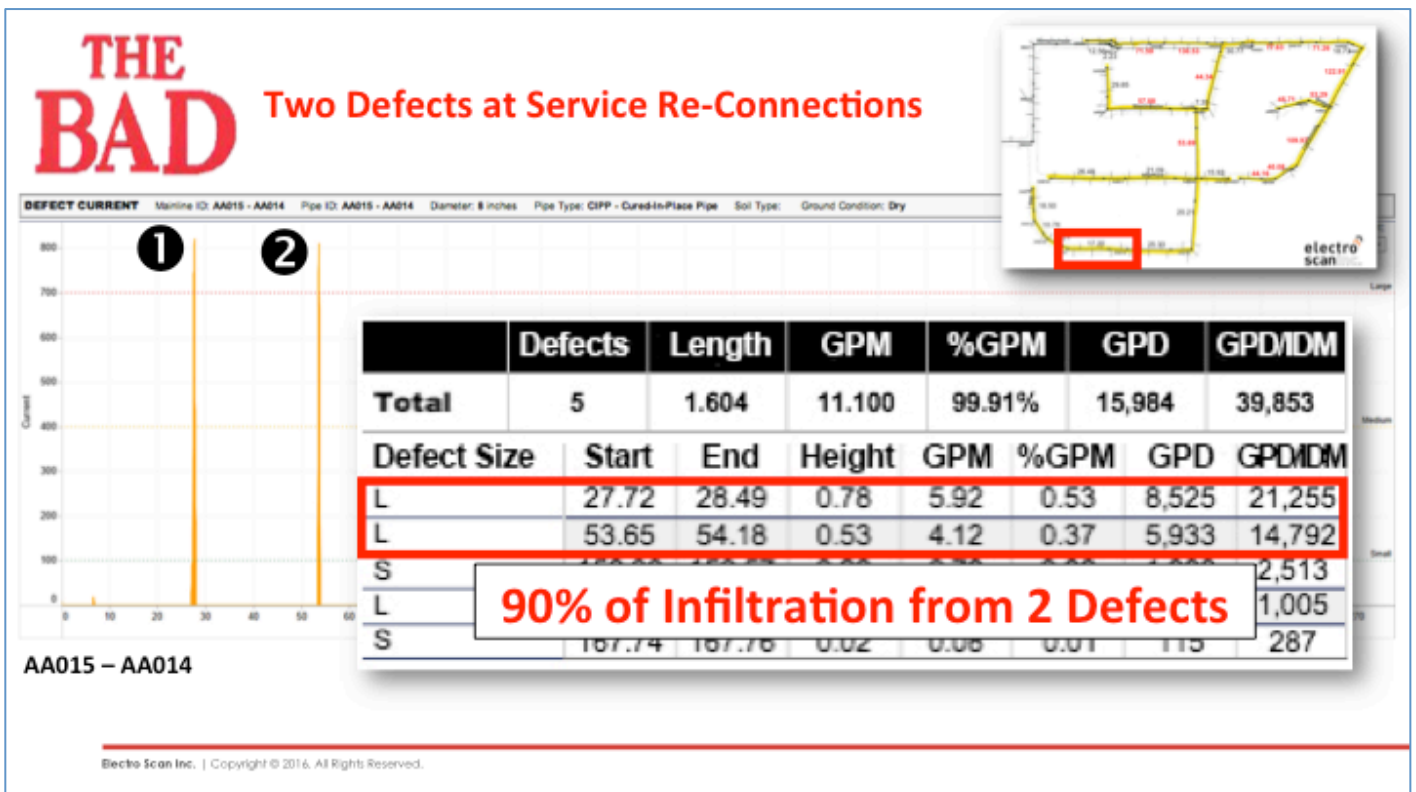
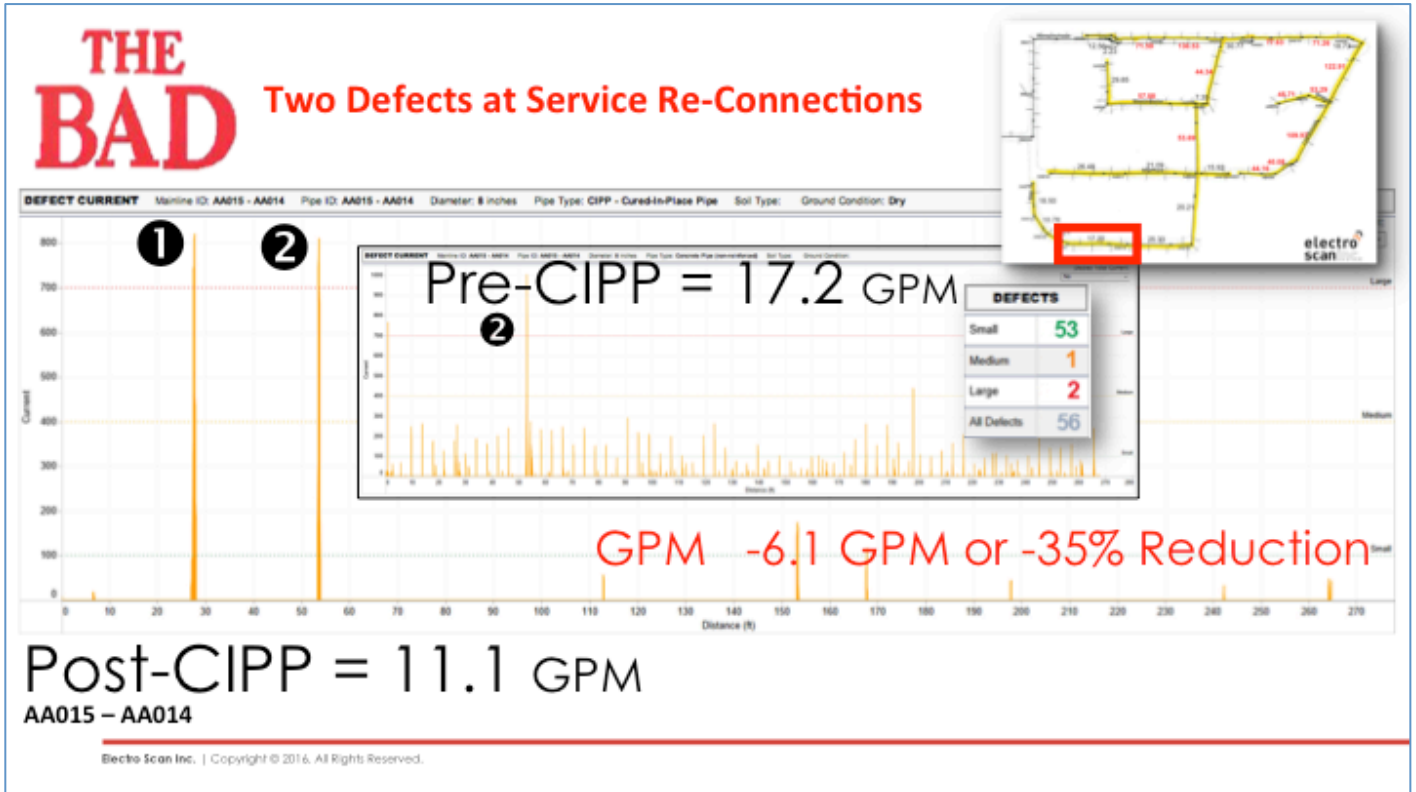


Mainline Segment				PRE-CIPP					POST-CIPP				
				Number of Defects				Defect Flow	Number of Defects				Defect Flow
From ID	To ID	Pipe Type	Pipe Dia.	Small	Med	Large	Total	GPM	Small	Med	Large	Total	GPM
AA004	AA003	CP	8	46	17	26	89	130.5	2	3	5	10	47.9
AA022	AA021	RCP	8	37	38	19	94	122.9	0	0	1	1	0.8
AA025	AA022	RCP	8	46	39	15	100	110.0	3	0	0	3	1.4
AA019	AA002	CP	8	29	17	12	58	77.6	0	1	0	1	0.3
B0273	AA004	RCP	8	39	24	11	74	71.6	0	1	1	1	12.2

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# AND THE UGLY

## Post-CIPP Flow Worse Than Pre-CIPP

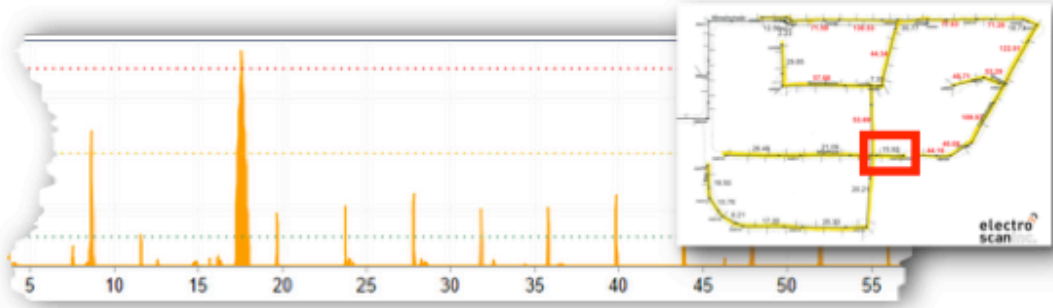


Mainline Segment				POST-REHABILITATION					GPM								
From ID	To ID	Pipe Type	Pipe Dia.	Length (Feet)	Number of Defects				Defect Flows			GPM		GPD		GPD / IDM	
					Small	Med	Large	Total	GPM	GPD	GPD / IDM	Qty	%	Qty	%	Qty	%
<b>TOTAL</b>				<b>5,563</b>	<b>36</b>	<b>21</b>	<b>40</b>	<b>96</b>	<b>302</b>	<b>434,823</b>	<b>1,356,115</b>	<b>-884</b>	<b>-75%</b>	<b>-1,273,348</b>	<b>-75%</b>	<b>-4,552,316</b>	<b>-77%</b>
AA011	AA009	CP	8	319.8	7	1	3	6	26.5	38,146	78,722	5	26%	7,776	26%	16,047	26%
AA010	AA009	CP	8	133.2	0	2	2	4	19.6	28,224	139,860	4	23%	5,299	23%	26,474	23%
AA014	AA013	CP	8	282.5	1	1	4	6	28.9	41,674	97,351	4	14%	5,199	14%	13,439	14%
AA012	AA011	CP	8	331.3	6	0	3	9	30.2	43,546	86,750	4	14%	5,415	14%	10,782	14%
B0302	B0273	PVC	8	19.7	0	1	0	1	1.5	2,174	73,221	-1	-32%	-1,037	-32%	-47,053	-39%
AA015	AA014	CP	8	264.7	2	0	3	5	11.1	15,998	39,869	-6	-35%	-8,770	-35%	-21,211	-35%
AA007	AA006	CP	8	400.0	2	1	4	7	30.2	43,546	71,845	-28	-48%	-39,801	-48%	-65,113	-48%
AA027	AA026	CP	8	152.3	1	0	3	4	20.8	29,880	129,470	-23	-53%	-33,710	-53%	-147,068	-53%
AA001	AA000	CP	8	1	2	0	0	2	19.5	28,224	139,860	5	26%	7,776	26%	16,047	26%

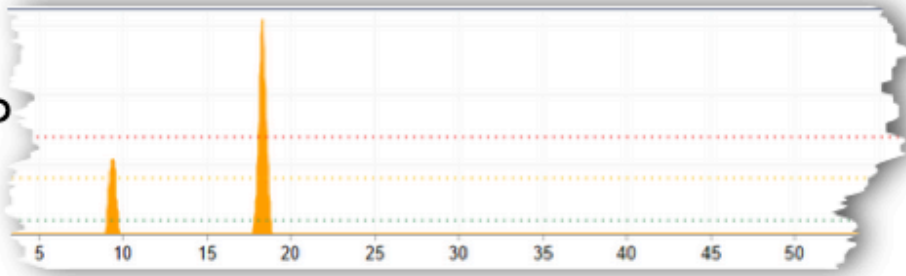
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# AND THE UGLY

## Pre-CIPP

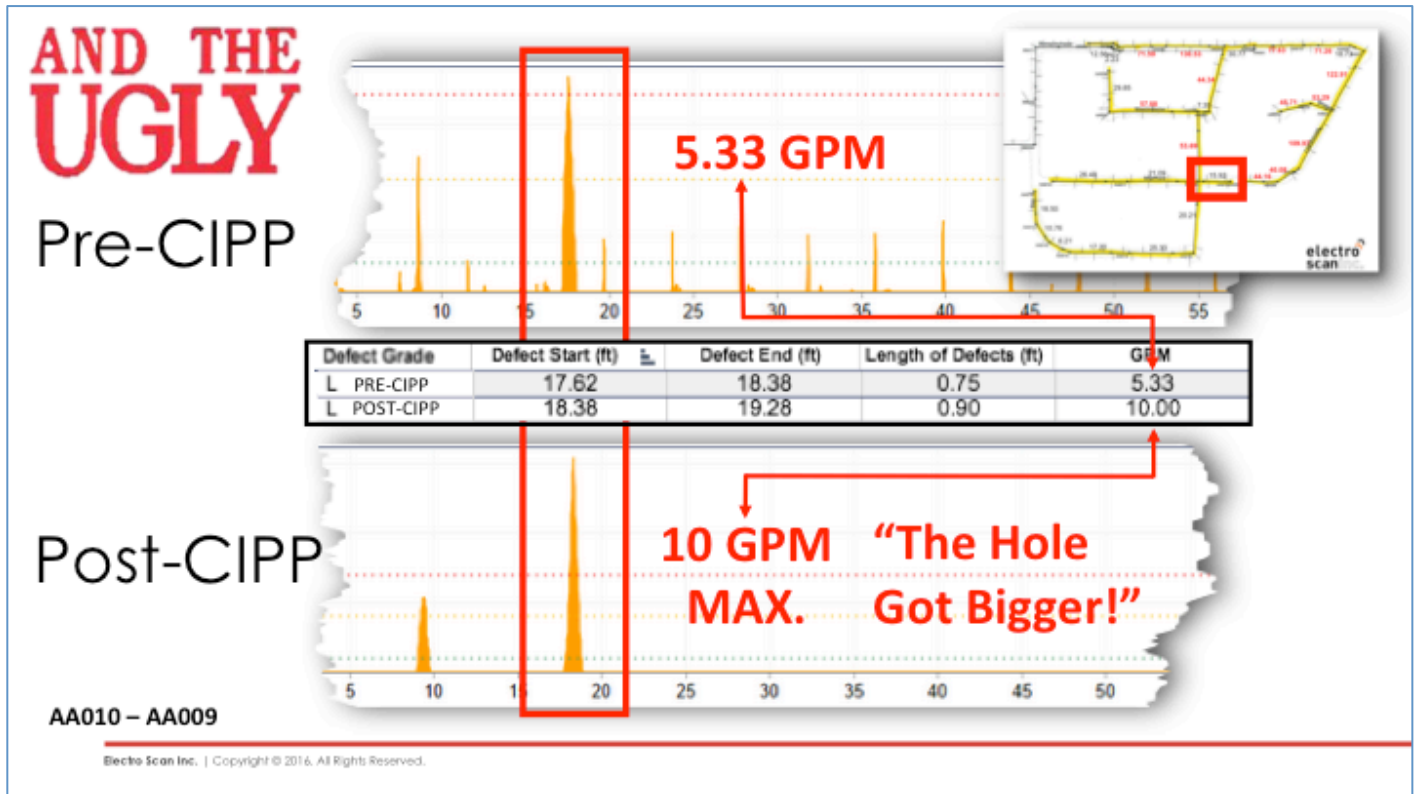


## Post-CIPP



AA010 – AA009

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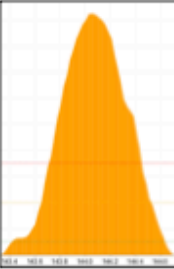
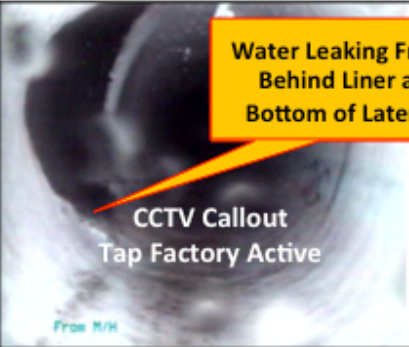

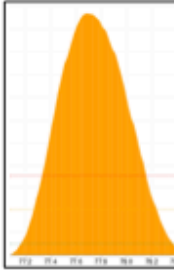

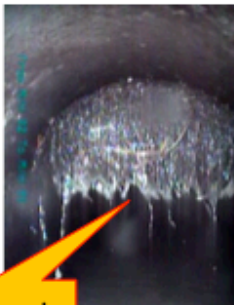
## Post-Rehabilitation Certification

- 6 of 28 Pipes Achieved 99% - 100%. 😊
- 8 of 28 Pipes Achieved 75% or more. 😊
- 10 Pipes Had Zero to 65% Reduction. 😓
- 4 Pipes Had Higher Leakage Rates AFTER CIPP, Than BEFORE CIPP. 1,066 LF of 5,562 LF or 19% 😡

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# How Could Defect Flows Be Worse After CIPP?

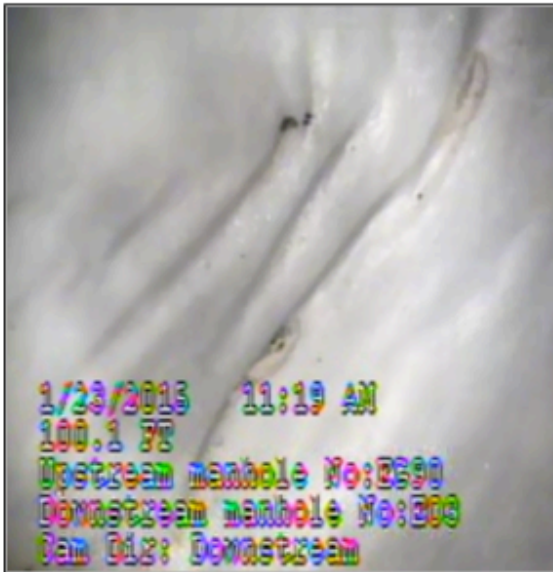
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<p><b>1</b> Bad Service Connection</p>	<p>electroscaninc.  Estimated Infiltration Flow: 10.00 GPM</p>	<p>Water Leaking From Behind Liner at Bottom of Lateral CCTV Callout Tap Factory Active</p> 	
<p><b>2</b> Liner Cuts Causing Roots</p>	<p>electroscaninc.  Estimated Infiltration Flow: 10.00 GPM</p>	<p>0888 5111 05/30/12 CCTV Callout Tap Factory Active</p> 	<p>Roots Through Lateral Liner</p> 

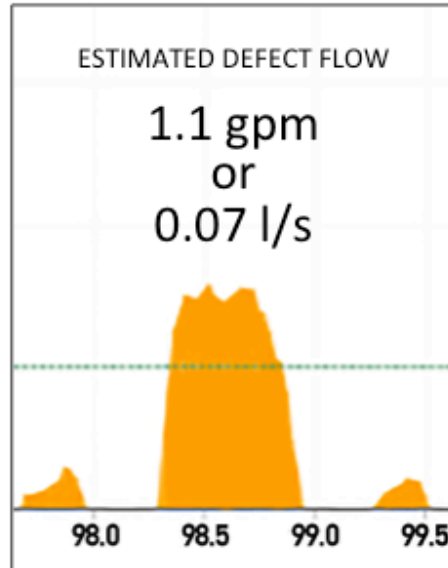
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### 3 Wrinkles



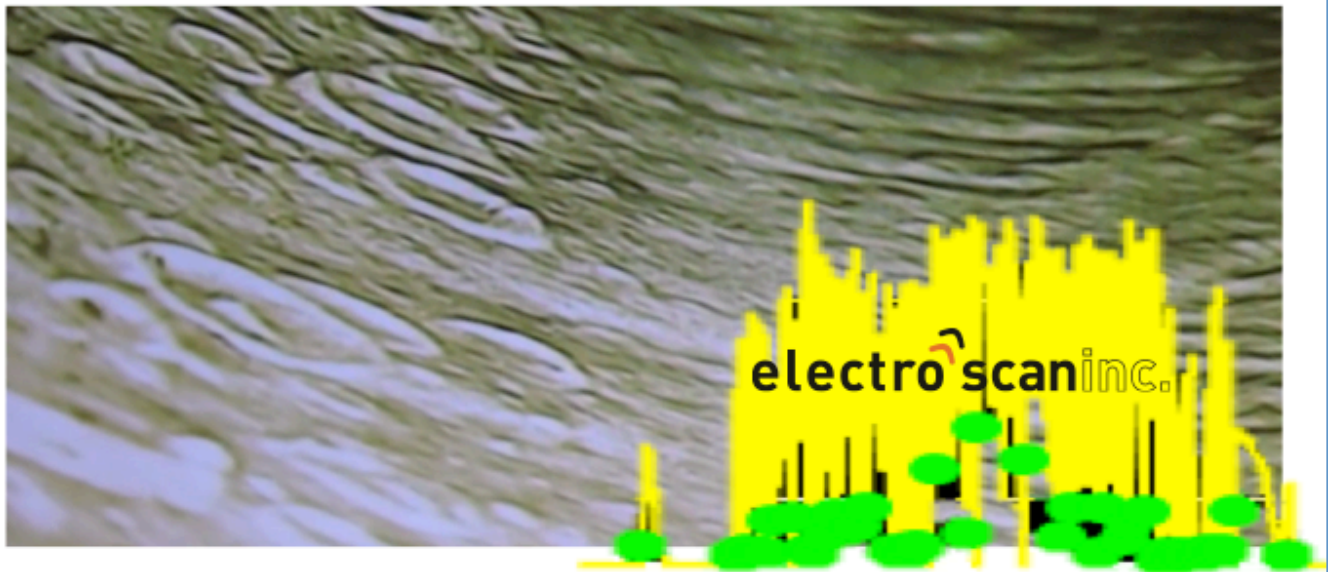
electroscaninc.



WRINKLES HAVE NOW BEEN FOUND TO LEAK!

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### 4 Over-Cooking a Liner *Also Referred to as Spotting or Pocking*



CCTV May 'See' It, But Has No Way of Assessing Leakage Risk

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