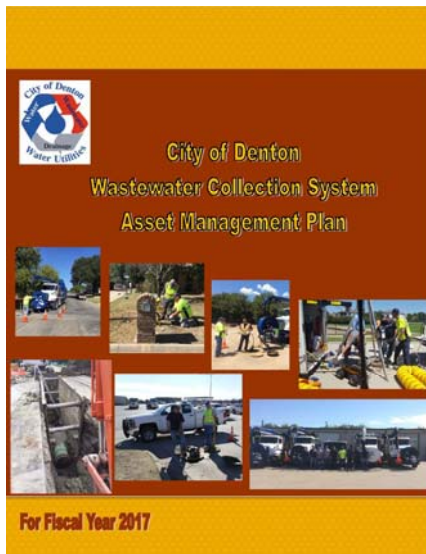




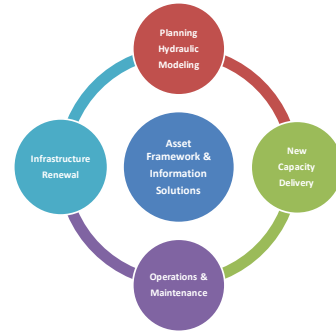
Buried Infrastructure Asset Management

P. S. Arora, P.E.
Director Wastewater Utilities
City of Denton, Texas



Presentation Scope

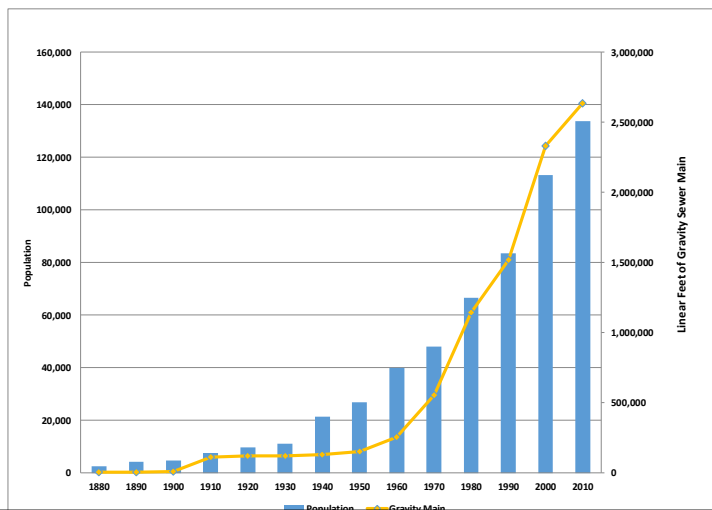
- Why asset management
- Software tools used in Denton asset management plan
- Detail discussion of asset management plan
- Benefits derived



Denton's Collection System Has Expanded to Match Population Growth



First sewer lines were constructed around the Courthouse in the early 1900s



Why Asset Management

- Substantial investment in wastewater collection system assets (\$0.5 Billion)
- Limited dollars for O&M and replacement
- Good steward of the environment, SSO reduction
- Work smarter
- High employee morale
- Lower rates, happy ratepayers

Software Tools Used in AM

- ESRI GIS
- Pipeworks/Cityworks CMMS
- Hydroworks/Infoworks Capacity Models
- WERF SCRAPS Prioritization Model
- CapPlan/Infomaster Asset Management Model
- Operations staff buy in
- Addition of IT/Database professional
- CMOM Program

How Denton Uses Cityworks

Work orders for:

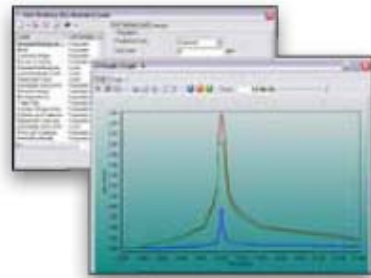
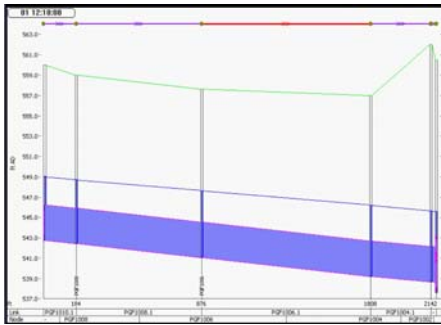
- Flushing program
- CCTV
- Point repairs
- Service line replacements
- Main line replacements
- Customer calls
- Odor complaints
- Chokes and overflows
- Manhole inspections

EVERY ACTIVITY IN THE COLLECTIONS DEPARTMENT IS ENTERED AS A WORK ORDER!

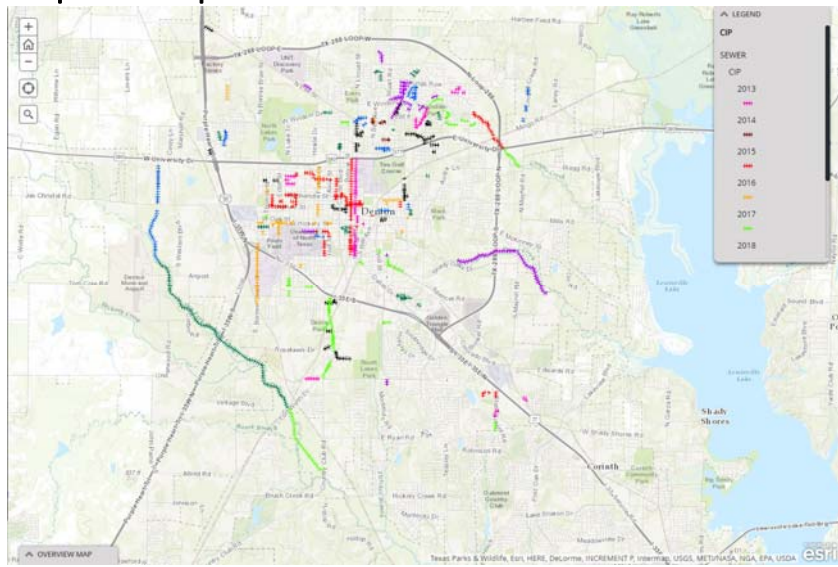
Cityworks Combined with GIS for Flushing Program Example



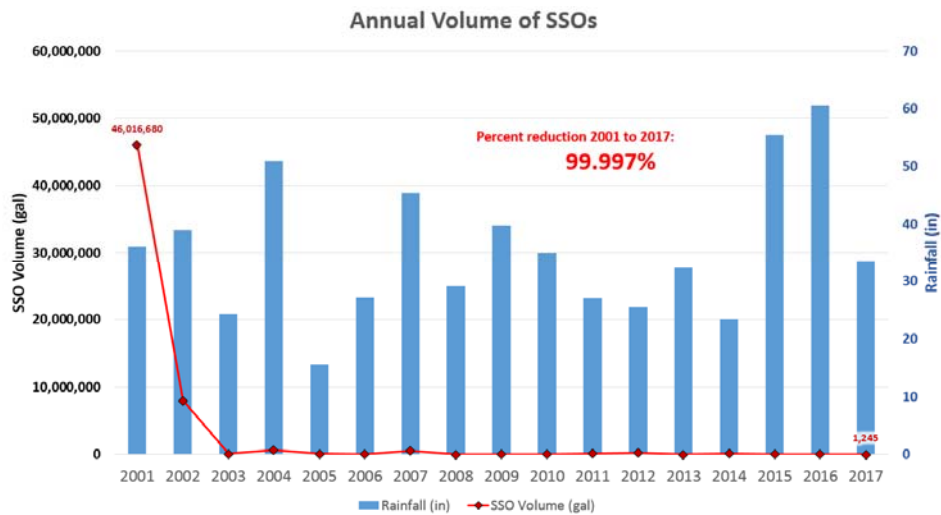
Info Works Model to Plan Capacity



5 Year Capital Improvement Plan



Success of Wet Weather Program

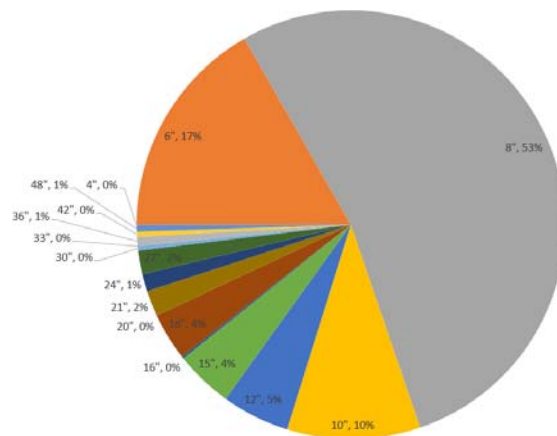


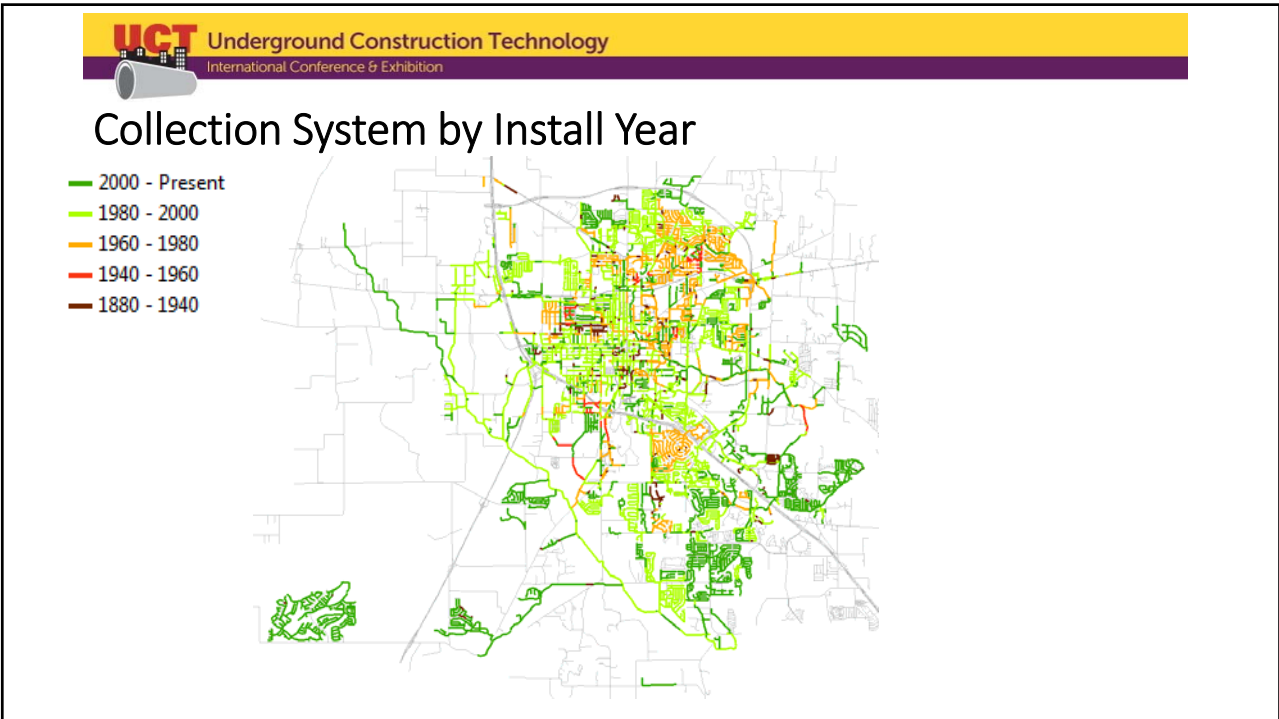
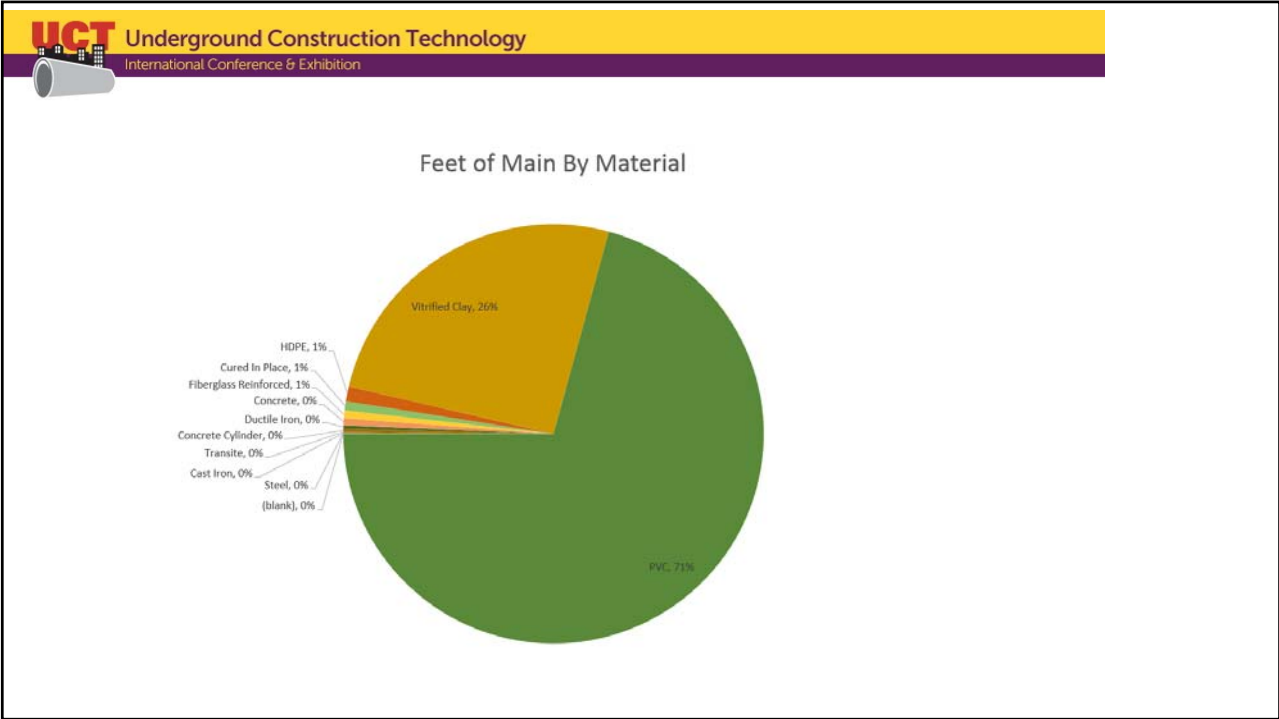
SCRAPS Model

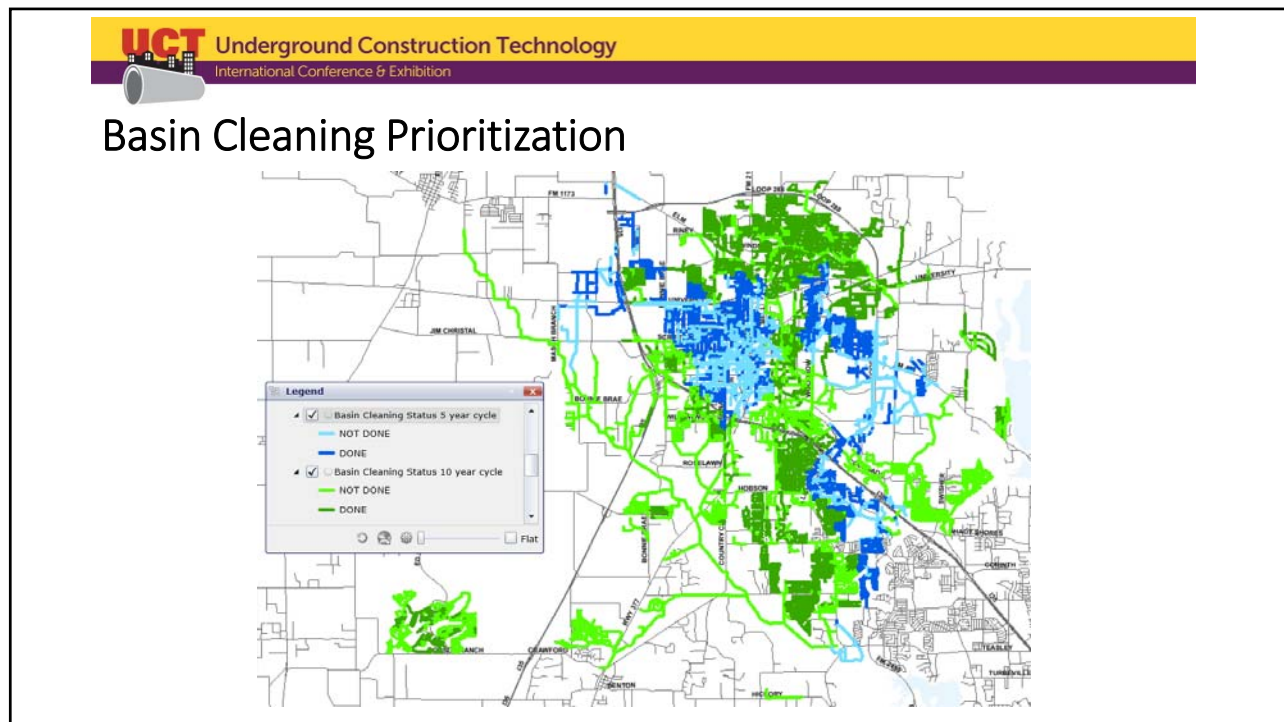
- Using Probability and Consequence of Failure SCRAPS provides a numerical ranking from 0 to 100 for each pipe segment, highest being worst
- Began focusing inspection and preventative maintenance in areas with higher risk based on the SCRAPS output
- Feedback from the field allowed for data corrections which brought down the average risk in the collection system

Benefits of Digital Database of Collection System That Accrued from Implementation of SCRAPS Model

Feet of Main By Diameter





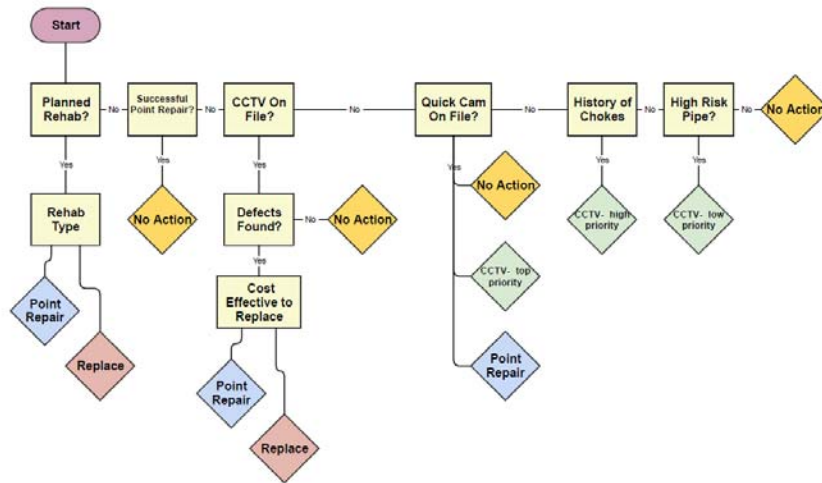


UCT Underground Construction Technology
International Conference & Exhibition

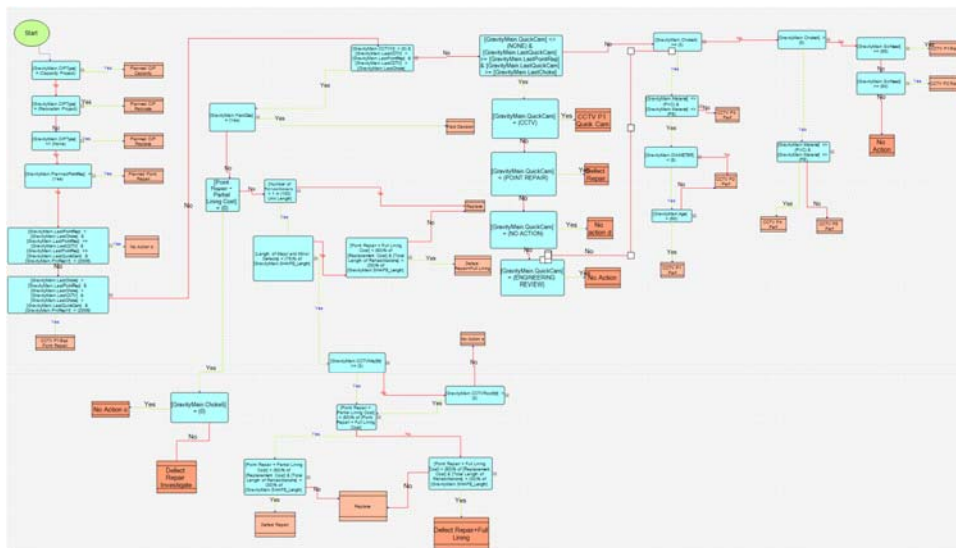
Enter CapPlan Sewer

- SCRAPs Model provided valuable priority ranking
- It is not a complete asset management system
- The next step was then to move to full asset management system

Denton's InfoMaster Flow Chart (simplified)



Denton's InfoMaster Flow Chart (full)



UCT Underground Construction Technology
International Conference & Exhibition

A Typical Pipe

Condition Assessment - Gravity Main 'PM-83-026 PM-81-024'
Survey Import: SurveyImport1.CCTV1 - CapPlan Result: RehabPlan1 With CIP

Upstream Manhole 'PM-83-026' Downstream Manhole 'PM-81-024'

Inspection 4299 (8/25/2015)

Task ID	PM-83-026 PM-81-024
Pipe ID	7979
Pipe Object ID	7979
Unclassified	
Structural Grade	
Service Grade	
Structural Mean Score	
Structural Peak Score	
Structural Total Score	
Service Mean Score	
Service Peak Score	
Service Total Score	
Active	1
Recorded	1

UCT Underground Construction Technology
International Conference & Exhibition

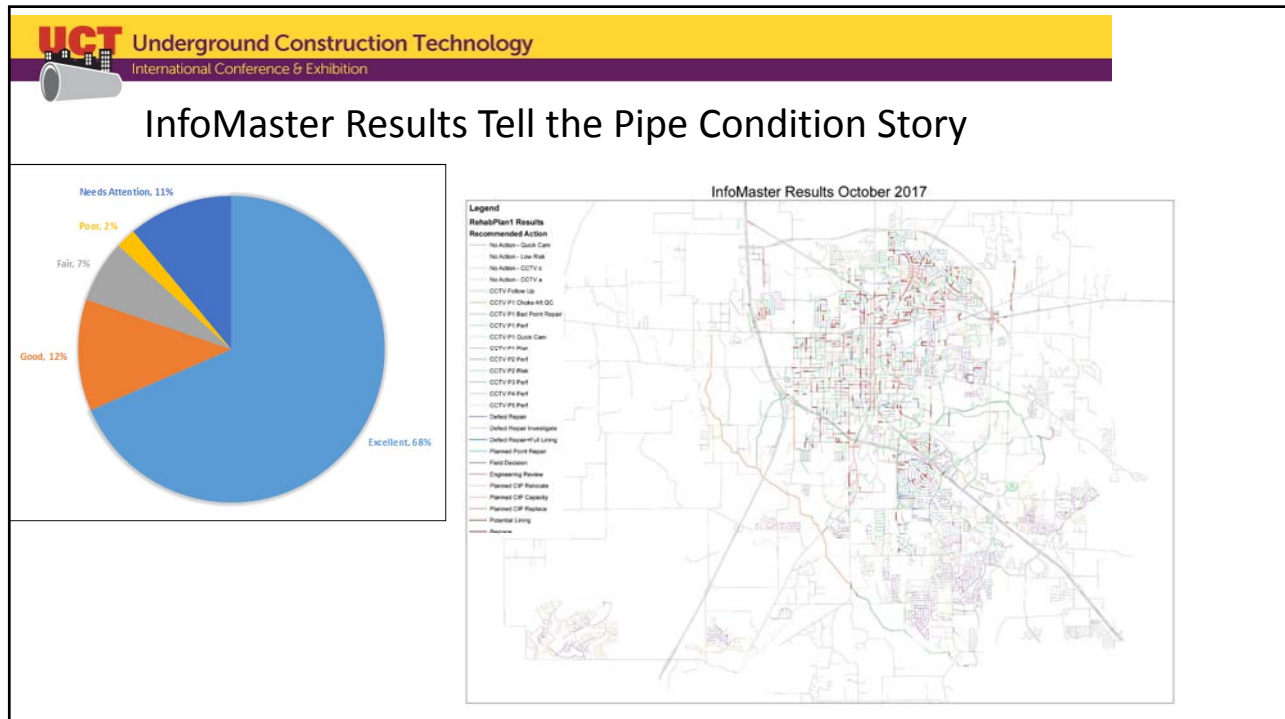
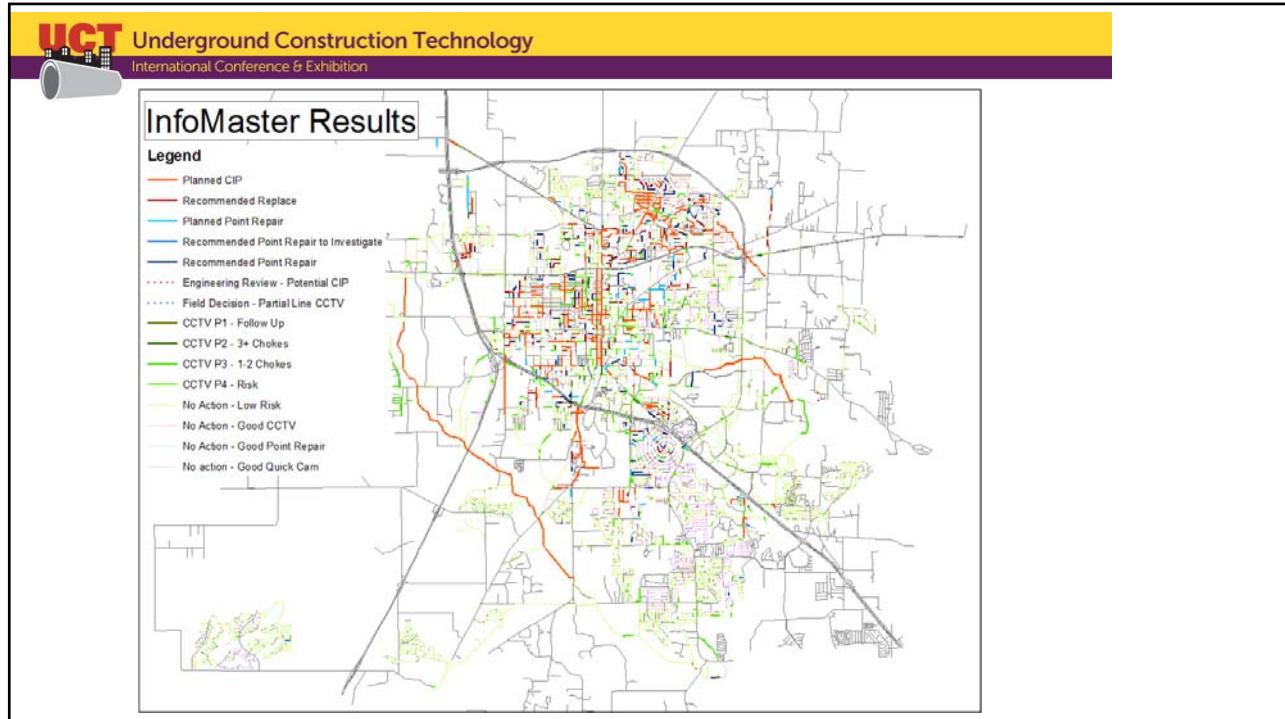
InfoMaster Recommends Individual Repairs

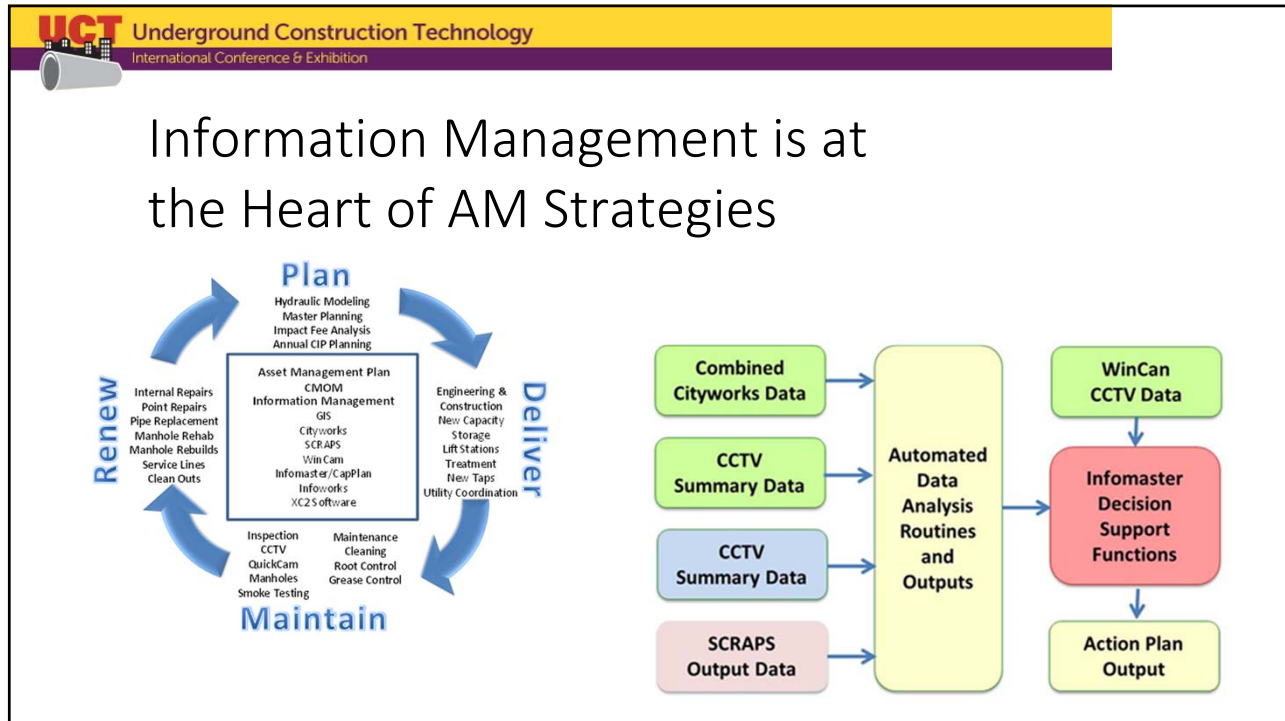
Condition Assessment - Gravity Main 'PM-83-026 PM-81-024'
Survey Import: SurveyImport1.CCTV1 - CapPlan Result: RehabPlan1 With CIP

Upstream Manhole 'PM-83-026' Downstream Manhole 'PM-81-024'

Inspection 4299 (8/25/2015)

Pipe Number	Rehab Method	Distance	Repair End	Length	Unit Cost	Plan Cost
1 2570	POINT REPAIR	38.4	49.1	10.7	1100	1100
2 2571	POINT REPAIR	58.9	70.2	11.4	1100	1100
3 2572	POINT REPAIR	88.6	98.9	10.3	1100	1100
4 2573	POINT REPAIR	136.2	140.2	4	1100	1100
5 2574	POINT REPAIR	171.7	175.7	4	1100	1100
6 2575	POINT REPAIR	188.6	189.6	4	1100	1100
7 2576	POINT REPAIR	210.2	214.2	4	1100	1100
8 2577	POINT REPAIR	252	285	33	1100	1100





Key O&M Strategies Drive Success

Targeted Cleaning

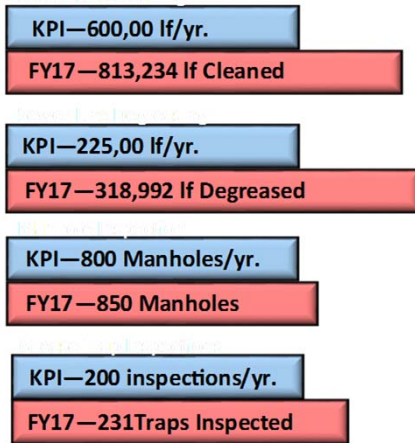
Quick Cam CCTV

Year	CCTV	Quick Cam
2013	~200,000	~100,000
2014	~150,000	~100,000
2015	~150,000	~300,000
2016	~150,000	~600,000
2017	~150,000	~400,000

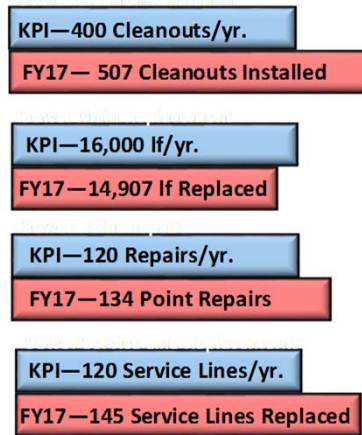
Quick Lock Point Repair

Metrics Drive Performance

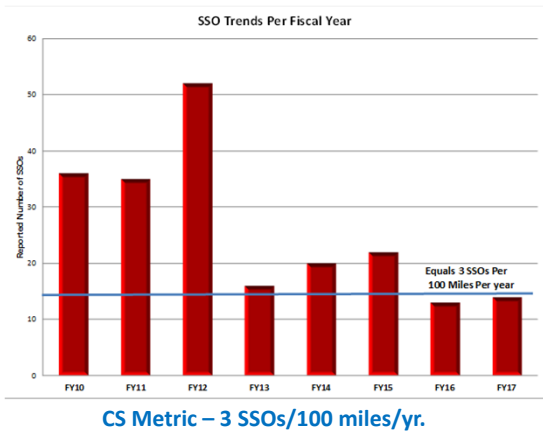
Maintenance and Inspection



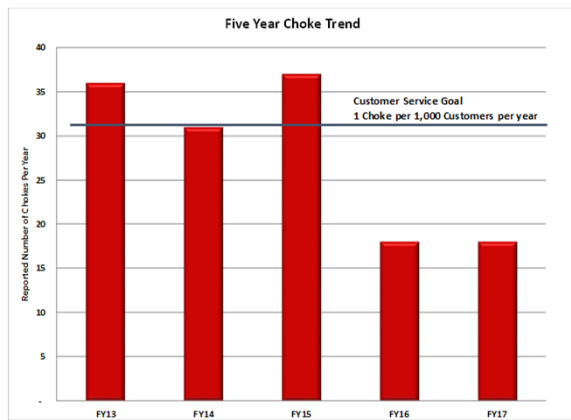
Repair and Replacement

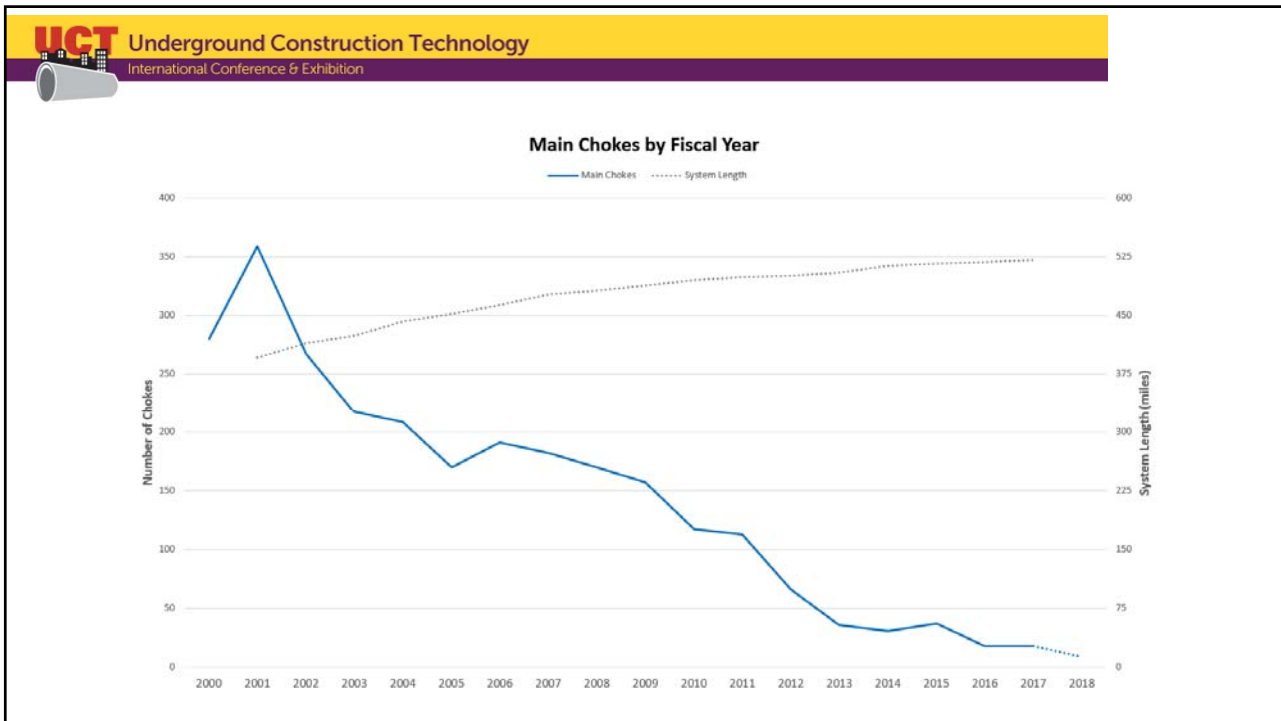
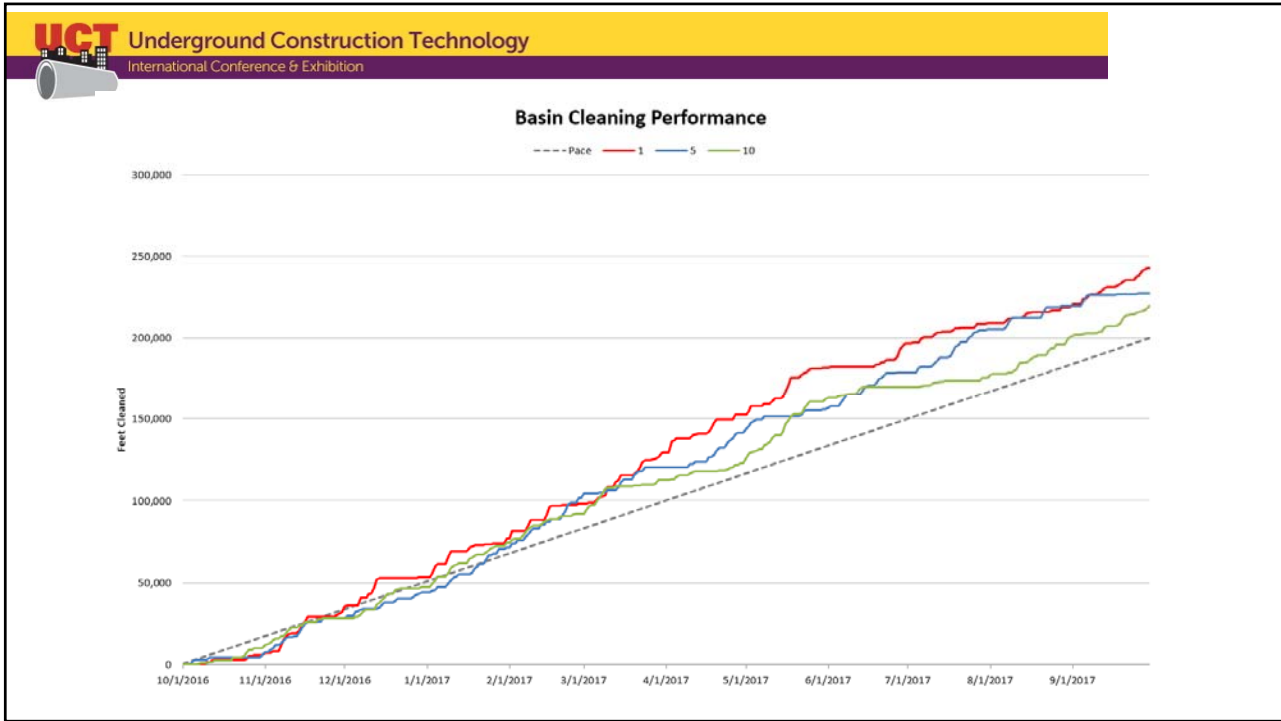


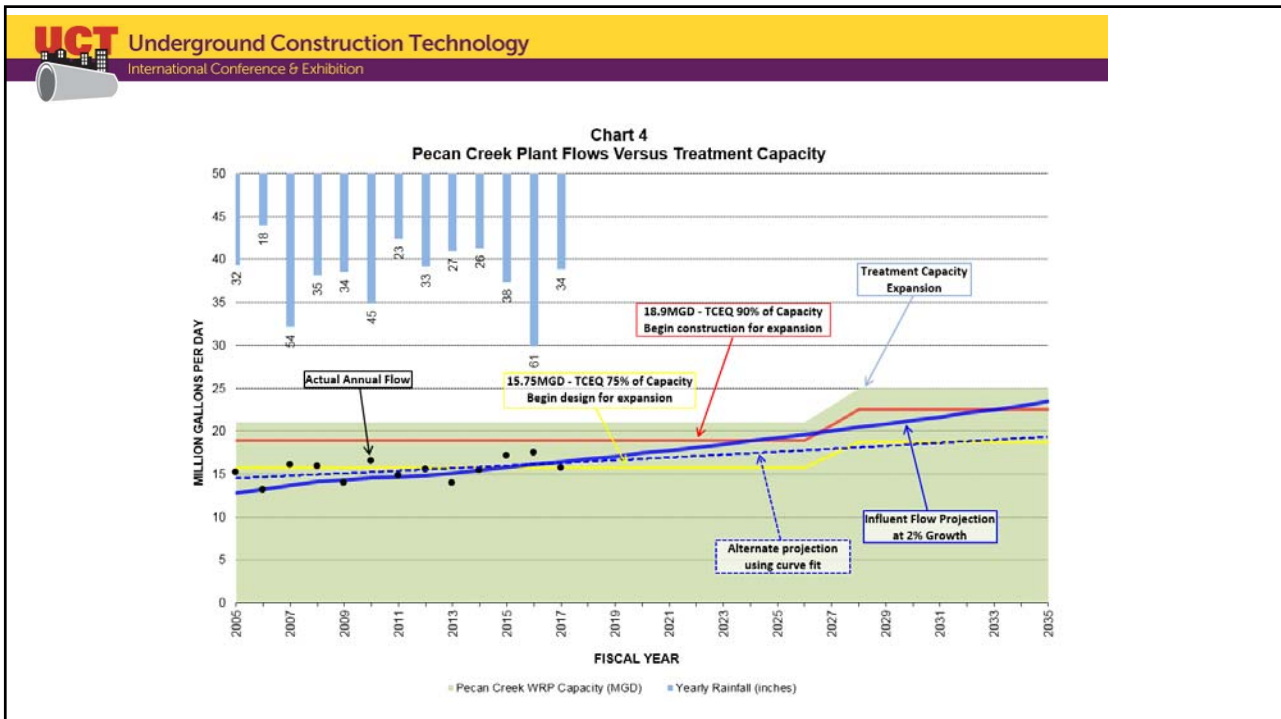
Customer Service Focuses on Reducing SSOs and Sewer Line Chokes



CS Metric – 1 Choke/1000 customers/yr.









Contact:

P. S. Arora, P.E.
Director Wastewater Utilities
p.s.arora@cityofdenton.com
940-349-7189