CMT

Making the Case for
Inspecting Storm Sewer

Illinois Association for Floodplain and Stormwater Management Conference

March 11, 2020

PRESENTATION OUTLINE

- Storm Sewer is Important
- Sewer Priority
- Justification for Inspection
- Failure Modes
- Municipalities Inspecting Storm Sewer
- Sewer Cleaning Contractor Assessment
- Developing a Plan for Inspection
- Taking Action
- Sustaining the Plan

STORM SEWER IS **IMPORTANT**

- Conveys runoff from buildings, streets and properties
- Helps prevent flooding and property damage
- Makes our urban transportation system possible
- Minimizes I/I entering sanitary sewer system
- Part of SWMP to reduce pollutant loadings & protect water quality

STORM SEWER typically takes a back seat to *sanitary sewer due to* backups and overflow

STORM SEWER **PRIORITY**

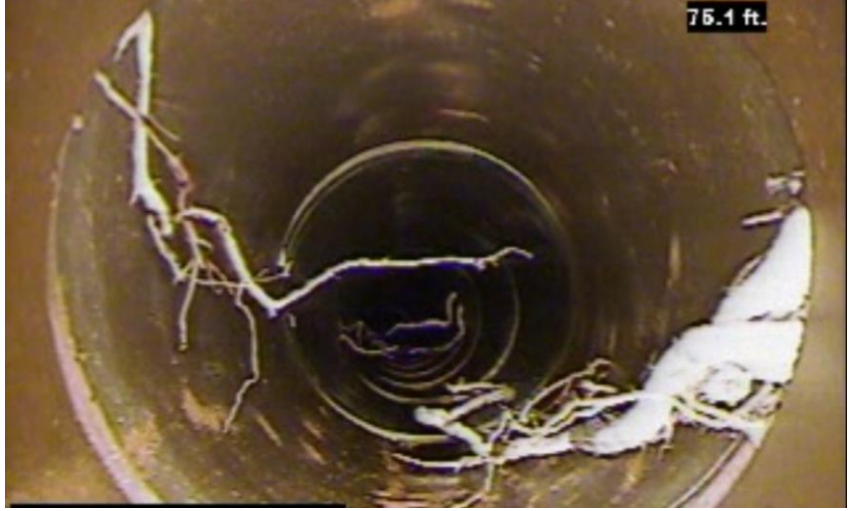
- Sanitary sewer inspection can be paid from the "Sewer Fund," but storm sewer inspection is problematic without a funding source
- ASCE's 2017 Report Card did not specifically address storm water
- Urban flooding is becoming more prevalent
- ASCE's next Infrastructure Report Card in 2021 will include national storm water infrastructure grade

JUSTIFICATION FOR **INSPECTION**

- Storm sewers are <u>assets</u> just like sanitary sewer
- Storm sewer should be in the GIS, like other assets
- Failure disrupts commerce, causes inconveniences, expensive to repair
- Miles of storm sewer may equal or exceed sanitary sewer

ILR40 Permit

- Maintain an updated storm sewer map
- Inspect outfalls
- Develop Illicit Discharge Detection & Elimination Plan
- Develop long term O&M plan for public facilities (control measures 5 & 6)



Structural

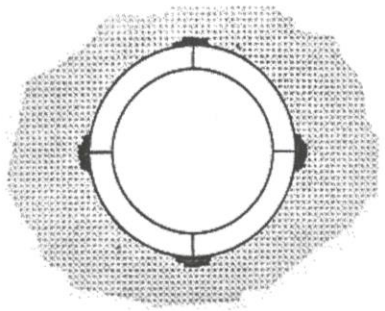
- Leaking Joints
- Holes
- Broken & Cracked pipes
- Utility conflicts
- Collapse

Maintenance

- Roots
- Sediment
- Debris & Trash
- Animals

FAILURE MODES

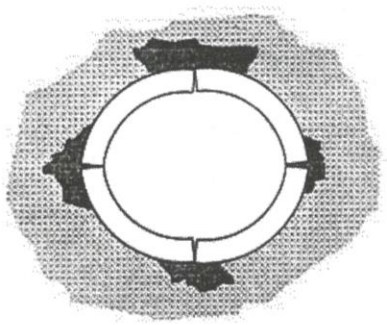
Deformation



Stage 1:

Pipe cracking is caused by poor pipe laying practice or subsequent overloading or disturbance. The sewer remains supported and held in position by the surrounding soil.

Visible defects: cracks at crown, invert and springline. Infiltration may or may not be visible.

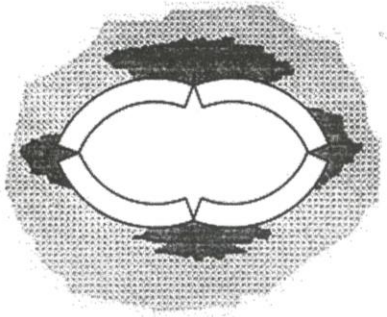


Stage 2:

Infiltration of groundwater or infiltration/exfiltration caused by surcharging of the sewer washes in soil particles. Side support is lost, allowing further deformation so that cracks develop into fractures.

Side support may also be insufficient to prevent deformation if the original backfill was either poorly compacted or of an unsuitable material.

Visible defects: fractures, slight deformation. Infiltration may or may not be visible.



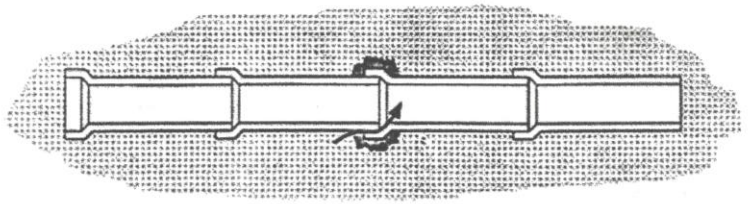
Stage 3:

Loss of side support allows side of pipe to move further outwards and the crown to drop. Once deformation exceeds 10%, the pipe becomes increasingly likely to collapse.

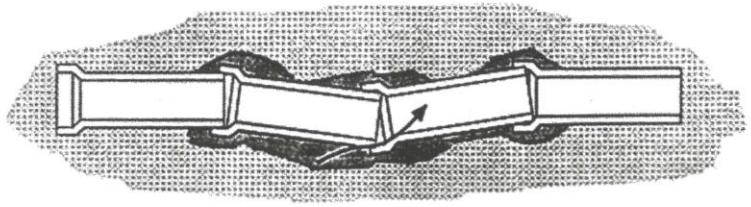
Development of zones of loose ground or voids caused by loss of ground into the sewer.

Visible defects: fractures and deformation, possibly broken.

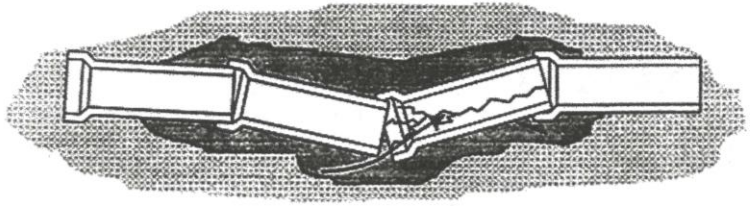
Subsidence



Stage 1: Gap in sewer at a joint or a poor lateral connection. *Visible defect:* Offset joint, badly made connection. Infiltration.



Stage 2: Infiltration of groundwater or infiltration/exfiltration caused by surcharging of the sewer washes in soil particles. Loss of soil support around the sewer allows pipe to move, opening joints and increasing in inwash of soil. *Visible defects:* open and displaced joints, loss of line and level. Infiltration.



Stage 3: Uneven loading of pipes due to joint displacement causes cracking of pipes. Process then acelerates, and cracked pipes may also deform. *Visible defects:* Open and displaced joints, cracked and fractured pipes, loss of line and level. Development of zones of loose ground or voids caused by loss of ground into the sewer.

WEF, 2009

FAILURE MODES

Municipalities Inspecting Storm Sewer

City	Miles of Storm Sewer	2013	2014	2015	2016	2017	2018	2019	SWU?
Champaign	303	197,000	100,000	100,000	100,000	<100,000	<100,000	<100,000	Yes
Decatur (1)(5)	216	0	0	0	0	0	0	50,000	Yes
Normal	128	0	0	0	0	0	7,303	11,544	Yes
Peoria (2) (5)	347	0	0	0	0	0	28,900	25,358	Yes
Springfield (3) (5)	220	0	0	0	0	4,900	4,900	4,900	No
Urbana	141	31,955	52,782	35,188	30,232	6,192	32,448	~30,000	Yes

Notes:
1) Budgeted, not actual; 2) Length estimated; 3) Average length; 4) All using PACP, no formal MH/Inlet/Catch Basin inspection program; 5) Combined Sewer System

Inspection Contractor Assessment

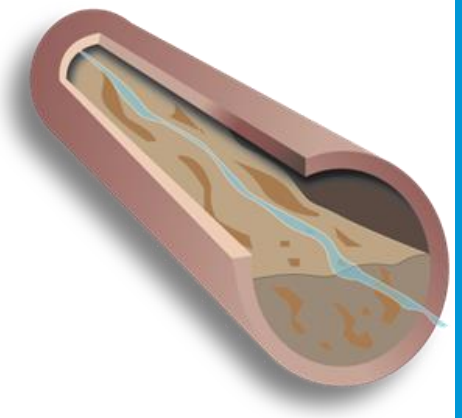
Contractor	Approx. % of Business	Inspection Increasing Part of Business?	Does Owner Benefit from Inspecting?	Using PACP?	Challenges
David Mason	20	Yes	Yes	Yes	Debris
Hoerr Construction	50-60	Yes	Yes	Yes	Access, Debris
National Power Rodding	40	Yes	Yes	Yes	Access
Sheridan Plumbing	No Data	Yes	Yes	Yes	Access
TeleScan	10-20	Yes	Yes	Yes	Access, Debris
Visu-Sewer	25	Yes	Yes	Yes	Access

DEVELOPING A **PLAN FOR INSPECTION**

1. Review maps, reports, prior inspections, etc.
2. Start with problem areas: failures, blockages, flooding
3. Walk the alignments - Is mapping accurate?
4. Assess manhole access for CCTV equipment
5. Assess debris level at the manhole
6. Clear any heavy debris or blockages
7. Summarize total pipe lengths and sizes
8. Prepare a scope of work

No Budget for Inspection Work?

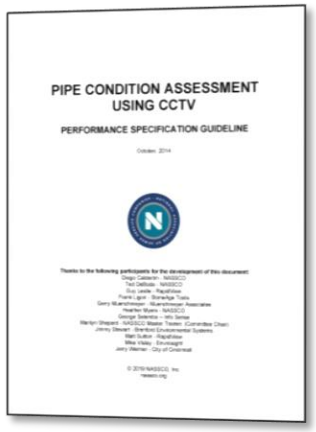
- Inquire with CCTV contractors you know / have used in the past
- Request budget pricing for the scope of work
- Is this work affordable?
- If not this year, budget for next year (add an inflation factor)
- Do a pilot project (knowing bidding threshold) with a reputable contractor to assess :
  - Project costs (inspection, cleaning, debris disposal, brush clearing)
  - Progress rates (mobilization, feet/day, set-ups, clean-up)
  - Obstacles to inspecting (fences, vegetation, structures, difficult land-owners)
- Is cleaning required and is this applicable to remainder of the system (clean only if camera won't pass)?
- Extrapolate the results to develop next year's budget



- Look inside the manholes and inlets
- Document conditions (pipe & structures) with pictures from:
  - Hand-held Camera
  - GoPro mounted on expandable pipe (~$100)
  - Pole Camera (~$16,000)
  - Get a good light source
- Take notes / record data on a tablet
- Compile information in a spreadsheet
- How much cleaning is required in the system?
- Extrapolate the results to develop next year's budget
- Initiated an asset management plan

TAKING ACTION

DIY



- Ensure the scope of work is clear and payment terms established
- Specify inspection format and deliverables are PACP compliant
- NASSCO has performance specification guidelines that can be customized (NASSCO, 2019)
- Require camera operator to look up at structures and record
- Identify conditions triggering sewer cleaning and payment
- Identify sewer conditions requiring immediate action vs. deferral
- Summarize any lessons learned for next year
- Use results to estimate cost to perform repairs / rehabilitation / replacement

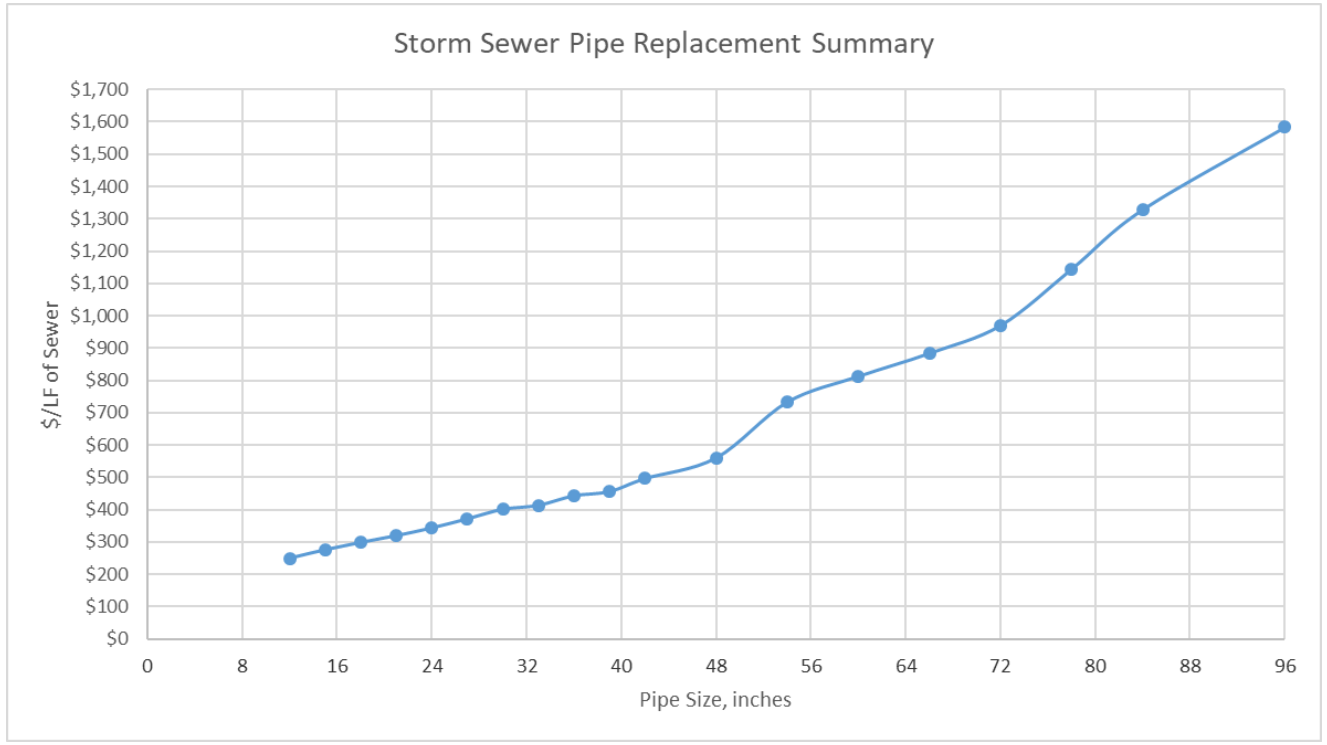
TAKING ACTION

Contractor/Bidding

SUSTAINING THE PLAN

- Track the defects identified and cost to repair, rehabilitate, or replace in a spreadsheet
- Discuss needs with council or board
- Include project costs as line item in annual budget & keep costs updated
- Coordinate needed repair, rehabilitation, or replacement with other infrastructure work (e.g., prior to or with pavement resurfacing)
- Add storm sewer inspection on to sanitary sewer inspection program/contract
- Goal: inspect and rate all storm sewer pipes to establish a baseline condition

- Storm sewer inspection:
  - $1-2/LF for 8”–18”,
  - $2-3/LF for 21”–48”,
  - $4-5/LF > 48”
- Inlet & catch basin inspection / cleaning:
  - $75-100/each, with sufficient quantity
- Costs increase with difficult access and more debris



SAMPLE BUDGET COSTS

REFERENCES

- National Association Sewer Service Companies (NASSCO), 2019. Pipeline assessment and certification program (PACP). Frederick, MD.

- Water Environment Federation (WEF), 2009. Existing sewer evaluation and rehabilitation – manual of practice No. FD-6. Alexandria, VA.

THANK YOU.

QUESTIONS?

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