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.
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.
• Storm sewers are **assets** 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)
FAILURE MODES

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

**Maintenance**
- Roots
- Sediment
- Debris & Trash
- Animals
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 accelerates, 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
# Municipalities Inspecting Storm Sewer

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

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

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

Start with problem areas: failures, blockages, flooding
Review maps, reports, prior inspections, etc.
Walk the alignments - Is mapping accurate?
Assess manhole access for CCTV equipment
Assess debris level at the manhole
Clear any heavy debris or blockages
Summarize total pipe lengths and sizes
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-owner)
- 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
• 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
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:
  • $1-2/\text{LF for 8''–18''},$
  • $2-3/\text{LF for 21''–48''},$
  • $4-5/\text{LF > 48''}$

• Inlet & catch basin inspection / cleaning:
  • $75-100/\text{each, with sufficient quantity}$

• Costs increase with difficult access and more debris
REFERENCES

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