THE IMPORTANCE AND MECHANICS OF ASSET MANAGEMENT FOR COLLECTION SYSTEMS:

The Operator’s Perspective

OWEA Collection Systems Workshop
The Objectives of the Presentation

- Why is asset management so critical today?
- Why is asset management so important in communicating the condition of the collection system and securing funding?
- What is the “Bottom-Up Approach” to asset management and how does it benefit frontline employees?
Setting the Scene

- Aging infrastructure that needs more intensive repair and replacement
- Continuing regulatory challenges, including the need to often balance priorities among multiple compliance endpoints
- Workforce challenges, including aging workforce and difficulties in recruiting and retaining qualified staff
- Uncertainty about future federal funding
- Competing local priorities and the dwindling resource base in many communities
What is Asset Management?

“The process of decision-making, planning, control over the acquisition, use, safeguarding, and disposal of assets to maximize their service delivery potential and benefits, and to minimize their related risks and costs over their entire life.”

How you manage your stuff!!
The Collection System Stuff
The 7 ½ Questions of Asset Management

- What do we own and where is it?
- What are these assets worth?
- What is its remaining service life?
- What condition is it in?
- What do we spend and what should we spend/invest?
- What is the gap?
- How do we get sustainable infrastructure?
- ½ How resilient is our infrastructure?
The 7 ½ Questions of Asset Management

GIS BASED INTEGRATED ASSET MANAGEMENT SYSTEM

- Inspection Data Collection
- Prioritize Your Future Analysis
- Condition Assessment
- Deterioration Model
- Decision Making
- Maintain Repair Rehabilitate Replace
The Benefits of an Asset Management Approach

- Better communication – good, bad and ugly
- Better coordination – street department and collection systems
- Better cooperation – community and political interaction and awareness
- Better decision-making – rehabilitation versus new
- Better performance management – transparency
- Better use of public funds – monitoring and accountability
The Asset Management Enablers

Field Operations

Processes

Information
The Bottom Up Approach

1. How long will it last?
2. What condition is it in?
3. What do we have and where is it?
Step Number One
Where Is My Stuff?
Consequence of Not Knowing

“In some cases, the infrastructure in New York is so old we don’t even know where it is under the street . . . There can be a water main break in lower Manhattan and our engineers won’t be able to find it.”
The Risk of Not Knowing

Better communication, coordination, and cooperation
Step Number Two
What Condition Is It In?

- Asset Performance
- Expected Useful Life
- Extended Life
- Benefit
- Creation
- Minimum Performance
- Rehabilitation
- O&M
- Renewal
The Three Conditions of an Asset

- The physical condition of an existing asset in the state of that physical infrastructure that allows it to meet the intended service level based on its original functional and demand criteria.

- The functional condition of an asset is the state of the design of the physical infrastructure to meet the intended service level as compared to current functional design criteria.

- The demand condition of an existing asset is the ability for the capacity of the physical infrastructure to meet the service level required.
Asset Management and 1912 Fenway Park

The Physical Condition

The Functional Condition

The Demand Condition
The View Up North

THE CITY OF CALGARY 2013
INFRASTRUCTURE STATUS REPORT
Seeing the Condition Trends and Patterns, but . . .

<table>
<thead>
<tr>
<th>Type</th>
<th>Rating</th>
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<td>7%</td>
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<td>6%</td>
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<td>Functional</td>
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<tr>
<td></td>
<td>Fair</td>
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<td>16%</td>
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<td>Poor</td>
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<tr>
<td>Demand</td>
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<td>Fair</td>
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<tr>
<td></td>
<td>Poor</td>
<td>9%</td>
<td>5%</td>
<td>3%</td>
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<td>2%</td>
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The numbers behind asset management versus . . .

<table>
<thead>
<tr>
<th>Stat</th>
<th>Team 1</th>
<th>Team 2</th>
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<tbody>
<tr>
<td>1st Downs</td>
<td>23</td>
<td>17</td>
</tr>
<tr>
<td>3rd down efficiency</td>
<td>11-18</td>
<td>7-15</td>
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<tr>
<td>4th down efficiency</td>
<td>0-1</td>
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<td>Total Yards</td>
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<td>431</td>
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<tr>
<td>Passing</td>
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<td>Comp-Att</td>
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<td>Yards per pass</td>
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<td>Rushing</td>
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<td>3</td>
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<tr>
<td>Fumbles lost</td>
<td>0</td>
<td>1</td>
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<td>Interceptions thrown</td>
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<td>2</td>
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<tr>
<td>Possession</td>
<td>32:27</td>
<td>27:33</td>
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the visual and mapping advantages embedded within asset management
## Moving from Codes to English, and . . .

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<tr>
<th>NASSCO Code and Grade</th>
<th>Grade</th>
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<tr>
<td>FL 3</td>
<td>Excellent</td>
<td>No noticeable defects</td>
</tr>
<tr>
<td>D 5</td>
<td>Good</td>
<td>Only minor deterioration or defects are evident</td>
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<tr>
<td>HVV 5</td>
<td>Fair</td>
<td>Some deterioration but function is not impacted</td>
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<tr>
<td>JS 2</td>
<td>Marginal</td>
<td>Moderate deterioration and function is adequate</td>
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<tr>
<td>SSS 2</td>
<td>Poor</td>
<td>Serious deterioration and function is inadequate.</td>
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<tr>
<td>MCU 4</td>
<td>Very Poor</td>
<td>Extensive deterioration and barely functional.</td>
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<td>Failed</td>
<td>No longer functions.</td>
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moving from English to Maps and Graphics to Information and Patterns

<table>
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<td>Fair</td>
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<tr>
<td>Marginal</td>
</tr>
<tr>
<td>Poor</td>
</tr>
<tr>
<td>Very Poor</td>
</tr>
<tr>
<td>Failed</td>
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“I didn’t realize my sewer was rated poor.”
Aids in communication, awareness, and support of collection system asset management.
Step Number Three
### How Long Will It Last?

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Estimated Years to First Failure</th>
<th>Average Years of Remaining Life</th>
<th>Average Years of Total Life</th>
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<tbody>
<tr>
<td>Vitrified Clay</td>
<td>20</td>
<td>100</td>
<td>120</td>
</tr>
<tr>
<td>Concrete</td>
<td>20</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>PVC</td>
<td>20</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Asbestos Cement</td>
<td>20</td>
<td>60</td>
<td>80</td>
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<td>Brick</td>
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</tr>
<tr>
<td>Ductile Iron</td>
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<tr>
<td>Corrugated Metal</td>
<td>20</td>
<td>40</td>
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</tr>
<tr>
<td>Lining</td>
<td>20</td>
<td>30</td>
<td>50</td>
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</table>
The transition probability $P_{y}$ of sewer $n$ (index $n$ is ignored for ease of expression) was determined by using a set of threshold values $\mu$ which is compared against the latent deterioration $Z_n$ as shown in Equation (7-22):

$$P_{y} = \Phi(\mu_{i(j-1)} - \beta_i X) - \Phi(\mu_y - \beta_i X)$$ (7-22)

The factor coefficients and threshold values for each condition $i=1$ to $3$ can be estimated by maximizing the logarithm of likelihood function (7-23):

$$LL = \sum_{n=1}^{N} \sum_{j=1}^{3} \gamma_{nj} \Phi(\mu_{i(j-1)} - \beta_i X) - \Phi(\mu_y - \beta_i X)$$ (7-23)

where: $N$ is the sample size

$\gamma_{nj}$ is equal to 1 if the observed condition change is $j$ and otherwise is zero
Why Asset Management Makes Your Life Easier

- Expected Useful Life
- Remaining Useful Life
- Assessed condition
- Deterioration under routine maintenance
- Premature failure under poor cycle-management regime

CONDITION:
- Very good
- Good
- Fair
- Poor
- Very Poor

TIME
Future Directions

RIM Analysis – Rehab, Inspect, or Mitigate
Closing Thoughts
The Best Outcome – Bottom Up
Asset Inventory Registry

1. Unique Asset ID
2. Material
3. Year Installed
4. Anticipated Useful Life
5. Replacement Cost
6. Relative Condition
This Is Not Asset Management

Platforms versus 3-ring Binders
This Is Asset Management

Collecting the right information for the right reasons at the right time to make the right decisions
Why do I have all this information?

To Make Better Decisions

How long will it last?

What condition is it in?

What do we have and where is it?
Where We Want to Get To

- Physical Condition
- Demand Condition
- Accurate Mapping
- CIP Ranking and Priority
- Utility Conflicts
- Pump Information
- Maintenance History
- Risk and Consequence Ranking
- Estimated Design Life
- Age
- Material
Thank You!

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