Wastewater Asset Management
Unique Perspectives from the Engineer & Municipality

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2018 Boyne Falls
Agenda for today

Introduction

Asset Management Framework

Risk & Prioritization

Condition Assessment

Questions
Introduction
Introduction

PLYMOUTH TOWNSHIP OVERVIEW

- Population – 27,500
- Area – 16 square miles
- Water assets:
  - ~183 miles of water main
  - ~4,200 water structures
- Wastewater assets:
  - ~145 miles of sewer main
  - ~3,600 manholes
Introduction (continued)

- Received $2MM SAW grant from MDEQ in 2015
- GHD teamed with Wade Trim was awarded full scope for SAW grant funds to in June 2016
- Grant eligible activities required completion by November 30, 2018
- Single contract established covering all SAW grant tasks to allow for one time board approval
Project Objectives

• Utilize SAW grant funding as efficiently as possible to maximize value to Plymouth Township

• Implement tasks outlined in SAW grant application
  – Asset Management Plan development
  – Condition assessment of wastewater assets
  – Asset management software, hardware and training

• Investment Prioritization & Planning

• Knowledge Transfer
Knowledge Transfer

- **External Resources Leads**
- **Township Staff Leads**

**Involvement**

- 100%
- 0%

**Time**

**Phases**

- Phase 1
- Phase 2
- Phase 3

Knowledge Transfer
**Added Value Items**

- Wastewater system flow monitoring
- Wastewater system hydraulic modeling
- CMMS implementation for wastewater
- Future expansion of wastewater AMP and CMMS to water system
- Leverage presence of CCTV and cleaning contractor
Asset Management Framework
Asset Management Defined

- Management paradigm and body of management practices
- Applied to the entire portfolio of infrastructure assets at all levels of the organization
- Seeking to minimize total costs of acquiring, operating, maintaining, and renewing assets
- Within an environment of limited resources
  - While continuously delivering the service levels customers desire and regulators require
  - At an acceptable level of risk to the organization
Five Core Questions of Asset Management

1. What is the current state of my assets?
   - What do I own?
   - Where is it?
   - What condition is it in? What is its performance?
   - What is its remaining useful life?
   - What is its remaining economic value?

2. What is my required level of service (LOS)?
   - What is the demand for my services by my stakeholders?
   - What do regulators require?
   - What is my actual performance?

3. Which assets are critical to sustained performance?
   - How does it fail? How can it fail?
   - What is the likelihood of failure?
   - What does it cost to repair?
   - What are the consequences of failure?

4. What are my best O&M and CIP investment strategies?
   - What alternative management options exist?
   - Which are the most feasible for my organization?

5. What is my best long-term funding strategy?
10 Step Process

1. What is the current state of my assets?
   - System layout
   - Data hierarchy
   - Standards inventory
   - Develop asset registry
   - Condition assessment
   - Protocol
   - Rating methodologies
   - Assess conditions
   - Failure modes

2. What is the required LoS?
   - Expected life tables, decay curves
   - Determine residual life
   - Determine life cycle and replacement costs
   - Valuation, life cycle costing
   - Set target Levels of Service (LoS)
   - Demand analysis
   - Balanced scorecard
   - Performance metrics

3. Which assets are critical?
   - Failure mode and effects analysis
   - Business risk
   - Exposure
   - Delphi technique
   - Root cause analysis
   - Reliability centered and Predictive maintenance
   - Optimized decision-making

4. Best O&M and CIP strategy
   - Confidence level rating
   - Strategic validation
   - Optimized decision making
   - Renewal annuity
   - Asset management plan
   - Policies and strategies
   - Annual budget

5. Best funding strategy
   - Determine Funding Strategy
   - Budget AM Plan

3. Which assets are critical?
4. Best O&M and CIP strategy
5. Best funding strategy
Core AM program elements

TOTAL ASSET MANAGEMENT PLAN

- Information Systems
- Data & Knowledge
- People Issues
- Service Delivery
- Lifecycle Process & Practices
- Organizational Issues

SUSTAINABLE, BEST VALUE SERVICE DELIVERY
What is the AMP used for?

1. Current State of the Assets
2. Infrastructure Improvement Plan
3. Business Improvement Plan
4. Long term capital and O&M projection (Nessie Curve)
5. Funding Plan
6. Challenges to AM Plan Implementation

THE AM PLAN TELLS THE STORY...

30 Year Investment Requirements

- Year: 2013 to 2043
- $1000
Risk & Prioritization
Business Risk Exposure (BRE)

PoF × CoF = BRE
Consequence of Failure Criteria

- Direct cost (external)
- Indirect cost (internal)
- Health & safety
- Levels of service
- Public image
- Regulatory compliance
- Regulatory violations
- Environmental impact

TRIPLE BOTTOM LINE

PoF \times \textbf{Dominant CoF} = \textbf{Core Risk}
## Calculating Dominant COF

<table>
<thead>
<tr>
<th>Social/Community</th>
<th>Public image (odor / noise / discharges)</th>
<th>Customers Affected</th>
<th>Health &amp; safety</th>
<th>Critical customers affected</th>
<th>Loss of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Impact</td>
<td>Alert posted on website but no media attention</td>
<td>Local coverage</td>
<td>State coverage</td>
<td>National coverage</td>
<td></td>
</tr>
<tr>
<td>&lt;15 connections</td>
<td>16-99 connections</td>
<td>100-150 connections</td>
<td>150-299 connections</td>
<td>300+ connections</td>
<td></td>
</tr>
<tr>
<td>No impact</td>
<td>Minor injury and sickness</td>
<td>Moderate injury and some sickness</td>
<td>Major injury, sickness</td>
<td>Potential for fatalities</td>
<td></td>
</tr>
<tr>
<td>No critical customers</td>
<td>No critical customers</td>
<td>No critical customers</td>
<td>1 critical customer</td>
<td>2+ critical customers</td>
<td></td>
</tr>
<tr>
<td>Can be out of service for extended period</td>
<td>Service needs to be restored within a week</td>
<td>Service needs to be restored within a day</td>
<td>Service needs to be restored within 4 hours</td>
<td>Critical - cannot be out of service</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financial</th>
<th>Cost to restore service</th>
<th>Operational/resource impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=$5,000</td>
<td>$5,001-$20,000</td>
<td>$20,001-$50,000</td>
</tr>
<tr>
<td>$50,001-$100,000</td>
<td>$100,000+</td>
<td></td>
</tr>
<tr>
<td>Negligible impact</td>
<td>Low impact</td>
<td>High impact (scheduled work is delayed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High impact &amp; diverts funds</td>
</tr>
<tr>
<td>Outsourcing to Specialty Contractors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environment/Regulatory</th>
<th>Regulatory compliance</th>
<th>Environmental Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>No consequence</td>
<td>Notice of Violation</td>
<td>Damage reversible within a week</td>
</tr>
<tr>
<td>Noncompliance for [90] days</td>
<td>Consent order likely: Noncompliance for [90] days</td>
<td></td>
</tr>
<tr>
<td>Damage reversible in less than one year</td>
<td>Damage reversible in one to five years</td>
<td>Damage reversible in five years or more</td>
</tr>
</tbody>
</table>

COF = 3
COF = 4
COF = 1
TBL COF = 3 + 4 + 1 = 8
Dominant COF = 4
**Core Risk Prioritization Approach**

Using Risk Management Zones

**Zone 5**
Significant risk zone: Significant CoF environmental and operational impacts
Address in short term (0-5 years)

**Zone 4**
Assets with high CoF but failure not imminent - Real time / more aggressive condition monitoring (as applicable)

**Zone 3**
Assets with moderate CoF but failure not imminent - Real time / more aggressive condition monitoring (as applicable)

**Zone 2**
Standard maintenance & replacement strategies

**Zone 1**
Low CoF assets. Run to repair:
- Not critical
- Redundancy
- Spares maintenance optimization

Consequence of failure with no mitigation
Risk Zone Map
Asset Management framework challenges

- Determining approach to utilize PACP inspection results to correlate and conform to GHD’s condition rating scale
- Best approach to incorporate the hydraulic model results to inform the failure mode of capacity and overall Probability of Failure
Condition Assessment
Data Collection & Condition Assessment

**Township Area:** 16 square miles

**Manholes:** 3,602 total

**Pipeline:** > 763,000 feet

(~145 miles)
Data Collection & Condition Assessment
Scope of Work

Basis for development of the Asset Management Plan

- Condition of each asset
- Prioritization
- Cost of implementation
- Rate structure

Create (or update) database of the assets in the municipality

- Ensures accuracy of any existing information
National Standards for Gravity Sewer Pipes

NASSCO Certifications:

• Pipe Assessment Certification Program (PACP)
• Manhole Assessment Certification Program (MACP)
**Data Collection & Condition Assessment sequencing**
**Data Collection & Condition Assessment**

**Coordination of Resources**

**SEQUENCING OF WORK:**
Data Collection & Condition Assessment Challenges
Data Collection & Condition Assessment

Value Added

- Intruding tap removal
- Hot-spot confirmation throughout the Township
- Recommended equipment attachments for cleaning efforts
- Opportunities for video usage outside of project scope:
  - Sewer overflows
  - Sinkhole investigations
  - Discharge investigations
  - Existing tap locations for new property development
Questions?

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