Asset Management
An Introduction

October 2017
Agenda

• What is Asset Management?
  • Asset Management
  • AM vs MBA
  • Municipal Asset Management in Ontario
    • PSAB / TCA / AM Regulations
  • 7 Key Asset Management Questions
  • Asset Management Plans

• Valuing Assets
  • PSAB & Natural Assets
Asset Management

Asset
Something of value

Management
The process of dealing with or controlling things or people
Asset Management

The Institute of Asset Management

ISO 55001 describes the Asset Management System Requirements
MBA vs Asset Management

One of:
- Finance
- Industry/Operations
- Marketing
- Supply chain management
- Human resources
- Accounting

All of:
- Finance
- Accounting
- Information Technology
- Forestry
- Operations Management
- Urban Planning
- Engineering
- Strategic Planning & Management

Municipal Asset Management
Asset Management

Balanced Scorecard Perspectives

Abstract

Effective Utility Management Model

Specific
http://www.watereum.org/resources/
Legislation & Standards in Ontario

PSAB 3150 (TCA)  
Building Together

Gas Tax Funding

Pending Ontario Regs.

7 Key Questions

- Many ways to describe “good AM planning”
  - ISO 55000
  - PAS 55
  - International Infrastructure Manual (IIMM)
  - Building Together Guideline

- AM Organizations
  - Institute of Asset Management (IAM)
  - NAMS (New Zealand)
  - CNAM (Canada)

- Projects & Initiatives
  - Municipal Natural Capital Initiative (MNCI)
Asset Management Plans

Asset Management Plan common components:

- Asset Management Policy
- State of Local Infrastructure
- Desired Levels of Service
- Asset Management Strategy
- Financing Strategy
- Implementation Plan
Asset Management - Goals

- Meet the expected level of service at the lowest total cost.

Figure 42: Total Lifecycle Costs Example

Periodic, planned rehabilitation of roadway asphalt has lower total lifecycle costs than rebuilding the road on a less frequent basis. Rehabilitation has higher costs at first, but becomes less expensive over the long term.
Asset Management - Goals

- Consider all of the lifecycle stages.
State of Local Infrastructure - Inventory

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Replacement Cost (2014 dollars)</th>
<th>Quantity</th>
<th>Data Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadway System</td>
<td>$618.1 M</td>
<td></td>
<td>Intermediate</td>
</tr>
<tr>
<td>Road Bed &amp; Road Surface</td>
<td>$458.6 M</td>
<td>4,686,944 m²</td>
<td>Advanced</td>
</tr>
<tr>
<td>Sidewalks &amp; Walkways</td>
<td>$61.1 M</td>
<td>601,982 m</td>
<td>Advanced</td>
</tr>
<tr>
<td>Bridges &amp; Culverts</td>
<td>$53.8 M</td>
<td>55 locations</td>
<td>Advanced</td>
</tr>
<tr>
<td>Street Lighting</td>
<td>$39.4 M</td>
<td>16,122 components</td>
<td>Basic</td>
</tr>
<tr>
<td>Traffic Signals</td>
<td>$5.1 M</td>
<td>35 locations</td>
<td>Basic</td>
</tr>
</tbody>
</table>
State of Local Infrastructure - Condition

Figure 9: Roadway System Asset Condition Distribution

Figure 10: Roadway System Components Age Distribution
State of Local Infrastructure – End of Life

Figure 11: Roadway System 100 Year Annual Percentage Reaching End of Life
**Levels of Service – What is the Service?**

**What is the service delivered by “Buildings”?**

Well-functioning buildings provide reliable, safe and predictable access and amenities for the purposes for which they were designed, such as arenas, community gyms, meeting rooms or swimming pools. Mechanical, electrical and architectural components perform in a way they do not detract from the experience or purpose of the building while minimizing energy and water usage.
# Levels of Service – Performance Measures

<table>
<thead>
<tr>
<th>Asset</th>
<th>Performance Measure</th>
<th>Measure Type</th>
<th>Target</th>
<th>Results (2012-2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings</td>
<td>Energy Conservation</td>
<td>Regulatory*</td>
<td>Energy consumption reduced by 8.5% (4.1 million ekWh/year) over the life of the plan</td>
<td>Annual Consumption 2012: 48.1 million ekWh 2013: 52.1 million ekWh 2014: 56.0 million ekWh</td>
</tr>
<tr>
<td>Facility Condition Index (FCI)</td>
<td>Condition</td>
<td></td>
<td>7%</td>
<td>Results not available</td>
</tr>
<tr>
<td>Repair Responsiveness: Routine Repairs</td>
<td>Safety &amp; Condition</td>
<td>14 days</td>
<td>Completed within 14 days</td>
<td>Reportable on a case by case basis</td>
</tr>
<tr>
<td>Repair Responsiveness: Urgent Repairs</td>
<td>Safety &amp; Condition</td>
<td>48 hours</td>
<td>Completed within 48 hours</td>
<td>Reportable on a case by case basis</td>
</tr>
<tr>
<td>Recreation Facilities: % Satisfied or Very Satisfied</td>
<td>Community Survey</td>
<td></td>
<td>No target defined</td>
<td>2016: 91%</td>
</tr>
<tr>
<td>Mechanical sub-components</td>
<td>Manufacturer’s recommended scheduled maintenance</td>
<td>Best Practice</td>
<td>No target defined</td>
<td>Reportable on a case by case basis</td>
</tr>
</tbody>
</table>
### Management Strategies

#### Sanitary Collection

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Sani Manhole Visual Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition Assessment</td>
<td>Sani Main Line CCTV</td>
</tr>
<tr>
<td></td>
<td>Sani Lateral Line TV Inspection</td>
</tr>
<tr>
<td>Operations &amp;</td>
<td>Sani Manhole Maintenance</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Sani Main Line Flushing</td>
</tr>
<tr>
<td>Repairs</td>
<td>Sani Lateral Line Blocked</td>
</tr>
<tr>
<td></td>
<td>Sani Lateral Line Repair</td>
</tr>
<tr>
<td></td>
<td>Sani Lateral Line Replace</td>
</tr>
<tr>
<td></td>
<td>Sani Manhole Repair</td>
</tr>
<tr>
<td></td>
<td>Sani Manhole Replace</td>
</tr>
<tr>
<td></td>
<td>Sani Main Line Blocked</td>
</tr>
<tr>
<td></td>
<td>Sani Main Line Repair</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>Sani Main Line Reaming</td>
</tr>
<tr>
<td></td>
<td>Sani Main Line Replace</td>
</tr>
<tr>
<td></td>
<td>Capital business case</td>
</tr>
<tr>
<td>End of Life</td>
<td>Road Reconstruction Priority Rating System considers Wastewater Network when identifying priority projects to include in the Ten Year Capital Forecast</td>
</tr>
</tbody>
</table>

#### Vehicles & Equipment

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Daily Circle Checks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual Inspection</td>
</tr>
<tr>
<td></td>
<td>Annual Safety Validation</td>
</tr>
<tr>
<td></td>
<td>Emissions testing</td>
</tr>
<tr>
<td>Operations &amp;</td>
<td>Annual Service</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Seasonal Service</td>
</tr>
<tr>
<td></td>
<td>‘A’ Service</td>
</tr>
<tr>
<td></td>
<td>Manufacturer Recommended</td>
</tr>
<tr>
<td></td>
<td>Scheduled Maintenance</td>
</tr>
<tr>
<td></td>
<td>Retorque Wheels</td>
</tr>
<tr>
<td>Repairs</td>
<td>Demand Work Orders</td>
</tr>
<tr>
<td>End of Life</td>
<td>Disposal of Vehicles &amp; Equipment (Auction)</td>
</tr>
<tr>
<td></td>
<td>Capital business case for replacement</td>
</tr>
</tbody>
</table>
Financial Strategies

Figure 45: Breakdown of Budgeted Expenditures by Lifecycle Expenditure Type (2014-2016)
Financial Strategies

End of life replacement models

Table 44: Forecasted Contributions to Repair & Replacement Reserve Funds

<table>
<thead>
<tr>
<th>Revenue Source</th>
<th>Reserve Fund</th>
<th>Allocation ($ million)</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Tax</td>
<td>Repair &amp; Replacement Reserve Funds</td>
<td></td>
<td>8.9</td>
<td>9.8</td>
<td>10.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Water &amp; Wastewater</td>
<td>Water &amp; Wastewater Reserve Funds</td>
<td></td>
<td>6.5</td>
<td>6.7</td>
<td>7.0</td>
<td>7.3</td>
</tr>
<tr>
<td>Stormwater Rates</td>
<td>Water Quality Protection Reserve Fund</td>
<td></td>
<td>1.1</td>
<td>1.4</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Gas Tax</td>
<td>Federal Gas Tax Reserve Fund</td>
<td></td>
<td>5.6</td>
<td>5.6</td>
<td>5.9</td>
<td>5.9</td>
</tr>
</tbody>
</table>
Financial Strategies

Options Analyzed

1. Increase R&R contribution by inflation percentage each year
2. Increase R&R contribution by growth percentage each year
3. Increase the Capital Sustainability Levy
4. Allocate Gas Tax
5. Pursue other revenue sources
6. Extend end of life
7. Increased deferred maintenance
8. Debt
9. Alternative Financing and Procurement
Implementation Plan

• Richmond Hill’s AMP includes 22 recommendations.
• The approximate timeframe is the next 4 years.
• Staffing requirements will be brought forward through the budget process.
Valuing Assets

Value

Centralized Water Treatment
- Reduced disease & lower costs

Paved Roads & Signals
- Lower accidents
- Lower transportation costs

Urban Trees
- Reduced GHG & heat island effect
- Improved water management

Cost

Centralized Water Treatment
- Costs to construct, operate & replace

Paved Roads & Signals
- Costs to construct, operate & replace

Urban Trees
- Costs to plant, maintain & replace

Business Case

Accounting
Recap

- Asset Management is focused on effectively providing services.
- An AMP usually includes:
  - Asset Management Policy
  - State of Local Infrastructure
  - Desired Levels of Service
  - Asset Management Strategy
  - Financing Strategy
  - Implementation Plan
- The PSAB tangible capital asset registry is commonly used for establishing the asset management inventory.
- Asset management uses costs.
- Business cases use the value of assets.
Thank You

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Environmental Assets in Richmond Hill’s AMP

October 2017
Agenda

- Richmond Hill’s AMP
- Green Infrastructure in the AMP
- Challenges & Opportunities
- Next Steps
Richmond Hill’s AMP

- Completed in 2016
- Follows Building Together
- Uses the PSAB Tangible Capital Asset registry as the base data
- “Made in Richmond Hill” approach – not trying to fit into one of the standards
- Documentation of existing data, processes and measures
Richmond Hill’s AMP

- All assets (grey & green) analyzed the same way:
  - Inventory (Value and Quantity)
  - Levels of Service
  - Management Strategies

- Green Infrastructure in the AMP:
  - Street Trees
  - Natural Areas - Forest
Green Infrastructure - Inventory

Table 18: Environmental Assets Inventory and Current Value

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Replacement Cost (2014 dollars)</th>
<th>Quantity</th>
<th>Data Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Trees</td>
<td>$13.4 M</td>
<td>43,217 trees</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Natural Areas - Forest</td>
<td>$74.2 M</td>
<td>696.2 hectares</td>
<td>Intermediate</td>
</tr>
</tbody>
</table>

Biodiversity in Richmond Hill

The 2014 inventory and assessment of Richmond Hill’s plant and animal diversity and health identified that the Town is benefiting from being connected to the Oak Ridges Moraine, with some of the highest biodiversity in the Greater Toronto Area.

- 223 vegetative communities
- 918 flora species with 271 species of regional concern
- 149 fauna species with 111 species of regional & urban concern
Levels of Service

What is the Service that Environmental Assets Provide?

“Well-functioning Environmental Assets provide healthy and resilient forest cover and water conveyance while contributing to a range of environmental and community benefits such as: stormwater control, biodiversity, clean air and water, opportunities to connect with nature, and overall improved quality of life.”
## Levels of Service

<table>
<thead>
<tr>
<th>Asset</th>
<th>Measure Measure</th>
<th>Measure Type</th>
<th>Target</th>
<th>Results (2012-2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Assets</td>
<td>Species at Risk requirements</td>
<td>Regulatory</td>
<td>Meet or exceed the Species at Risk conditions in Town owned Natural Areas</td>
<td>Reportable on a case by case basis</td>
</tr>
<tr>
<td>Natural Cover</td>
<td></td>
<td>Condition</td>
<td>25% natural cover</td>
<td>2012: 25%</td>
</tr>
<tr>
<td>Stream Channel Stability</td>
<td></td>
<td>Condition</td>
<td>Prevent damage to public infrastructure and private property</td>
<td>High Priority Areas Identified</td>
</tr>
<tr>
<td>Biodiversity</td>
<td></td>
<td>Condition</td>
<td>No target defined</td>
<td>2014: 271 plant species of concern, 111 animal species of concern</td>
</tr>
<tr>
<td>Environmental Protection: % Satisfied or Very Satisfied</td>
<td></td>
<td>Community Survey</td>
<td>No target defined</td>
<td>2012: 89 2016: 80</td>
</tr>
<tr>
<td>Resident Connection to Nature in Town Parks and Natural Areas: %</td>
<td></td>
<td>Community Survey</td>
<td>No target defined</td>
<td>2012: 87 2016: 84</td>
</tr>
</tbody>
</table>
Management Strategies

<table>
<thead>
<tr>
<th>Street Trees</th>
<th>Natural Areas</th>
<th>Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring</td>
<td>Inspection</td>
<td>Stream flow and elevation</td>
</tr>
<tr>
<td>Condition Assessment</td>
<td>Tree Condition Inventory</td>
<td>Stream Condition Inventory</td>
</tr>
</tbody>
</table>
| Operations & Maintenance | Block pruning  
Fertilizing                                                 | Tree & shrub planting  
Watering & mulching                              |
| Repairs               | Pruning                                                                       | Invasive species removal                      |
| Rehabilitation        |                                                                              | Emergency repairs                             |
| End of Life           | Street Tree Replacement  
Contract  
Emerald Ash Borer Strategy | |

Table 38: Environmental Assets - Asset Management Strategies
Financial Strategies

“Richmond Hill has $1.85 billion in infrastructure assets and an additional $87.6 million in Environmental Assets.”

- Asset management plans do not have to follow PSAB requirements.
- There is flexibility to analyze non-PSAB assets.
- Be clear on what is being reported.
Green Infrastructure AM Challenges

• Creating similar Condition categories
• Deciding on an asset value methodology
• Determining expected life
Challenges - Condition

### Table 5: Age-based Asset Condition Rating System

<table>
<thead>
<tr>
<th>Rating Category</th>
<th>% of Estimated Life Remaining</th>
<th>Asset Condition Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Good</td>
<td>76% - 100%</td>
<td>“Fit for the Future”: New or recently rehabilitated. Very low risk of failure. Low capital maintenance needs. Scheduled maintenance reduces the probability of premature failure.</td>
</tr>
<tr>
<td>Good</td>
<td>51% - 75%</td>
<td>“Adequate for Now”: Some signs of deterioration. Low risk of failure. Some unplanned maintenance is required.</td>
</tr>
<tr>
<td>Fair</td>
<td>26% - 50%</td>
<td>“Requires Attention”: Additional signs of deterioration. Level of service may be affected. Some failures occur. Rehabilitation possible.</td>
</tr>
<tr>
<td>Nearing End of Life</td>
<td>0% - 25%</td>
<td>“At Risk”: Failures will increasingly occur. Reduced ability to provide the service. Maintenance costs will likely increase. Rehabilitation may become impossible.</td>
</tr>
<tr>
<td>Beyond End of Life</td>
<td>&lt;0%</td>
<td>“At Risk”: Similar characteristics to Nearing End of Life. Assets in this category are considered to be part of the “Infrastructure Backlog”.</td>
</tr>
</tbody>
</table>

### Table 19: Tree Condition Rating Systems

<table>
<thead>
<tr>
<th>% Dieback of Branches</th>
<th>Tree Condition Rating</th>
<th>AMP Condition Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt; 1 dieback)</td>
<td>Excellent</td>
<td>Very Good</td>
</tr>
<tr>
<td>1-10</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>11-25</td>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>26-50</td>
<td>Poor</td>
<td>Nearing End of Life</td>
</tr>
<tr>
<td>51-75</td>
<td>Critical</td>
<td>Beyond End of Life</td>
</tr>
<tr>
<td>76-99</td>
<td>Dying</td>
<td>Beyond End of Life</td>
</tr>
<tr>
<td>100 - no leaves</td>
<td>Dead</td>
<td>Beyond End of Life</td>
</tr>
</tbody>
</table>
Challenges - Asset Value

**Value**

Centralized Water Treatment
- Reduced disease & lower costs

Paved Roads & Signals
- Lower accidents
- Lower transportation costs

Urban Trees
- Reduced GHG & heat island effect
- Improved water management

**Cost**

Centralized Water Treatment
- Costs to construct, operate & replace

Paved Roads & Signals
- Costs to construct, operate & replace

Urban Trees
- Costs to plant, maintain & replace

**Business Case**

**Accounting**
**Challenges - Asset Value**

**APPENDIX B1 – QUOTATION PRICING FORM**

The Quotation Pricing Form must be completed in its entirety and in accordance with Stage II. NOTE: Any quantities set out herein are estimates only and are provided as a basis for establishing and comparing submissions only.

**FALL PLANTING 2016 - CONTRACT TERM: ENDING DECEMBER 2016**

**TABLE 2 – REPLACEMENT TREE SPECIES LIST**

<table>
<thead>
<tr>
<th>Item</th>
<th>Common Name</th>
<th>Botanical Name</th>
<th>Replacement Fee Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Burr Oak</td>
<td><em>Quercus macrocarpa</em></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Japanese Zelkova</td>
<td><em>Zelkova serrata</em></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hackberry</td>
<td><em>Celtis occidentalis</em></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ohio Buckeye</td>
<td><em>Aesculus glabra</em></td>
<td><strong>$360</strong></td>
</tr>
</tbody>
</table>
Opportunity – AM Regulations

- PSAB 3150 drove early AM activity
- Ontario’s AM regulations will drive future activity, and will include green infrastructure

- AMP’s do not have to use PSAB definitions
Challenges - Expected Life

Asset Mortality Distributions

- Grey infrastructure lifespans are derived from their mortality (failure) probabilities.

Challenges - Expected Life

Mortality rates and lifespan are reciprocals.

Mortality to Lifespan:

- Street trees: 3.5% = 28.5 years
- Natural Forest Area: 1% = 100 years
Next Steps

• Trees in Parks
  • Handled as individual trees, similar to Street Trees

• Valley lands
  • Inventory
  • Ownership: Town, TRCA, Private, Other(s)
  • Management Strategies
  • Unlikely to include a Cost/Value measure