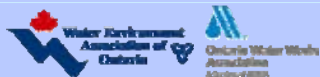




Presentation Outline

- Definition of Asset Management
- Business drivers for AM
- Components of an Asset Management Program
- World-wide Asset Management Benchmarking
- Flavours of Asset Management Programs
- Toronto Water Asset Management

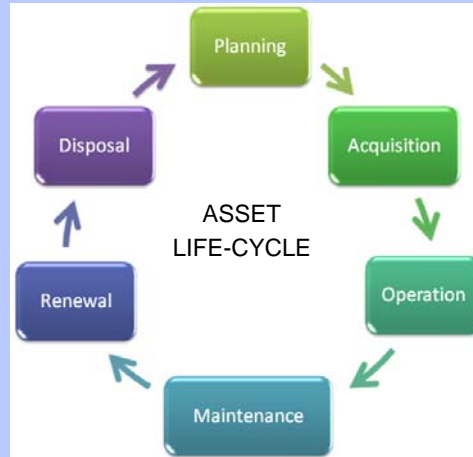


The "Big" Picture



Asset Management Definition

- Systematic process of operating, maintaining, and upgrading physical assets throughout the complete life-cycle
 - Includes all stages from before acquisition to disposal



The "Big" Picture



Drivers for Asset Management

- Limited Resources
 - Financial and Human
- Aged Infrastructure
- Growth Needs
- Public Demand High Level of Service
 - Low Tolerance for Infrastructure Failures
- Regulations
 - Safe Drinking Water Act and associated DWQMS
 - CCME Discussions on Non-Toxic Effluent
- Due Diligence
 - Liability/Risk Management



The "Big" Picture



Effective Asset Management

- Effective management combines engineering and mathematical analyses with sound business practice and economic theory
- Drive to use Triple Bottom-Line analysis in priority setting and decision making
 - considers Social and Environmental impacts



The "Big" Picture



Asset Management Plan

- Strategic Goals
- Levels of Service and Performance Standards
- Growth and Demand Projections
- Asset Management Tactics
- Monitoring, Control and Review Mechanisms
- Asset Management Improvement Plan



The "Big" Picture



Life-cycle Management Plan

1. What do you have and where is it?
 - Inventory
2. What is it worth?
 - Costs/replacement rates
3. What is its condition and expected remaining service life?
 - Condition and capability analysis
4. What is the level of service expectation, and what needs to be done?
 - Capital and operating plans
5. When do you need to do it?
 - Capital and operating plans
6. How much will it cost and what is the acceptable level of risk(s)?
 - Short- and long-term financial plan
7. How do you ensure long-term affordability?
 - Short- and long-term financial plan

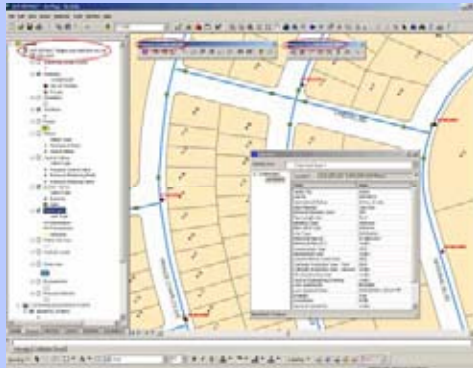


The "Big" Picture



What do you have and where is it?

- Age, material, size, soil type, coordinates, criticality, rehabilitation status
- Challenge to compile and verify data in a common and accessible database
 - Some data more than 150 years old
 - Multiple (and incompatible) data sources
 - Paper, spreadsheets, microfiche
- Benefits
 - Efficiency – one source for everything
 - Accuracy – increased
 - Improved communication between groups

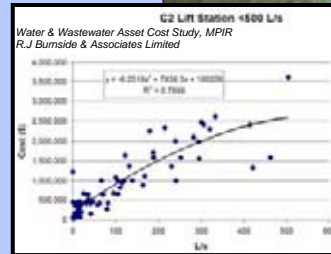


The "Big" Picture



What is it worth?

- Replacement Cost preferred for Renewal Planning
 - Historical Data (where available)
 - Appraisals
 - Unit Rates
 - Cost Curves



The "Big" Picture



What is its condition & remaining service life?



- Condition Assessment difficult for buried assets
 - Visual Inspection
 - CCTV
 - Not possible for watermains
 - Technology for non-intrusive inspections is evolving
 - Maintenance History
 - Blockages and Breaks
 - Consumer Complaints
 - Rusty Water or Low Pressure
 - Performance Testing
 - Hydraulic Performance,
 - Leak Testing
- Above-ground assets
 - Visual Inspection (X-ray)
 - Preventative Maintenance Records
 - Vibration testing
- Service Life based on performance history by asset class and site conditions
 - Needs to be reviewed on a regular basis



The "Big" Picture



Age Doesn't Tell The Whole Story

	Age	Type	Pipe Diameter (")	Wall Thickness (")	Pitting (")	Soil	Condition
	1904	Sand Cast	12	0.69±0.04	0.11	Sandy	Excellent
	1964	Spun Cast	6	0.44±0.005	0.44	Very Corrosive	Poor



The "Big" Picture



What Needs to be Done When?

- Remaining Service Life before Failure
 - Deterioration Curves
 - compare current condition with age and condition of similar assets
 - Asset failure when asset no longer achieves required level of service or is cost effective (i.e. costing more to maintain than a new asset)
- Identification and Review of Alternative Solutions
 - Replace vs Rehabilitation
 - Conventional vs "Trenchless"
 - Triple Bottom Line Analysis
 - Life-cycle costing
 - Current renewal cost vs long-term O&M costs
 - Coordination with Utilities and Transportation Division
 - Environmental Impact
 - Risk analysis of activity vs ramification of inactivity (i.e. Do Nothing Alternative)
 - Social Impact
 - Short term construction disturbance vs potential decline in level of service
- Capital and Operating Plan



The "Big" Picture



How much will it cost & How do we afford it?

- Develop short and long-term financial plans based on renewal needs, priorities and asset replacement costs
 - Long-term - Strategic Plan based on % Renewal required to maintain State of Good Repair
 - Short-Term - Street by street or specific plant process identification reflecting Strategic, long-term plan objectives
- Financial Plan
 - Revenue forecasts to match costs of infrastructure management (including both renewal and development of new infrastructure or Service Enhancements)
 - Revenue Forecasts Challenges
 - Projecting consumption (dry vs wet vs Water Efficiency)
 - Maintaining Reserve Balances
 - Low demand years
 - Catastrophic loss
 - Development Charge Recoverables matching growth-related investment
 - Continued Council support of proposed rate increases



The "Big" Picture



IWA/WSAA Asset Management Process Benchmarking

- In 2004, initiated Asset Management Process Benchmarking
 - 20 WSAA members and 3 US
- Objective:
 - To improve the standard of Asset Management performance within the water industry; principally through the identification and promotion of “best practice”.



The "Big" Picture



Asset Management Process Benchmarking

- Self-assessment using common database followed by Consultant “audit”
- Examine “whole of business” process capability and execution which underpin AM outcomes.



The "Big" Picture



2004 Benchmarking Observations

- Higher performing utilities
 - Performed consistently well
 - Large, metropolitan business, strongly regulated
 - Established Minimum Customer Service Level
 - Stronger commercial focus, driven by ageing asset base
- Utilities performing at lower end
 - Younger asset base
 - Local – government owned with multiple objectives across a number of services
 - Believed that improvement requires leap to “ultimate AM system”



The "Big" Picture



2008 Benchmarking

- Participant group expanded to 42 water sector utilities across seven countries
 - Australia, New Zealand, USA, Canada, Hong Kong, UAE and Oman
- Canada
 - City of Toronto
 - Region of Peel
 - Region of York
- Self-assessment against almost 600 measures



The "Big" Picture



Standard Scoring Scale

Process Capability

Process Development	Informal	Aware	Formulated	Advanced	Robust
Process Documentation	None	Minimal	Moderate	Advanced	Complete

Process Execution

Process Coverage	Sparse	Limited	Moderate	Predominant	Total
Process Frequency	Rarely	Occasionally	Often	Usually	Always

Source: IWAWSAA



The "Big" Picture



Evaluation Process

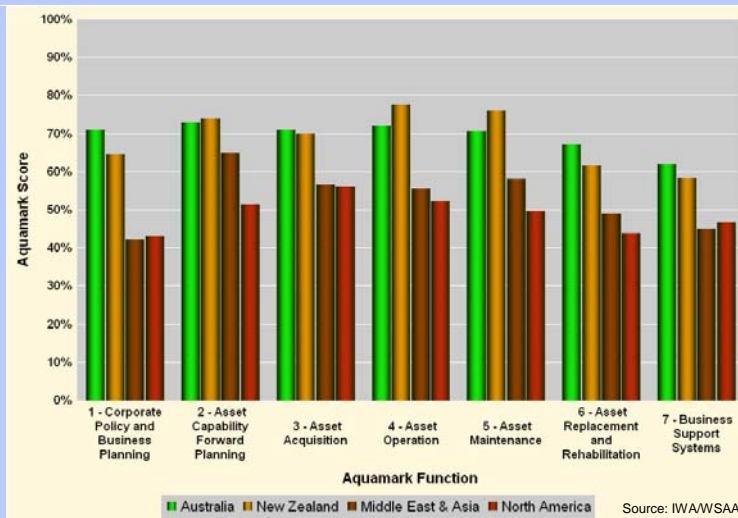
- Scores entered into “Aquamark” Database
- On-site interviews with participants to validate results
- Reviewers identified 20% to 30% of all measures for review. based on importance and relevance, considering:
 - The utility AM profile
 - Business drivers
 - Outliers and anomalies



The “Big” Picture



International Comparison



The “Big” Picture



2008 Benchmarking Observations

- Australia & New Zealand
 - scored at “mature” level, reflecting 20+ years of asset management practice development
 - Long-term national focus on AM in New Zealand
 - Highly economically regulated operating environment and corporatization of major utilities
- North America
 - Considered “developing” or “established”
 - Generally municipal-based utilities
 - Different levels of performance regulation
 - Established processes for forward-planning, asset acquisition, O&M
 - Lower results for Corporate and Strategic Planning and Replacement and Rehabilitation processes



The “Big” Picture



Benchmarking Conclusions

- Length of time involved in developing plans has greater impact than ownership, level of economic regulation or organizational structure
 - Australia & New Zealand at similar levels despite different regulatory regimes and ownership
- Likely driver for initiating process but time and business-like approach led to level of maturity

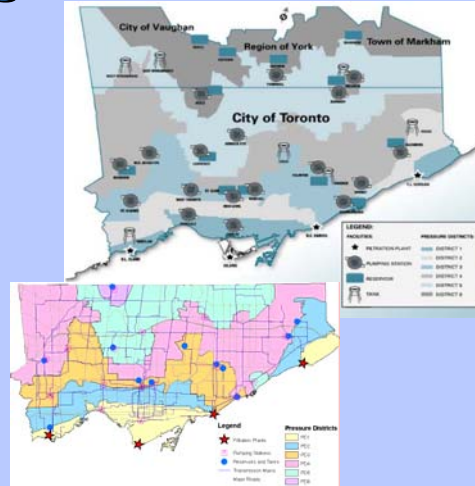


The “Big” Picture



Toronto Water Asset Management Drivers

- Serves 3.1 million residents and businesses in Toronto, and portions of York and Peel
- Over \$26 billion in infrastructure
- Program is 100% rate-supported and no reliance on the property tax base to support Toronto Water services



The "Big" Picture



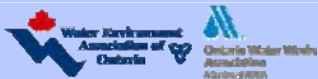
Inventory of Assets

WATER - \$8.7 Billion

- 4 water filtration plants
- 10 reservoirs and 4 elevated storage tanks
- 5,015km of distribution watermains and 510km of trunk watermains
- 52,900 valves and 40,460 hydrants
- 470,202 water service connections, plus York Region (population served 400,000)
- 18 water pumping stations

WASTEWATER - \$17.9 Billion

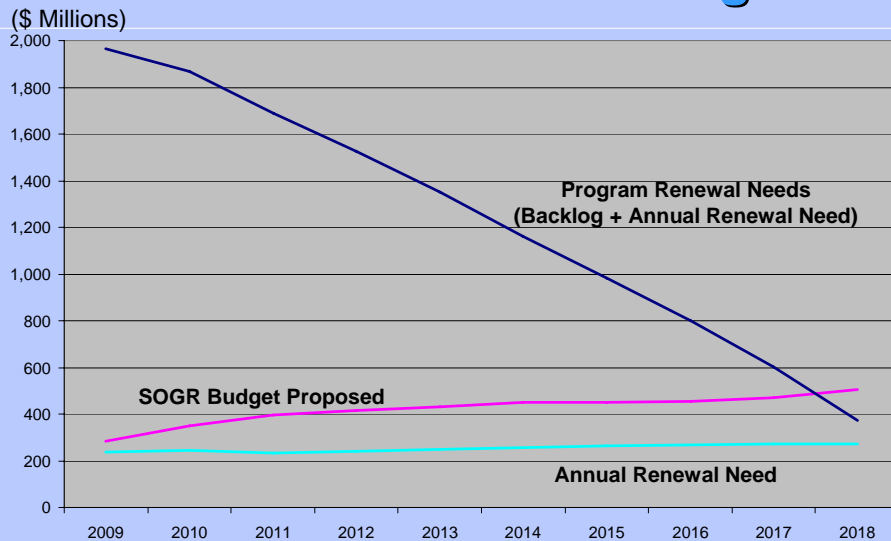
- 4 wastewater treatment plants
- 5 storage and detention tanks
- 4,397km of sanitary, 1,301km of combined and 358km of trunk sewer
- 4,305 km of storm sewers and 546km of roadside ditches
- 463,300 sewer service connections
- 82 wastewater pumping stations
- 371km of watercourses, 43 stormwater management ponds
- 2,300 outfalls & 122,500 catchbasins



The "Big" Picture



Infrastructure Backlog



The "Big" Picture



Toronto AM Benchmarking Lessons Learned

- Strategic Asset Management Plan (AMP)
- Operationalize AM Concepts
- Level of Service Framework
- Formalize R&R Strategies
- Managing maintenance work practices



The "Big" Picture



Toronto Water

Asset Management (AM) System Future Plans

- Committed to developing AM system for linear and plant assets
 - initial focus on sewers and watermains
- Immediate AM needs:
 - Formalize Asset Management Strategy
 - Complete integration of information:
 - construction history, asset condition & criticality
 - hydraulic performance - modelling & field testing
 - soils data - borehole database & GIS spatial analysis
 - maintenance history - Hansen
 - integrate with Transportation/Utilities capital programming
 - Define, prioritize & map (via GIS) capital program needs at pipe segment level
- Identify preferred Planning & Reporting Methodology



The "Big" Picture



Asset Management Planning & Reporting Options

- Basic Option
 - Useful when discrete data is not available or incomplete
 - Provides preliminary assessment of needs at an aggregate level – not pipe segment
 - Communication of results is effective & easily understood
 - High level annual renewal needs
- High End Option
 - Data needs are intensive
 - Can provide pipe segment analysis
 - Sensitivity/assessment of criteria weights recommended
 - Criticality
 - Maintenance History
 - Answers question of "How and Where do We Invest?"
- Strategic Option
 - Adds financial analysis to above
 - Allows for funding envelope scenario testing



The "Big" Picture



Toronto Water Next Steps

- Release RFP for Integrated Asset Management System
- Formalize Asset Management Strategy
- Short-List vendor options
- Demonstration Trials using linear data sub-set
- Select and Implement Asset Management System



The "Big" Picture



Acknowledgements/Resources

- Toronto Water
 - Michael D'Andrea, Director, Water Infrastructure Management
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 - Candice Au, Senior Engineer, Watermain Asset Planning
- Roop Lutchman – "Sustainable Asset Management"
- InfraGuide – Managing Infrastructure Assets
- Worley International Ltd for The World Bank – Strategic Municipal Asset Management
- Peter Gee, IWA / WSAA



The "Big" Picture



A background of numerous blue water droplets of various sizes, some large and prominent, others small and scattered, set against a light blue gradient background.

Questions?

 Water Environment
Association of
Ontario 

 Ontario Water Works
Association
A Section of AWWA