



Asset Management Workshop





Top Down Asset Management 101

Case Study+Templates

Yann Delieuvn
October 28, 2011

What is a Long-Range Renewal Capital Plan? (and more importantly, what is it not?)

- Strategic level decision making tool
- High level identification of future infrastructure requirements of a utility
- It is not a detailed analysis
- It does not focus on specific assets

Why is it important?

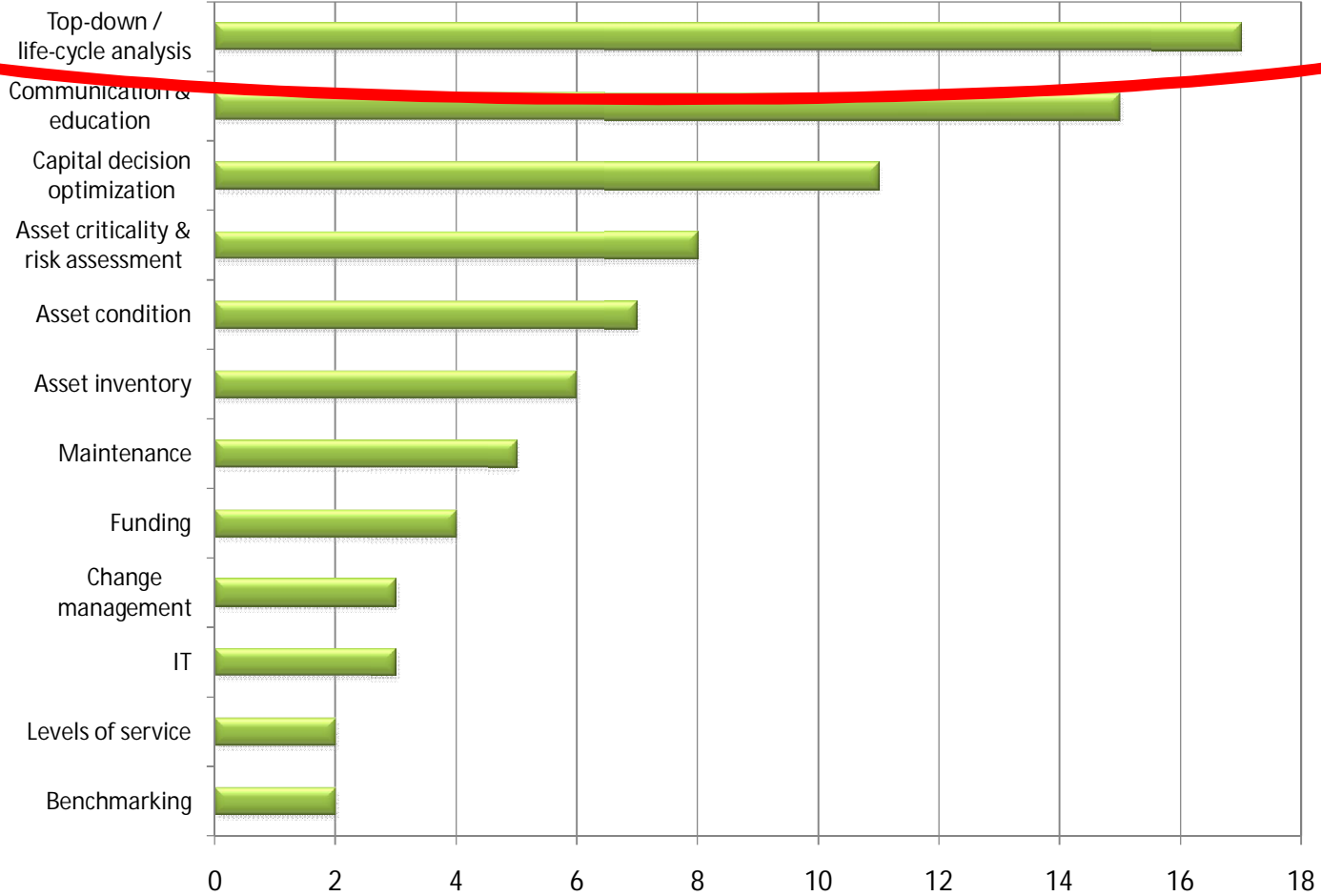
- To identify a potential funding gap
- To take the right decision at the right time
- To raise public and council awareness

...but ultimately...



to get more money

Quick Win Asset Management Strategies (80 / 20 Rule)



April 18th, 2011

christiaan.lombard@aec.com

Key Points

- 1. You don't need perfect data and you don't need expensive software or equipment**
- 2. If kept simple, it can be done quickly**
- 3. Communicate your results within and outside the organisation**

Case Study

*Water Infrastructure Asset Management
Program of a medium size BC municipality*



Step 1

Map out your system - What do you own?

WATER	Count	Count (units or length)	Material	Installation Year	Service Life	Unit Cost	Condition	Source
Mains	490 km	✓	✓	✓	✓	✓		LinearUtilities_Simplified11Feb2010.xls / Water Facilities.xlsx
Wells	19	✓	NA	✓	✓	✓		Facilities Asset Summary.xlsx / Water Facilities.xlsx
Treatment facilities	1	✓	NA	✓	✓	✓		
Booster stations	7	✓	NA	✓	✓	✓		Facilities Asset Summary.xlsx / Water Facilities.xlsx
Chlorination stations								
Reservoirs	7	✓	NA	✓	✓	✓		Facilities Asset Summary.xlsx / Water Facilities.xlsx
SCADA systems								
PRV stations	20	✓	N.			✓		Facilities Asset Summary.xlsx
Valves								
Hydrants	2,280	✓	NA		✓	✓		Water Hydrants - 2009 Summary Final_r2.pdf
Service connections	18,132 units	✓	NA		✓	✓		Water Connections - 2009 Summary Final_r2.pdf
meters	1,601	✓	NA		✓	✓		Water Meters - 2009 Summary Final_r2.pdf
Other								

yann.delieuvain:
Is this a good representation of the water system or am I missing important components?

yann.delieuvain:
Included in the mains

yann.delieuvain:
Included in other facilities

yann.delieuvain:
FOR WELLS, BOOSTER STATIONS, RESERVOIRS, AND PRV STATIONS:
List of active facilities to be validated by relevant staff

yann.delieuvain:
FOR HYDRANTS, SERVICE CONNECTIONS, AND METERS:
2 options:

A- Complete inventory with installation year + ESL

B- Inventory summary (total count, ESL, unit cost) + annual \$ value spent on renewal

yann.delieuvain:
If you have inspection reports, great. If not I can do without.

yann.delieuvain:
FOR WELLS, BOOSTER STATIONS, RESERVOIRS AND PRV STATIONS:
I need ideally the condition or the installation year

Step 1

Map out your system - What do you own?

- It is a high level analysis – don't get caught up in small details
- Ask for help – staff knowledge will prove helpful
- Track & log your work – you or someone else will have to do it again in a near future

Step 2

What asset data do you need?

When will this asset be replaced?

How much will it cost?

Step 2

What asset data do you need?

When will this asset be replaced?

- What's its remaining service life?
 - Condition based
 - Age based
- What is its Estimated Service Life (ESL)?

Step 2

What asset data do you need?

How much will it cost?

- What is the replacement cost of the asset?
- Not a depreciated value

Step 2

What asset data do you need?

Where to look for information?

GIS

PSAB

Paper based or digital asset inventories

Databases

Condition assessment studies

As-built drawings

Maintenance management systems

Local knowledge



Step 3

From raw data to data you can use

- How complete must your inventory be?
- Don't worry about data gaps
- Make assumptions and educated guesses
- Use local knowledge
- Do not waste too much time on your estimates

Trade off between accuracy and practicality

Step 3

From raw data to data you can use

An example

Unknown Parameters	Length in Raw Inventory	As % of the Raw Inventory	After Assumptions
At Least One Unknown Parameter	167,790	71%	4%
Unknown Material	151,801	65%	4%
Unknown Installation Year	45,033	19%	0%
Unknown Diameter	13,360	6%	0%

Step 3

From raw data to data you can use

The “quota” method

<i>IF UNKNOWN</i>			<i>THEN</i>			<i>Length in meters</i>
Material	Installation Year	Diameter	Material	Installation Year	Diameter	
X			Unknown Materials guessed based on existing data			120,111
X	X		Unknown Materials guessed based on existing data	Unknown Installation Years guessed based on existing data		18,719
	X			Unknown Installation Years guessed based on existing data		15,599
X	X	X	Unknown Material (80 year Expected Service Life for the purpose of this study)	Unknown Installation Years guessed based on existing data	Unknown Diameters guessed based on existing data	10,465
X		X	Unknown Materials guessed based on existing data		Unknown Diameters guessed based on existing data	2,506
	X	X		Unknown Installation Years guessed based on existing data	Unknown Diameters guessed based on existing data	250
		X			Unknown Diameters guessed based on existing data	140

Templates

- #1: Weibull Distribution for Linear Infrastructure
- #2: Life-cycle analysis + summary outputs

February 2011

Weibull Probability Density Function

$$\frac{\beta}{\eta} \left(\frac{T - \gamma}{\eta} \right)^{\beta-1} e^{-\left(\frac{T - \gamma}{\eta} \right)^\beta}$$

$T \geq 0, T \geq \gamma, \beta > 0, \eta > 0, -\infty < \gamma < \infty$

scale parameter.
shape parameter (or slope).
location parameter

The Weibull distribution is often used in the field of failure analysis. Provided parameters are reasonably accurate, it simulates the failure density of a pipe inventory.

The dashboard below allows users to test different parameters and to see the effect of these changes on the graphical plots located on the graph tabs of this workbook.

Material	ESL*	In % of inventory	Diameter	cost per meter	In % of inventory
AC	50	16.14%	20	\$ 260	0.01%
STEEL	80	0.17%	25	\$ 266	0.05%
PERMA	80	0.03%	30	\$ 271	0.01%
CONC	75	0.04%	50	\$ 288	0.19%
DI	80	15.05%	75	\$ 294	0.00%
HDPE	80	0.49%	100	\$ 299	3.06%
PVC	80	67.51%	150	\$ 311	36.72%
Unknown	80	0.56%	200	\$ 327	23.71%
			250	\$ 355	15.38%
			300	\$ 406	10.69%
			350	\$ 462	2.17%
			400	\$ 495	4.90%
			450	\$ 557	0.95%
			500	\$ 619	1.57%
			600	\$ 675	0.46%
			750	\$ 792	0.00%
			Unknown	\$ 352	0.13%
			Future	\$ 352	

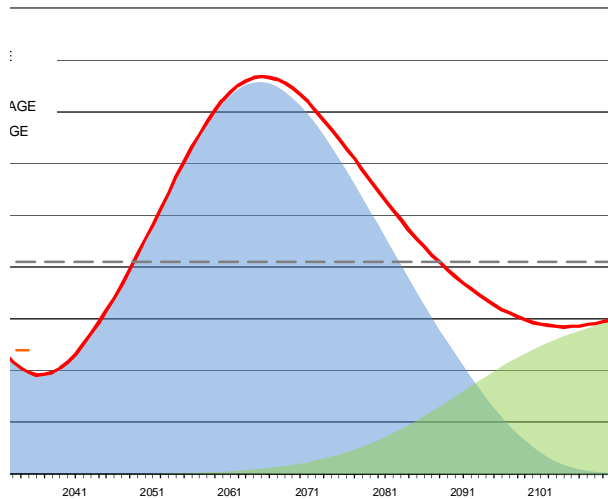
yann.delleuvin:
Defines the failure rate. A shape parameter > 1 means the failure rate increases over time. An increasing failure rate is typical of assets that wear out and that are more likely to fail due to fatigue as time goes on. Pipes fall in this category.

yann.delleuvin:
Used for 2nd cycle

Previous studies showed that any value between 7 and 8 is a good shape parameter for pipes.

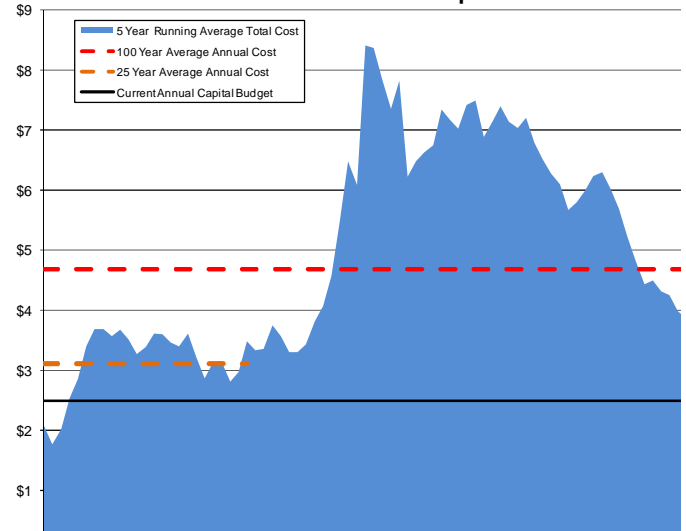
yann.delleuvin:
Used for 2nd cycle

Water Mains Anticipated Replacement Cost



osts, valves and all nodal fittings such as junctions, tees, crosses, bends and ferrules. They do NOT include road resurfacing costs.

WATER Estimated Annual Replacement Cost



Templates

Available for download at

www.NationalBenchmarking.ca

the world's
most advanced
public sector benchmarking
exercise

**NATIONAL WATER & WASTEWATER
BENCHMARKING INITIATIVE**

Home | Contact Us | Site Map

Final deliverables will be online June 8th!

Member's Area

Please Log In

User Name:

Password:

Forgot your password?
Please [click here](#) or call 1-604-444-6400 and ask to speak with our Benchmarking Team.

2010-2011 Iteration

A large group of people, including men and women in business attire, are posing for a group photo outdoors. They are standing in front of a modern building with a stone wall and a paved walkway. In the background, there are snow-capped mountains and evergreen trees under a clear blue sky. The text "2010-2011 Iteration" is overlaid on the right side of the photo.

Weibull distribution function for pipes

- Why a distribution function?
- How does it work?

Key Points

- 1. You don't need perfect data and you don't need expensive software or equipment**
- 2. If kept simple, it can be done quickly**
- 3. Communicate your results within (and outside) the organisation**

Yann Delieuvain – AECOM Burnaby, BC

604 444 6436

yann.delieuvain@aecom.com

