

It's all right here

City of Cambridge Integrated Capital Planning Tool

INFRA – QUÉBEC 2015

Johan Krijnen, P.Eng Manager Asset Management City of Cambridge

> Ronnie Flannery-Guy Regional Manager Aqua Data Inc.





Agenda

- Introduction
- History
- InfraModex Concepts
- First Results
- Project Remarks



Introduction





Aqua DATA

City of Cambridge

- Cambridge located in Southern Ontario
- Population: 130,000 (with 3 Town Cores)
- Two-Tier Local Government (Regional and Local)
- \$20M \$25M Annual in Capital Expenditures supporting
- Core Municipal Services
 - Roads & Bridges
 - Water Distribution
 - Sewage Collection and conveyance
 - Storm Water Drainage



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CAMBRIDGE

Old Org Chart (before Sept 2015)





New Org Chart (Sept 2015)





History

Integrated Capital Planning





Or the art of throwing darts



The Challenge



- Components of each exist in same physical space.
- Every excavation to repair, replace, renew a system negatively impacts other system's components.
- Every intervention interrupts transportation and at least one other municipal service.
- Every system is typically independently funded and managed.
- Funding sources are 'rule' based.
- Infrastructure funding gap.



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Integrated Life Cycle Management

• Goal

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- Minimize total cost of ownership of all components and systems within same physical area
- Minimize service interruptions
- Solution
 - Extend life of shorter lived assets to match life of longer lived assets
 - All components/systems in same location have achieved full life expectancy
 - Replace all systems at same time (full re-construct)



Integrated Decision Making





Software Tool Search

- Long term understanding that a good Asset Registry is 'Key'
- Research project with IBM led to better understanding Integrated Capital Planning Process (2011 – 2014)
- In 2014 Capital Budget (3 year period) was based on applying Integrated Capital Planning Process principles together with semi-automatic GIS analysis
- Fall 2014 start Request For Proposal (RFP) Process
- April 2015 selection of 'INFRAMODEX'
- June 2015 start implementation project



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InfraModex Data Environment



InfraModex Import Tables













Region of Waterloo







Project prioritization

- Asset's condition (PQI, lifespan ratio, break rates, etc.)
- Dimension (Length / Diameter / Surface)
- Material, size
- Consequence of failure
- Location type





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The Objective

...to find the strategy that will optimize the whole lifecycle costs (over 100 years) of owning assets geographically linked, using their actual and forecast's conditions based on proper deterioration models, considering the different interventions possible and their costs, respecting budgetary and capacity constraints, in order to achieve a minimum level of service now and for the foreseeable future.

Decision policy: Individual Based on city's expertise, how asset should be managed individually based on their attributes, conditions and required level of service.

Decision policy: Integrated

Based on city's expertise, how assets geographically linked (location) should be managed as a whole based on their individual attributes, conditions and required level of service.

"Individual decision could be wise, but become completely stupid when taken as a whole" (e.g. road resurfacing two years before water main replacement)



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Video placeholder

First Results

- Decision model built for:
 - Roads
 - Sewer
 - Water
- Input for State of Infrastructure report
 - Backlog
 - Trends
- Capital Program confirmation



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CAMBRIDGE

First Results



Unconstrained Model (Unlimited Budget)



NADA

CAMBRIDGE

First Results



Constrained Model (Limited Budget)



First Results



------ Integrated Decision-Road condition index - PQI (avg) (Local) - [Jurisdiction:Local] -Average



Constrained Model – Roads Investment and Trends

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Get Directions History

▼ Places

- DANDO AVE : END WATER ST N (RS18019) 2016 : Full synchronized reconstruction
- DUNDAS ST N [REG RD 8] : HADDINGTON ST EASTON ST (RS18124) 2016 : Full synchronized reconstruction
- MAIN ST : ARTHUR WHITE AVE PECK ST (RS18181) 2016 : Full synchronized reconstruction
- VIMY ST : ELLIOTT ST SOUTH ST (RS18198) 2016 : Full synchronized reconstruction
- ELLIOTT ST: CHRISTOPHER DR DUDHOPE AVE (RS18199)

 2016: Full synchronized reconstruction
- SAMUELSON ST : PRETORIA RD KIMBERLEY RD (RS18221) 2016 : Full synchronized reconstruction
- SAMUELSON ST : MERCER RD PRETORIA RD (RS18231) 2016 : Full synchronized reconstruction
- BRUCE ST : MCKENZIE ST CHISHOLM ST (RS18262) 2016 : Full synchronized reconstruction
- BALLANTYNE AVE : MURDOCH ST MCDONALD AVE (RS18267)

 2016 : Full synchronized reconstruction
- ELLIOTT ST : CENTRE ST BURROWS ST (RS18272) 2016 : Full synchronized reconstruction
- SOUTH ST : MCKAY ST MURDOCH ST (RS18274) 2016 : Full synchronized reconstruction
- SOUTH ST : MURDOCH ST MCDONALD AVE (RS18275) 2016 : Full synchronized reconstruction
- AINSLIE ST S [REG RD 24] : IMPERIAL LANE VALOUR PL (RS18330) 2016 : Full synchronized reconstruction
- CAMBRIDGE ST : ROSEVIEW AVE LANEWAY 173 (RS18342) 2016 : Full synchronized reconstruction
- PORTLAND ST : WELLINGTON ST CAMBRIDGE ST (RS18345)

 2016 : Full synchronized reconstruction
- CAMBRIDGE ST : BROOK ST LANEWAY 178 (RS18348) 2016 : Full synchronized reconstruction

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Earth Gallery	, >>



Asset	Intervention	Length	Timing	Cost 52,113 \$	
DP16500	Replacement	89.2 m	0 %		
DP16501	Replacement	58.7 m	0 %	34,340 \$	
DP20324	Replacement	40.9 m	0 %	23,633 \$	
RS18019	Reconstruction	227.8 m	0 %	215,764 \$	
SP14637	Replacement	88.2 m	0 %	58,598 \$	
SP16062	Replacement	115.2 m	0 %	76,950 \$	
WP31871	Replacement	24.5 m	0 %	19,741 \$	
WP31873	Replacement	193.7 m	0 %	160,407 \$	
	641,547 \$				

DANDO AVE : END - WATER ST N (R\$18019)

2016 : Full synchronized reconstruction

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Right of Way	8458	120 SHADE ST (FROM SPRUCE ST)	Ward 4		18430	SP18430	2016	Replacement	0%	61,482 \$ Individual rehab/recon - Sanitary
Right of Way	8433	127 HESPELER RD TO BLAIN AVE	Ward 4		16030	SP16030	2016	Lining	0%	43,136 \$ Individual rehab/recon - Sanitary
Right of Way	8433	127 HESPELER RD To BLAIN AVE	Ward 4		16031	SP16031	2016	Lining	0%	16,809 \$ Individual rehab/recon - Sanitary
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Right of Way	8650	127-131 GRAND AVE S	Ward 6		13208	DP13208	2016	Replacement	0%	51,187 \$ Individual recon - Storm
Right of Way	8625	130 WATER ST N TO EAST BANK LEVEE	Ward 4		15444	DP15444	2016	Replacement	0%	13,955 \$ Individual recon - Storm
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Right of Way	8315	1328 DUNBAR RD	Ward 4	UTILITY CORRIDOR	40934	WP40934	2016	Replacement	0%	147,789 \$ Individual rehab/recon - Water main
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Right of Way	8708	141-145 DORSET RD To CHURCHILL PARK	Ward 6		18361	SP18361	2016	Lining	0%	23,824 \$ Individual - Minor works
Right of Way	8399	152-156 NORTHVIEW HEIGHTS DR	Ward 8		14539	DP14539	2016	Replacement	0%	26,661 \$ Individual recon - Storm
Right of Way	8582	188-190 WATER ST N	Ward 4		19117	DP19117	2016	Replacement	0%	58,692 \$ Individual recon - Storm
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# Project Remarks

- Project Progress Manpower resources
- First model completed (decision trees) Requires many discussions and iterations
- Key is input data quantity and quality Inventory, history, condition, asset life and deterioration
- Next steps:
  - Improvement data quality
  - Continue testing simulation outcomes
  - First capital program
  - Start modeling next asset group...



QUA C



# Questions?

### **THANK YOU**

# **MERCI BEAUCOUP**

Contacts:

Johan Krijnen

krijnenj@cambridge.ca

Ronnie Flannery–Guy

rguy@aquadata.com

