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Development of Ottawa's State Of Assets Report

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Abstract: In September 2012, one week after the Federation of Canadian Municipalities released the Canadian Infrastructure Report Card, the City of Ottawa released its first State Of Assets Report (SOAR). The City's report is very similar in nature to the Canadian Report card in that it provides a condition rating of physical assets at a point in time. Where they differ is on the breadth of assets evaluated and the method used to compile and present the results.

The City's SOAR presents the physical condition of 191 different asset types rolled up at two different levels: the overall service, and the asset types that enable that service's delivery. The overall level provides an overview of the physical condition of all assets owned for the purpose of delivering the specified service (e.g., potable water, recreation and culture, transit, etc.). The asset type level provides a report on the condition of all the asset types evaluated to create the overall assessment. Each asset type is presented individually to help readers understand the makeup of the overall condition distribution.

In order to generate rolled-up overall condition ratings, the City used replacement values and relative importance as the common denominators. For the majority of assets, the replacement values were readily available but the innovative component of the approach was the inclusion of a "relative importance" score (as a proxy to risk). This paper presents the detailed process and methodology developed and used by the City of Ottawa to generate its first State Of Assets Report.

1 Introduction

Over the last decade, a number of public organizations have produced report card-like reports identifying the physical condition of some of their assets. City staff had gained an appreciation of the benefits of having a factual report to help investment discussions with senior management and elected officials through preliminary work done in 2006, a literature review in 2010, and discussions with peers from across the country (and internationally).

In September 2012, nearly one year after the project start-up meeting was held, the City of Ottawa released its State Of Assets Report (SOAR). The SOAR was delivered as part of a report to Council (Ref No: ACS2012-PAI-INF-0007 Comprehensive Asset Management Program) that laid out the magnitude of assets owned by the City for the delivery of various services. The report to Council outlined the benefits of a Comprehensive Asset Management (CAM) approach through the demonstrated linkage between infrastructure investments and resulting impacts on service delivery. The report included the CAM Policy for adoption by Council; a copy of the CAM Strategy endorsed by Senior Management; a copy of the Canadian Infrastructure Report Card; and the State Of Assets Report.

This paper presents the method used to develop the City of Ottawa's first version of its SOAR.

2 Background

In 2010 the City was invited to participate in the Canadian Infrastructure Report Card (CIRC). At the time of providing data for the CIRC, some data were not available or not available in the required format. The data that were available at that time were gathered and when necessary assumptions were made and values generated to fit the requirements of the survey.

The time and effort required to generate data for the CIRC reinforced the need and provided the opportunity to initiate the development of the City's own report card. Staff needed to have sufficient data to answer Council's questions when the Canadian report card would be released and also be in a position to help demonstrate the outcome of years of marginal investments in infrastructure rehabilitation (often for the benefit of growth).

Initially, the City's infrastructure report card was to focus on five asset groups (water, sewer, transit, roads [including bridges], and buildings) evaluated on physical condition and performance. The report card was to be generated within six months such as to have material ready by the time of public release of the CIRC. And finally, due to time constraints, the City's SOAR was to be developed internally.

3 Methodology

As mentioned earlier, it was initially decided to present results according to five major asset groups that could be broken down into the various supporting asset types. Further along in the process it was decided to postpone the evaluation of the asset's performance to a future version of the SOAR and to move away from reporting by asset groups towards reporting results by City service.

The ten City services were as follows:

- Drinking Water
- Wastewater
- Stormwater
- Transit
- Transportation
- Recreation and Culture
- Libraries
- Fire, Paramedic and By-Law
- Community Services
- Civic Facilities and Corporate Realty

As such, the physical condition of the assets, presented in the City of Ottawa's first State Of Assets Report, was compiled following these steps:

1. Identify unified grading scale to allow compiling numerical values (including condition ranking).
2. Capture granular inventory data.
3. Determine appropriate fields to use for condition status.
4. Determine appropriate proxy metrics where existing condition properties are not available.
5. Align metrics to condition ratings to appropriately reflect perception (both from subject matter experts and management).
6. Determine factual condition distribution of assets for each asset type.
7. Determine relative importance value for each asset type within each asset group or service.
8. Identify replacement cost for each asset.
9. Determine level of granularity to be reported upon (which assets have sub types (e.g., roads reported by road class, and watermains reported as transmission and distribution).
10. Apply relative importance weighting to factual distribution.
11. Apply replacement cost weighting to factual distribution.
12. Combine weighted distributions to generate final condition distribution of assets.
13. Align assets under a City service (not necessarily the funding source).
14. Roll up granular values to the higher report levels.
15. Generate the final overall "grade" using the weighted distribution.

Step 1

One of the valuable steps (from a project perspective) was to establish a single evaluation scale to act as the common denominator for all assets. The project team opted to go with a 5-point scale to align with the CIRC for ease of comparison and to leverage any future generated information. The 5-point scale was based on a 100-point score (common denominator) that allowed different assets using different attributes, different metrics and different scales to be rolled up to a common rating and condition description. The evaluation scale shown in Figure 1 is the final version used by the City.

Figure 1 – SOAR evaluation scale

Rating	Rating - Description	Score (common)	Asset Type Metric (examples)	
			Life Consumed	Pavement Quality Index
Very Good	**Very Good - Fit for Future** Well maintained, good condition, new or recently rehabilitated	80 – 100	0 to 19%	9 < PQI ≤ 10
Good	**Good - Adequate for Now** Acceptable, generally in mid stage of expected service life	70 - 79	20% to 39%	7 < PQI ≤ 8.9
Fair	**Fair - Requires Attention** Signs of deterioration, requires attention, some elements exhibit deficiencies	60 - 69	40% to 59%	5 < PQI ≤ 6.9
Poor	**Poor - At Risk of Affecting Service** Approaching end of service life, condition below standard, large portion of system exhibits significant deterioration	50 - 59	60% to 79%	3 < PQI ≤ 4.9
Very Poor	**Very Poor - Unfit for Sustained Service** Beyond expected service life, widespread signs of advanced deterioration, some assets may be unusable	0 - 49	80% or more	0 < PQI ≤ 2.9

Steps 2 to 6

The project team singled out the asset types to be included in each asset group along with the staff that could provide specific details against each asset type. Workshops were arranged with targeted staff to discuss which properties and attributes could be used to evaluate their condition. These workshops were typically held with senior non management staff, (i.e., subject matter experts [SME]) with inherent knowledge of their assets and a good understanding of the data (reliability, availability, etc.).

For those assets that had physical condition attributes already populated in the database, workshops were focused on clarifying how the available condition data aligned with the condition rating description.

For those cases where physical condition data were not available or unknown, the SMEs were asked to identify metrics to use as proxies to physical condition. For example, the City's data on the water main network were very thorough and reliable but only very few segments had a physical condition score attributed to them. The installation year and material type of each segment were well populated and the estimated expected service lives of each material type were also known. As such, the ratio of age over expected service life was used as a proxy for condition.

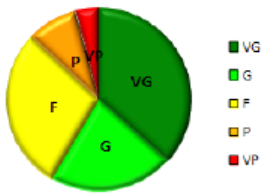
The project team kept track of all assumptions, limitations, exclusions/inclusions used to determine the condition at the asset level through a "form" that was completed for each asset. These forms were never intended as a public facing document but rather as a reference for future use and validation of data. Figure 2 shows a sample form used to capture background data on distribution watermains. The details include the inventory at the time when the data snapshot was taken, the sample size used to evaluate the

condition, the replacement cost of the inventory, the makeup of the final condition (condition distribution), the metrics used to compute the condition, and any assumptions of significance.

Figure 2 – Asset form used to capture background data for all assets evaluated

Asset Type:	Distribution Watermains	
Asset Condition:	Good	Internal score: 74
Asset Performance	N/A	Internal score: N/A
Inventory:	2,691.1 km	
Replacement Value:	$ 5,500 M	
Sample used for reporting:	2,638.4 km	98%

Distribution Pipes



Asset Type Includes:	Asset Type Excludes:
• All City owned water mains with diameter < 410 mm that have "In Service" life cycle status • Asset type includes appurtenances such as valves, hydrants, chambers and service connections	• Not in service water mains • Lateral connections
Performance Indicators / Metrics	**Assumptions**
• Life Consumed (age/expected service life)	• Expected service life different for each material type • Age as captured on December 31st, 2011

Grade – Score - Points

Grade	Score	Consumed
Very Good	80 - 100	0.0 – 0.19
Good	70 - 79	0.2 – 0.39
Fair	60 - 69	0.4 – 0.59
Poor	50 - 59	0.6 – 0.79
Very Poor	≤ 49	≥ 0.8

Comments / Notes

- See Appendix A for Water Pipe Material and Expected Service Life.

With the different metrics established and the data provided, the project team compiled preliminary condition distributions for each asset type. Through a second round of workshops, the SMEs were asked to review preliminary numbers to evaluate whether the results compiled using the proxy metrics aligned with their professional opinions, or if some adjustments were required to the thresholds previously established.

The preliminary condition distributions were, for the most part, accepted as presented but for a handful of assets the thresholds had to be reviewed.

Steps 7 to 11

This second round of workshops with SMEs yielded preliminary results at the asset type level. Prior to circulating the granular results to management for review, results were rolled up to the five asset groups using relative importance as the common denominator.

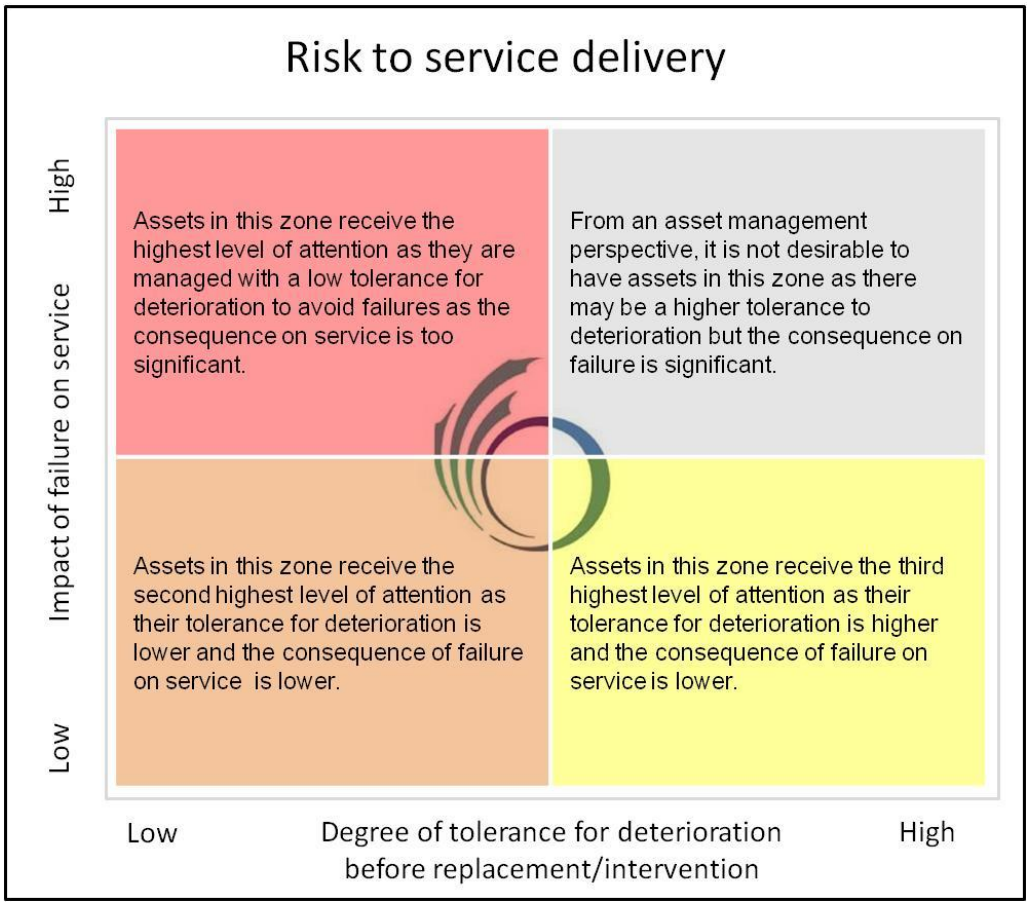
Several asset types were evaluated at the most granular level available within each asset group; length, location, area, etc. The process of rolling up a condition value for a group of assets that were measured against different denominators meant that a common denominator was required for a proper representation at the highest level. Initial discussions pointed to the replacement cost of the asset as the most basic common denominator available. There was, however, some resistance since some assets of

high value were essentially obsolete without properly functioning low cost assets. The example used to illustrate this concept was that of a pump station and the associated force mains, where the force mains could represent several times the cost of the pump station. In this illustrative example, would it have been fair to show the sewer network in good condition if the pump station was in a much worst physical condition?

At the time of compiling the results, the City did not have criticality values established for all of its assets, much less criticality values spreading across different asset types. The use of a relative importance factor was devised for the benefit of the exercise. The asset's relative importance within an asset group was determined by staff familiar with the role, purpose and intended function of each asset type. They were asked to rate each one against a risk to service delivery matrix. Figure 4 shows the matrix used to assign a Relative Importance (RI) value against each asset type.

Each quadrant was attributed a value. The upper left quadrant had a RI value of 5, the lower left quadrant, a RI value of 3, and the lower right quadrant a RI value of 1. No asset types were placed in the upper right quadrant, and those asset types straddling quadrants were given RI values of 2 or 4, respectively.

Figure 4: Relative Importance matrix



With each asset type rated for relative importance, the condition distribution of each asset type was "weighed" against the relative importance and a rolled up condition distribution was produced.

Preliminary results were circulated to Senior Management for review.

Senior Management did not entirely agree with the approach. The overall condition grade associated to the assets under their stewardship reflected their perception and that of senior staff but it was felt that those assets representing the majority of the asset group (based on replacement cost) should have a greater influence in the overall condition score.

Given the earlier position on using replacement cost as the common denominator, the project team opted to use both the replacement cost and the relative importance rating to roll up the results.

Steps 12 to 15

The project team revisited the results and the method used to compile rolled-up condition values and took advantage of the opportunity to revisit the reporting format. Up to this point the results were compiled according to the five asset groups identified initially. The final version of the report was now to report the condition of assets from a service delivery optic. This entailed revisiting the analysis of all assets maintained in the buildings and park, and fleet databases to realign individual facilities or assets to different services. The method used to calculate, weigh and agglomerate granular results was repeated for the new groups to ensure consistency.

4 Results

One of the first objectives identified by the project team, other than generating a factual, consistent, repeatable report, was to produce a report that was clear and understandable. The final report was not aimed at subject matter experts or technical staff but rather at the general public, elected officials and management.

As such, the information provided was intentionally kept straightforward, factual and laid out in a reader friendly format. The published results include inventory (quantity), inventory replacement cost, current condition and the makeup of the condition. The results were presented using a three level approach: City wide, Service, and Asset type. Figure 6 shows an extract of the report showing the information for a single service.

Figure 6 – Extract of SOAR showing the transportation service

In the upper right corner of the left page the white arrow points to the current overall physical condition (Good to Fair) of all of the assets that were evaluated for this service. The left page also shows the current replacement costs of those same assets and the makeup of the overall condition (pie chart distribution). The right hand page of Figure 4 shows the condition makeup of the 12 different asset types that were individually evaluated according to the method previously outlined.

5 Discussion

Over the course of creating the City's first asset report card, the project team made the following observations.

- The use of relative importance provided a means to roll up data but is not ideal. As risk-based assessments and criticality identification evolve, the City should move away from the use of relative importance to a fully documented risk-based score.

- In a few cases no condition data or installation years were available at the time of compiling data (or where installation year was deemed non-representative of condition). In those cases, the SMEs were asked to provide an opinion to the best of their knowledge of the current physical condition of the assets. This approach was also done with some assets where condition metrics were available to establish a level of confidence on the expert opinion. When the condition generated through data was compared to the condition stated by the SMEs the differences were minimal. This same observation has also been reported by individuals involved in the development of the CIRC.

- At the onset of the workshops with SMEs, some "uneasiness" was observed based on the questions that were directed at the project team. For example questions like 'what is the objective of this report" often followed by questions like "if the report shows that our assets are in good shape are we going to get less funding?" or "if the report shows that our asset are in poor condition does that reflect on us as poor managers?". Questions like these were frequently fielded in the opening dialogues of the different workshops.

Overall, the project team observed that following the tabling of the report at City Council, discussion quickly went from "why should we do this project" to the more strategic discussion along the lines of "how do we ensure that we provide adequate funding to prevent further deterioration of these assets".

6 Conclusion

The SOAR helped to demonstrate that services provided by the City through different assets were at risk of being impacted due to several years of funding growth at the expense of rehabilitating existing infrastructure.

The City of Ottawa generated its first State Of Assets Report one week after the release of the Canadian Infrastructure Report Card during a period where public confidence in city administrators was relatively low (lookup 2012 Ottawa highway sinkhole). The impact of a factual, comprehensive report on the physical status of the City assets was almost immediately felt in that there was a general acceptance that the City had a good knowledge of the condition of its assets.

The authors would like to thank City staff and staff from peer municipalities for their contribution and assistance in developing the City's first factual report on the condition of assets.

7 References

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