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# ***City of Saskatoon*** Snow and Ice Management Program Audit – Update/Dashboard

*SPCF Public Meeting*

*April 8, 2019*



# ***Background***

## ***Snow & Ice Management Program Audit***

The Snow & Ice Management program audit was initially presented to the City of Saskatoon Standing Policy Committee on Finance in September 2016. The intent of the project was to determine whether the Snow & Ice Management program achieved economy, efficiency and effectiveness during the period of examination. Within the report were 16 specific findings and recommendations. At the initial presentation of the report in September 2016, the City of Saskatoon's Administration provided detailed responses and timelines for full implementation to each of the 16 recommendations. As of January 2019, we consider 7 of the recommendations to be complete and fully addressed, 7 of the recommendations to be partially complete (with certain aspects delayed but in-progress), and 2 of the recommendations to be on-schedule and in-progress.

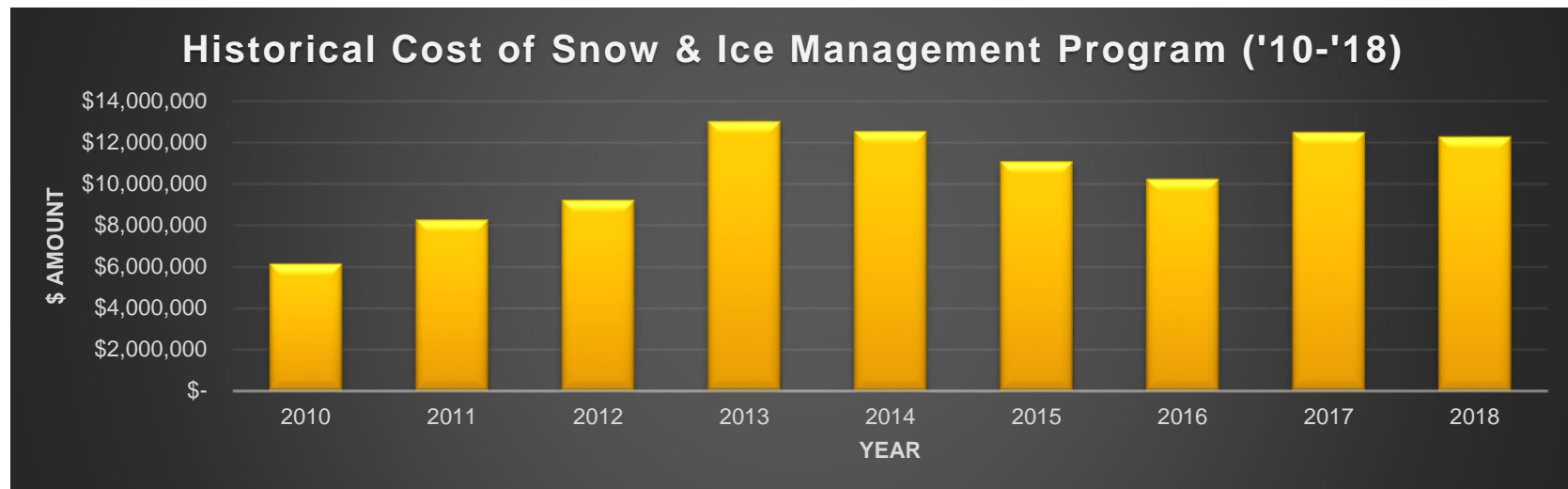
On the pages that follow there are also certain elements of analysis of total Snow & Ice Management Program spending that have been updated from the initial report and presentation in 2016. These illustrations speak to trends in total program spending, significant components of the program spending and trends therein, and a comparison of total program spending based on available national benchmarking information. The information has been compiled by PwC based on information provided by the Administration. A contextual understanding of changes to the Snow & Ice Management Program in 2016, 2017 and 2018 is important to fully understanding and assessing the data on the following pages.

# Updates on Snow & Ice Program Cost Trends

## Snow & Ice Management Actual Spend (2010 to 2018)

The following chart illustrates the Snow & Ice Management program actual spending for the 9 calendar years starting in 2010 and concluding in 2018. There are three important points to consider when reviewing total program spending in this fashion:

- The level of program spending outlined below is consistent with trends in the approved operating budget for the Snow & Ice Management program, in which additional funding allocations occurred to increase the level of service. The Administration created the current level of service for winter maintenance based on direction from City Council.
- The largest single cost of the program is salaries and benefits for the employees required to execute the program, which increased from 33% of total program costs in 2014 to 45% of total program costs in 2018.
- There are two significant operational components: snow removal and street sanding. Snow removal activities represent from 68% to 77% of the total program costs while street sanding represents 23% to 32%.

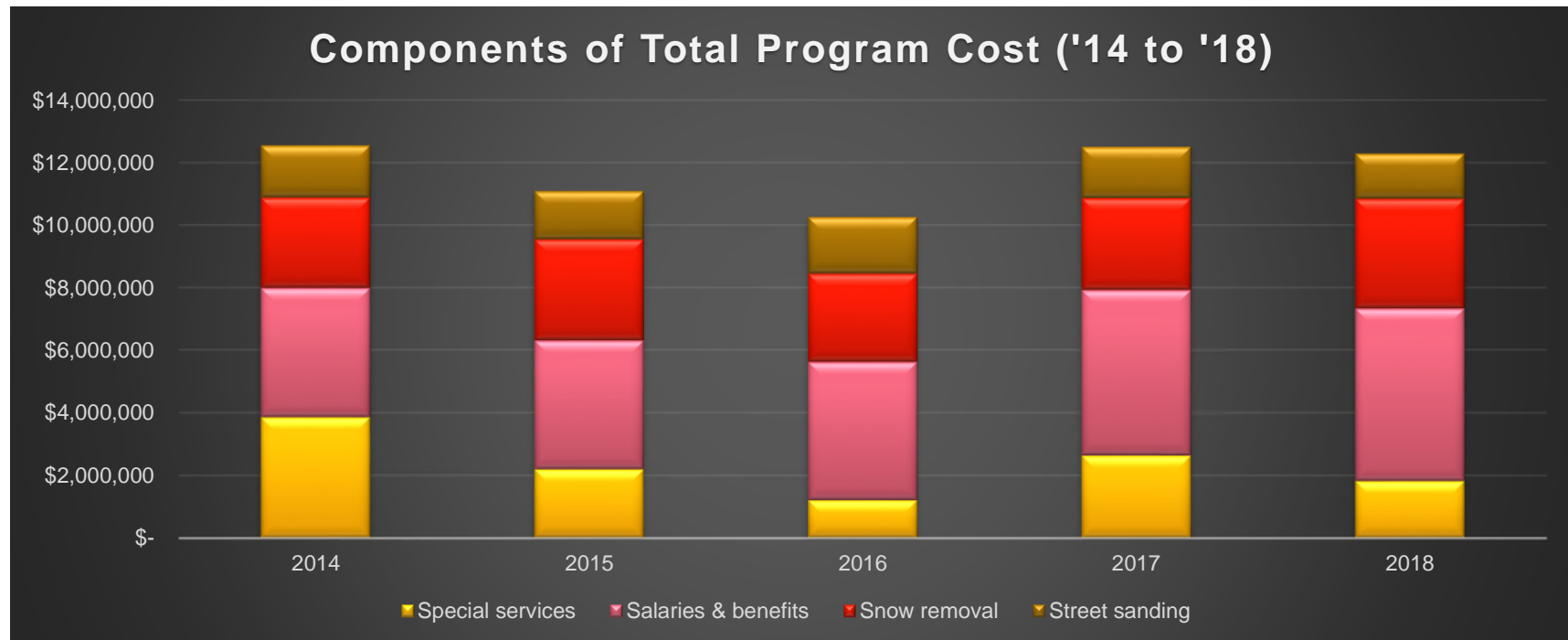


Overall, Snow & Ice Management costs reached a high of just over \$13 million in 2013 and declined significantly from 2013 through 2016; in 2016 there was a spend of just over \$10 million for the year. In 2017 and 2018, costs of the Snow & Ice Management program have increased to slightly above \$12 million annually. The impact of a single weather event (snowfall that causes initiation of contractor assistance or overtime) or a single snow event (5 cm+ of snow that initiates snow grading on priority streets) can have a significant impact on program costs in a given year. For an example, from November 1 '17 to March 23 '18, the program tracked 10 weather events and 4 snow events with the 'surge' cost (i.e. incremental contractor and overtime costs) impact of a weather event ranging from approx. \$17,000 to \$269,000 and the 'surge' cost impact of a snow event ranging from approx. \$280,000 to \$860,000. Note that these are the incremental costs of the event only and do not reflect existing baseline costs.

## Components of Snow & Ice Management Actual Spend (2014 to 2018)

The following charts illustrate the composition of the Snow & Ice Management program actual spending for the 5 calendar years starting in 2014 and concluding in 2018. There are two important points to consider when reviewing the programs spending in this fashion:

- “Special services” primarily represent contractor costs in a given year. “Salaries and benefits” include all salaries and other payroll costs for both the snow removal and street sanding aspects of the program. “Snow removal” and “Street sanding” represent all other costs of both of those elements of the program after removing payroll and contractor costs.
- As noted on the preceding page, the largest cost component of the program is salaries and benefits for the employees required to execute the program, which have increased steadily each year, from 33% of total program costs in 2014 to 45% in 2018. Correspondingly, the 2nd-highest individual cost component is contractor costs or “special services”, which have decreased steadily each year, from 31% in 2014 to 15% in 2018. In total, special services and salaries and benefits represent between 55% to 64% of total program costs in any given year.

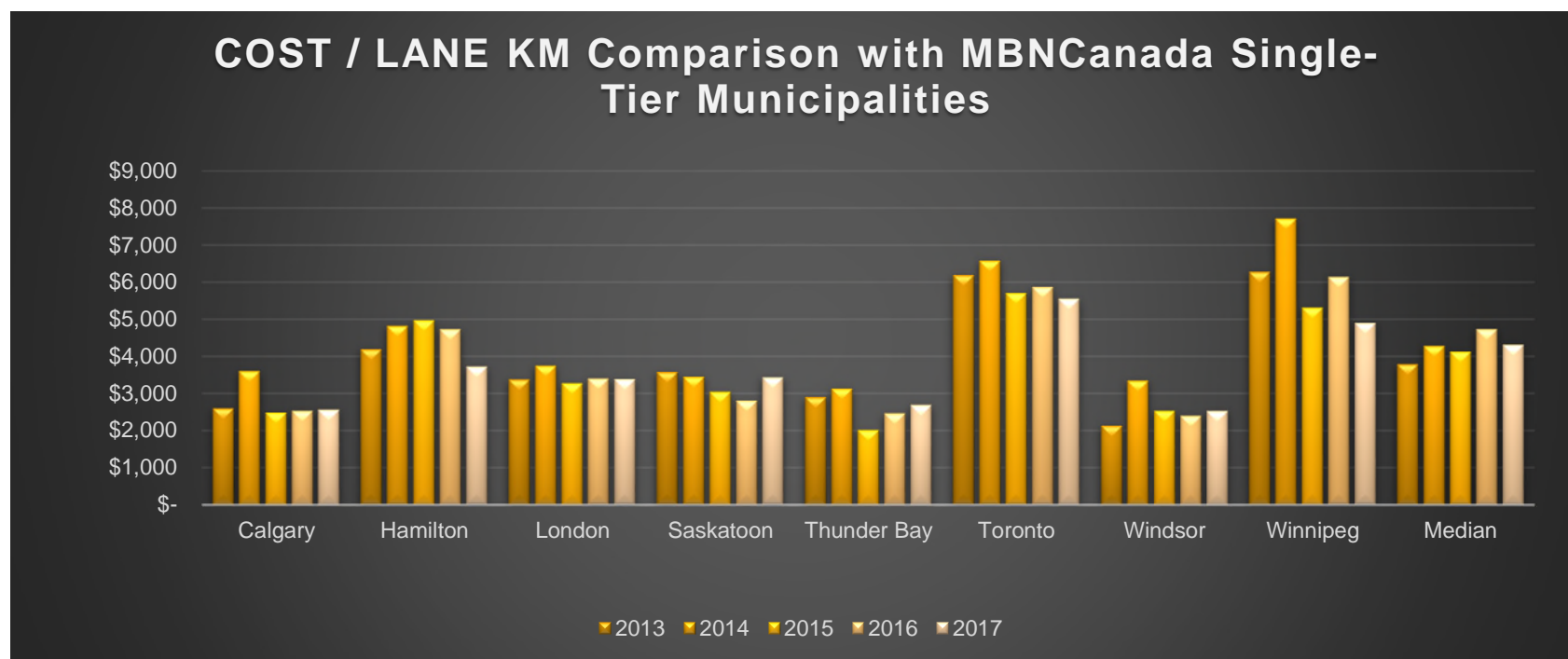


Overall from 2014 through 2016, the savings in contractor costs resulted in total annual program costs decreasing from approximately \$12 million to \$10 million. In 2017 and 2018, total program costs rose to the \$12 million level due to significant increases in salaries and benefits, while at the same time also experiencing increases to the absolute value of contractor costs above 2016 levels. Please note that for 2018, the total program spend remained approximately \$400,000 below the originally budgeted amount.

## Snow & Ice Management Actual Spend per Lane KM Benchmarked

Note that there are significant challenges in benchmarking the Snow & Ice Management program based on costs per unit, per lane kilometer, or per capita. While examining trends based on these 3 measures can provide anecdotal information regarding trends, we caution against relying on this information for detailed conclusions. When examining these figures, important factors such as changing levels of service, changes in density of snowfall, and abnormal conditions (i.e. freezing rain) are difficult to factor in from a statistical perspective.

The measure that does allow for benchmarking on a national level is the total cost for winter maintenance of roadways per lane km maintained. This is tracked annually by MBNCanada as part of its benchmarking for participating municipalities. Information obtained from the Snow & Ice Management Program in Saskatoon has been included in the chart below for purposes of comparison to peer cities.



Note that Saskatoon’s cost trends on a lane kilometer basis are consistent with the information on the previous two pages in terms of a) decreases in 2015 and 2016 and b) a return to pre-2015 levels in 2017. The factors for this are noted on the previous two pages. Another notable factor relevant to the cost per lane kilometer is the fact that the total amount of priority lane kilometers has been rising steadily, at a rate of almost 2% annually. On a total basis, priority lane kilometers represented just under 40% of the total roadway network in 2014 and now represent over 43%.

In terms of benchmarking on a national level, the costs of the Snow & Ice Management Program in Saskatoon rank as average (i.e. in spots 3 to 5 out of 8) in any particular year and the cost statistics for Saskatoon rank below the median level tracked by MBNCanada in each of 2013 to 2017.

# Updates to Recommendations and Timeline

## Administration Response and Timelines

At the presentation of the report in September 2016, the City of Saskatoon’s Administration provided detailed responses and timelines for full implementation to each of the 16 recommendations. As of January 2019, we consider 7 of the recommendations to be complete and fully addressed, 7 of the recommendations to be partially complete, with certain aspects delayed but in-progress, and 2 of the recommendations to be on-schedule and in-progress.

## Summary of Recommendations, Responses, and Implementation Timelines

Summarised Response	Initial Timeline for Full Implementation	Updates to Timeline for Implementation	Status	
<p>1) PwC recommends that the program formally incorporate components such as mission statement, program objectives, weather monitoring techniques, material utilization plans, technical and equipment needs, communications plans, personnel plans, and reporting on key performance indicators into its policy documents.</p>	<p>Administration agrees and will continue to develop the Winter Roads Level of Service document into a complete Customer and Technical Level of Service document. After more complete level of service documents are finished, an asset management plan with resource requirements (both staff and equipment), demand forecasting, performance standards, and support tools will be developed.</p>	<p>Updated Winter Road Level of Service documents will be presented to Committee in November of 2016. An asset management plan for the Roadways section will be developed in January of 2018.</p>	<p>Level of Service documents were created in 2017 and approved by Council and are now publicly available. The Level of Service defines program objectives and customer performance measures. Succession planning has been improved by creating a ‘Roadmap to Success’ for Roadways employees, which is used as a guide for employee development. A ‘Road Weather Information System’ is being planned for 2019 to assist with road and weather monitoring. As part of this, Roadways will be exploring the implementation of a Maintenance Decision Support System to provide a decision making framework for winter maintenance monitoring. ‘Snow Storm Communications’ document guides Roadways on how to communicate with the public for weather &amp; snow events. Asset Management Plans for Roadways continue to be in development. The updated Service Level Document includes customer performance measures for regular maintenance and the response to a snow event. Tracking of performance is completed for each event.</p>	<p><b>Partially complete; remainder delayed but in progress</b></p>

- 2) PwC recommends that standard operating procedures (SOP’s) be developed for all staff levels within the program. All employees should review and acknowledge the SOP’s to ensure that they have understood their duties.

Administration agrees. Job Safety Analysis is currently complete and will form the basis of the SOP development.

Job Safety Analysis documents will continue to be updated annually. Summer SOP’s will be completed by Apr. ‘17 & winter SOP’s by Oct. ‘17.

Job Safety Analysis documents have been completed for winter maintenance activities. Employee schedules for the winter are set in the fall and are shared with all employees. Serious incident & emergency management guidelines are being developed City-wide; once these guidelines are developed, specific plans will then be developed for the Roadways section. A document titled “100 Steps to a Snow Event” outlines the maintenance objectives, roles & responsibilities of superintendents, contractors & Municipal Engineering Services. These SOP’s have not yet been expanded to include all of the roles and responsibilities of supervisors, equipment operators and laborers, but this will be done in 2019.

**Partially complete; remainder delayed but in progress**

- 3) PwC recommends conversion of all reporting to an electronic format to facilitate the creation of a dashboard, trending reports, historical information on snow and ice event responses, and all other relevant information relating to these events.

Administration agrees. SharePoint will continue to be developed as an interim solution until a City-wide ERP solution is in place.

SharePoint development is ongoing. Current items such as materials management for aggregates are being tracked; however, further development of processes and workflows to prepare for an interim solution are required. Interim solutions for winter programs will be in place in October of 2016.

A dashboard is currently under development to track progress that will be available for senior management and councillors. Electronic tracking of snow event and weather responses is completed.

**Partially complete; remainder delayed but in progress**

- 4) PwC recommends that risk management processes be integrated into future contract planning to ensure a continuous source of materials in the event of delayed shipments. As there are constraints with respect to storage capacity at existing facilities, ensuring a contingency supply is vital.

Administration agrees. New material suppliers have been secured and delivery requirements are explicit in the contract. A trial of new material management processes will be utilized in the winter of 2016.

New material supply contracts will be in place by September 2016. A trial Material Management Process will be implemented for the winter of 2016. A report will be presented to City Council in April 2017 with the findings and recommendations.

Storage of materials is limited by the space available at City yards. The contract for sand supply includes a performance and materials bond for 50% of the contract value. Delivery requirements are within 3 hours. Contracts for salt supply include terms requiring delivery of materials within 6 hours of order and completion of delivery requirements within 48 hours. Consideration has been made to add a “back-up” contract for salt supply but this has been deemed not feasible due to there only being one bidder.

**Complete**

- 5) PwC recommends that the program investigate the application of technology such as weather monitoring stations, temperature pucks in major roadways, and supporting components. Empowerment of field operators can be achieved by providing them with technical training on how they can monitor the roadway network and report back in a timely manner. Real time condition assessments would result in tailored deployment strategies throughout the City and a more efficient delivery of the service plan.

Administration agrees. An investigation of available resources and technology that could be utilized by the City to monitor the road network will be conducted. Consideration will be given for partnership with local environmental agencies and Emergency Management Operations based on the infrastructure.

A report will be presented to City Council in April 2017 with the findings and recommendations.

The City completed a “Service Level for Snow and Ice Management” report in July of 2017. This document outlines the current service level for snow and ice management provided to the City. The document defines the priority streets and provides timelines for snow clearing on the various levels of priority streets and also discusses the resources required and how the required resources change dependent on the snow events that occur in a year. The City has deployment strategies for when contractor resources are required to assist City crews with responding to a snow event. Funding for a Road Weather Information System was approved in the 2018 budget submission and there are plans to have this installed in late 2019.

**Complete**

- 6) PwC recommends that technology and access controls (i.e. security cameras, radio frequency identification) be utilized to better monitor and protect the program’s inventory. Monitoring of inventory should integrate the use of Epicor as opposed to manual Excel files.

Administration agrees. Administration from various divisions are working collaboratively to find interim solutions for electronic tracking of materials until the ERP system is implemented. These include trial portable 3D laser truck scales, the use of existing software and tracking solutions, and modernized survey techniques for stockpile monitoring. Currently the security for City yards is under review.

Electronic tools will be trialed over the 2016/2017 winter and a report with recommendations will then be prepared for City Council for Oct. 17. The review of security at City yards will be completed by June '17.

Security at the City yards has been improved with the addition of: 1) reduced access to yards except through a guarded gate between 6 pm and 6 am; 2) facilities in the yards have been secured through the addition of key or code access; and 3) CCTV cameras were installed in areas of the yard and plans are in place to add cameras in the summer of 2019 to the materials storage areas.

**Partially complete; remainder delayed but in progress**

Materials tracking is being studied using the City’s continuous improvement process and the findings and recommendations from this study are expected in late 2019. Plans are in place to use Epicor for material tracking and management. This is expected to be completed in 2019 or early 2020.



- 7) PwC recommends that the priority street system and related service levels be reviewed with a focus on increased collaboration between the Snow & Ice Management program and other civic departments to establish a tailored priority system that targets the most critical infrastructure.

Administration agrees. The priority streets system is currently being reviewed and updated based on the winter level of service, emergency services and transportation requirements.

A report will be presented to City Council in November 2016, along with the updated Winter Road Maintenance Level of Service document.

The Level of Service document was updated in 2017 to include this information.

**Complete**

- 8) PwC recommends that access control mechanisms be implemented at snow management facilities and City yards to ensure complete daily coverage and that personnel liability risk be discussed with legal counsel to ensure appropriate coverage is being maintained by the City within their yards and snow management facilities as 'use at own risk' signs may not provide adequate coverage.

Administration agrees. The security for City yards is currently under review. Additional lighting and a new main gate were recently installed.

The new Civic Operations Centre (COC) Snow Management Facility will be opened on January 1, 2017. The facility will secure, manage users and utilize access control cards and vehicle useage. A report will be presented to City Council in June 2017 with the lessons learned from the COC site and how that can be applied to the City yards site.

Roadways is currently assessing the feasibility of a user pay system for the Civic Operations Center. A report was sent to Council with preliminary findings. The recommendation from the report was to continue the investigation to determine the feasibility of adopting a user-pay model and a follow-up report to Council will be submitted in June of 2019. Refer to the update to recommendation 6 on the previous page regarding security of the City yards.

**Partially complete; remainder delayed but in progress**

- 9) PwC recommends that: 1) hazard risk assessments be performed within City yards to ensure all risks are contained appropriately; 2) engineering inspections of City yard structures be performed to ensure they are certified for their current usage; and 3) that engineers provide guidance on the impact of materials being exposed to weather elements and losing their effectiveness.

Administration agrees.	A master material management plan is currently being developed which will include consideration of the risk for exposed materials.	Concrete blocks have been replaced with coverall buildings for salt and sand material storage. Refer to the update to recommendation 6 regarding security of the City yards. Roadways is planning engineering inspections of the coverall buildings that are used for salt and sand storage located in City yards in 2019.	<b>Partially complete; remainder delayed but in progress</b>
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- 10) PwC recommends that Fleet Services review the current replacement costs and useful lives assigned to their equipment as part of the Service Agreement review currently underway. Gaining sufficient comfort that their reserves are managed appropriately in order to replace assets that have reached the end of their useful lives will benefit the Snow & Ice Management program. Overutilization or underutilization of assets has a direct impact on the replacement reserve.

Administration agrees. Fleet Services is scheduled to go through an Asset Management Plan in the fall of 2016 which will address the condition of all of its assets and also any funding gaps which may be identified upon adjusting useful life expectations. Once review is complete, 3 bylaws (acquisition, replacement and stabilization) will then be considered and modified if/where required based on review's recommendations.	Fleet Services is currently engaging departments to deploy the concept of being "Business Partners" with departments when managing their equipment needs. This includes, but is not limited to, the full-access concept of data for users to be able to properly analyze at what point in their operations an addition to their fleet requirement may be needed. In regards to existing complements of equipment, service agreements are being put into place so that all user groups clearly understand the roles and responsibilities of all parties.	Fleet Services completed the Asset Management Plan in August of 2017 entitled 'Building Better Fleet: An Asset Management Plan for Fleet Services'. The primary outcome of this review was the revision of Bylaw 9476 in December 2017. The bylaw revision eliminated the 'Civic Vehicles and Equipment Asset Disposition/Acquisition Reserve' and diverted fleet service surpluses from the rental rates from the 'Civic Vehicles and Equipment Asset/Disposition Reserve' to the 'Civic Vehicles & Equipment Stabilization Reserve'. With the bylaw revision, the funding gap identified in the Asset Management Plan was eliminated and Fleet is now well positioned to replace vehicles in a timely manner.	<b>Completed</b>
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- 11) PwC recommends that Fleet Services implement a formal service agreement with Public Works. Public Works and Fleet Services are currently creating a collaborative work environment, including development of a process for real time status updates.

Administration agrees. Fleet Services was involved in a Civic Service Review in the fall of 2015, at which time the need for service agreements with various user departments, including Roadways, was identified.	Fleet Services is now drafting the final version of the Service Agreement for Roadways and is expecting finalization and implementation by the fall of 2016. In addition to service agreements, Fleet Services has just completed an upgrade to the M5 Fleet Management System.	M5 Fleet Management System is now implemented. This allows Roadways staff to receive real time updates on equipment that is being serviced at any time. The Service Agreement for Roadways is not yet finalized. A draft has been created to outline responsibilities of both Fleet and Roadways. The calculation of up-time requirements has been challenging and has not been resolved. This is currently being worked on by utilizing the City's Continuous Improvement Process.	<b>Partially complete; remainder delayed but in progress</b>
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<p>12) PwC recommends that an optimization strategy be determined for the Snow &amp; Ice Management program based on current shift structures and the operating capacity of Fleet Services. The strategy should focus on up-time requirements, ensuring only cost-effective procedures are being performed in-house, and ensuring that where efficiencies can be gained with contractors (i.e. outsourcing) they are utilized.</p>			
<p>Administration agrees. The shift structure at Fleet Services was an issue raised during the Civic Services Review in the fall of 2015.</p>	<p>The shift structure at Fleet Services will be evaluated in the 2017 Budget.</p>	<p>Fleet Services revised their shift structure in January of 2017 so that there is now availability 7 days per week for mechanics and service writers. This required the addition of 5 full time equivalents. Fleet Services has increased the amount of work being outsourced. This was done by entering into standing agreements with several companies for automotive repairs, tire repairs, and major repairs on trucks such as engine rebuilds.</p>	<p><b>Complete</b></p>
<p>13) PwC recommends that detailed activity-based budget variance analysis be performed on a monthly basis and then aggregated at year-end. This, coupled with the electronic tracking of snow and weather events (per recommendation #3), could lead to future cost savings. The electronic tracking of snow and weather events will assist in documenting budget to actual variances, and if management is aware of the root causes of monthly and annual variances, it will be able to adapt their strategies.</p>			
<p>Administration agrees. Activity based budgeting (ABB) will require documented levels of service. For the winter of 2016/2017, winter snow and weather events will be electronically tracked. For the past 2 years, job numbers and activities within each program have been tracked using Timberline.</p>	<p>Winter service levels were updated and approved in 2015. Levels of service are being developed and will be submitted in 2017. Long-term, the City is investigating ERP and asset management tools. For the next 5-year period, Roadways will use existing systems to achieve this objective. A portion of the 2017 operating budget will be developed using ABB. 2018's Roadways budget will be entirely activity based.</p>	<p>Winter snow and weather events are electronically tracked to indicate the event, the amount of snow, the cost for overtime and contractual services and adherence to the level of service. Budget variances (actual to budget projection) are tracked on a monthly basis and reviewed by management. The City has made headway with the development of an ERP system and further developments are expected in 2019.</p>	<p><b>Complete</b></p>
<p>14) PwC recommends that a cost recovery model be investigated to determine if this would enhance the sustainability of current funding agreements. Costs recovered could be used to generate snow facility reserves, to maintain current facilities, to reinvest in new facilities and to cover the costs of access controls.</p>			
<p>Administration agrees that the model should be researched fully. The Civic Operations Center Snow Management Facility will open on January 1, 2017. The Administration does not recommend a fee structure until all costs, and benefits, have been reviewed.</p>	<p>A report will be presented to City Council in June 2017 with the lessons learned from the COC site and how that information can be applied to the City yards site. This report will address the issue of cost recovery.</p>	<p>A report was submitted to the “Standing Committee on Transportation” in June 2018. The report highlighted that potential operating savings vary highly based on total snow volumes, number of high accumulation snow events, and timing of those events over the course of the season. A full year investigation is required to definitively determine the cost effectiveness of a user-pay snow management model. The Committee’s recommendation is planned to be discussed in June ’19</p>	<p><b>On schedule, in progress</b></p>

15) PwC recommends that GPS technology be utilized to better track personnel and equipment. The GPS system could allow for automatic updates on route completion, as well as potential optimization of the routes through analysis.

Administration agrees. Trials for GPS units have recently been procured for 4 sanders and will be piloted over the 2016/2017 winter season.

A report will be presented to City Council in 2017 to discuss the findings from the GPS pilot study and present a recommendation.

The City of Saskatoon has GPS units on some of its snow clearing and sanding equipment, but not all equipment. GPS information alone is not sufficient to update the public map showing which streets have been cleared. In addition to location, information on whether the plow was up or down and whether the equipment was spreading de-icing materials is needed. Procurement of GPS on all snow clearing and de-icing equipment with these capabilities is currently underway as part of an overall City GPS initiative.

**On schedule, in progress**

16) PwC recommends that the communication of Key Performance Indicators (KPI's) and performance monitoring be integrated into a formalized communication plan.

Administration agrees. KPI's and performance measuring will form part of each program close-out so adjustments can be made to ensure programs are efficient and optimized.

A KPI communications page for winter operations is being developed using Sharepoint. The lessons learned from the Sharepoint trial will be integrated into the Winter Road Maintenance Level of Service document updated to City Council in the fall of 2017.

Over the spring of 2017, a comprehensive engagement study was undertaken to identify improvements that would most significantly improve accessibility across different transportation modes including passenger vehicles, transit riders, cyclists and sidewalk users and was included in a report to Committee in November of 2017. The results are also posted on the saskatoon.ca website under "Better Winter Roads".

**Complete**