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Winter Street Sand Recycling and Mixing Program Audit

September 19, 2016



The Office of the City Auditor conducted
this project in accordance with the
*International Standards for the
Professional Practice of Internal Auditing*

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Executive Summary

Annually, the City of Edmonton places an average of 152,000 tonnes of winter sand on its road and sidewalks. Of this, street sweepers recover approximately 70 percent each spring. For the past 12 years, the City has been recycling this sand under the Winter Street Sand Recycling and Mixing Program. The City has spent approximately \$74 million on the Winter Street Sand Recycling and Mixing Program since it started in 2005.

The City has contracts in place with the Edmonton Waste Management Centre of Excellence to wash the street sweepings and mix them with salt and rock chip for use during the next winter season. Between 2005 and 2015, the City paid the Edmonton Waste Management Centre of Excellence \$37 million for these services as part of the program. Other costs of the program include (but are not limited to): salt and rock chip purchases, disposal of waste, environmental testing, and transportation costs of hauling mixed winter sand to the City's district yards.

We assessed the following three aspects of the Winter Street Sand Recycling and Mixing Program to determine if the City is receiving value-for-money from it:

1. If the program is effective in meeting its intended objectives;
2. If the City is receiving the best value from the Edmonton Waste Management Centre of Excellence for recycling and mixing services; and
3. If City property is being used economically.

Overall, we found that the City did not receive value-for-money from the current Winter Street Sand Recycling and Mixing Program. There were three key findings that support our overall conclusion:

1. The current Winter Street Recycling and Mixing Program has not met its intended objectives and outcomes.
2. Ambiguous terms in the contracts and failure to question the contractor's interpretation of certain contractual terms have exposed the City to additional costs. This had a significant impact on the value received from these contracts and the overall cost-effectiveness of the program.
3. The Winter Street Recycling and Mixing Program was not properly managed and monitored. This has opened the City up to the risks of potential negative regulatory or legal exposure and loss of reputation.

We did find that the City received a product that met its specifications and was suitable for reuse on City streets.

We made four recommendations to address the concerns identified. We recommended that management:

1. Update the goals, strategies and targets of the program, determine and document the best way to achieve these, and review these decisions on a periodic basis.
2. Develop, document and implement a performance management system.
3. Consult with Corporate Procurement and Supply Services Branch and the Law Branch on all contracts related to the Winter Street Recycling and Mixing Program to ensure the City's interests are protected.
4. Ensure adequate program management procedures are in place.

We believe that by implementing these recommendations, the City will be able to ensure the Winter Street Sand Recycling and Mixing Program is meeting its objectives, improve contract management, enhance contractor and staff oversight, and strengthen program management procedures.

Winter Street Sand Recycling and Mixing Program Audit

1. Introduction

Every winter City crews spread an average of 152,000 tonnes of sand, rock chip, and salt on the streets. During the spring, City crews sweep up the sand that has remained on the streets. The street sweepings are then recycled and mixed with salt and rock chip for use during the next winter season at an average annual cost of \$6.8 million.

The City has contracts with the Edmonton Waste Management Centre of Excellence (the Centre of Excellence)¹ for recycling and mixing services. Between 2005 and 2015, the City paid the Centre of Excellence \$37 million for these services.

In January 2016, a City of Edmonton employee brought a number of concerns with the Winter Street Sand Recycling and Mixing Program to the attention of the Office of the City Auditor. As the contracts with the Centre of Excellence are due to expire in December 2016 and January 2017, respectively, the Office of the City Auditor added this audit of the Winter Street Sand Recycling and Mixing Program to its *2016 Annual Work Plan*.

2. Audit Objectives

The overall objective of this project was to determine the value-for-money offered by the Winter Street Sand Recycling and Mixing Program. We define value-for-money as whether or not the City obtained the maximum benefit from the services it acquired and provided, given the resources used (e.g., payment to contractors, City assets, City staff).

Through our risk identification and assessment process, we identified the following three specific audit objectives for this audit:

1. To assess the effectiveness of the City's Winter Street Sand Recycling and Mixing Program.
2. To determine if the City is receiving the best value from the Edmonton Waste Management Centre of Excellence for services relating to the Winter Street Sand Recycling and Mixing Program.
3. To determine if City property is used economically as part of the Winter Street Sand Recycling and Mixing Program.

¹ The Edmonton Waste Management Centre of Excellence is a non-profit company established by the City of Edmonton, University of Alberta, Alberta Innovates-Technology Futures, Northern Alberta Institute of Technology (NAIT), AMEC Environment & Infrastructure Ltd, and EPCOR. Its vision is to be recognized as a leader in the development of state-of-the-art knowledge, technology and facilities for waste management.

The results of the risk assessment, audit scope, and audit methodology are provided in Appendix 1.

3. Background

The City of Edmonton places on average 152,000 tonnes of winter sand annually on its road and sidewalks. Of this, street sweepers recover approximately 70 percent or 106,000 tonnes each spring. For the past 12 years, the City has been recycling this sand under the Winter Street Sand Recycling and Mixing Program. On average, the City has been able to recycle 79 percent of street sweepings into clean, reusable street sand.

In 2005, the City signed an agreement with the Centre of Excellence to recycle street sweepings for a period of 6 years under the Winter Street Sand Recycling and Mixing Program. The total value of the contract was not to exceed \$16 million.

The intention was to position the City to ultimately be self-sufficient in an innovative street sand recycling process. Instead, in January 2011, City Administration signed an

amending agreement with the Centre of Excellence to extend the contract for another 6 years. The value of the amending agreement was not to exceed \$20 million. This recycling agreement is set to end at December 31, 2016.

In 2010, City Administration signed a separate six-year contract with the Centre of Excellence to mix the clean, reusable winter street sand with salt, rock chip and/or new sand to be used during the next winter season. The value of this mixing contract is \$7 million.

Including the payments made to the Centre of Excellence, the City has spent approximately \$74 million on the Winter Street Sand Recycling and Mixing Program since it started in 2005. Other costs of the program include (but are not limited to): salt and rock chip purchases, disposal of waste, environmental testing and transportation costs of hauling mixed winter sand to the City's district yards.

Additional background information on the City's Winter Street Sand Recycling and Mixing Program, including a financial overview, is provided in Appendix 2.



Picture 1: Winter Sand Being Placed on City Streets

4. Observations and Recommendations

Our observations revolve around the following three themes:

1. Effectiveness of the Winter Street Sand Recycling and Mixing Program (Section 4.1).
2. Value received from contracts (Section 4.2).
3. Lack of program management and oversight (Section 4.3).

4.1. Effectiveness of the Winter Street Sand Recycling and Mixing Program

We defined effectiveness as the extent to which intended objectives are achieved. Overall, we found that the Winter Street Sand Recycling and Mixing Program has not been effective in meeting its objectives. As well, management set the objectives in 2005, and since then has not updated them or evaluated the results of the program against them.

4.1.1. Program objectives not met

Management defined and documented nine objectives and performance measures for the Winter Street Sand Recycling and Mixing Program and provided these to Executive Committee in 2005 (see Table 1, next page). That same year, the Transportation and Public Works Committee approved the Program. A full listing of the objectives and performance measures is provided in Appendix 3.

We assessed the current status of the nine objectives and performance measures. Three of the objectives were not achieved; five of them were partially achieved and one objective was inconclusive. Table 1 shows the results of our assessment (next page).

We also did not find any evidence to show that management has reviewed or updated these objectives since 2005.

As the recycling and mixing contracts are due to expire in December 2016 and January 2017, respectively, there is an opportunity for management to reevaluate the Program, its objectives and its desired outcomes. It also provides management with an opportunity to develop a business case to determine the best way of achieving these goals and desired objectives. The business case should include a detailed cost analysis and realign the Program with the City's strategic objectives.

(See Recommendation 1)

Table 1: Assessment of Winter Street Sand Recycling and Mixing Program Objectives

Program Objectives	OCA Assessment
Economic Objectives	
1. Promoting an Environment Conducive to Economic Development	Partially achieved
2. Administrative Excellence - \$2.5 million annually cost savings	Unable to Assess for 2005-2013*
	Inconclusive results depending on landfill 2014-2016
Environmental Objectives	
3. Improving Air Quality	Partially achieved
4. Ensuring Land Stewardship and Protection	Partially achieved
5. Sustaining the Environment through Partnership and Participation	Not achieved
Social Objectives	
6. Promoting and Maintaining a High Quality of Life	Not achieved
7. Promote Community Stability	Not achieved
Strategic Growth Objectives	
8. Sustainable Growth	Partially achieved
9. Integrated Decision Making	Partially achieved

* Administration was unable to provide any support to demonstrate these savings had been achieved since 2005. We therefore decided to calculate the estimated savings for the past 3 years (2014-2016) (See Section 4.1.2).

4.1.2. Performance management system not in place

Management needs to have a performance management system in place to provide them with information to make business decisions and to provide sufficient program oversight. An effective performance management system ensures that management is informed that goals are consistently being met in an effective and efficient manner.

We did not find any evidence that management had a performance management system in place and has been evaluating the performance of the Program against its defined objectives. Without continually monitoring actual results against the established performance targets, there is a risk that the Program's objectives and outcomes will not be realized. This could then also have a negative impact on the costs of the Program if poor performance in regards to efficiency, economy, and effectiveness is not addressed in a timely manner.

For example, one of the objectives was to save \$2.5 million annually for each of the 6 years in the original contract when compared to the costs of purchasing new sand and disposing of all street sweepings in a landfill in each of those years. In 2012, City Administration reported to the Transportation and Infrastructure Committee that these savings had been realized, and the Committee agreed to extend the contract for another 6 years. We did not find any support demonstrating these savings had been achieved or whether changes were made to the original savings projection due to changing variables (e.g. landfill fees, transportation costs) and the contract extension.

We therefore decided to calculate the estimated savings in 2014 and 2015 to compare to the original projection of \$2.5 million savings per year. We compared the cost of recycling street sand to the cost of buying new sand and disposing of all street sweepings in a landfill.

During the fieldwork for this audit, the current Program Management provided us with the location of the landfill they thought they would take any street sweepings to (Scenario A). This landfill is not far from the City. However, if this landfill is not available then Administration would have to bring the street sweepings to a landfill further from the City. We therefore also compared costs using that landfill (Scenario B). Our results are presented in Table 2.

Table 2: Cost-comparison of Recycled Mixed Sand to New Mixed Sand
(in \$000's)

Scenario A (landfilling cost incl. transportation \$25.97 per tonne)

Year	Recycled Mixed Sand*	Estimated New Mixed Sand	Estimated Savings (Cost)	Performance Target
2014	\$11,187	\$11,039	(\$148)	\$2,500
2015	\$10,751	\$10,371	(\$380)	\$2,500
2016	\$9,418	\$8,079	(\$1,339)	\$2,500

Scenario B (landfilling cost incl. transportation \$53.60 per tonne)

Year	Recycled Mixed Sand*	Estimated New Mixed Sand	Estimated Savings (Cost)	Performance Target
2014	\$11,187	\$14,268	\$3,081	\$2,500
2015	\$10,751	\$13,911	\$3,160	\$2,500
2016	\$9,418	\$11,146	\$1,728	\$2,500

* Actual costs were used for 2014 and 2015. For 2016, we estimated the cost using historic averages as the recycling and mixing season has not taken place (See section 4.3.2.)

We found that depending on the location of the landfill, actual savings may or may not meet the performance target. In Scenario A, the performance targets are not achieved, and in Scenario B the performance targets are achieved for 2014 and 2015, but would not have been achieved for 2016.

The difference in results for 2016, compared to 2014 and 2015, are mainly the result of Administration's decision to mix sand with salt at the five district yards, instead of a

central location. Delivery of new sand directly to the yards is included in the price of new sand, whereas the City will have to pay for hauling costs of washed recycled sand to the yards.

Besides landfilling costs, our analysis indicated that the costs for either recycling or buying new sand are dependent on a number of variables that fluctuate over time. They include the prices of new sand and salt, cost of recycling, other waste disposal costs, and hauling costs.

Had management been evaluating the costs of the program, monitoring the changing variables and comparing these costs to viable alternatives on a regular basis, they would have identified the risk of lack of savings. This would have allowed more accurate information regarding the costs of the program to be provided to Transportation and Public Works Committee prior to the first contract extension. As well as, having this information available from 2005 to date, would have positioned management in a better position to ensure that the current Program is the best option for the City of Edmonton.

A performance management system would strengthen accountability, enhance contractor and staff oversight, and improve performance by identifying opportunities to improve the quality, effectiveness, and efficiency of services.

(See Recommendation 2)

Conclusion on the Effectiveness of Winter Street Sand Recycling and Mixing Program

The Winter Street Sand Recycling and Mixing Program has not been effective in meeting its objectives. Most notably, we were unable to determine conclusively if it has achieved the expected cost savings of annual \$2.5 million per year. As well, management has not evaluated or updated the objectives since the City created the Program in 2005. Management does not have an adequate performance management system in place for the Program. This has exposed the City to significant risks and has limited management's ability to ensure that the current Program is the best option for the City of Edmonton.

4.2. Value from Contracts

To determine if the City received the best value from the contracts with the Centre of Excellence, we assessed if the contracts' terms and conditions allocated each parties respective rights, risks and responsibilities appropriately. We also assessed if the terms and conditions were met in the execution of the contracts.

Overall, we found that the City is not receiving the best value from the contracts with the Centre of Excellence for services relating to the Winter Street Sand Recycling and Mixing Program.

Table 3 shows the contracts and amendments that the City has entered into with the Centre of Excellence that were in the scope of this audit².

Table 3: Winter Street Sand Recycling and Mixing Program Contracts with the Centre of Excellence

Name	Type	Value	Duration
Original Sand Recycling Agreement	Sole Source	\$16 M	Jan 2005 – Dec 2010
<ul style="list-style-type: none"> 1st Amendment – Various revisions to terms and conditions 		\$0	Mar 2007 – Dec 2010
<ul style="list-style-type: none"> 2nd Amendment – Extension of contract term 		\$20 M	Jan 2011 – Dec 2016
Sand Mixing Agreement	Sole Source	\$7 M	Jan 2010 – Jan 2017

We found that these contracts have exposed the City to the risks of overpaying for goods and services and not obtaining the best value from its contractors. Specifically we found that:

1. The recycling contract and its amendments were unclear or ambiguous on some details (Section 4.2.1).
2. The City will ultimately not have a self-sufficient sand recycling and mixing process, as was originally intended (Section 4.2.2).
3. Concerns regarding some of the amounts paid to the Centre of Excellence (Section 4.2.3).

4.2.1. Concerns regarding the recycling contract

Review of the recycling and mixing contracts and applicable amendments by the Office of the City Auditor and the Law Branch indicated the following regarding the recycling contract and its amendments:

- Some key terms were not clearly defined;
- The contract and amendments contained ambiguities; and
- The responsibilities of each party for some matters were not clearly defined.

We found that the Corporate Procurement and Supply Services Branch (CPSS) was not involved in the procurement process. This was consistent with the normal practices at the time. Business areas could decide not to involve CPSS in sole-source procurements as long as they obtained the proper approvals.

We found that proper approvals were not in place for the first amendment to the original sand recycling contract. This amendment required approval from the Transportation and Public Works Committee, which was not obtained. This amendment had cost

² City of Edmonton also had a sole source agreement in place with the Centre of Excellence to manage the City's snow storage sites. This agreement was also subcontracted to the recycling subcontractor. This agreement ended on January 31, 2016 and was outside the scope of this audit.

implications as it placed all the costs for the disposal of waste materials on the City of Edmonton. Prior to this amendment, these costs were the responsibility of the EWMCE. No changes to the rate structure were made to compensate for these additional costs.

For the second amendment the Committee did not approve the amendment until one year after the previous agreement had expired.

The contract has exposed the City to a number of risks that have had the following impacts:

- Ambiguous contract terms have led to different interpretations and expectations.
- The City has incurred costs (e.g., for equipment rentals) because responsibility is not clearly defined in the contract.
- The City has not held the Centre of Excellence to its obligations under the contract to comply with all legislation, codes, bylaws and regulations and obtain and pay for all necessary permits, approvals and licenses.
- Any legal disputes over the terms of the contract will be uncertain and costly to resolve.

Management needs to ensure that the City's interests are protected in the contracts the City executes. **(See Recommendation 3)**

4.2.2. Outcome of a self-sufficient process not achieved

The sand recycling and mixing contracts were intended to position the City of Edmonton to ultimately be self-sufficient in an innovative street sand recycling process. This means the City should be able to recycle street sweepings in-house, without assistance from external vendors (except for the delivery of ingredients such as salt).

We conclude that the City will not ultimately be self-sufficient in street sand recycling due to the following two issues:

1. *Equipment* - The City will not own all the equipment required to recycle sand at the end of the contract term.

The contract transfers, at no cost to the City, ownership of all sand washing equipment owned by the Centre of Excellence at the end of the contract term. However, it does not specify that this will be all of the equipment required to run the process. The Centre's subcontractor currently owns the majority of the equipment and its equipment will not become the property of the City at the end of the term. As the original contract did not contain a detailed list of equipment to be transferred to the City, the Centre is only required to provide whatever assets they own at the end of the term.

The City will have to buy the remaining equipment from the subcontractor or new equipment if it decides to continue with the recycling process.

2. *Trained staff* - The City will have staff trained in the operations of the equipment, but not in the management or waste water treatment requirements of the process at the end of the term.

Both the recycling and mixing agreements include terms that the City will assign employees to assist the Centre of Excellence's subcontractor in its operations. In return, the Centre of Excellence will ensure these employees are trained. However, the agreements do not specify the level of ability of the employees or how this training is assessed. City Administration provided only operational level staff. In addition, it was City Administration's responsibility to follow up and ensure the employees would be fully trained in all dimensions of the process, including management. There is no indication that this occurred.

The effect of these issues will be costly to the City if it decides to continue to pursue a self-sufficient sand recycling and mixing program.

4.2.3. Invoicing concerns

We conducted a detailed review of the Centre of Excellence invoices and identified the following concerns:

Materials processing surcharge

The City paid \$3.1 million in materials processing surcharges between 2007 and 2015.

The Centre of Excellence added an additional charge to its invoices for the processing of used sand from boulevards and snow storage sites starting in 2007. This surcharge was not included in the original contract or as a change order. We feel the City could have challenged these additional charges. The contract doesn't distinguish between sources of used sand and doesn't specify the quality of used sand from City streets that must be provided for recycling. If the City chose to accept them as reasonable they should have been specified in a change order to the original contract and in the second amendment. We also could not find support for how the subcontractor determined the rates or the quantities it charged for.

Sludge dewatering surcharge

The City has paid \$1.9 million in sludge dewatering surcharges since 2012.

The Centre of Excellence added an additional charge to its invoices for the use of a centrifuge to dewater the sand recycling waste product (sludge) and make it acceptable to deliver to landfills in 2012. This surcharge was not included in the original contract, the amendments or a change order.

Prior to 2012, wet sludge was extracted from seepage bays, mixed in with dry materials and stored temporarily. Once dry enough, the City would then haul this material to the landfill. The subcontractor claimed that the centrifuge process would save the City \$450,000 annually, primarily as much less materials would need to be hauled to the landfill.

Our analysis of the business case and additional information indicates that the \$450,000 was overestimated. Based on our calculations and factoring in the sludge dewatering surcharge, the results range from a net annual cost saving of \$82,000 to a net annual cost increase of \$57,000 for the handling of the sludge, depending on various factors (e.g., transportation costs for disposal of sludge).

Quantities on invoices

There was no supporting documentation for the quantities billed on the invoices (e.g., scale receipts). Administration received the invoices from the Centre of Excellence by e-mail without any supporting documentation. They assumed that the Centre reviewed the supporting documentation for each invoice. As supporting documentation was not submitted with the invoices at the time of payment, we cannot conclude on the accuracy of the quantities on the invoices or the amounts paid.

Year-end cost reconciliation

The year-end cost reconciliation is the difference between what the City has paid for on behalf of the Centre of Excellence and what they have paid for on behalf of the City throughout the year (e.g., when the City's fabrication shop conducts repairs on contractor's equipment, or loading costs incurred by the contractor). Following the end of the recycling and mixing season, this difference is calculated and the amount owed is paid by the responsible party.

We observed that the year-end cost reconciliations did not include any supporting documentation. We requested the support and found that the City Administration could not adequately support or justify some amounts on the reconciliations. We believe that the City paid for some equipment and labour that the Centre of Excellence should have paid for. We calculated that the City may have paid the Centre of Excellence \$213,000 more than required in 2014 and \$140,000 more than required in 2015.

Agreement with other municipality

In 2014 another municipality supplied the City of Edmonton with approximately 20,500 tonnes of street sweepings. The City of Edmonton paid \$464,000 to cover the acceptance fee³, the on-site equipment costs to filter out any debris, and to haul the street sweepings to the City of Edmonton's processing site at Horse Hill.



Picture 2: Asphalt Millings on City Property

In exchange, the City received this municipality's asphalt millings to recycle or sell. To date the asphalt millings are still

³ According to the contract terms, the City has to pay acceptance fee to Centre of Excellence for accepting used street sand.

stored at the Horse Hill site. The City has not realized any revenue or cost avoidance to offset the costs paid to the Centre of Excellence. In addition, due to the challenges of the Horse Hill site (see Section 4.3.2), the City will have to move the millings which will result in added costs. As a result, the costs to the City of Edmonton might now outweigh the benefits of obtaining these asphalt millings.

Cause of issues

We observed that the invoice issues identified above were primarily caused by:

- Ambiguous contract terms and the City not questioning the contractor's interpretation of certain contractual terms in the execution of the agreements;
- Lack of supporting documentation and adequate business cases;
- Poor program management, oversight and due diligence; and
- Undocumented changes to contracts.

As costs associated with various services have not been properly supported and justified, there is a risk that the City did not receive value-for-money from the recycling and mixing contracts.

As part of contract management, City Administration should have proper contract administration and invoice verification procedures in place. Management should also ensure that new services and fees added to the contract are appropriately captured in new agreements, amendments to the original agreements, or change orders.

(See Recommendation 4)

Conclusion on Value Received from Contracts

We conclude that ambiguous contracts and the failure to question the contractor's interpretation of certain contractual terms have exposed the City to the risk of overpaying for goods and services and not obtaining the best value from its contractor. We also conclude that invoices lacked supporting documentation and charges were not properly reviewed. Finally, we conclude that additional charges lacked adequate business cases and were not properly documented in amendments or change orders.

4.3. Program Management and Oversight

We found that the program management and oversight activities and processes in place for the Winter Street Sand Recycling and Mixing Program require improvement. In addition to our earlier observations on performance management reporting, the contracts, and invoice verification, we observed the following issues that indicate poor program management:

1. Unsupported program cost calculations (Section 4.3.1)
2. Use of City property (Section 4.3.2)
3. Noncompliance with permits (Section 4.3.3)
4. The addition of costly rock chip to road sand without benefit (Section 4.3.4)
5. Fine washed sand contracts are not cost effective (Section 4.3.5)

Adequate program management is essential to providing value-for-money and demonstrating sound stewardship in program delivery to the citizens of Edmonton. Adequate program management activities include proper planning (e.g., documented and supported business cases), monitoring and reporting of ongoing activities through the use of an adequate performance management system, and proper contract management.

The risks associated with poor program management practices include contract non-compliance and increased costs; each can negatively impact the City significantly if not managed effectively. **(See Recommendation 4)**

4.3.1. Unsupported program costs calculations

City Administration calculates a total cost per tonne of mixed recycled sand for each recycling year. They use this cost to assign a value to the inventory of mixed street sand and to charge third parties for sand purchases. However, they do not use a consistent process for the calculation or retain sufficient back up to demonstrate how they arrived at their figures.

This created a challenge for us to assess the reasonableness of the cost per tonne figures calculated by City Administration and to calculate actual program costs. We recalculated the cost per tonne for 2014 and 2015 based on our interpretation of the contract and determined that Administration has underestimated the costs (See Table 4).

Table 4: Cost per Tonne Comparison (2014 - 2015)

	2014 - City	2014 - OCA	2015 - City	2015 - OCA
Total recycling and mixing cost per tonne of mixed washed sand	\$70.00	\$80.50	\$70.47	\$77.49

Using an incorrect cost per tonne would result in assigning an inaccurate value to the inventory of mixed sand, inaccurate transfer pricing for mixed sand between business areas, and inaccurate pricing when sand is sold to third-parties. The OCA reviewed the sales of mixed sand to third-parties during 2015 and 2016 and found that, when using our calculated cost per tonne rate, an insignificant loss of about \$3,000 occurred (under 1,000 tonnes of mixed sand were sold to third parties during 2015 and 2016). This loss could increase if a larger volume of sales were to occur in the future.

Cost per tonne calculations performed consistently year-after-year could be used by management to track the cost-effectiveness of the program. Without documenting the methodology to calculate the cost per tonne, the approach may vary from year-to-year. In addition, without retaining sufficient documentation to support the calculation, a review of how it was determined cannot be performed allowing errors to go uncorrected. This would have an impact on management's monitoring ability.

4.3.2. Use of City property

Sand recycling operations have always been located on City property. From 2006 to 2013, they were located at the City's Poundmaker Snow Storage Facility. Due to a scheduled redevelopment of the Poundmaker site, the City moved them to the Horse Hill Snow Storage Facility in 2014. Sand mixing operations have taken place at various City properties, but have been located at Horse Hill since 2013.

We determined that the recycling and mixing operations at Horse Hill are facing a number of issues, including:

1. *Negative environmental impacts*

The salt handling and salt blending activities that are happening at Horse Hill may be polluting the groundwater. Further testing is being conducted by Engineering Services.

In addition, the Horse Hill Snow Storage Facility does not have access to the municipal sanitary drainage system. Therefore, there is no way for the City to discharge contaminated pond water. In 2015, City Administration determined that as a result of the recycling operations on the site the E.coli levels in the ponds were significantly higher than the allowable limits. They had to suspend the sand recycling operations for the 2016 season to avoid the risk of E.coli contamination to the North Saskatchewan River.

This has resulted in a temporary suspension of the recycling contract with the Centre of Excellence. Currently, City Administration and the Centre of Excellence are working together to find a solution for the 2016 recycling season.

2. *Damage to infrastructure*

Locating the sand recycling activities at Horse Hill Snow Storage Facility has resulted in damage to the concrete pad at the snow storage site. The pad was not designed to handle the significant weight of the equipment and piles of sand now located on it. As well, the excessive truck travel to and from the site has damaged 50th Street.

3. *Site development limitations*

The sand recycling process is heavily dependent on water. It uses the water in the snow melt ponds at Horse Hill. However, the site does not have access to an additional water supply if contamination levels get too high to use the water in the ponds or if the water levels are too low to supply the recycling process.

In addition, under its original development permit, the Horse Hill site was only approved as a snow storage facility. This permit was not updated when the recycling and mixing operations were moved to the site. This and other permit issues are addressed under Section 4.3.3.

We could not locate any evidence to show that management reviewed any of these issues or their implications prior to moving the recycling and mixing operations to Horse Hill. Without adequately documenting and retaining sufficient evidence that support program costs and significant program decisions (e.g., physical moves), the accountability for decision-makers is reduced. Further, the ability to learn from decisions based on poor estimates or judgement becomes more difficult.

Due to the issues identified prior to and during this audit, management has been in discussions with the Centre of Excellence since March 2016 to look at options to move the sand recycling and mixing operations out of the Horse Hill site.

4.3.3. Noncompliance with permits and regulations

We found that the recycling and mixing operations taking place at Horse Hill do not have all required permits in place. Table 5 shows our assessment of compliance with the applicable permits.

We found that City Administration did not review permit requirements adequately prior to commencing sand recycling and mixing at Horse Hill. According to the contracts it is the Centre of Excellence's responsibility to obtain permits. However, the City is ultimately responsible as the landowner.

The City's reputation is at risk as it is not ensuring that permits are obtained and regulations are complied with. Furthermore, the City could be facing additional costs such as possible fines, clean-up costs, moving costs (if issues cannot be resolved), and costs to address permit issues. However, the contracts do provide for set off against monies owed to the Centre of Excellence if the City is required to do anything or take any steps or pay any sums to rectify such non-compliance.

Table 5: Permit Compliance Assessment

Permit Category	Valid permit in place?
Municipal	
Development Permit	No
Building Permit	No
Drainage	No
Utility Line Assignment Permit	Yes
Provincial	
Transportation Permit	No
Water Act	No
Federal	
Department of National Defense (due to proximity of the base)	No

4.3.4. Adding costly rock chip

Until 2009, the City only used rock chip in certain situations to improve road traction (e.g., icy conditions on bridges, hills, and intersections). Starting in 2009, the City had the rock chip mixed with the recycled sand and salt that they use on all City roads. This replaced new sand whenever it needed to be added to the mix to maintain desired specifications.

Rock chip is significantly more expensive than new sand. We calculated that adding rock chip to the winter street sand mix from 2009 to 2015 instead of new sand and a more strategic use of the rock chip cost the City approximately \$7 million.

Management made their decision to add the rock chip based on one road test on a prepared test section that had modest positive results. We did not find any evidence that management prepared a business case and conducted a pilot project to justify their decision.

In 2015, City Administration conducted a study to evaluate the performance of the rock chip blend and determine if the City-wide use of rock chip was cost-effective. The result of the study showed that the addition of rock chip in the winter street sand mix has not improved overall road friction, sweepings recoverability or recyclability. As a result, City Administration decided to phase out the use of rock chip in the 2016 winter season and return to using rock chip more strategically.

Another issue concerning the rock chip was that the City sole-sourced its purchase up to the end of 2014 and there is no evidence that supports this decision. When Management decided to tender the procurement of rock chip in 2015, the rate per tonne in the winning contract was \$12.62 less (16 percent) than the sole-sourced rate in 2014. The winning contractor was not the same company that the City sole-sourced with for the previous years. If the City had paid the 2015 tendered rate in 2014 it could have saved \$379,000.

4.3.5. Fine washed sand contracts not cost effective

The City mixes fine sand with concrete crushings to make a saleable product.

The sand recycling subcontractor has sold the City washed fine sand, a by-product from the sand recycling process, under a separate sole-sourced arrangement since 2007. This agreement with the subcontractor lasted from 2007 to 2013. In 2014, the City tendered the contract and awarded it to the subcontractor again as it was the only qualified bidder. Since 2007, the City has paid the subcontractor \$612,017 (including GST) for fine washed sand.

Under the terms of the recycling contract, the subcontractor owns the by-products of the recycling process and is allowed to sell the fine washed sand. However, unlike the recycled sand, the City has no obligation to buy the fine washed sand and could buy a similar product from another vendor.

We found the following issues with the contracts to purchase fine washed sand:

- *The City may not have even required the product:* We did not find an adequate business case for purchasing the fine washed sand. We also learned that beginning in 2016, the City will no longer be mixing in this product with the concrete crushing's to meet the specifications for their saleable product.
- *The terms of the tendered contract were set in such a way that it favored the subcontractor and gave it an unfair advantage:*
 - City Administration asked that the winner of the tender deliver the fine washed sand to Horse Hill (the location of subcontractor's operations), even though the product was needed elsewhere. As a result, the City has been faced with additional costs for hauling the washed fine sand to the aggregate crushing sites.
 - In addition, the product specifications in the tender were written in a manner that only allowed the subcontractor to easily provide it. This may be because management based the tender's specifications on the original sole source agreement rather than what was actually needed.

There is a risk that the City has not been receiving value-for-money from the fine washed sand contracts.

4.3.6. Quality of washed and mixed winter street sand

As part of program management and oversight activities, management needs to ensure that the City is receiving a quality product that meets City specifications.

The Edmonton Quality Assurance Laboratories tested the quality of the recycled and mixed sand produced by the Centre of Excellence. Testing results of the washed sand indicated that it met the required grain size distribution for winter street sand. Testing results for mixed sand indicated that the City received a product that met its specifications and was suitable for reuse on City streets.

Management indicated that there have not been any major concerns with the quality of the street sand produced by the Centre of Excellence.

Conclusion on Program Management and Oversight

Overall, we found that improvements to the program management and oversight activities and processes are required. We observed a number of instances where insufficient documentation was retained to support program costs or business decisions that were made. These risks, among others, did not allow the City to obtain value-for-money from the Winter Street Sand Recycling and Mixing Program and prevented City resources from being used efficiently. Even though the City received a quality product, the City overpaid for this product.

5. Conclusions and Recommendations

Overall, we found that City of Edmonton did not receive value-for-money from the current Winter Street Sand Recycling and Mixing Program.

There were three key findings, among others, that support our overall conclusion:

1. The current Winter Street Sand Recycling and Mixing Program has not met its intended objectives and outcomes.
2. Ambiguous terms in the contracts and the failure to question the contractor's interpretation of certain contractual terms have exposed the City to additional costs. This had a significant impact on the value received from these contracts and the overall cost-effectiveness of the program.
3. The Winter Street Sand Recycling and Mixing Program was not properly managed and monitored. This has opened the City up to the risks of potential negative regulatory or legal exposure and loss of reputation.

We are making the following four recommendations to address the issues we observed during this audit. City Administration has provided its responses to these recommendations.

Recommendation 1 – Winter Street Sand Recycling and Mixing Program Review

We recommend that the Branch Manager of Parks and Roads Services updates the goals, strategies, and targets of the Winter Street Sand Recycling and Mixing Program and subsequently,

1. Determines the best way of achieving the goals and targets;
2. Ensures decisions are documented (e.g. business cases); and
3. Reviews the decisions on a regular basis or as variables change (e.g., price of virgin sand, landfill fees, and environmental regulations).

Management Response

Action Plan: The Branch Manager of Parks and Roads will:

1. Present a complete business case for Council approval including goals, strategies and targets with a recommendation on how to best handle the City's winter street sand.
2. Document all decisions related to the winter street sand and mixing program.
3. Review the feasibility of the business case every year to ensure that the business case for the selected process to handle winter street sand is still feasible. This would include comparing all variables of the selected process to other available alternatives.

Planned Implementation Date: June 30, 2017.

Responsible Party: Branch Manager, Parks and Roads Services

Recommendation 2 – Performance Management System

We recommend that the Branch Manager of Parks and Roads Services develop, document and implement a performance management system for the Winter Street Sand Recycling and Mixing Program that includes the following components:

1. A system to collect valid, useful, and easily-obtainable data.
2. Regular reporting and monitoring of actual performance against established goals, strategies and targets.
3. Processes to improve operational activities based on identified gaps between actual performance and established goals, strategies, and targets.

Management Response

Action Plan: The Branch Manager of Parks and Roads will develop and implement a performance management system for the Winter Street Sand Recycling and Mixing Program, which will include:

1. Documentation on the program performance.
2. Metrics on the program performance.
3. Monitoring the metrics against the established performance targets.
4. Performance improvements based on the program performance.
5. Yearly reporting on the program performance.

Planned Implementation Date: October 31, 2017

Responsible Party: Branch Manager, Parks and Roads Services.

Recommendation 3 – Quality Assurance on Contract Content

We recommend that the Branch Manager of Parks and Roads Services consult with the Corporate Procurement and Supply Services Branch and the Law Branch on all Winter Street Sand Recycling and Mixing Program contracts to ensure that the City's interests are protected. The following identified concerns should be addressed in any future agreements:

1. Key terms are clearly defined.
2. Responsibilities of each party are clearly defined.
3. Terms contain no ambiguity (uncertainty of meaning and intention).
4. Amendments or change orders are clearly documented.

Management Response

Action Plan: The Branch Manager of Parks and Roads will:

1. Consult with the Corporate Procurement and Supply Services Branch and the Law Branch on all Winter Street Sand Recycling and Mixing Program contracts.
2. Implement all the recommendations from the Procure to Pay and Contract Management Transformation project (corporate project started in 2015 and referenced in the Administrative Response to the Change order Process audit).

Planned Implementation Date: October 31, 2017

Responsible Party: Branch Manager, Parks and Roads Services.

Recommendation 4 – Program Management and Oversight

We recommend that the Branch Manager of Parks and Roads Services ensures that documented program management procedures are in place and adhered to including but not limited to contract administration, invoice verification, legislative compliance and quality control activities.

Management Response

Action Plan: The Branch Manager of Parks and Roads Services will

1. Ensure that documented procedures are in place for all operations and processes related to the Winter Street Sand Recycling and Mixing Program.
2. Ensure that procedures are in place for contract management.
3. Ensure that invoices are verified and supported with proper documentation.
4. Legislative requirements including permits and environmental regulations are met.

Planned Implementation Date: October 31, 2017

Responsible Party: Branch Manager, Parks and Roads Services.

Appendix 1: Results of Risk Assessment, Audit Scope, and Audit Methodology

Results of Risk Assessment

We completed a risk assessment to assist us in focusing this audit on the processes and risks that have the greatest impact on the success of the Winter Street Sand Recycling and Mixing Program.

The results of the risk assessment indicated that the highest risks are:

- Not meeting program objectives;
- Not obtaining value-for-money from contracts with the Centre of Excellence; and
- Inefficient use of City resources.

We translated these risk areas into the audit objectives.

Audit Scope

The scope of this audit included a review of the 2014 and 2015 recycling and mixing seasons in detail and the 2005 to 2013 seasons in general. We also included a review of the recycling and mixing contracts that were in place between 2005 and 2016.

We did not assess the recycling and mixing operational processes conducted by the Centre of Excellence's subcontractor as this is outside of the City's control.

Audit Methodology

We used the following methods to address our audit objectives:

- Discussions with management, general supervisors, and other staff as appropriate.
- Discussion with the Executive Director, Edmonton Waste Management Centre of Excellence.
- Review of relevant electronic and paper contract files.
- Review of performance measurement information.
- Review of invoices and supporting documentation.
- Review of transactions in the City's financial system (SAP).
- Review of relevant policies and directives.
- Discussion of various topics with subject matter experts outside of the City Operations Department.

Appendix 2: Background Information on Winter Street Sand Recycling and Mixing Program

History of the Winter Street Sand Recycling and Mixing Program

In 2003, the City's Transportation and Streets Department (currently the City Operations Department) and the Centre of Excellence formed a partnership, to investigate the feasibility of recycling recovered winter street sand.

They conducted a winter street sand recycling pilot project. The objectives of the pilot were:

- To develop a cost effective process to recycle street sand, minimizing the quantity of material landfilled; and
- To monitor and report on all environmental issues related to the project.



Picture 3: Stockpile of Street Sweepings Prior to Processing

There were many factors that led to the development of the winter street sand recycling pilot project. This included: the increasing costs of disposing of the recovered used sand, the reduction in the overall capacity of suitable landfills, concerns regarding the depletion of natural, non-renewable sand resources, and the increasing costs of quality natural winter sand.

According to a report presented to the Transportation and Public Works Committee in January 2005, the result of the pilot project showed that of the roughly 115,000 tonnes of material collected annually from spring

sweeping, approximately 92,000 tonnes (80%) could be recycled as clean, reusable winter street sand. Based on the results of the pilot, a sole source agreement was signed between the City of Edmonton and the Centre of Excellence to recycle winter street sand for a period of six years (2005-2010) under the Winter Street Sand Recycling Program. This agreement was extended through an amendment for another six years (2011-2016).

The Centre of Excellence subcontracted Sand Recycling Ltd. to provide sand recycling services to the City on their behalf, as well as to develop process improvements. In 2009 and 2010 respectively, two additional sole source agreements for snow storage management and mixing services were set up in the same manner.

The management team of Sand Recycling Ltd. are former City of Edmonton employees who were involved in the recycling pilot project when they were employed with the City.

Governance Structure

The 2003-2004 pilot project was led by the Technical Services and Gravel Operations unit in the Engineering Services business area (Transportation and Streets Department).

From the start of the Winter Street Sand Recycling and Mixing Program in 2005 until December 31, 2012, the program was administratively located under the Roadway Maintenance business area (Transportation and Streets Department).

Effective January 1, 2013, the program was moved to the Engineering Services business area and grouped with aggregate recycling and the City's asphalt plant operations. In November 2015, the program was moved again as part of a reorganization of Transportation Operations Branch, and placed back under the Roadway Maintenance business area. Operations have not taken place in 2016.

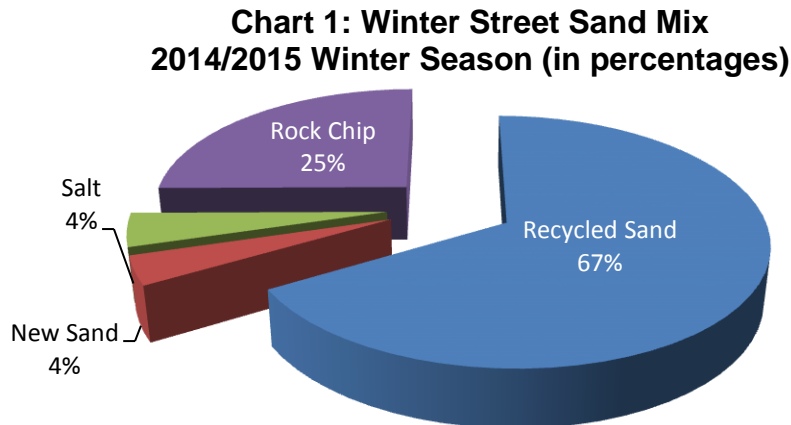
Winter Streets Sand Recycling and Mixing Processes

The sand recycling operations take place on City property. From 2006 to 2013 operations occurred at the City's Poundmaker Snow Storage Facility and from 2014 at the City's Horse Hill Snow Storage Facility. Sand mixing operations have taken place on various City properties between 2006 and 2013, but have since been located at the Horse Hill Snow Storage Facility.

The sand recycling process consists of four phases:

1. *Two-stage screening* – The recycling process includes initial and secondary screening of street sand to remove over-sized materials, trash, fine grained mineral material and organics from the sweepings.
2. *Product separation* – The remaining sand goes through a vigorous wash phase to remove road abrasive from the wash mixture.
3. *Fines separation and dewatering* – The fine sand (which cannot be used as part of the recycled sand again), organic fibers and process water are segregated.
4. *Process water treatment* – As the recycling process is water intensive, the last phase of the process focuses on treating the water to meet City discharge by-laws and to remove solids captured during the washing phase.

Once the sand has been washed, it is mixed with salt, rock chip and new sand (as appropriate). To illustrate the winter street sand mix, Chart 1 provides a breakdown of the “ingredients”: new sand, salt, rock chip, and recycled sand for the 2014/2015 winter year.



Cost of Winter Street Sand Recycling and Mixing Program

The costs of the Winter Street Sand Recycling and Mixing Program are made up of:

1. Amounts paid to the Centre of Excellence per the contracts, including:
 - An Environmental Acceptance Fee to accept the contaminated street sweepings; much like a landfill fee or waste disposal fee;
 - The cost of buying back all the cleaned sand; and
 - Beginning in 2010, the cost to mix the cleaned sand with other ingredients (previously performed by another contractor).
2. Amounts paid for other ingredients including: new sand, rock chip, and salt.
3. Amounts paid to dispose of any by-product or waste from the sand recycling process (loading costs, transportation costs, and landfill fees).
4. Amounts paid for transportation of the mixed product.
5. Amounts paid for environmental testing.
6. Overhead (e.g., program management).

Table 6 (on next page) provides an overview of these costs by year. Between 2005 and 2015, the City has spent approximately \$74 million on the Sand Recycling and Mixing Program. Of this, approximately \$37 million was paid to the Centre of Excellence for recycling and mixing services.

Table 6: Costs for Sand Recycling and Mixing Program
(in \$000's)

Recycle Year	Total Program Cost (1 to 6)	Paid to EWMCE (excl. GST)* (1)
2005	\$2,286	\$1,798
2006	3,405	1,894
2007	5,305	2,067
2008	5,596	2,335
2009	6,683	2,816
2010	7,910	3,467^
2011	8,552	3,708
2012	7,583	3,925
2013	7,735	4,835
2014	10,850	5,075
2015	8,446	5,182
Total	\$74,351	\$37,102

*Under recycling and mixing contracts only.

^In 2010, EWMCE started mixing winter sand.

Winter Street Sand Amounts

Table 7 provides an overview of the amount of street sweepings recovered for recycling and washed sand produced through the recycling process. The percentage of reusable street sand from the recycling process has remained consistent from year-to-year since the Sand Recycling Program was initiated in 2005, with an average of approximately 79 percent.

Table 7: Winter Street Sand Reusable Records
(2005 to 2015 Recycling Seasons)

Recycle Year	Collected Street Sweepings for Recycling (tonnes)	Washed Sand Produced by Recycling Process (tonnes)	% Recovered Sand Recycled
2005	110,788	91,052	82%
2006	112,309	84,540	75%
2007	98,051	78,947	81%
2008	91,027	71,191	78%
2009	111,876	87,350	78%
2010	85,751	73,535	86%
2011	103,095	84,579	82%
2012	100,015	67,753	68%
2013	107,228	86,224	80%
2014	116,504	95,145	82%
2015	128,146	104,369	81%
Average	105,890	84,062	79%

Appendix 3: Triple Bottom Line Evaluation Performance Measures

Policy Themes	Performance Measurement	2004/5 Pilot Results (Baseline)	Target
Economic Policy Themes:			
1. Promoting an Environment Conducive to Economic Development	Nurture and leverage benefit of Edmonton Waste Management Centre of Excellence	TBD	Continued involvement to further Edmonton's international reputation
2. Administrative Excellence	Cost Savings		\$15 million savings over 6 years
Environmental Policy Themes:			
1. Improving Air Quality	Greenhouse Gas Emission	TBD	Reduced by 1,000 tonnes of CO ₂
	Reduce Truck travel	700,000 km	10% further reduction
2. Ensuring Land Stewardship and Protection	Reduction in landfill materials from sweeping	101,000 tonnes	101,000 tonnes
	Reduction in new sand mined	56%	Reduce negative impact on the environment and biodiversity areas
3. Sustaining the Environment through Partnerships and Participation	Collaborative long-term partnerships with Edmonton Waste Management Centre of Excellence and local consulting firms	TBD	Continue
Social Policy Themes:			
1. Promoting and Maintaining a High Quality of Life	% Rated Overall Quality of Life Is Good	95%	90 – 95% of citizens satisfied with quality of life
	% of citizens satisfied with the City's spring clean-up	TBD	> 75% of citizens satisfied
	Citizens pride in Edmonton's accomplishments	TBD	% of citizens satisfaction

Policy Themes	Performance Measurement	2004/5 Pilot Results (Baseline)	Target
2. Promote Community Stability	Collaborative long-term partnerships with Edmonton Waste Management Centre of Excellence and local consulting firms	TBD	TBD
Smart Growth Policy Themes:			
1. Sustainable Growth	Reduce truck travel	TBD	Positive effect in community by reducing infrastructure damage and traffic noise
2. Integrated Decision Making	Best Practice Guide to Sustainable Municipal Infrastructure	TBD	Increase number of Canadian municipalities using recycling program