

# AUDITOR GENERAL

Halifax Regional Municipality



## LED Streetlight Conversion Project Audit

November 2019

**November 15, 2019**

The following audit of the **LED Streetlight Conversion Project**, completed under section 50(2) of the Halifax Regional Municipality Charter, is hereby submitted to the Audit and Finance Standing Committee of Regional Council.

Respectfully,

*Original signed by*

Evangeline Colman-Sadd, CPA, CA  
Auditor General  
Halifax Regional Municipality

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# LED Streetlight Conversion Project Audit

**43,000**  
Converted Lights



Project payback period – 12 years  
Cost \$49.6 million




Effective systems and procedures to manage conversion



Room for improvement in project planning



Contracts complied with procurement policy

- Installation contract: adequate terms
- Proposal reviewed by internal stakeholders prior to public posting
- Proposals publicly posted – Nova Scotia procurement website
- Vendors – highest-scoring proponents



Savings have been realized from LED technology

- Project issues, schedule and budget adequately monitored
- Contracts mostly effectively managed
- Approximately 4% over 2015 budget



Most key roles and responsibilities defined;  
IT role not clearly identified

Project budgets prepared

- Lack of supporting documentation
- Submitted to Regional Council for approval and project funding
- No central file

Comprehensive risk assessment not completed

## Conclusion

Overall, HRM had effective systems and procedures to manage the LED streetlight conversion project; LED savings have been realized. Project issues, schedule and budget were monitored. However, there was room for improvement in project planning. A comprehensive risk assessment was not completed; Information, Communication and Technology (ICT) division's role was not clearly defined; and budgets lacked supporting documentation.

LED streetlight project contracts complied with the procurement policy. The contracts were mostly effectively managed to ensure terms were met. Streetlight operations processes were implemented to identify, track and claim LED streetlight warranties; and a review of staffing levels is in progress.

## Key Take-aways

- HRM monitored project issues, schedule and budget during LED conversion
- Change orders and contract increases appropriately approved
- Contracts were managed relatively well, improvements needed in certain areas.
  - LED installation and project management contracts monitored but lack of support streetlight deficiencies were addressed.
  - Lack of monitoring of design review services contract
- Comprehensive risk assessment not completed during project planning.
- Most key roles and responsibilities were outlined in the project charter; ICT role not defined.
- Project budgets were prepared, lack of supporting documentation
  - Original project estimate was not supported.
  - Maintenance and ICT costs were underestimated.
- LED installation contract had adequate terms and streetlight contracts were in line with the procurement policy.
- Processes implemented to identify, track and claim warranties

## Audit Results

### LED Savings Realized

HRM has achieved savings from the LED streetlight conversion project. The original project payback period was 10 years. Based on updated 2017 projections, the project will be paid back by LED savings in approximately 12 years. We reviewed the LED savings transferred to the reserve account for the past five years and found the process to calculate the annual savings was reasonable.

Streetlight Operating Costs	Pre-LED Conversion 2018-19 Budget <sup>(1)</sup>	Post-LED Conversion 2018-19 Actual <sup>(2)</sup>	2018-19 LED Savings <sup>(1)</sup>
Electricity	\$6,822,384	\$2,276,011	\$4,546,373
Maintenance	\$324,730	\$399,854	\$(75,124)
Additional LED Costs (System, Sim Cards, other)	-	\$292,195	\$(292,195)
<b>Total:</b>	<b>\$7,147,114</b>	<b>\$2,968,060</b>	<b>\$4,179,054</b>

Source: <sup>(1)</sup> HRM Finance

<sup>(2)</sup> SAP

### LED Conversion Project Effectively Managed

HRM effectively managed the conversion to LED streetlights. However, some improvements were needed in contract monitoring. Management outsourced the LED installation to one contractor and hired consultants for project management and design review services.

#### **Project issues, schedule and budget adequately monitored**

HRM hired an external project management company to monitor the LED streetlight installation. The external project manager was responsible for meeting with the contractor and tracking project progress against the schedule and budget. The project manager communicated this information to HRM through weekly progress reports and regular meetings.



We reviewed the weekly progress reports and found they provided updates on project issues, schedule, and budget. An HRM employee attended each meeting. Issues that required further action were assigned to the appropriate individuals and resolved in a timely manner. Effective monitoring allows management to track project performance and progress.

Overall, the LED installation project was completed six months late and cost \$49.6 million, approximately 4% over the 2015 budget. Management told us the LED installation contractor and HRM needed to clarify certain contract clauses which caused delays. Once these issues were resolved, the project was completed based on the revised schedule. The delay, and other issues including streetlight inventory discrepancies, contributed to budget overages.

***Scope changes appropriately approved***

We reviewed 30 change orders submitted by the contractor and found they were appropriately approved. The change orders related to additional work outside the scope of the contract.

HRM also issued 34 change directives to the contractor. Thirty-three were appropriately approved; management said the remaining directive was approved but not documented. HRM issued change directive forms to the LED installation contractor to request additional work outside the scope of the contract.

***LED streetlight contracts: most aspects effectively managed***

Overall, the LED installation contract terms were effectively managed. HRM managed the LED installation contract for the first five months of the project. During this time, staff obtained the contractor’s project plans and met with the contractor regularly for updates. However, the contract required weekly and monthly reports to provide updates on work planned and completed, critical project issues, and inspection and testing results. There was limited support these were received.

<p><b><i>LED Streetlight Contracts:</i></b></p> <p>LED Installation Contractor (Design, Supply and Install LED streetlights) – \$39.6 million</p> <p>Project Management Services – \$0.7 million</p> <p>Design Review Services – \$0.1 million</p>
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In October 2015, HRM hired an external project manager to oversee the LED installation contract and inspect the streetlight installations. HRM received weekly progress reports, met with the project manager regularly and obtained their approval for the LED installation contractor’s progress payments. HRM staff and the project manager confirmed the streetlight system technical requirements were met prior to handover. The project manager submitted deficiency lists for each district to the LED installation contractor for correction. However, HRM did not receive confirmation a second inspection occurred or that deficiencies were addressed.

HRM hired a consultant to review the LED installation contractor’s streetlight designs to confirm they met the American National Standard Practice for Roadway Lighting. There was limited

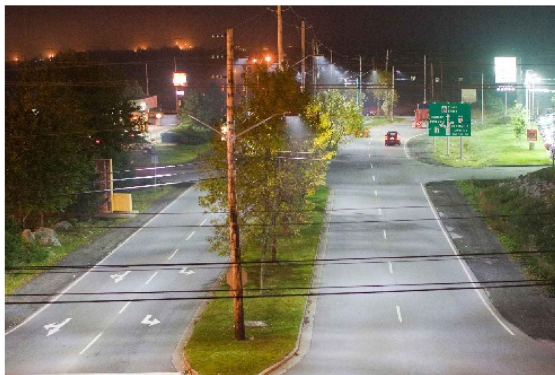
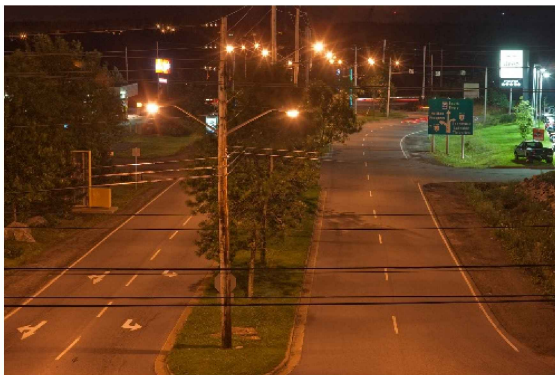
monitoring of this contract. It required the consultant provide HRM with monthly progress reports, but these were not obtained. The contract also required summary reports for the design reviews. Management was only able to provide 11 of the 18 design reports. Management said the external project manager was responsible for overseeing this contract. However, the external project manager's approved project plan limits its responsibility to coordinating work between parties. It is important HRM monitors outsourced services to ensure vendors meet contract requirements.

Management completed vendor evaluation forms for the LED installation contract and project management contract but there was no vendor evaluation of the contractor reviewing streetlight designs. HRM obtained most project files from the external project manager. However, the documents related to the streetlight design review had to be requested from the contractor for our audit.

In our 2017 Contract Management Audit, we recommended improvements to help ensure key contract terms to protect HRM's interests. These included improved monitoring and evaluation of vendor performance. We will report whether that recommendation was implemented in our next follow-up report.

We reviewed budget increases for the three contracts and found they were appropriately approved.

***HRM Intersection Before and After LED Streetlights were Installed***



Source: LED Roadway Lighting



## Project Planning Needed Improvement

HRM had systems and procedures to plan the LED streetlight conversion project; however, improvements were needed.

### ***Comprehensive risk assessment not completed***

Management did not complete a comprehensive assessment of project risks for the LED streetlight conversion project. The project charter included a section outlining key program level risks. Management's report to Regional Council for project funding approval stated the risk to the project was relatively low. However, there was no overall project risk ranking in the project charter and, therefore, a lack of support for that statement. It is important that information reported to Regional Council is accurate and adequately supported. We expected management to have a documented risk register for a significant capital project of this nature and to monitor those risks throughout the project.

#### **Recommendation 1**

HRM should develop a comprehensive risk assessment process for planning significant capital projects.

#### ***Management Response***

*Agreed. The Enterprise Asset Management (EAM) Office will define what a significant capital project is for the purposes of risk management and working with the Corporate Planning division will provide guidance to business units on risk identification and processes for mitigation.*

### ***Most key roles and responsibilities defined; IT role not clearly identified***

Most key roles and responsibilities were clearly defined in the project charter documents, but Information, Communication and Technology (ICT) was not listed. ICT was identified as an internal project stakeholder with limited details on the technical support required. This project had a large technology component, which included installing technology throughout the streetlight network and obtaining a system to allow remote streetlight monitoring, but the project charter did not consider IT hardware and system management. The Planning and Infrastructure Business Unit, now Planning and Development, should have engaged ICT during the planning stages of this project.

After the contract was awarded, ICT prepared an analysis to determine if managing the service internally or outsourcing was more cost-effective. Ultimately, the service was outsourced.

However, the analysis lacked supporting documentation so we could not determine if it was reasonable. The 10-year outsourcing contract will cost HRM \$2.4 million; this is in addition to the \$49.6 million already incurred.

Additionally, ICT management told us the lighting network SIM cards may be obsolete before the warranty period ends. SIM cards are installed periodically throughout the streetlight network to communicate streetlight data back to the system. ICT management said replacing the SIM cards would either cost \$4,000 per access point if the vendor replaced them, or void the warranty if another contractor changed the SIM cards. There are 92 access points throughout the streetlight network. It would cost HRM roughly \$368,000 to replace these.

Planning and Development should have involved ICT in this project from the beginning. The consequences of not including key stakeholders increase the risk projects will not be done on time or on budget.

**Project budgets prepared, lack of supporting documentation**

HRM staff developed project budgets and forecasts which were submitted to Regional Council for approval and funding. However, there was a lack of supporting documentation for the information in the reports.

A 2012 Regional Council report summarized the results of maintaining current streetlight inventory levels or purchasing Nova Scotia Power’s streetlights. The report indicated the cost-effective option was to purchase the assets. However, staff could not provide the analysis prepared to support this; therefore, we were unable to assess the reasonableness of this calculation.

	2013 Original Budget <sup>(1)</sup>	2015 Revised (after contracts signed) <sup>(1)</sup>	2017 Mid-Project Expected Outcome <sup>(2)</sup>	2019 Actual Project Costs <sup>(3)</sup>
<b>LED Installation</b>	\$31,500,000	\$37,230,000	\$44,980,000	\$39,610,000
<b>LED Installation Contingency</b>	-	\$1,861,500	-	-
<b>Other Capital Costs (Consultants)</b>	-	\$1,356,000	\$2,920,000	\$2,835,000
<b>Nova Scotia Power Asset Purchase</b>	\$7,950,000	\$7,200,000	\$7,200,000	\$7,200,000
<b>Total</b>	<b>\$39,450,000</b>	<b>\$47,647,500</b>	<b>\$55,100,000</b>	<b>\$49,645,000</b>

Source: <sup>(1)</sup> HRM Finance

<sup>(2)</sup> Prepared by the external project manager and reviewed by HRM Finance.

<sup>(3)</sup> SAP

Examples of supporting documentation management did not retain to verify data and assumptions include the following.

- There is no documentation to verify how the LED installation cost was calculated in 2013. We could not determine if it was based on reasonable assumptions. The 2015 budget used the actual contract cost.
- The 2013 budget estimated 5% of the LED lights would fail over the 20-year life of the assets; this was based on a report from the Transportation Association of Canada. However, the 2015 budget estimated 2% of LED lights would fail annually. Staff told us the lighting supplier provided the 2% failure rate. However, HRM staff could not provide support for this. Independent verification of vendor information is important.
- Historical electricity rates from Nova Scotia Power were used to calculate projected LED electricity costs. The supporting documentation to verify these rates was not retained.

Additionally, we found the projected LED maintenance costs were underestimated. The calculation only included LED light failures. It did not consider other streetlight maintenance costs related to the technology, wiring and electrical work, and physical assets (poles, bases). In 2018-19, budgeted maintenance costs were \$135,600 but actual costs were \$400,000.

We encountered issues obtaining supporting project documentation partly because there was no central project file. Staff may have kept individual files. However, many staff involved in project planning are no longer employed with HRM. This limited our ability to verify whether information on the purchase of streetlight assets from Nova Scotia Power, LED installation costs and ICT analysis reported to Regional Council, were accurate and complete. It also limits management's and Regional Council's ability to effectively evaluate project results against project plans.

### **Recommendation 2**

HRM should develop a policy related to significant capital project files. This should include assigning overall project file responsibility and determining what documents to include in project records.

### **Management Response**

*Agreed. Working with capital project managers the EAM Office will provide guidance on project file contents and structure.*

## Streetlight Contracts Complied with Procurement Policy

### ***LED installation contract had adequate terms***

We reviewed the LED installation contract and found the contract had adequate terms and conditions to protect public interest. For example, the contract had dispute resolution and termination clauses, and included detailed descriptions of goods and services.

Additionally, the request for proposal was reviewed by internal stakeholders prior to being publicly posted. The request for proposal forms the basis of the contract. It was reviewed by Traffic Management (Streetlight Operations), Procurement, and Legal. However, we saw limited support that ICT was involved. As previously noted, ICT was not involved until after project planning was complete.

### ***Procurement policy followed***

The LED streetlight contracts complied with HRM's Procurement Policy. We reviewed the procurement files for the three contracts (LED installation, project management, and design review services).

- Requests for proposals were publicly posted on the Nova Scotia procurement website.
- Evaluation scoring sheets were kept, and the successful vendors were the highest-scoring proponents.
- Appropriate approvals were obtained.

Following a competitive procurement process helps to ensure HRM receives best value for outsourced services.

## Other Matters

### ***Processes implemented to identify, track and claim warranties***

A warranty process was implemented to identify, track and claim warranties on the new LED streetlights. The LED installation contract included a 10-year warranty for parts and a one-year warranty for service. Streetlight staff manually identify warranty work and track the claims in spreadsheets after they have been submitted. We obtained support staff submitted claims to the appropriate vendors as detailed on the tracking spreadsheets.

### ***Outstanding project deliverables***

The LED project charter included two deliverables which were outstanding when we completed our audit work.

- Developing a protocol for reducing energy consumption through LED streetlight dimming technology
- Obtaining commitment from Nova Scotia Power to base billing on actual energy usage for dimmed streetlights

Management told us residential streetlights are at the lowest lighting level that still meets lighting standards. Technology installed during the project was promoted for its ability to provide dimming capabilities, which would allow additional energy savings. However, regulations required the streetlights be designed in compliance with the American National Standard Practice for Roadway Lighting. Unless the lighting standards change, management does not plan to pursue system-wide streetlight dimming.

Nova Scotia Power bills HRM for streetlight electricity costs based on a fixed price; it is not based on actual energy usage. Management had preliminary discussions with Nova Scotia Power in February 2018 on adjusting energy rates from a fixed rate to an actual usage rate. However, there has been limited further discussion.

***Review of operational staffing requirements in progress***

Prior to the LED conversion, Traffic Management was responsible for maintaining approximately 13,000 streetlights. Division staff are now responsible for maintaining 43,000 streetlights, including related technology and warranties. One staff position was added to support streetlight operations. HRM staff are reviewing the Traffic Management division's staffing resources and ability to meet operational requirements. This includes streetlight operations, which was a project deliverable outlined in the charter.

## Background

In September 2012, the Nova Scotia Energy-efficient Appliances Act was amended and required all roadway lighting in Nova Scotia be converted to LED by December 2022. At the time, HRM owned approximately 13,000 streetlights and leased roughly 27,000 streetlights from Nova Scotia Power.

In May 2013, Regional Council approved the purchase of all Nova Scotia Power-owned outdoor streetlights servicing the municipality and directed staff to initiate the procurement process to convert all streetlights to LED technology. Energy and Environment, in the Planning and Development Business Unit, initially managed the LED streetlight conversion project and developed the plans which included implementing streetlight monitoring technology. The streetlight purchase and conversion were originally estimated to cost the municipality \$40 million, which would be paid back from the operational energy and maintenance savings from LED technology.

Traffic Management, in the Transportation and Public Works Business Unit, is responsible for streetlight maintenance operations. The primary operating costs associated with managing streetlights include electricity, outsourced maintenance services, and salaries and benefits. In late 2014, the project was being managed by the Traffic Management division; LED installations began in October 2015 and were completed October 2017.

## About the Audit

We completed a performance audit of the LED streetlight conversion project from project initiation in 2012 to project completion. Information from outside the audit period was considered as necessary.

The purpose of the audit was to determine if HRM effectively managed the LED streetlight conversion project to maximize savings realized from LED technology. Our role is to express an independent audit opinion of this area.

The objective of the audit was to assess whether HRM had effective systems and procedures to plan and execute the LED streetlight conversion project in a cost effective and timely manner.

Many staff involved in the initial planning of the LED streetlight conversion project are no longer with HRM. Certain information related to initial budget assumptions and the cost effectiveness of purchasing Nova Scotia Power's streetlight assets could not be located. Accordingly, we were unable to express an opinion on these matters. This is further detailed in the body of this report. The lack of information on certain initial planning items did not prevent us from expressing an opinion on whether HRM had effective systems and procedures to plan and execute the LED streetlight conversion project in a cost effective and timely manner.

We developed the criteria for this audit. These were discussed with, and accepted as appropriate by, management of Transportation and Public Works.

1. Project budgets and forecasts should be prepared using relevant and reliable information.
2. Risks associated with the project should be identified, monitored and addressed.
3. Roles and responsibilities should be clearly defined to provide adequate project oversight.
4. Contract terms should be developed with consideration to value-for-money and protection of public interest.
5. HRM's procurement policy should be followed when selecting appropriate and cost-effective contractors for the project.
6. Project costs and timelines should be adequately monitored, and issues addressed in a timely manner.
7. Key contract terms should be monitored to ensure adequate vendor performance.
8. Processes should be implemented to identify, track and submit warranty claims.

Our audit approach included: examination of project documentation and other relevant information; and interviews with management in Transportation and Public Works; Finance, Asset Management and ICT; Legal, Municipal Clerk and External Affairs; and Planning and Development Business Units.

This audit was conducted in accordance with the Canadian Standard for Assurance Engagements (CSAE) 3001 – Direct Engagements published by the Chartered Professional Accountants of Canada.

We apply the Canadian Standard on Quality Control 1, and our staff comply with the independence and ethical requirements of the Chartered Professional Accountants of Nova Scotia Code of Conduct.

## Appendix 1 – Recommendations and Management Responses

### **Recommendation 1**

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### **Management Response**

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## Contact Information

Office of the Auditor General  
Halifax Regional Municipality  
PO Box 1749  
Halifax NS B3J 3A5

Phone: 902 490 8407

Email: [auditorgeneral@halifax.ca](mailto:auditorgeneral@halifax.ca)

Website: [www.hrmauditorgeneral.ca](http://www.hrmauditorgeneral.ca)

Twitter: [@Halifax AG](https://twitter.com/HalifaxAG)