

AUDITOR GENERAL

Halifax Regional Municipality



Halifax Transit Bus Maintenance Audit

November 2018

November 22, 2018

The following audit of **Halifax Transit Bus Maintenance**, 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

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Auditor General
Halifax Regional Municipality

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Summary

Conclusion

Overall, Halifax Transit performs day-to-day activities to manage bus maintenance and ensure value-for-money in replacing buses. Management implemented preventative maintenance programs and has a system to schedule required maintenance. However, one of the two garages completes preventative maintenance late most of the time. In addition, Halifax Transit needs to do a better job of ensuring warranties purchased with new buses are documented to maximize warranty dollars claimed. While key performance indicators have been established for bus maintenance, work is needed to make some indicators more useful. We also found the process to decide which buses to replace and when was reasonable.

We identified issues with who has physical and online access to parts inventories. Management needs to address these matters to improve inventory security.

Key Take-aways

- Halifax Transit has a bus fleet preventative maintenance program
- Good system to prompt when maintenance is due
 - Burnside: Two-thirds or more of scheduled maintenance performed more than 1,000 kilometres after it is due
- Process to identify and claim warranties purchased needs improvement
 - Some warranty terms are recorded but information is not always complete or accurate
- Key performance indicators for the fleet have been developed, more work needed
- Capital decision-making is reasonable; management should develop a formal asset management strategy
- Inventory security needs improvement
 - Access to storerooms was not limited to those who need it
 - Certain staff can adjust inventory quantities and have access to the storerooms

Audit Results

Management of Bus Maintenance

Preventative maintenance program developed informally, formal process going forward

Halifax Transit has a preventative maintenance program. Management told us Transit employees reviewed the manufacturer maintenance manuals when developing the program. However, these reviews were not documented, including which manuals were reviewed or decisions about which maintenance items to include and why.

When issues arise, management takes steps to determine possible causes. For example, in Spring 2018, as part of an investigation into engine issues, Halifax Transit identified manufacturer-recommended preventative maintenance which was not included in its program. Management told us this will have an impact on some warranties and they are considering how to add the preventative maintenance items into Transit's program.

Last year, Halifax Transit management started a preventative maintenance program for bus bodies, to extend life and reduce the amount of body work required. Management does not yet know the effectiveness of this program.

Halifax Transit has common preventative maintenance checklists for all buses. Some manufacturer manuals also have preventative maintenance checklists. Halifax Transit does not use these but mechanics have access to the manuals.

We compared a sample of 32 maintenance tasks from ten manufacturer maintenance manuals to Halifax Transit's preventative maintenance checklists.

- Twenty-eight items were either included on the checklists or management had reasonable explanations for why they were excluded or why Transit decided to perform the maintenance at a different interval.
- Management was reviewing two items to determine whether they should be added to the checklists.
- Two items were missing from the checklists.

In June 2018, management began a formal process to review maintenance manuals when new buses are acquired to identify items which should be added to Transit's preventative maintenance program. This should address our concerns that the previous, informal process could allow manufacturer-recommended items to be missed.

Good process for scheduling maintenance but one garage consistently late

We tested the records for 30 buses and found the appropriate preventative maintenance was set up in Transit’s fleet management system to prompt management to schedule maintenance when it is due.

We found staff investigate common issues and add additional preventative maintenance tasks if needed. We also found Transit has a good process to track vendor communications requiring urgent action. For the 30 bus records tested, there were seven vendor communications that required action be taken within a certain timeframe. Management tracked these items and had evidence all work was completed.

Halifax Transit’s preventative maintenance program is mainly delivered through four preventative maintenance checklists, each completed at certain mileage intervals. A small number of items are scheduled separately.

Overall, the four preventative maintenance checklists were often completed late during our audit period.

- Ragged Lake improved significantly in 2017-18, performing 83% of the preventative maintenance inspections we tested on time, compared to only 8% in 2016-17.
- Burnside performed two-thirds or more of the preventative maintenance inspections we tested more than 1,000 kilometres late in both years.

Management at Ragged Lake schedule preventative maintenance in anticipation of when buses will reach the mileage for the next maintenance checklist. Burnside management does not schedule preventative maintenance until the bus reaches the mileage limit. Transit has not established a kilometre range within which preventative maintenance should be performed.

Timeliness of Preventative Maintenance				
Garage	Overdue by at least 1,000 km		Overdue by at least 2,000 km	
	2016-17	2017-2018	2016-17	2017-18
Burnside	75%	66%	54%	41%
Ragged Lake	87%	2%	65%	1%

Aside from the four checklists discussed above, Halifax Transit schedules additional preventative maintenance items separately because they are performed at different intervals. For our sample of 30 buses, 116 preventative maintenance items should have been performed. Twenty-two were missed and two were performed late. Management told us most of these were missed due to a hoist being out of service and staffing shortages.

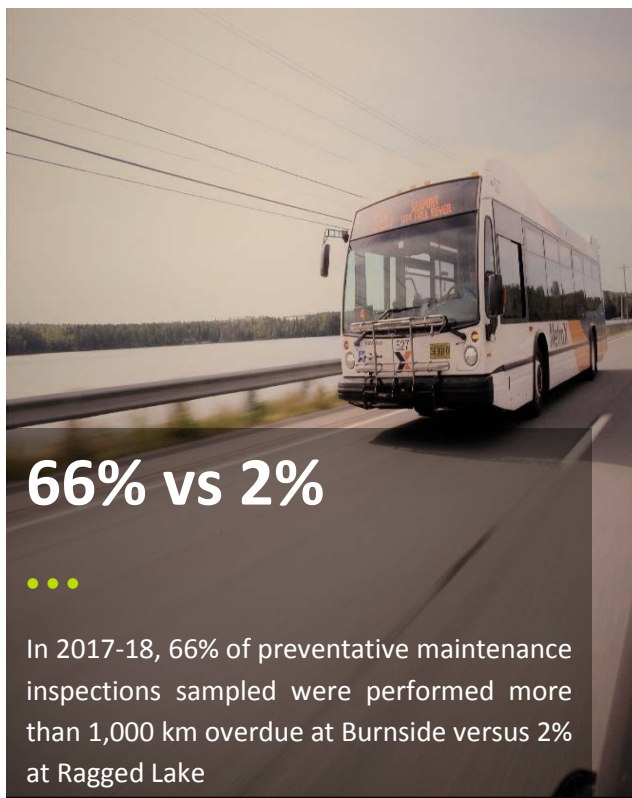
Recommendation 1

Halifax Transit should develop and implement a plan to complete preventative maintenance in a timely manner at both of its garage facilities. This could include establishing a kilometre range within which preventative maintenance should be completed.

Management Response

Agreed: Halifax Transit currently measures preventative maintenance compliance vs preventative maintenance schedule adherence. Halifax Transit will measure the impact of kilometer range deviations to ensure value for money, taking into consideration that manufacturer recommendations for preventative maintenance are based on assumptions relating to environment and operating conditions, and hence can vary within an acceptable range. The intention of this initiative will be to develop a policy addressing preventative maintenance intervals, their acceptable deviances, corresponding escalation and investigation procedures, and will ensure they are consistently applied at both garage facilities.

We found Halifax Transit mechanical staff addressed most issues on preventative maintenance checklists. For the 30 buses in our sample, of the 243 inspections with issues noted, over 90% had documentation confirming the deficiencies were corrected.

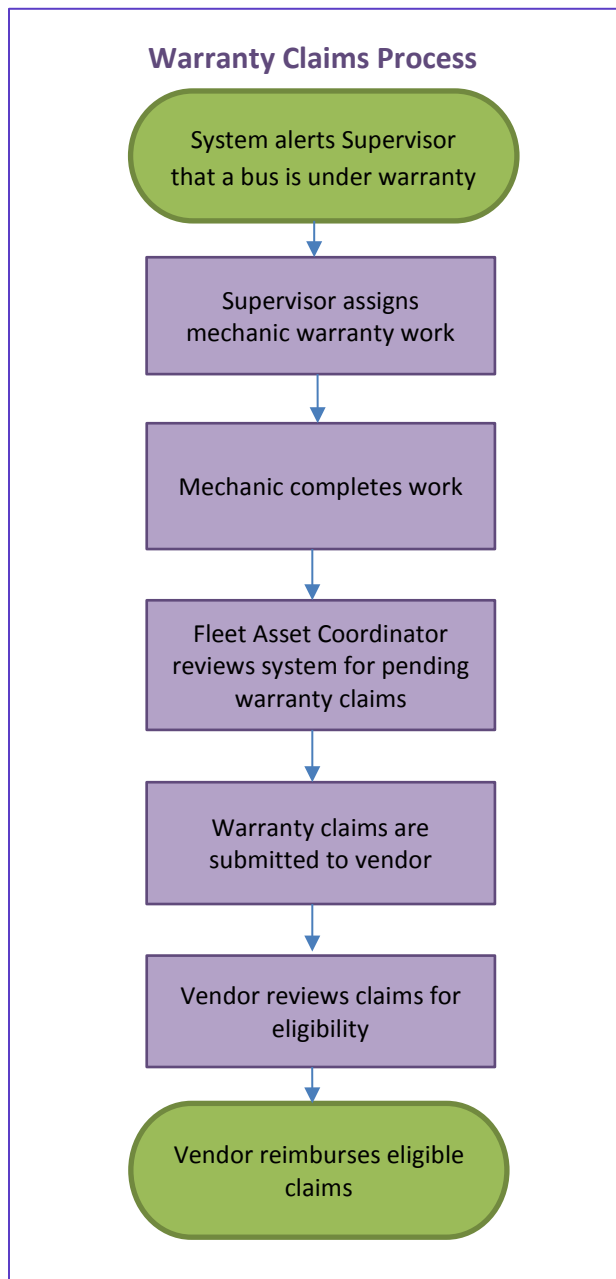


In 2017, a consultant's report noted Ragged Lake was at capacity and Burnside was over its capacity for bus maintenance. Management has plans for changes at Ragged Lake, but overall, expects to address the anticipated growth at this facility by managing maintenance scheduling. However, Burnside is not expected to meet Halifax Transit's needs. Management told us the lack of capacity at Burnside is having an impact on maintenance activities. A consultant has been engaged to look at options for Transit's maintenance facilities. Management told us they anticipate a decision will be made by March 2019.

Monitoring of preventative maintenance scheduling is adequate

Monitoring of preventative maintenance scheduling is adequate. The fleet management system prompts those responsible for scheduling maintenance when buses are nearing the mileage for preventative maintenance, and other scheduled maintenance items.

Warranty management needs improvement



More than one-third of the warranty items (79 of 201) for the 30 buses tested were either not recorded in the fleet system, or were recorded incorrectly. We also found the effective dates for warranties were not consistently captured in the system and warranty documentation did not always include this information.

- Sixty-six items were not set up.
- Eight items were set up incorrectly.
- We could not verify whether five items were treated correctly because management did not know which warranty terms were purchased.

It is important to capture all warranty terms in the fleet management system to prompt supervisors if warranties are available when creating work orders.

Recommendation 2

Halifax Transit should record all warranties in the fleet management system to help maximize warranty dollars claimed.

Management Response

Agreed: Halifax Transit reviewed the items and found that 25 of the items were related to extended warranty that has not yet been triggered because they are still covered under the manufacturers bumper to bumper warranty; therefore, no risk to recovery has occurred. Halifax Transit will enter these items to reduce the risk that they may be missed in the future. Halifax Transit has reviewed most missing warranties and has sent forward a list of warranties that are to be uploaded to Fleet Focus using the new XML loader tool which will resolve naming discrepancies upon which many of the errors were founded, this is currently at a testing stage. Additionally, the most impacting missing warranties were entered and corrections made in August 2018.

Key performance indicators developed, some work still needed

We looked at six key performance indicators which related to Halifax Transit's bus maintenance activities. We found indicator calculations were reasonably accurate. There were minor errors and data issues, but these did not have a significant impact on the results.

Further work is needed to make three of the six performance indicators more meaningful.

- Management has not set a target for one indicator – mean distance between failures. Management told us there are multiple ways this performance indicator can be defined. They are investigating possible approaches, including understanding how other transit authorities measure this indicator. Although there is currently no target, an analysis was done to identify buses with the lowest mean distance between failures to investigate possible causes.
- The target for warranty dollars recovered is a dollar value, based on the budgeted amount. This does not provide good information for management. A percentage of warranty dollars claimed versus recovered would provide better information on the effectiveness of the warranty program.
- Management has set a target for percent comeback, a measure of how often buses come back for the same issue after it should have been addressed. However, there are known limitations on the data available to measure this performance indicator. It is not always possible to distinguish between cases in which the bus has returned for the same issue versus a different issue related to the same item. Management told us the data has only been available for the last year and further analysis is required.

Standard repair times are also useful for evaluating ongoing work efficiency. While Halifax Transit uses standard repair times to assess efficiency for certain tasks, these have not been developed for all tasks.

Recommendation 3

Halifax Transit should establish targets for all bus maintenance key performance indicators. Targets should be based on accurate data and should assist management in assessing maintenance activities.

Management Response

Agreed: Halifax Transit implemented key performance indicators (KPI's) in 2017 to improve reporting and accountability in the Bus Maintenance department. Many of the metrics were new to the organization requiring baselining and others have proved to be poor indicators due to data quality. Mean Distance Between Failure was recently revised to remove non-service impacting defects from the metric, a target will be established in Q3 2018. We agree that Warranty Recovery as a percentage of claimed warranty is a good metric and it will be incorporated into report. Comeback data is problematic requiring a project to restructure task codes, this may extend beyond an 18-month period to resolve.

Recommendation 4

Halifax Transit should develop and use standard repair times to evaluate performance for all significant maintenance tasks.

Management Response

Agreed: Since September 2017 Halifax Transit has developed and implemented standard repair times (SRT's) for all kilometre-based preventative maintenance; Halifax Transit is currently in the process of implementing engine repair STR's and will continue to develop standard repair times for significant repairs in conjunction with a revamping of task codes within the Enterprise Asset Management system to ensure more accurate data, therefore allowing for better comparison of targets to actuals.

Tracking staff qualifications

Certain bus maintenance tasks require staff to have a mechanic trade license. Mechanics are responsible to renew these licenses based on provincial regulations. Halifax Transit management maintains a tracking sheet with trade license expiry dates for staff in each garage. If a staff member does not renew the license before it expires, management told us supervisors cannot assign that individual certain tasks until the license has been renewed. Management's tracking sheets were found to be mostly complete. However, we noted six of 94 employees were not

included on the tracking sheets. Of these, two did not have a valid licence and had not renewed since 2015. The remaining four had current licences.

Capital Planning and Decision-making

Short-term capital decision-making is reasonable

We found Halifax Transit's decisions to replace buses considered value-for-money. Management compiled historical information on when large bus components were rebuilt and condition information for older buses in the fleet. It is working on centralizing this information for the remaining buses. Similarly, condition assessments were performed for the oldest buses in the fleet and are underway for buses which are nearing their expected replacement point.

We found Halifax Transit had a well-documented, systematic process to determine which buses to replace. Halifax Transit decommissioned 62 buses during the audit period. Forty-one buses were old or inaccessible. For the remaining 21 buses, management assessed which to replace.

Long-term capital planning reasonable, no asset management strategy

Management's process to identify, prioritize, and plan long-term capital needs was reasonable. Halifax Transit has its own capital steering committee that meets regularly to discuss ongoing and future capital projects.

Management is working towards improving asset management but a formal strategy has not yet been developed. Management told us they intend to develop a formal asset management strategy in conjunction with the asset management office, and work towards using performance data captured by the fleet system.

Recommendation 5

Halifax Transit should move forward with developing a formal asset management strategy for buses, including a detailed project plan and timelines for completion.

Management Response

Agreed: Halifax Transit has been using the principles of good asset management concerning replacement and lifecycle since 2014 but is currently restricted by system limitations to improve practice to full ISO compliance. With continued support from the Asset Management Office, Halifax Transit plans to formalize an Asset Management Strategy by fiscal 2020/2021.

Management of Small Equipment and Parts Inventories

No small equipment inventory

Halifax Transit does not maintain an inventory of small equipment used in its maintenance garages. There is no process to track and identify items which may be missing. Management told us they intend to perform a count of small equipment and are considering a process to track it. Since we completed fieldwork, a count was performed at the Burnside location.

Recommendation 6

Halifax Transit should determine the value of small equipment and assess whether a process to track these items is worthwhile, considering cost versus benefit.

Management Response

Agreed: The amount of small equipment under the oversight of Halifax Transit that is not in a system with regular inspection is quite small, however Halifax Transit is developing a project plan to include these remaining assets in the Enterprise Asset Management system to track their scheduled inspections, maintenance and replacements.

Parts inventory levels are monitored, security needs improvement

Finance and Asset Management monitors Halifax Transit's parts inventory levels to identify obsolete items and adjust ordering thresholds. However, inventory count discrepancies are not investigated. While we appreciate small variances may not be followed up, we expected Finance and Asset Management to have a process to investigate large dollar value or significant quantity differences.

Recommendation 7

Finance and Asset Management should establish and implement a process to investigate significant inventory count discrepancies.

Management Response

AGREE

A process based on value and/or quantity of the discrepancy, will be developed to provide guidelines for Inventory supervisors to action discrepancies. These guidelines will consider value, quantity, and attractiveness of the item(s) in question. Attractiveness is defined as items that have value to users external to the workplace.

This process will be developed and in practice by March 31, 2019.

Access to the Halifax Transit maintenance storerooms was not limited to those who require it. There were 296 access cardholders with access to the storerooms. When we brought this to management's attention, access was limited to 46 staff who require it for their jobs. During our audit, Transit Security told us changes were made so that storeroom access will only be granted in the future if it is specifically requested.

Seventeen cardholders with access to Halifax Transit's storerooms could also adjust inventory quantities in the system. Storeroom access was removed for six of these cardholders. Eleven users still have access to the storeroom and to adjust inventory. Five users require access to adjust inventory for their jobs and need storeroom access due to their work location. The remaining six with access they do not need had not been addressed when we completed our audit fieldwork. (See recommendation 9 below.)

Having physical access to inventory while being able to adjust the quantity in the inventory system gives an individual the ability to remove inventory from the storeroom and adjust the system accordingly.

Staff are supposed to provide inventory adjustments to supervisors for review. However, the system does not prevent an adjustment without review. Additionally, supervisors do not monitor adjustments. Since access to adjust inventory cannot be limited to those with no storeroom access, supervisor review would help ensure adjustments are appropriate and properly approved.

Recommendation 8

Finance and Asset Management supervisors should periodically review Halifax Transit inventory adjustments to confirm they are appropriate and were properly approved.

Management Response

AGREE

The current practice is for Inventory staff to send discrepancies to Inventory Supervisors to review and decide on the appropriate action to take to address the discrepancies. A process will be developed to formalize the current practice (above) and include a monthly report that will require Inventory Supervisors to review all adjustments made to inventory to ensure discrepancies have been addressed.

This process will be developed and in practice by March 31, 2019.

We identified an additional 29 users who could adjust inventory but did not require this access for their job duties. While these users did not have physical access to Halifax Transit's storeroom inventory, the ability to change inventory quantities in the system should be limited to those who require it to prevent accidental adjustments.

We also identified 53 fleet system users with access to issue parts from inventory who do not require this access for their job duties. However, for 33 of these users, management told us access to issue parts is tied to other access these employees need. It may not be possible to limit access based on how access is currently established in the system. The remaining 20 users do not require this access for their roles.

Recommendation 9

Finance and Asset Management should determine which roles require access to storerooms, to issue parts, and to make inventory adjustments. Access should be removed if it is not needed for an employee's role.

Management Response

AGREE

Roles have been reviewed and rationalized as part of Procurement's response to the audit. Roles requiring access have been limited to applicable Procurement and Fleet staff (limited to Fleet supervisors) who require Storeroom and Fleet Focus Storekeeper access. Additionally, staff onboarding and off boarding now includes addition/removal of Storeroom, SAP, Fleet Focus, and Procurement H drive access.

The Fleet Focus Storekeeper module cannot be limited to: parts lookup, parts issue and inventory adjustment due to software limitations. Fleet Supervisors who have access for the parts lookup function also have access to the parts issue and parts adjustment transactions. A request will be submitted to Asset Works to determine if there are options in their Fleet Focus software to limit access in the storekeeper module. If access cannot be removed, a query will be created regarding access to a report that would be done monthly, showing who has made inventory adjustments and when.

Process for parts warranty claims in development

Finance and Asset Management is responsible for claiming parts warranties. Management is piloting a process which uses the fleet management system but there are no formal plans and timelines to finalize this project.

Recommendation 10

Finance and Asset Management should establish timelines to finalize the pilot project and assess whether a parts warranty process is feasible.

Management Response

AGREE

Fleet Focus was purchased in April 2012 and went live in May 2015. Warranty was a key component in choosing fleet management software; the warranty component of Fleet Focus performs as expected whereas the requirements of HRM are more detailed and unable to be met by Fleet Focus. HRM requires a software system that can fully manage warranties.

A pilot (of 10 warrantable parts) has been in progress from June 2018 to present. This pilot is being conducted and validated by Inventory staff using a complex Excel spreadsheet and manual processes. This pilot will conclude on November 30, 2018. Upon completion of the warranty pilot, the results will be reviewed to confirm feasibility of adopting the pilot approach.

The results of the pilot review will identify:

- 1. Effectiveness of the spreadsheet approach*
- 2. Suggested enhancements to the spreadsheet method if it is deemed usable on a larger scale*
- 3. Suggested changes to the pilot processes and workflow*
- 4. Estimated potential parts warranty recoveries if implemented*
- 5. Resources required to stand up a warranty program using the pilot approach*

The potential recoveries and resource requirements will include both Transit Fleet and Corporate Fleet locations. The investment in significant additional resources will be required if the manual system is to be utilized for all HRM fleet and all potential warrantable parts (estimated to be at 4500 stock keeping units SKU). This review will be completed by February 28, 2019.

The Asset Management Office is working with the ICT Business Intelligence team and AssetWorks to have the data in the spreadsheet automated into a report that Fleet Focus is currently unable to provide. Even with this report, there will be additional resources required to manage the parts warranty workflow and it is believed that we may not be able to assess whether the potential warranty savings will exceed the cost of the resource investment for up to 12 months. Industry practice and fit-gap assessments related to our current system will continue to be researched to determine the optimal business decision.

Background

Halifax Transit services the largest municipality in Nova Scotia with over 60 conventional bus service routes. Halifax Transit’s Bus Maintenance Department operates two garages and is responsible for purchasing, maintaining, and disposing of Halifax Transit’s bus fleet. Maintenance work is occasionally outsourced to external vendors for certain types of warranty work, when specialized equipment is required, or to reduce fleet downtime.

Garage	# of Conventional Buses	# of Access-A-Buses*	Bus Maintenance Expenditures 2017-18
Burnside Transit Centre	180	41	\$12.7 million
Ragged Lake Transit Centre	152	0	\$10 million
Total	332	41	\$22.7 million

Source: Halifax Transit

* Our audit did not include Access-A-Bus.

The Bus Maintenance Department developed and manages a preventative maintenance program for the Transit fleet. It requires a conventional bus be inspected every 10,000 kilometres. The Department uses a fleet management system to schedule preventative maintenance inspections and unplanned maintenance work. The system also records maintenance history and bus kilometre data, tracks warranty claims, and is utilized by Finance and Asset Management to manage Halifax Transit’s parts inventory.

The Bus Maintenance Department is also responsible for managing small equipment used in the garages. This includes purchasing and maintaining equipment such as pressure washers, welders, and ladders.

Finance and Asset Management operate a storeroom at each garage to stock and distribute parts inventory and tools to Halifax Transit mechanics. On March 31, 2018 Halifax Transit’s parts and supplies inventory was valued at \$2.6 million.

About the Audit

We completed a performance audit of bus fleet maintenance and asset management activities at Halifax Transit, including the management of fleet parts inventory and small equipment in the Transit garages. The Access-A-Bus fleet and Utility and Review Board bus inspections were not included in the scope of this audit.

The purpose of the audit was to determine whether Halifax Transit manages the maintenance of its bus fleet and ensures value-for-money in managing its bus assets. Our role is to express an independent audit opinion of this area.

The objectives of the audit were to determine whether:

- Halifax Transit effectively manages its bus fleet maintenance and asset management activities to ensure value-for-money; and
- Halifax Transit, and Finance and Asset Management effectively manage stores inventory and small equipment.

We developed criteria for this audit. These were discussed with, and accepted as appropriate by, Halifax Transit, and Finance and Asset Management senior management. The criteria used for this audit were:

- Policies and procedures should be developed and implemented for the efficient and effective maintenance of the bus fleet.
- Bus fleet performance goals should be identified, monitored and accurately reported.
- Bus fleet maintenance activities should be managed to ensure value-for-money.
- Capital needs should be identified, prioritized and planned to ensure a sustainable transit bus fleet.
- Processes and controls should ensure bus fleet parts inventory and small equipment are appropriately safeguarded.

The audit period included activities from April 1, 2016 to May 31, 2018. Information from outside the audit period was considered as necessary.

Our audit approach included: reviewing internal policies, procedures, and programs; interviews with management; reviewing bus manufacturer maintenance manuals; and examining bus maintenance records and other relevant documentation on a sample basis.

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 follow the Chartered Professional Accountants of Nova Scotia Code of Conduct.

Appendix 1 – Recommendations and Management Responses

Recommendation 1

Halifax Transit should develop and implement a plan to complete preventative maintenance in a timely manner at both of its garage facilities. This could include establishing a kilometre range within which preventative maintenance should be completed.

Management Response

Agreed: Halifax Transit currently measures preventative maintenance compliance vs preventative maintenance schedule adherence. Halifax Transit will measure the impact of kilometer range deviations to ensure value for money, taking into consideration that manufacturer recommendations for preventative maintenance are based on assumptions relating to environment and operating conditions, and hence can vary within an acceptable range. The intention of this initiative will be to develop a policy addressing preventative maintenance intervals, their acceptable deviances, corresponding escalation and investigation procedures, and will ensure they are consistently applied at both garage facilities.

Recommendation 2

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Management Response

Agreed: Halifax Transit reviewed the items and found that 25 of the items were related to extended warranty that has not yet been triggered because they are still covered under the manufacturers bumper to bumper warranty; therefore, no risk to recovery has occurred. Halifax Transit will enter these items to reduce the risk that they may be missed in the future. Halifax Transit has reviewed most missing warranties and has sent forward a list of warranties that are to be uploaded to Fleet Focus using the new XML loader tool which will resolve naming discrepancies upon which many of the errors were founded, this is currently at a testing stage. Additionally, the most impacting missing warranties were entered and corrections made in August 2018.

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Recommendation 4

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Recommendation 5

Halifax Transit should move forward with developing a formal asset management strategy for buses, including a detailed project plan and timelines for completion.

Management Response

Agreed: Halifax Transit has been using the principles of good asset management concerning replacement and lifecycle since 2014 but is currently restricted by system limitations to improve practice to full ISO compliance. With continued support from the Asset Management Office, Halifax Transit plans to formalize an Asset Management Strategy by fiscal 2020/2021.

Recommendation 6

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Recommendation 7

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Management Response

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Management Response

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Recommendation 10

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Management Response

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Contact Information

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