Office of the Auditor General of Ontario

Winter Highway Maintenance

Special Report

April 2015

Office of the Auditor General of Ontario

To the Honourable Speaker
of the Legislative Assembly

I am pleased to transmit my Special Report on Winter Highway Maintenance, as requested by the Standing Committee on Public Accounts under Section 17 of the *Auditor General Act*.

Bonnie Lysyk
Auditor General

April 2015

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Winter Highway Maintenance

1.0 Reflections

The Ministry of Transportation (Ministry) is responsible to ensure that Ontario highways—both surrounding our large urban centres as well as the thousands of kilometres of highways in rural Ontario—are kept cleared of winter snow and ice on a reasonably timely basis and that this service is being performed cost effectively. For almost two decades now, the Ministry has outsourced winter highway maintenance to private-sector contractors.

Based on a motion by the Legislature's Standing Committee on Public Accounts, we audited this area. Our audit found that in 2009, a significant change was made to how the Ministry handled its contracting process. While the change has been successful in reducing and containing winter highway maintenance expenditures, it has done so at the cost of Ontario's roads not being as well-maintained in the winter as they used to be. In essence, over the past five years, winter highway maintenance service levels have declined from the level that Ontarians have historically been used to. This was especially evident in the harsher winter of 2013/14, which led to us being asked to do this audit.

Essentially, the new performance-based contracting approach gave contractors full autonomy in determining how they would meet the Ministry's winter highway maintenance outcome targets (standards) to clear the highways of snow and ice within prescribed time frames. The amount of snow plows, salters and other equipment, as well as the amount of salt, sand and anti-icing liquid used was left solely up to the contractor. However, as the overriding criterion used by the Ministry to award contracts was the lowest bid, there was an obvious incentive for contractors to minimize their equipment and use of winter treatment materials. The Ministry's position was that as long as the contractors committed to meet the standards, this was not a critical eliminating factor in their selection. Monitoring the contracts was difficult, because ministry staff simulated storms after the fact to assess whether contractors were clearing highway snow and ice. However, in-storm monitoring of whether the contractors were actually meeting the standards was left almost entirely up to the contractors themselves.

When private-sector contractors assume the responsibility for providing what may be an essential service to the public—where their work can impact, in this case, road conditions for driver safety—the expectation is that contractors step up and deliver. Our work at regional offices in contract areas throughout Ontario found that it is now taking much longer to return highways to a safer state after a snowfall than prior to the introduction of performance-based contracts, and the amount of salt, sand and anti-icing liquid used declined substantially. For instance, in one contract area, the amount of anti-icing liquid used went from 3.2 million litres in a winter under the previous contracts

to only 9,500 litres under the new performance-based contracts.

The bottom line is that the Ministry has been successful in reducing and containing escalating winter maintenance costs, but this has been achieved at the expense of a reduction in the timeliness of ensuring Ontario highways are safe for motorists in the winter. The Ministry has taken and continues to take steps to make needed improvements in winter highway maintenance in conjunction with the private-sector contractors. However, on reflection, one wonders whether the potentially negative impact of the changes made five years ago was not somewhat foreseeable and could have been avoided at the time private-sector contractors were selected for performance-based contracts with the Ministry. One also wonders why the Ministry chose to continue awarding contracts on the same basis for the next five years.

2.0 Background

2.1 Overview

Ontario's provincial highway network is about 17,000 kilometres long, consisting of single-lane and multi-lane roadways, interchange ramps and shoulders. The total single-lane kilometres in the network add up to about 43,000 kilometres, and over 38,000 kilometres of shoulders.

Highway driving conditions in winter vary from good to poor, depending on the amount and intensity of snow that falls, temperatures, the amount of ice that may form on the road, and the timeliness and thoroughness of winter highway maintenance activities such as snow removal and salting. Reduced winter highway maintenance can result in a higher likelihood of collisions. In other words, adequate winter road maintenance can be a significant factor in providing a safe commute on Ontario highways.

Under the *Public Transportation and Highway Improvement Act*, the Ministry of Transportation (Ministry) is responsible for maintaining this highway network. To maintain highways in winter, the Ministry has divided highways into five classes based on the volume of traffic they carry, shown in **Figure 1**. The higher a highway's winter traffic volume, the higher the level of winter maintenance service it should receive.

To enhance winter highway safety, maintenance activities must be effective during storms (plowing and salting must be sufficiently frequent to prevent snow and ice buildup) and after storms (snow and ice must continue to be cleared until the highway is clean and bare). The Ministry has established the following to guide these maintenance activities:

- In 1996, it established "circuit times" for each highway class in order to set the baseline for plowing and salting frequency. The circuit time is **the maximum time it should take to plow or spread salt** on a measured section of a highway during and after a storm.
- In 1997, it set a **maximum time to regain bare pavement after a storm** for each class of highway. This is the maximum time for snow and ice to be cleared so the pavement is bare. It is measured from the time the storm ends to when there is bare pavement.

Figure 2 shows these maximum time limits.

The bare-pavement maximum time limit for each class of highway is the Ministry's only standard for winter maintenance operations. The Ministry's performance target is for winter maintenance operations to meet the bare-pavement standard across the province for 90% of winter storms each winter.

According to the Ministry, when establishing highway classes and setting the related winter maintenance standard, the Ministry balances the level of service with the cost of the service. While adequate winter maintenance can be a factor in providing a safe commute, drivers also need to adjust their driving behaviour for less desirable winter road conditions.

Figure 1: Ministry's Class Designations for Winter Highway Maintenance

Source of data: Ministry of Transportation

Class	Average # of Vehicles on Highway Per Day	Examples	% of Total Highway System
1	More than 10,000	Highway 401, Queen Elizabeth Way, Highway 11, four-lane highway sections of other highways	34
2	10,000–2,000[a]	Highway 17, parts of the Trans-Canada Highway	35
	10,000–1,500[b]		
3	2,000–1,000[a]	Highway 35	9
	1,500–800[b]		
4	1,000–500[a]	Highway 516	6
	800–400[b]		
5	Less than 500[a]	Low-traffic highways and roads	16
	Less than 400[b]		

a. Traffic volume for highway classes in southern Ontario.

b. Traffic volume for highway classes in northern Ontario.

At the time of our audit, the Ministry was expecting to release its Ontario Road Safety Annual Report at the end of April 2015, which gives the safety results for the 2012 calendar year. This report shows that Ontario roads have consistently ranked among the safest in North America. This is measured by calculating the number of collision-related fatalities for every 10,000 licensed drivers. Overall, fatalities in Ontario have decreased between 2002 and 2012 (however, preliminary results show an increase in the number of deaths on Ontario highways in 2013 where snow, slush or ice was a factor). The overall decrease up to 2012 can be attributed to a variety of factors in addition to how quickly and well roads are cleared of snow and ice, such as improvements in vehicle technology (for example, better anti-lock braking systems, traction control, air bags and safer tires), and people's driving behaviours evolving. In addition, the Ministry considers its own program initiatives and new legislation, along with strong driver enforcement and education aimed at reducing fatalities, as contributing factors. This includes legislation penalizing street racing, stunt driving and distracted driving, and new speed limiters for large trucks. The focus of this report, however, is not on these factors, but specifically on winter highway maintenance in Ontario.

Figure 2: Maximum Time Limits for Completing Circuits and Regaining Bare Pavement

Source of data: Ministry of Transportation

Class	Maximum Circuit Time (minutes)[1]	Maximum Time to Bare Pavement (hours)[2]
1	78	8
2	108	16
3	174	24
4	294	24
5	480	24

1. The maximum amount of time it should take to plow and salt a route or a circuit.
2. The maximum amount of time after the end of a winter storm for ice and snow to be removed so that the pavement is bare. For class 4 highways, only the centre of the road needs to be bare within 24 hours of the storm's end. For class 5 highways, the road can remain snow-packed but all excess snow has to be plowed off.

2.2 Evolution of Winter Highway Maintenance in Ontario

Before the 1980s, the Ministry of Transportation (Ministry) in Ontario performed all winter highway maintenance activities in-house, through its own maintenance staff of patrollers and equipment operators, its own equipment fleet and its own stores of materials at its own patrol yards.

In the 1980s, the Ministry started to privatize some highway maintenance operations in an incremental manner. By 1996, maintenance for about half of the provincial highway network had been outsourced through a number of small private contracts. Ministry staff still, however, directed all the work—about 2,800 ministry staff were involved in maintenance operations. Annual winter maintenance expenditures totalled about $149 million in 1996.

2.2.1 Movement to Full Outsourcing—1996 to 2009

In 1996, in response to provincial government direction, the Ministry developed a business case for fully outsourcing highway maintenance to the private sector. Management Board of Cabinet approved the business case on October 22, 1996, and the Ministry began outsourcing in December 1996.

Under the 1996 business case, the main objective was for outsourcing to reduce staffing and to save $10 million a year. Two different types of contracts would be used to cover maintenance of all provincial highways: "Managed Outsourcing" (MO) contracts and "Area Maintenance Contracts" (AMCs).

By 2000, the Ministry had outsourced all winter highway maintenance using a combination of MO and AMC contract models. Outsourcing notwithstanding, the Ministry was still ultimately responsible and liable for ensuring the safety of the provincial highway system.

Managed Outsourcing (MO) Contracts

MO contracts were for specific services such as plowing, salting and sanding. Ministry staff did the necessary patrolling of highways to determine how much equipment and material was needed to keep highways clear and safe. They directed the contractors in delivering the services needed, following the best practices and operational procedures the Ministry had developed from years of in-house winter highway maintenance (many of these were laid out in a Maintenance Manual). Contractors were paid on a unit-cost basis for the work they completed. For example, an hourly rate for plowing and salting highways was set based on the bids received, and contractors would be paid for the numbers of hours worked.

There were 700 of these contracts, awarded to 130 contractors, and the contracts were for three to five years.

Area Maintenance Contracts (AMCs)

For the AMCs, a large portion of the provincial highway network was divided into 16 areas. The contractor that won the contract for each area (the AMC) was responsible for planning and managing the work specified in the AMC. Although ministry staff would no longer be patrolling the highways to direct contractors' work, the AMCs still required contractors to follow the Ministry's best practices and procedures, and meet the bare-pavement standard. Some best practices and procedures included:

- patrolling highways at least once a day;
- closely monitoring weather reports to predict harsh winter weather in advance;
- keeping circuit lengths and equipment speeds at prescribed levels, and using this information to calculate the minimum amount of equipment needed to effectively service the area's highways;
- following prescribed procedures to prioritize plowing operations for different highway segments such as main lanes, left-turn lanes, shoulders and ramps; and
- following prescribed procedures for applying treatment material such as anti-icing liquids, sand and salt.

The AMCs also laid out cost-sharing arrangements for the salt and sand used by the contractor, as well as how many litres of anti-icing liquid to use and under what conditions. In addition, successful contractors would be required to document their maintenance activities and report this information to the Ministry.

To oversee the contractors and ensure they met contract requirements, the Ministry would conduct audits of contractors' maintenance work, using the information provided by the contractors, their own data acquired in the field during storms and data from other sources, such as weather radar information.

The Ministry chose the contractors based on the quality of their work proposals (including demonstrating how they would follow the Ministry's best practices and procedures) and their price bids. Winning contractors were to be paid an annual lump sum for fulfilling contract requirements, and would be fined if they did not.

The 16 AMCs were awarded among six contractors and were for seven to nine years.

2.2.2 Shift to "Performance-based" Contracts—2009 to 2014

In 2009, when the MO contracts and AMCs began expiring, Ontario was experiencing the effects of the 2008 economic downturn, putting pressure on the Ministry to find ways to further decrease its costs. The Ministry forecast that its costs for highway maintenance and contractor oversight could reach $273 million in the 2009/10 fiscal year. Almost two-thirds of this amount, roughly $174 million, related to winter maintenance. Under these circumstances, the Ministry chose in 2009 to transition into "performance-based" AMCs. The Ministry estimated at this time that it could realize annual savings of $4.6 million if just four contract areas were maintained under performance-based AMCs, and this was a key factor in the Ministry deciding to make all subsequent contracts performance-based (a full business case for the remaining contract areas was not prepared).

This meant phasing out managed outsourcing altogether and, instead of 16 areas maintained through AMCs, the entire highway network would be covered through performance-based AMCs. Between 2009 and 2014, the Ministry phased in 20 performance-based AMCs with five contractors.

Ontario is among several other cold-climate jurisdictions that use performance-based contracts for winter highway maintenance. In Canada, British Columbia and Quebec have followed the same trend. Outside Canada, Alaska, Finland, Norway and Sweden apply a performance-based approach to highway maintenance.

Characteristics of and Reasons for the Performance-based Approach

In a performance-based contract, the awarder of the contract sets standards and outcome targets for the contractor to meet. The contractor, not the awarder of the contract, performs the patrols to determine what's needed, and plans and manages all the work. In other words, rather than being told in the contract what means to use to get the end result, the contractor decides how to deliver the end result.

Also tied to the shift to a performance-based approach has been a trend toward longer-term contracts as an incentive for the contractor to invest in the best-value equipment and methods.

The rationale for this shift is innovation and efficiency, and better customer service, which may ultimately lead to cost savings. It is assumed that traditional contracts that reimburse contractor costs or pay for the work performed will not lead the contractor to find efficiencies or ways of doing the work more effectively. On the other hand, in a performance-based arrangement where the focus is on outcomes, it is assumed that the contractor has more incentive to be proactive and more customer-oriented, all of which leads to cost savings. Further cost savings result from the awarder of the contract needing fewer staff because it only provides oversight and no longer does its own patrolling and managing of the work.

In summary, reasons for the shift to performance-based winter maintenance have been:

- The costs for the awarder of the contract should decrease (including, under long-term contracts, fewer resources needed for contract administration).

- With long-term contracts allowing the contractor more time to pay off the costs of equipment, the contractor has the incentive to invest in the best-value equipment and methods; this may improve efficiency and further lower costs.
- Giving the contractor extensive freedom to manage the work may encourage the contractor to find innovation and try out experimental winter materials; this may improve quality of service.

Performance-based Contracts in Ontario Compared to Original AMCs

The performance-based contracts that the Ministry developed for Ontario differed from its original AMCs as follows:

- *Best practices and procedures from prior contracts were replaced with outcome targets or dropped altogether:* Most of the Ministry's best practices and procedures (as well as the bare-pavement standard) for winter highway maintenance were expressed as outcomes for the contractor to achieve. These remained in the performance-based contracts as "outcome targets," which the Ministry defines as performance requirements with a measurable goal that is to be met within a specified time. In some cases, the language of the best practice was altered slightly to make the outcome target measurable in a time limit. For example, the best practice of beginning to salt highways before snow accumulates to half a centimetre became the outcome target that salting must begin within 30 minutes of the start of a storm. Other best practices and procedures, however, such as the maximum length for plow circuits, the maximum speeds for operating equipment, and patrolling highways at least once a day, were not part of the new contracts. This is consistent with the performance-based concept of making the contractor responsible for delivering an end result without prescribing the means by which to achieve it. The performance-based contracts stipulated that if the contractor does not meet the outcome targets, it is assessed a financial consequence (fine). **Appendix 1** lists the new contracts' outcome targets and the fine amounts for not meeting them.
- *Contracts became longer in duration:* The previous AMC contracts were for seven to nine years. The performance-based contracts were for nine to 13 years. This meant the contractor had a longer time to amortize its investment in equipment and therefore could make the appropriate substantial initial investments in equipment to ensure effective highway maintenance throughout the contract term.
- *Fines for non-compliance were higher:* Under the original AMCs, fines for non-compliance were smaller in dollar value and would escalate based on the number of times a contractor was found to not meet specific contract requirements. Under performance-based AMCs, the fine amounts were increased and calculated based on the number of minutes the contractor continued to not meet outcome targets. For example, the original AMC fine for not fixing or replacing within two hours equipment that broke down during a storm was $1,000 to $10,000 (the fine escalated to the higher end of the range if the contractor had failed to meet the requirement on multiple prior occasions). The performance-based AMC fine was $3,000 for the first 18 minutes equipment had not been fixed or replaced after the two-hour deadline, and $1,000 for every subsequent 15-minute period that the equipment continued to not be fixed or replaced.

2.2.3 Changes in Expenditures

Figure 3 shows how the changes in how Ontario has maintained winter highways since 1995 (the year before the Ministry fully outsourced winter highway maintenance) have involved changes in

different areas of spending. As **Figure 3** shows, total expenditures went from $149 million in 1995/96 to $202 million in 2008/09. Without the change to performance-based contracts the following year, this upward trend would likely have continued. **Figure 4**, which outlines changes in the per-kilometre cost of winter highway maintenance over the same time period, shows that the shift to performance-based contracts in 2009/10 enabled the Ministry to counteract the upward trend in costs that had been occurring to that point.

The cost savings the Ministry expected for shifting to performance-based AMCs had been realized at the time of our audit, as shown in **Figure 5**—we determined that annual cost savings in terms of contract value were about $36 million.

Figure 3: Changes in Different Types of Expenditures on Winter Highway Maintenance Since 1995 ($ million)

Source of data: Ministry of Transportation; see Note

	Expenditures Within the Ministry		Payments to Contractors[1]			
Fiscal Year	Highway Maintenance Performed In-house[2]	Contract Administration and Oversight	Under Managed Outsourcing Contracts[2]	Under Original Area Maintenance Contracts (AMCs)[3]	Under Performance-based AMCs[4]	Total
1995/96						**149**
1996/97	116			3		**119**
1997/98	105			4		**109**
1998/99	103	1	2	7		**113**
1999/2000	71	2	13	29		**115**
2000/01		5	48	59		**112**
2001/02		7	48	70		**125**
2002/03		8	52	78		**138**
2003/04		9	54	87		**150**
2004/05		11	54	94		**159**
2005/06		11	50	110		**171**
2006/07		10	47	114		**171**
2007/08		11	59	119		**189**
2008/09		11	66	125		**202**
2009/10		10	50	110	4	**174**
2010/11		10	51	102	15	**178**
2011/12		8	40	95	37	**180**
2012/13		5	13	73	75	**166**
2013/14		5	3	24	139	**171**

Note: All data was ultimately provided by the Ministry of Transportation, but from a number of specific sources.

- 1995/96: Total expenditures estimated based on information in the 1996 business case. Therefore, breakdown by expenditure type is not available.
- 1996/97–2003/04: Expenditures estimated from Ministry of Transportation data provided for our *2004 Annual Report*. The expenditure data was for both summer and winter maintenance, and we have estimated the winter maintenance portions.
- 2004/05–2013/14: Data provided by the Ministry of Transportation during this audit.

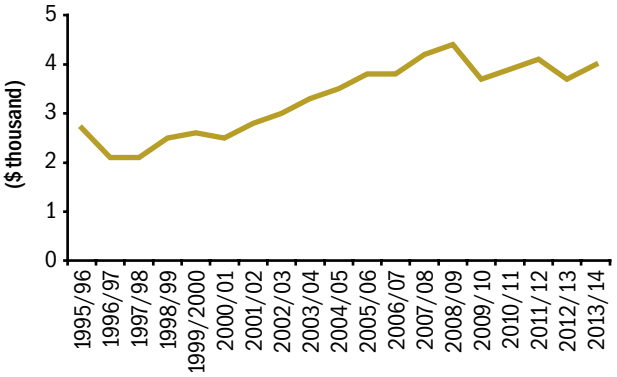
1. Payments include all costs for winter maintenance services procured, including materials such as salt and sand.
2. Although the Ministry began its initial outsourcing strategy in December 1996, unresolved labour issues prevented the Ministry from outsourcing additional maintenance until January 1999, once the issues had been resolved. Until then, the Ministry continued to perform highway maintenance in-house in those areas. In 1999/2000, the shift to full outsourcing was completed. The last of the managed outsourcing contracts expired in 2013.
3. The previous AMCs began in 1996 on a trial basis. Following the implementation plan, contracting expanded, with the last of the these AMCs expiring in 2014.
4. Performance-based AMCs began to be phased in 2009. Under the implementation plan, the last of the performance-based contracts is due to expire in 2026.

2.2.4 Comparison With Other Jurisdictions

Canadian provinces vary in their approaches and contract models for highway maintenance. Manitoba, for example, has opted to keep service delivery in-house, while British Columbia uses performance-based AMCs somewhat similar to those used in Ontario. **Figure 6** compares Ontario's current approach to winter highway maintenance to the approaches of other provinces.

Figure 4: Changes in the Per-kilometre Cost of Winter Highway Maintenance Since 1995

Source of data: Ministry of Transportation



Note: The overall decrease in the per kilometre cost of winter highway maintenance since 2009/10 coincides with the introduction of performance-based contracts.

2.3 Recent Issues With Highway Maintenance

After the performance-based AMCs were introduced, winter maintenance service levels across the province decreased, leading in some cases to hazardous driving conditions. This created significant safety concerns both among the general public and for those delivering emergency services such as the Ontario Provincial Police (OPP).

The Ministry began taking action to address these concerns in 2012. When in February 2014 Ontario was experiencing a harsh winter, with concerns about winter highway maintenance not yet fully resolved, the Legislature's Standing Committee on Public Accounts passed a motion for the Auditor General to conduct a review of the winter road maintenance program.

Appendix 2 provides a chronology of Ontario winter highway maintenance from 1996 to the winter of 2014/15 when we completed our audit.

Figure 5: Annual Reduction in Winter Highway Maintenance Contract Costs Resulting From Performance-based AMCs

Prepared by the Office of the Auditor General of Ontario based on information provided by the Ministry of Transportation

	Amount ($ 000)
Annual contract values of all MOs and previous AMCs[1]	**174,844**
Annual contract values of all performance-based AMCs	123,514
Plus: Costs of ministry actions to restore service levels[2]	
Additional equipment (55 units) for truck-climbing and passing lanes (Section 5.5.2)	8,984
Additional equipment (38 units) for freeway shoulders and ramps (Section 5.5.5)[3]	5,973
Total annual contract values of performance-based AMCs[4]	**138,471**
Amount by which performance-based contracts are less costly	**36,373**

Note: As the title indicates, this figure presents cost reductions resulting from performance-based AMCs. As such, it compares the contract values of non-performance-based contracts and performance-based contracts. It does not include costs relating to the following over the 2009–15 period when performance-based AMCs were phased in: changes in ministry staffing, the use of treatment materials, fines collected from contractors and damage claims paid because of vehicle collisions where inadequate winter highway maintenance was judged to be a contributing factor.

1. This amount does not tie into Figure 3 because it consists of annual contract values over multiple years — one year prior to the introduction of performance-based AMCs that took place between 2009 and 2014.
2. As explained in Section 5.5, the Ministry took actions from 2012 to 2015 to restore service levels, which decreased after the introduction of performance-based AMCs.
3. To increase plowing frequency on freeway shoulders and ramps, the Ministry added a total of 50 additional units — 38 were added as a result of direct negotiations as explained in section 5.5.5 and 12 units were added through the tendering process as explained in section 5.5.4.
4. Since this amount consists only of annual contract values (excluding payments made for sand and salt usage), it does not fully reconcile with the $139 million in Figure 3 (which includes payments made for sand and salt usage).

Figure 6: Winter Highway Maintenance in Selected Canadian Provinces
Prepared by the Office of the Auditor General of Ontario

Province	Delivery Model	Contract Structure	Contract Administration
Ontario	100% Outsourced	Performance-based	Penalties imposed for not meeting outcome targets
British Columbia	100% Outsourced	Performance-based	Bonuses issued for exemplary performance
Quebec	80% Outsourced, 20% In-house	Performance-based	Penalties imposed when breach could negatively impact public safety
New Brunswick	8% Outsourced, 92% In-house	Performance-based	Penalties imposed when the total number of unresolved performance issues exceeds a specified threshold amount
Alberta	100% Outsourced	Managed outsourcing	n/a
Manitoba	In-house	n/a	n/a
Saskatchewan	In-house	n/a	n/a

3.0 Audit Objective and Scope

The Standing Committee on Public Accounts passed the following motion on February 26, 2014:

> *That the Auditor General conduct a review of the winter road maintenance program, considering contracts negotiated on behalf of the government by the Ministry of Transportation.*
>
> *This report should include, but not be limited to, a focus on the following issues:*
>
> *(1) the number of vehicles;*
> *(2) circuit times;*
> *(3) the proper and efficient use of chemicals, melters and salt on behalf of the contractor;*
> *(4) hours of operation; and*
> *(5) response times*
>
> *A review of this program from one year before it was privatized.*

We accepted this assignment under Section 17 of the *Auditor General Act*, which states that the Committee can request that the Auditor General perform special assignments.

As for the last part of the motion, as noted in **Section 2.2.1**, full privatization of the program began in 1996. Because of a lack of detailed information on the program one year before that (1994/95), our program review for this period focused only on cost comparisons between the in-house service delivery of 1995/96 and private-sector service delivery afterwards (as shown in **Figure 3** and **Figure 4**).

In conducting our work, we met with key personnel at the Ministry's head office, and visited all five of the Ministry's regional offices and 13 of the 20 contract areas (including Kenora, Thunder Bay East, North Bay, Sudbury, Kingston West, Kingston East, Ottawa, Bancroft, Chatham, Owen Sound, London, Simcoe, and Niagara-Hamilton) where oversight of contractor performance occurs. We interviewed staff involved in procurement, administration and oversight of winter highway maintenance; and examined related data and documentation, including the Ministry's audits on contractor performance conducted during winter 2013/14. We also reviewed the Ministry's 1996 business case for transitioning the delivery of highway maintenance to the private sector, approved by the Management Board of Cabinet.

We performed research on winter road maintenance standards in other jurisdictions (discussed in **Section 5.4**), and met with representatives from the 407 ETR privatized highway and Regional Municipality of Peel to find comparisons to Ontario's bare-pavement standard.

To gain an understanding of how poor road conditions resulting from inadequate winter road maintenance can affect the public and emergency workers, we met with representatives from the Ontario Provincial Police.

We also interviewed each of the five contractors that are currently responsible for winter maintenance of provincial highways and met with representatives of the Ontario Road Builders Association (an organization representing contractors' interests) to gain their perspective on the current performance-based AMCs.

In response to the poor winter maintenance conducted during the 2011/12 and 2012/13 winters, the Ministry internally conducted a review of the delivery of winter road maintenance in 2013 to determine if there were areas where improvements could be made. The findings of this review resulted in the Ministry entering into separate negotiations before winter 2014/15 with each of the five contractors that maintain provincial highways in an attempt to improve winter road maintenance. As of January 31, 2015, the Ministry had concluded some of these negotiations and signed contract amendments with three out of the five contractors. As part of our work, we met with ministry staff and reviewed the documentation relating to the internal review and the contract amendments.

4.0 Summary

Since 2000, Ministry of Transportation (Ministry) staff have not directly performed winter highway maintenance as it has been fully outsourced. Our audit found that because of significant changes to the winter highway maintenance program since 2009, winter roads have not been maintained as effectively as they were prior to this date.

In an effort to reduce overall expenditures, the Ministry introduced a new performance-based contract model in 2009, which is currently used in all areas of the province for winter highway maintenance. Under this new model, contractors are not required to use the Ministry's historically proven best practices to, for example, determine the amount of equipment (that is, snow plows, salt and sand spreaders, and combination units) required to effectively carry out winter highway maintenance. Instead, they can decide on their own how to perform the maintenance required to keep highway conditions as safe as possible in winter. In addition, the Ministry procured private-sector contractors primarily on the basis of the lowest price bid, without properly ensuring that the contractors chosen were fully equipped to provide effective winter highway maintenance services. Even though ministry staff, including engineers, raised serious concerns during the procurement process that the majority of winning contractors would not be able to meet their winter maintenance commitments because of insufficient equipment, these lowest-price contractors were still awarded the contracts. These contractors assured the Ministry that they would be able to meet the contract requirements.

This procurement process, contractors' performance and other factors have led to a decrease in winter highway maintenance service levels across the province, resulting in less safe driving conditions. Contractors under performance-based contracts have taken longer to achieve bare pavement than previous contractors did. In 2009/10, contractors took an average of 2.1 hours after the end of the storm to achieve bare pavement on Ontario's most frequently travelled highways. In the harsher winter of 2013/14, when about 85% of these highways were maintained under performance-based contracts, contractors took an average of 4.7 hours after the end of the storm to achieve bare pavement. This is 2.2 times longer than the 2009/10 time.

Highway maintenance during storms also declined. In addition, the Ministry reduced winter maintenance services for highway shoulders, ramps, and truck-climbing and passing lanes (in some cases, delaying them until after a storm). The end result was that drivers on Ontario's highways no longer experienced the safer winter road conditions they had been accustomed to.

While winter highway maintenance service levels declined with the introduction of the performance-based contracts over the last five years, performance-based contracts resulted in significantly lower winter highway maintenance costs for the Ministry, enabling it to control the upward trend in costs that would likely have been incurred under the previous contract model.

Beginning in late 2012 and continuing after an internal review in late 2013, the Ministry has negotiated, and is continuing to negotiate, increased equipment and service levels with the performance-based private-sector contractors in an effort to improve winter highway maintenance in the province. As the Ministry pursues further improvements to service levels, costs will likely increase.

The following are some of our key observations on the deterioration of service under performance-based contracts:

- **Contractors under performance-based contracts used less equipment, which resulted in a reduction in service**—Having enough equipment (such as plows and spreaders) is one of the most important factors in adequately maintaining highways in winter. The original Area Maintenance Contracts (AMCs), which were not performance-based, set out numerous best practices for contractors to follow to ensure they would have enough equipment to do an adequate job. Because the Ministry's procurement process for the performance-based contractors created a natural incentive to cut costs in order to win the contract, most contractors chose to aggressively minimize their winter equipment levels, which reduced their ability to meet contract requirements and resulted in reduced service.
- **Contractors under performance-based contracts used less treatment material to service highways**—Spreading materials such as salt, sand and anti-icing liquids to treat highways is an important winter maintenance activity. As it did for the equipment levels contractors used, the Ministry's procurement process created a natural incentive for contractors to cut costs by using less treatment material. Also, under the previous AMCs, contractors would have to reimburse the Ministry if they did not use minimal amounts of treatment materials stipulated in the contract. This ensured that contractors would at least use these amounts. Under the performance-based AMCs, the reimbursement arrangement was eliminated. Therefore, contractors no longer had an incentive to use the same amounts of treatment material. Also, it was no longer mandatory for contractors to use anti-icing liquid. This affected service levels. For example, some contractors almost eliminated the use of anti-icing liquid altogether. In one contract area, anti-icing-liquid use over the winter season went from an average of 3.2 million litres under the original AMC to 9,500 litres in the first year of the performance-based AMC.
- **Contractors under performance-based contracts patrolled less often, resulting in service failures**—Contractor patrollers—the "eyes on the road"—monitor road and weather conditions to decide when to deploy plows and spreaders and what treatment material should be used. They are also required to provide accurate and timely reports on road and weather conditions to the Ministry, which the Ministry then makes public on its website. Under the original AMCs, contractors' hours of operation had to include patrolling all their area highways at least once a day in winter. Patrolling requirements under performance-based AMCs were far different: the only requirement for contractors was to "be aware" of road and weather conditions, where doing so is not tied to any minimum hours of operation. We found some examples of contractors being not adequately aware of actual road conditions, resulting in late deployment of plows and spreaders, and contractors making inaccurate reports of road conditions to the Ministry.

- **Contractors under performance-based contracts were unable to meet contract requirements**—Ministry audits identified about 1,100 instances in 2013/14 where contractors did not meet multiple outcome targets. About half of these related to contractors being unable to complete circuits on time. While contractors' failure to meet this target could often be attributed to insufficient equipment, the safety of the public and of providers of emergency services were put at risk because contractors did not plow or salt at all, did so far too infrequently, or drove equipment too quickly for the plowing and salting to be fully effective. We also found instances of contractors outright refusing to perform timely maintenance services, even after requests received from the Ontario Provincial Police based on their observations of road conditions.

Some of our key observations on the process the Ministry followed to procure performance-based contractors were as follows:

- **The procurement process did not adequately factor in contractors' ability to deliver required services**—The procurement process had two stages for contractors that met the minimum pre-qualification requirements. In the first stage, contractors submitted winter maintenance strategies, which the Ministry scored on a set of criteria. Any contractor that scored 70% on these criteria passed on to the second stage. In the second stage, the contractor proposing the lowest price was awarded the contract. Because of how points were assigned for the different criteria, it was possible for contractors to score 70% and pass on to the bidding stage without having all the requirements needed to adequately deliver winter highway maintenance service. For example, having enough equipment is crucial for maintaining winter highways, but having enough equipment accounted for only 15% of the criteria on which contractors were evaluated in stage 1. Once at the second stage, qualitative differences between contractors with respect to the amount and type of equipment or any other aspect of maintenance were irrelevant in choosing the winning contractor. The only factor considered from this point on was how low a price the contractor bid. This favoured contractors that pursued every possible way to cut costs, including using the least amount of equipment and less material, which ultimately resulted in a reduction in service.
- **Procuring the lowest-bidding contractor can cost more in the long run**—We noted one case where the second-lowest bidder for a contract had a much greater equipment complement than the lowest bidder, which won the contract. Specifically, for an annual contract price of only $700,000 more, the second-lowest bidder proposed the use of 22 additional pieces of equipment as compared to the winning contractor. This equated to a cost of about $32,000 per piece of equipment. To improve service levels in this contract area, the Ministry has since incurred an annual cost of $1.7 million for 13 additional pieces of equipment. This equates to a cost of about $131,000 per piece of equipment, more than four times the per-piece equipment cost of the second-lowest bidder. If the second-lowest bidder hadn't lost out on the contract, the area could have been served with significantly more equipment at a significantly lower cost.

Some of our key observations on ministry oversight of contractors were as follows:

- **Audits not risk-based or the most effective**—The Ministry uses audits conducted by Maintenance Co-ordinators (ministry staff responsible for contract oversight) to monitor and oversee contractor performance. However, risk factors—such as highway traffic volumes, weather patterns and the number of fines previously issued to a contractor—were not the basis for audit selection. Also, the Ministry has not developed standards for

conducting audits and documenting results. As a result, we noted a great amount of inconsistency across the province in the adequacy of contractor oversight .

- **Audit targets not being met**—We found that more than one-quarter of Co-ordinators did not meet the target set by the Ministry of five storm audits each from October to April. The Co-ordinators not meeting the target conducted on average less than three audits, and one Co-ordinator performed only one audit over the winter season.
- **Over-reliance on contractors' self-reporting their performance**—Whether contractors met certain outcome targets can be verified only through in-field observations made during and immediately after snowstorms. However, most audits are "desk audits," conducted a few weeks after a storm, using GPS tracking information and information from contractors self-reporting their performance. There is a potential conflict of interest here: it is not in the contractors' interest to report if they have not achieved outcome targets, and contractors are aware that the Co-ordinators' in-field presence is limited. Ministry audits have found many instances of inaccurate information being reported by contractors or contractors not providing complete information.
- **Monitoring tools lacking**—We found that the Ministry failed to supply most of its staff with necessary monitoring tools (for example, dashboard cameras for in-field audit observations). We also found that ministry training for Co-ordinators was basic and minimal.
- **Waiving of fines inconsistent**—Regional ministry staff have the discretion to waive the fines that Co-ordinators conclude should be levied against contractors for not meeting their outcome targets. This undermines the effectiveness of fines as a deterrent to prevent poor contractor performance. It has also resulted in inconsistencies in how the Ministry has responded to service failures throughout the province, which in turn affects service delivery, with some contractors being able to take advantage of ministry leniency in their region. Based on our work, we determined that of approximately $13.3 million in fines assessed for winter 2013/14, approximately $4.8 million, or 37%, was waived, and another $5.2 million, or 39%, was being reassessed at the time of our audit.
- **Information for decision-making lacking**—We were concerned that a vital tool for oversight—a centralized ministry database of audits conducted and fines assessed—was not yet fully functional years after the introduction of performance-based AMCs. A trial of the system was conducted in 2013/14, and the system was launched in 2014/15. Its data at the time of our audit was still incomplete and, in some cases, inaccurate.
- **Potentially increased legal costs not considered**—Under the *Public Transportation and Highway Improvement Act*, the Ministry bears the legal responsibility to maintain and keep in repair provincial highways, and bears the legal liability for failure to do so. Under the performance-based AMCs, contractors may also be liable if they fail to be in material compliance with the contract. Under the government-operated road liability insurance program, primarily the Province, not contractors, may be exposed to paying damages if inadequate road maintenance was a contributing factor in vehicle collisions. To date, the Province has not held contractors liable for any such damages.

The Ministry informed us that it believed that the shift to performance-based AMCs in 2009 would not affect the Province's liability risk. It further believed that fines collected would be sufficient to cover the actual loss or damage that the Ministry could accrue as a result of failure to provide the service. Nevertheless, the deterioration in service under performance-based AMCs increases the risk of higher legal costs for the Province.

OVERALL MINISTRY RESPONSE

The Ministry appreciates the Auditor General's observations and recommendations. Keeping Ontario's highways as safe as possible during winter weather is important to all Ontarians. While there has been a substantial decrease in the number of winter-related deaths on our highways between 2002 and 2012, the Ministry also acknowledges that, based on preliminary information, there was an increase in the number of deaths on Ontario highways in 2013 where snow, slush or ice was a factor. More can be done.

The maintenance of provincial highways is a shared responsibility between the Ministry and its contractors. Beginning in 1996, the Ministry transitioned delivery of highway maintenance services to the private sector. Over this time, the contracts have evolved to allow contractors to decide how best to deliver maintenance services providing they meet the performance requirements.

Following the Ministry's internal review, the Ministry and its maintenance contractors have added 105 pieces of winter equipment to better service truck-climbing and passing lanes, and freeway ramps and shoulders. In addition, to improve contract oversight, the Ministry added 20 oversight staff across the province and made other organizational changes. The Ministry partnered with the OPP this past winter to deliver a safe driving campaign, encouraging drivers to prepare for Ontario's rapidly changing winter weather. The Ministry will continue to identify additional winter maintenance enhancements, and before next winter, additional changes will be incorporated into existing winter maintenance contracts.

Recently, the Ministry tendered a new maintenance contract for the Kenora area. This new contract model, guided by the Ministry's review and the Auditor General's recommendations, follows a procurement approach that appropriately rates the bidder's proposal and uses this mark, plus the financial component of its bid, to ensure the best-value bid is selected. It is strengthened by including specific requirements for the amount of equipment, proper road patrolling coverage, and appropriate application of road salt and anti-icing liquids.

The Ministry will continue to work with its contractors and the OPP to promote safe winter driving and deliver the winter maintenance services the people of Ontario deserve, and we will continue to make winter maintenance enhancements, including the changes recommended in this report.

5.0 Detailed Audit Observations

The changes that the Ministry made to the previous AMC contract to create its performance-based contracting model, along with contractor performance under that model, resulted in reduced winter maintenance service levels on Ontario highways. **Section 5.1** examines the deterioration of service in detail. **Section 5.2** explains how the Ministry's process for procuring the contractors for the performance-based work contributed to the likelihood that service would become worse. **Section 5.3** presents our concerns with ministry oversight of contractors. **Section 5.4** has our findings on the Ministry's public reporting on highway maintenance. **Section 5.5** describes the actions the Ministry has taken, and continues to take, to restore highway maintenance service to the levels that existed before the introduction of performance-based AMCs.

5.1 Service Has Deteriorated Under Performance-based Contracts

Contractors under performance-based AMCs have taken longer to achieve bare pavement than contractors did under MO contracts and the original

AMCs. In 2009/10, when almost every highway in the province was maintained by MO or under the original AMCs, contractors took an average of 2.1 hours after the end of the storm to achieve bare pavement on Class 1 highways. In the harsher winter of 2013/14, when about 85% of Class 1 highways were maintained under performance-based AMCs, contractors took an average of 4.7 hours after the end of the storm to achieve bare pavement on Class 1 highways. This is 2.2 times longer than the 2009/10 time. **Figure 7** shows this, as well as how much longer achieving bare pavement took for the other four highway classes in 2013/14.

We identified three key factors that contributed to winter highway maintenance services deteriorating under performance-based contracts: contractors not using enough equipment, contractors not using enough treatment material (salt, sand and anti-icing liquid) and contractors not doing enough patrolling to ensure that equipment is deployed soon enough before and during a storm.

Figure 7: Bare-pavement Achievement Times, Winter 2009/10 vs. Winter 2013/14 (Hours)

Source of data: Ministry of Transportation

	Ministry Standard	Actual Average Time Taken	
Highway Class	Maximum Time Limit	Winter 2009/10	Winter 2013/14
1	8	2.1	4.7
2	16	4.3	7.0
3	24	5.5	8.6
4[a]	24	8.9	10.8
5[b]	24	—[c]	6.7

a. For class 4 highways, only the centre of the road needs to be bare within 24 hours of the storm's end.

b. For class 5 highways, the road can remain snow-packed but all excess snow has to be plowed off.

c. Actual average time taken for achieving bare pavement on a Class 5 highway in 2009/10 not available.

5.1.1 Contractors Under Performance-based Contracts Used Less Equipment, Which Resulted in a Reduction in Service

Equipment for winter maintenance includes snow plows, salt and sand spreaders, and combination units (equipment that can both plow snow and spread salt and sand).

Having enough equipment is one of the most important factors in adequately maintaining highways in winter. Calculating the minimum amount of equipment needed is based on a formula that factors in circuit lengths, equipment speeds and circuit times. The original AMCs required contractors to adhere to ministry best practices for each of these factors in their equipment calculations. This gave the Ministry assurance that contractors had at least the minimum amount of equipment it deemed necessary for adequate winter highway maintenance.

Two factors contributed to performance-based contractors not maintaining these minimum equipment levels. First, the contractors were not required to use the Ministry's best practices in their equipment calculations. Second, as explained in detail in **Section 5.2**, winning a contract depended on having the lowest-priced bid proposal. So to cut their substantial equipment costs and come up with the winning, lowest-priced bid, most contractors under the performance-based AMCs moved away from using the Ministry's best practices in their equipment calculations and proposed the circuit lengths and equipment speeds they determined would enable them to meet circuit-time outcome targets with the lowest possible equipment numbers.

The following subsections explain this in more detail.

Original AMC Requirements Regarding Equipment Levels

The formula for calculating the minimum amount of equipment needed to properly plow and salt a circuit is:

(circuit length ÷ equipment speed) ÷ circuit time

The original AMCs required contractors to not exceed the best-practice maximums for each factor in the formula. These are described in **Figure 8**.

For example, for a Class 1 highway, the result from plugging in the best-practice factors is (for

this formula, the circuit time is input in hours, so 78 minutes would be input as 1.3 hours):

(55 ÷ 42) ÷ 1.3 = 1

The formula determines that a minimum of one plow is required to service a Class 1 highway circuit of 55 km at a reasonable speed of 42 km/hr within the allowed time of 1.3 hours.

The original AMCs also required contractors to follow the Ministry's best practices for the specific highway segments described in **Figure 9**.

Different Requirements Under Performance-based AMCs

Performance-based AMCs shifted away from requiring contractors to follow best practices for plowing and salting to requiring contractors to meet the outcome targets noted in **Appendix 1**. Longer circuit-time outcome targets developed for performance-based AMCs, combined with contractors' not having to follow best-practice maximums in their equipment calculations and the Ministry's contractor procurement strategy of "the lowest price wins," led to reductions in equipment use and reduced highway maintenance.

New Circuit-time Outcome Targets

In developing the circuit-time outcome targets, the Ministry included a buffer and made the circuit times longer. The Ministry informed us that it did not expect contractors to exceed the longer circuit

Figure 8: Previous AMC Specifications Calculating Equipment Levels

Source of data: Ministry of Transportation

	Highway Class				
	1	2	3	4	5
Maximum Circuit Length (km)[1]	55	75	120	206	336
Equipment Speed (km/hr):[2]					
While spreading	32	32	32	32	32
While plowing	42	42	42	42	42
While travelling	60	60	60	60	60
Maximum Circuit Time (minutes)[3]	78	108	174	294	480

1. Maximum circuit lengths were arrived at based on maximum allowable snow accumulation for each class of highway.
2. Equipment speed, which is the same for all highway classes, refers to the speed to be used for performing the salt spreading/plowing work. Travelling speed is when the equipment is neither plowing nor salting.
3. Maximum circuit time is the maximum number of minutes it should take to service (spread salt/sand or plow) a circuit and return equipment to the yard.

Figure 9: Ministry Best Practices Followed Under Previous AMCs for Specific Highway Segments

Source of data: Ministry of Transportation

Highway Segment	Best Practice
Interchange ramps	Should be cleared during a storm after through lanes and left-turn lanes.
Freeway shoulders	Right side shoulders should be cleared within 24 hours after the end of a storm; however they should be cleared during a storm where an excessive amount of snow has accumulated. Left side shoulders should be plowed during the storm. In areas where blowing snow causes snowdrifts, the snow should be plowed off the shoulder.
Non-freeway shoulders	Should be cleared within 24 hours after the end of a storm; however they should be cleared during a storm where an excessive amount of snow has accumulated.
Truck-climbing lanes[1] and passing lanes[2]	Should be cleared when conditions permit.

1. Highway lanes for trucks to travel more slowly when climbing steeply uphill.
2. Highway lanes for motorists to pass by slower traffic.

time because the fines set for not meeting outcome targets were significant.

As well, the definition of circuit time was changed: the return trip to the yard no longer had to be included within the circuit time. Ministry staff and engineers estimated that this trip took an average of 13 minutes province-wide. Thus, contractors were allowed a longer time to do less. **Figure 10** outlines these changes.

No Required Use of Best Practices in Equipment Calculations

How contractors were to achieve these new circuit-time outcome targets, and how much equipment they were to use to do so, was up to them. There was no contractual requirement for contractors to use ministry best-practice maximums for circuit lengths and equipment speeds in calculating their minimum equipment needs, and they now could use a longer circuit time in this calculation. Ministry staff informed us that, when the performance-based model was developed, they never expected contractors to include the added buffer in the circuit times in their equipment calculations.

We found examples like the following in our examination of winning contractors' equipment calculations:

- **Circuit lengths to be completed by one plow:**
  - for a Class 1 highway, 80 km instead of the 55-km ministry best-practice maximum length shown in **Figure 8** (45% longer);
  - for a Class 2 highway, 106 km instead of the 75-km ministry best-practice maximum length shown in **Figure 8** (41% longer); and
  - for a Class 3 highway, 188 km instead of the 120-km ministry best-practice maximum length shown in **Figure 8** (57% longer).

(As **Figure 8** indicates, the ministry best-practice maximum circuit length for a Class 4 highway is 206 km and for a Class 5 highway is 336 km. We did not find any examples of winning contractors significantly exceeding these maximums in their equipment calculations for these two highway classes.)

- **Equipment speeds:**
  - while spreading, 50 km/hr instead of the 32-km/hr ministry best-practice maximum speed shown in **Figure 8** (56% faster);
  - while plowing, 50 km/hr instead of the 42-km/hr ministry best-practice maximum speed shown in **Figure 8** (20% faster); and
  - while travelling, 80 km/hr instead of the 60-km/hr ministry best-practice maximum speed noted in **Figure 8** (33% faster).

Lowest-price Procurement

Contractors bidding for a performance-based AMC were aware that winning the AMC would depend on their bidding the lowest price. Since the cost of equipment is the major component for contractors to base their bid prices on, it was in the contractors' interest to devise work plans that required the smallest amount of equipment possible, and to base their bids on that. With the freedom to insert

Figure 10: Increased Maximum Circuit Times Under Performance-based AMCs (minutes)

Source of data: Ministry of Transportation

Highway Class	A. Original AMC Maximum Circuit Time	B. Performance-based AMC Outcome Target	C. Time Extension (B – A = C)	D. Added Minutes From Not Including Return Trip to Yard*	E. Total Added Time to Complete Circuit (C + D = E)
1	78	96	18	13	31
2	108	132	24	13	37
3	174	198	24	13	37
4	294	330	36	13	49
5	480	600	120	13	133

* Although the Ministry estimated the trip to the yard takes an average of 13 minutes, we noted instances in northern Ontario where it could take as long as 53 minutes.

their own circuit lengths and equipment speeds in calculating their equipment needs, as well as the opportunity to input the longer circuit times allowed by the Ministry, the winning contractors for most contract areas proposed reduced equipment levels, at the risk of incurring significant fines.

Regional ministry staff in one area looked at how storm plowing service changed for a specific stretch of Highway 401 from the original AMC to the performance-based AMC. Under the original AMC, following the best-practice maximum for circuit length, the stretch was divided into 13 plow circuits. The equipment level for servicing the stretch, in accordance with the best-practice maximums for equipment speed and circuit time, was 27 pieces of equipment. The winning contractor's proposal for the performance-based AMC, which was not required to follow the best-practice maximums for circuit length and equipment speed, divided the stretch into eight longer plow circuits and assumed equipment speeds during a snow storm of 50 km/hr. It also used the longer circuit-time outcome targets. These changes resulted in a 37% drop in winter equipment, from 27 pieces of equipment to 17 pieces of equipment, to service the same stretch of highway.

Overall Impact on Different Kinds of Equipment Used

Overall, under performance-based contracts, there was a significant reduction in equipment (that is, plows, spreaders and combination units) used. In 16 out of 20 contract areas, the total amount of equipment used under performance-based contracts was 19% less than what was used before the introduction of performance-based contracts. In the remaining four contract areas, equipment levels increased by a total of 22%, which includes the additional units discussed in **Section 5.5.4**.

Figure 11 compares the use of equipment before and after performance-based contracting for each type of equipment by contract area.

Figure 11 also shows that, while equipment levels have decreased overall (including a 38% decrease in plows from 357 to 223, and a 100% decrease in spreaders from 133 to 0), there has been an increase in combination units. Combination units are less expensive to operate since only one driver instead of two is needed to perform both plowing and spreading activities. Also, since a single combination unit can replace two pieces of equipment (one plow and one spreader), repairs and maintenance costs are lower. Thus, the move to replace plows and spreaders with combination units enables performance-based contractors to cut costs.

However, winter highway maintenance has been negatively impacted by this change in the following three instances:

- *When salting and plow routes have different starting and end points and salting is not completed quickly enough:* For highways to be maintained effectively, salting takes place first on the salting route. At a certain point afterwards, once road and weather conditions have reached a certain state, plowing begins on the plow route. When combination units are assigned to do both, and the salting and plow routes have different starting and end points, the unit may still be salting on the salting route when it should begin plowing on the plow route, and snow and ice may accumulate on the plow route for want of an available plow.
- *When salting and plow routes are the same but salt needs to be reloaded during a storm:* Combination units can plow and salt at the same time when the salting and plow routes are the same. However, if salt needs to be reloaded during a storm, the time taken to travel to the reloading yard from the route that's being serviced, and back, can result in contractors not maintaining continuous plowing operations during a storm. This is especially a concern in rural communities, where we noted that reloading yards can be up to an hour away from plow and salting routes, resulting in highways not being plowed for up to two hours during a storm because a combination unit needs to be reloaded with salt.

Figure 11: Changes in Winter Maintenance Equipment Under Performance-based AMCs by Contract Area

Source of data: Ministry of Transportation

	Plows			Salt and Sand Spreaders			Combination Units		
Contract Area	# Under MO Contracts and Older AMCs	# Under Performance-based AMCs*	Change (%)	# Under MO Contracts and Older AMCs	# Under Performance-based AMCs*	Change (%)	# Under MO Contracts and Older AMCs	# Under Performance-based AMCs*	Change (%)
Sault Ste. Marie	11	0	(100)	9	0	(100)	23	29	26
Niagara-Hamilton	57	21	(63)	30	0	(100)	12	30	150
Sudbury	11	5	(55)	9	0	(100)	16	26	63
Thunder Bay East	11	5	(55)	6	0	(100)	38	38	0
London	42	22	(48)	11	0	(100)	34	41	21
Durham	26	16	(38)	14	0	(100)	17	24	41
Peel-Halton	62	40	(35)	19	0	(100)	26	54	108
Ottawa and Kingston East	40	26	(35)	3	0	(100)	75	51	(32)
Huntsville	13	9	(31)	8	0	(100)	18	29	61
Simcoe	14	10	(29)	5	0	(100)	20	24	20
Bancroft and Kingston West	15	11	(27)	0	0	None	63	42	(33)
Chatham	14	12	(14)	2	0	(100)	26	26	0
Toronto-York	41	39	(5)	17	0	(100)	17	48	182
North Bay	0	2	100	0	0	None	31	28	(10)
Owen Sound	0	2	100	0	0	None	34	30	(12)
Thunder Bay West	0	3	100	0	0	None	24	15	(38)
Kenora	0	0	None	0	0	None	31	28	(10)
New Liskeard-Cochrane	0	0	None	0	0	None	43	39	(9)
Total	**357**	**223**	**(38)**	**133**	**0**	**(100)**	**548**	**602**	**10**
	490 plows and spreaders reduced to 223 = (54%) drop								

Note: There are 20 contract areas. In this figure, information from Ottawa and Kingston East, and from Bancroft and Kingston West, has been combined.

* This number refers to equipment levels at the time performance-based AMCs were awarded. At the time of our audit, after the Ministry had taken some action to address some of the shortfalls in service (see Section 5.5), there were 261 plows, 0 spreaders and 697 combination units.

- *When units are not available for "echelon plowing":* On multi-lane highways, not only should plowing begin without delay when conditions dictate, but all lanes must be plowed together, with a row or echelon of plowing equipment available to work in unison across the lanes (this is referred to as "echelon plowing"). We noted instances of contractors not meeting the outcome targets for echelon plowing; in some cases, echelon plowing was delayed for up to three hours because combination units were still salting and unavailable for plowing.

Aging Equipment and Breakdowns

Since performance-based AMCs do not specify the minimum age and condition of the equipment used for highway maintenance, contractors using old and poorly functioning equipment is a concern. For example, we found that an aging equipment fleet and breakdowns significantly reduced service levels in two contract areas. In one, about half the equipment was approaching the end of, or already past, its useful life, and there was an average of eight breakdowns per day during the 2013/14 winter. During a snowstorm in that year, 18 units, representing 35% of the contractor's total fleet, broke down, and the highways could not be satisfactorily plowed and salted as a result.

Reductions in Plowing and Salting Service

The new circuit-time outcome targets under performance-based contracting, along with changes in ministry requirements for clearing ramps, shoulders, and truck-climbing and passing lanes, led to reductions in plowing and salting service.

Impact of New Circuit-time Outcome Targets

The fact that circuit times were longer under performance-based AMCs, as well as the added minutes from not including the return trip to the yard (see **Figure 10**), meant that highways could be plowed less frequently during storms than they were required to be under the original AMCs. Specifically, we found that these changes resulted in the following potential drops in plowing and salting frequency under performance-based AMCs as compared to under the original AMCs:

- up to a 40% drop in plowing and salting frequency for Class 1 highways;
- up to a 34% drop in plowing and salting frequency for Class 2 highways;
- up to a 21% drop in plowing and salting frequency for Class 3 highways;
- up to a 17% drop in plowing and salting frequency for Class 4 highways; and
- up to a 28% drop in plowing and salting frequency for Class 5 highways.

Impact of Changes in Ministry Requirements for Clearing Ramps, Shoulders, and Truck-climbing and Passing lanes

For highway ramps, shoulders and truck-climbing and passing lanes (segments), the Ministry changed the required service levels (see **Figure 9**). It eliminated the following requirements for plowing during a storm:

- plowing non-freeway shoulders where an excessive amount of snow has accumulated;
- plowing right-side freeway shoulders where an excessive amount of snow has accumulated;
- continuously plowing left-side freeway shoulders; and
- continuously plowing blowing snow that causes snowdrifts on shoulders.

It also made the following reductions in required service levels:

- Plowing frequency on interchange ramps during a storm was reduced in most contract areas.
- Plowing frequency on truck-climbing and passing lanes was required only once snow accumulation exceeded 15 cm.

An internal review the OPP conducted on winter highway maintenance and public safety in winter 2013/14 reported the frustrations of front-line police officers with these reduced service levels. The report cited examples of OPP officers having to

pull over vehicles or park in active traffic lanes while responding to accident victims, because freeway shoulders had not been cleared of ice and snow.

When the original AMCs were in effect, the Ministry had arranged for segments of certain highways to be plowed even more frequently than dictated by best practices. This was done for safety reasons. For example, certain ramps in Southern Ontario that had higher historical collision rates were plowed more frequently to reduce the risk of collisions. The switch to performance-based AMCs resulted in an even more noticeable reduction in service in these areas than noticed elsewhere in the province.

Even after the switch to performance-based AMCs, ministry staff and engineers could request increased plowing frequency for ramps, shoulders, and truck-climbing and passing lanes in some areas. However, when ministry staff and engineers made these requests, there was no formal process at the Ministry for approving them—there were no guidelines to follow or protocols to apply in accepting or denying requests. In reviewing a sample of these requests, we did not find any consistent basis for the Ministry's approval or denial of these requests; for instance, a request from one region to plow truck-climbing and passing lanes more frequently was accepted while a similar request from another region was denied. The Ministry denied a number of requests where staff had warned that reduced plowing would "directly lead to increased hazardous winter driving conditions," and even one request where its own study of ramps on a specific highway recommended more frequent plowing and salting. This inconsistent approval process resulted in highway maintenance service levels varying between regions. Drivers travelling from one region to another may have had to cope with unexpected conditions as a result.

In **Section 5.5**, we note actions the Ministry was taking to increase the amount of equipment used and to change required maintenance activities in order to improve service for ramps, shoulders and truck-climbing and passing lanes.

RECOMMENDATION 1

To ensure effective winter highway maintenance and enhance road safety, the Ministry of Transportation should:

- verify that contractors have a sufficient quantity of each type of winter equipment, in good working order, in all contract areas (this might include introducing guidance for contractors to use in their equipment calculations relating to circuit times, circuit lengths and equipment speeds);
- if it determines that an area has an insufficient quantity of each type of winter equipment for effective highway maintenance, work with that area's contractor to resolve issues and bring winter road maintenance to effective levels; and
- establish protocols for appropriately and consistently responding to requests from its staff for increased winter highway maintenance.

MINISTRY RESPONSE

The Ministry agrees with the Auditor General that having contractors provide sufficient equipment in good working order is a key requirement of achieving appropriate, timely and effective winter maintenance.

Since the Ministry's 2013 Winter Maintenance Review, the Ministry has worked with contractors to add winter equipment across the province to better service passing and truck-climbing lanes, freeway ramps and shoulders, and to improve their compliance with circuit-time requirements.

The recent RFP for the Kenora area prescribes how to calculate the amount and type of equipment required. All future performance-based contracts will include this and other equipment-related requirements.

The Ministry will continue to monitor winter maintenance performance in each contract area

and will work with contractors to address any chronic issues, including equipment reliability and complement. Adjustments within existing contracts will be considered on a case-by-case basis to ensure value for money.

By October 2015, the Ministry will have established protocols for consistent and appropriate responses to staff requests for increased winter highway maintenance.

5.1.2 Contractors Under Performance-based Contracts Used Less Treatment Material to Service Highways

Spreading materials such as salt, sand and anti-icing liquids to treat highways is an important winter maintenance activity.

- Salt should be applied to roads at the beginning of a snowstorm to help prevent the buildup of snow and ice. Also, when salt has been applied, it is easier for plows to remove built-up snow.
- Anti-icing liquids, which function similarly to salt, should be applied before a storm to prevent icy and slippery road conditions and delay the buildup of snow and ice.
- Sand, which is abrasive and can provide traction on slippery roads, should be applied when temperatures are too low for salt or anti-icing liquids.

Cost-sharing arrangements for these materials under the original AMCs were changed under the performance-based AMCs. These changes enabled contractors under performance-based AMCs to use smaller amounts of treatment materials, which affected service levels.

Original AMC Arrangements Regarding Treatment Material

Under the original AMCs, the Ministry shared salt and sand usage costs. The cost of any amount of salt and sand the contractor used that was more than 10% of the average amount of salt and sand used over the past five years was reimbursed to the contractor by the Ministry. On the other hand, if a contractor used less than 70% of the average amount of salt and sand it had used over the past five years, it had to reimburse the Ministry for the cost of the unused salt and sand.

The Ministry also specified how many litres of anti-icing liquid was to be used in each contract area.

Changes Under Performance-based AMCs

Under the performance-based AMCs, contractors no longer had to reimburse the Ministry for unused salt costs. This created an incentive for contractors to use less salt, saving money for the contractors in the long run.

Also, how much anti-icing liquid to use was entirely up to the contractor, as long as outcome targets relating to ground frost and slippery road conditions were met. This also created an incentive for contractors to use less anti-icing liquid to save money.

We found that most contractors acted on these incentives and used less treatment material. Specifically:

- Salt use decreased in about one-fifth of the contract areas in the first year the areas began to be maintained under performance-based AMCs. The average amount of the decrease in these areas was almost 20%.
- In one instance, one contractor in southern Ontario inappropriately supplemented its salt use with sand on the area's Class 1 and 2 highways. Sand is cheaper than salt but, under the conditions in this instance, less effective. As a result, the highways that were treated this way did not achieve the bare-pavement outcome in the required time.
- Anti-icing-liquid use decreased in most contract areas in the first year the areas began to be maintained under performance-based AMCs. The average amount of the decrease in these areas was almost 75%. Some contractors almost eliminated the use of anti-icing

liquid altogether. In one contract area, anti-icing-liquid use over the winter season was nearly eliminated, going from an average of 3.2 million litres under the original AMC to 9,500 litres in the first year of the performance-based AMC.

In **Section 5.5**, we review changes the Ministry has made to the cost-sharing arrangements for treatment material in response to these contractor practices.

RECOMMENDATION 2

To help ensure that contractors use treatment materials proactively to perform effective winter highway maintenance, the Ministry of Transportation should re-establish cost-sharing arrangements and other measures that encourage such proactive use of materials in all contract areas.

MINISTRY RESPONSE

The Ministry agrees with the Auditor General that the timely and appropriate use of treatment materials allows highways to be maintained more effectively.

The Ministry had similar observations and, starting last winter, re-established for existing contracts a cost-sharing arrangement that encourages contractors to proactively use treatment materials at appropriate levels.

The recent RFP for the Kenora area details the quantities of materials (salt, sand and anti-icing liquid) that a contractor is reasonably expected to use.

All future performance-based contracts will include expected quantities and related cost-sharing arrangements. In addition, as part of the RFP process, the Ministry will evaluate each contractor's strategy to proactively use materials to maintain and restore bare pavement.

5.1.3 Contractors Under Performance-based Contracts Patrolled Less Often, Resulting in Service Failures

Patrollers—the "eyes on the road"—monitor road and weather conditions to decide when to deploy plows and spreaders and what treatment material should be used. They are also required to provide accurate and timely reports on road and weather conditions to the Ministry, which the Ministry then makes public on its website.

Original AMC Requirements Regarding Patrolling

Under the original AMCs, contractors' hours of operation had to include patrolling all their area highways at least once a day in winter. In competing for the AMC, contractors had to include a patrolling strategy in their proposals. The strategy included information on patrollers' shift schedules (for example, three eight-hour shifts to ensure 24-hour coverage), the number of patrol yards, the number of patrollers per yard and the number of kilometres each patroller would be responsible for (the Ministry deemed a reasonable length of route for a patroller to be responsible for to be 300–350 km). The Ministry assessed the strategy and contractors' hours of operation to ensure that daily or more frequent patrolling would occur.

Changes Under Performance-based AMCs

Patrolling requirements under performance-based AMCs were far different: there were no outcome targets for patrolling, and the only requirement for contractors was to "be aware" of road and weather conditions, where doing so is not tied to any minimum hours of operation. Also, in competing for the performance-based AMCs, contractors were not required to include as detailed a patrolling strategy in their proposals as contractors under the original AMCs were required to include. The Ministry informed us that it was therefore not in a position to provide us with any information about patrol coverage across the province.

We found the following:

- Patrolling and therefore service delivery varies from area to area because contractors interpret the requirement to "be aware" of road and weather conditions differently. For example, one contractor chooses not to use weather radar information to determine when to deploy plows and spreaders, and another contractor chooses not to patrol some parts of its area 24-7.
- Some contractors have made individual patrollers responsible for monitoring routes in excess of 350 km. One patroller was responsible for a 700-km route. This poses the risk of decreased overall awareness of highway conditions on the part of the patroller and, as a result, less effective patrolling.

Examples of Patrolling-related Service Failures

Our review of information provided at ministry regional offices found examples of contractors being noticeably unaware of actual road conditions and of contractors making inaccurate reports of road conditions to the Ministry. These included the following:

- A contractor that chose not to patrol its area 24-7 was not aware of ground frost causing slippery driving conditions and therefore did not deploy the equipment required to address the road hazard. During that time, an accident occurred and a person died.
- A patroller reported that road conditions were partly snow-packed. However, a regional Maintenance Co-ordinator (a ministry staff person responsible for contract oversight) driving through the area being reported on at the time took photographs showing that the road was completely snow-packed.
- A patroller reported that road conditions were "bare and dry." However, weather information on the area being reported on at the time indicated that snow had begun falling an hour before. Two hours after the storm started, an SUV slid off the highway, and the OPP recorded that roads were "covered in snow" at the time of the accident.

Also, information reported by patrollers is fed into the Ministry's Ontario 511 website, which is used for public reporting of highway conditions. Therefore, patrolling-related service failures, such as those noted above, result in the website reporting inaccurate information.

The Ministry expressed concerns that there also may be delays between when contractors observe information on road conditions and when they report the information to the Ministry, making this information not as useful to highway drivers as it needs to be. However, the Ministry does not collect information on these potential delays.

RECOMMENDATION 3

To ensure that winter highway maintenance activities are timely and effective, and to ensure that highway and weather conditions are accurately reported to the Ministry of Transportation (Ministry), the Ministry should prescribe in detail the responsibilities of contractors for patrolling and ensure it obtains the information necessary to assess contractors' ability to meet those responsibilities.

MINISTRY RESPONSE

As identified in its 2013 Winter Maintenance Review, the Ministry is committed to ensuring that contractors must be aware of and accurately report highway and weather conditions to provide effective maintenance services.

After winter 2013/14, the Ministry worked with contractors to deliver patroller training to ministry and contractors' staff.

For current contracts, the Ministry will continue to verify that contractors are appropriately monitoring and reporting road and weather conditions. Any concerns with the contractor's awareness will continue to be immediately

addressed. Recently developed patroller training will be delivered to contractors' staff prior to the start of each winter season.

The Ministry will continue to add more Road Weather Information System (RWIS) stations and roadside cameras to supplement patrolling observations.

Our recent RFP for the Kenora area includes minimum patrolling requirements consistent with ministry best practices. This requirement will be included in all future performance-based contracts. For future contracts, the Ministry will also consider contract models that include the Ministry patrolling and directing operations.

RECOMMENDATION 4

To improve the reliability of the Ontario 511 website, the Ministry of Transportation should monitor when information is collected in each area and update the website regularly, clearly indicating the time at which the information on road conditions was observed by the contractor.

MINISTRY RESPONSE

The Ministry agrees with the importance the Auditor General places on contractors reporting, and the Ontario 511 website providing, accurate and timely information.

For current contracts, the Ministry will reinforce the importance of reporting changes to road and weather conditions as they occur during the annual patroller training, and will more closely monitor this requirement going forward.

The new RFP for Kenora and all future contracts will include prescriptive responsibilities for patrolling, including reporting changes to road conditions that occur or are observed between scheduled reporting times.

The Ministry has also been reviewing the technology of the Ontario 511 website to support time-stamped information as well as new technologies, such as automating road-condition reporting, displaying roadside camera images, and providing the locations and camera images from maintenance equipment. All of this will be undertaken to provide the public more complete and timely information on road conditions.

5.2 Process for Procuring Performance-based Contractors Not Prudent

The Ministry changed its process for procuring contractors under the performance-based AMCs. For the 16 original AMCs, it selected contractors on the basis of which contractor would provide the best overall value. It followed a process that factored in the quality of contractors' proposals along with the prices the contractors bid. For the 20 performance-based AMCs, the process allowed contractors not equipped to provide adequate service to bid for the contract. The final selection did not distinguish between better-equipped, adequately equipped and inadequately equipped contractors—whichever bid the lowest price was awarded the contract. As a result, the Ministry did not ensure that the contractors it selected could provide effective winter road maintenance services.

Even when ministry staff expressed concerns about the fact that the winning contractors for most of the contract areas would likely not deliver sufficient winter maintenance, the Ministry decided to proceed with its procurement approach after receiving assurances from the contractors that they would meet outcome targets within the contracts.

In the following subsections, we examine the process in detail and outline our concerns.

5.2.1 Process Did Not Adequately Factor In Contractors' Ability to Deliver Services

The procurement process had two stages. In the first stage, contractors that met the minimum pre-qualification requirements (an example of a pre-qualification requirement was having the financial capacity

to perform the work) submitted winter maintenance strategies, which the Ministry scored using the criteria in **Appendix 3**. Any contractor that scored 70% on these criteria passed on to the second stage. In the second stage, the contractor proposing the lowest price was awarded the contract.

In analyzing the weighting of the criteria, we noted that critical factors relating to a contractors' ability to perform satisfactorily were given the same weighting as administrative matters, which were less relevant to effective winter maintenance. For example, contractors received almost the same number of points for having enough equipment to maintain highways adequately as for things such as correctly identifying the dates of winter transition periods (even though the Ministry provided them with these dates) and remembering to include all the routes from their maps in other parts of the proposal. The adequacy of contractors' equipment accounted for 15% of the criteria on which contractors were evaluated, while points awarded for the formatting and physical presentation of contractors' proposals accounted for 13%.

As made clear in **Section 5.1.1**, having enough equipment is crucial for maintaining winter highways adequately. Even if a contractor scores well on all kinds of other criteria, if the contractor does not come into the job with enough equipment, it is not possible for the service provided to be fully satisfactory. However, under the Ministry's scoring methodology, contractors that proposed using significantly less equipment than had ever been used before could pass on to the bidding stage. Once at the bidding stage, qualitative differences between contractors in respect of equipment levels or any other aspect of maintenance were irrelevant. In fact, as discussed in **Section 5.1.1**, determining the winner at this stage solely on the basis of lowest price favoured contractors that pursued every possible way to cut costs, including using the least amount of equipment.

In support of these concerns, we noted that 75% of the winning proposals we sampled did not obtain full points in the more important areas of winter highway maintenance, such as the contractor's ability to meet required circuit times with the proposed level of equipment.

5.2.2 Concerns Raised by Ministry Staff and Engineers Did Not Affect Contractor Selection

For most of the 20 performance-based AMCs, some of the regional ministry staff and engineers evaluating the proposals expressed serious concerns about awarding contracts to the contractors with the lowest-priced proposals. The reason was the inadequate level of equipment and the likelihood of contractors not consistently meeting outcome targets. Examples of the documented concerns were:

- "The equipment complement does not appear to be adequate."
- "Plow route is close to the maximum circuit time allowed…circuit times on this route may not be achieved."
- "Route does not have sufficient equipment to service the multi-lanes through the town."
- "There is insufficient equipment to service all lanes."
- "Route may have insufficient equipment to plow all lanes and shoulders on Hwy 401 eastbound express."

These concerns were formally brought to personnel at the Ministry's head office. We found, however, that these concerns were not fully resolved. Personnel at the Ministry's head office instructed regional staff and engineers to accept the lowest-priced bids regardless of their concerns. The head office position was that a key attribute of performance-based contracting is that contractors are to be given full autonomy to fulfill their responsibility for achieving stated outcomes. Requiring them to add more equipment during the procurement process to address the Ministry's concerns does not align with their having full autonomy to get the job done.

Certain ministry staff tested one winning contractor's proposed winter maintenance strategy to see if it could meet the circuit-time outcome target.

They conducted a trial run of a circuit on a clear day, on bare and dry roads, using the contractor's proposed strategy. The time to complete the circuit was 40% over the outcome target time. It was therefore extremely unlikely that this contractor's strategy could result in meeting the target during a storm.

Some concerned ministry staff formally notified the contractors whose proposals they deemed lacking that they would be fully charged with all related fines if they did not meet outcome targets. This was something the engineers were foreseeing would most certainly occur.

The contractors acknowledged the staff's concerns, and although contractors did not increase their equipment levels, most responded by stating that outcome targets would be met.

5.2.3 Contractors Unable to Meet Contract Requirements

Through audits (see **Section 5.3**), the Ministry identified about 1,100 instances in 2013/14 where contractors did not meet multiple outcome targets, and the Ministry assessed fines against these contractors. Details are given in **Figure 12**. Over a quarter of these instances related to contractors unable to complete their circuits on time.

As noted in **Section 5.1.1**, the Ministry extended the time-length target for completing a plowing-and-salting circuit in the performance-based AMCs, allowing a "buffer." While contractors' failure to meet this target could often be attributed to insufficient equipment, as discussed in **Section 5.1.1**, contractors' poor performance further contributed to poor winter maintenance. In some cases, the safety of the public and providers of emergency services were put at risk. For example:

- During a snowstorm, when a contractor's plow driver should have been plowing routes, he instead sat idle in the plow in a parking lot for almost two hours for no known reason.
- A contractor was more than an hour late in deploying three spreaders (the target to meet was 30 minutes after snow begins falling). During the delay, the roads became slippery. Three car accidents and two deaths occurred on these slippery roads.
- A contractor, not aware of road conditions on highway 400 during a storm that had been predicted long beforehand, was several hours late in deploying spreaders (the OPP had requested the contractor to deploy them three times before the contractor responded). During the delay, an accident involving more than

Figure 12: Fines Assessed, Winter 2013/14

Source of data: Ministry of Transportation

Reason	Amount ($)	# of Instances[1]
Inaccurate reporting of winter operations and activities	360,500	283
Untimely deployment	1,558,050	115
Circuit times not met	7,173,000	300
Continuous plowing service not maintained	250,500	67
Multi-lane highways not plowed using a staggered approach	343,500	41
Incorrect salt and sand application rates	358,000	68
Equipment breakdowns & equipment not fully utilized	1,739,875	156
Bare Pavement not achieved within the maximum time allowed	525,000	13
Frost and slippery conditions not addressed	196,000	11
Other winter maintenance outcome target categories[2]	843,875	65
Total	**13,348,300**	**1,119**

1. Total number of instances where contractors were notified that either one or multiple outcome targets were not met.
2. Includes untimely clearing of shoulders, passing lanes, commuter parking lots and truck inspection stations.

50 vehicles occurred. When the contractor did deploy spreaders, only half of the required spreaders were used.

We were also concerned about the several instances where contractors drove equipment at speeds more than double than those recommended by best practices—going as fast as 70 km/hr—in order to meet their circuit target times and not be fined. Plowing at speeds faster than those recommended by best practices usually will not properly remove snow or slush from the road. When salt or sand is applied at fast speeds, it may bounce off the road onto the shoulder or into a ditch, potentially leaving slippery roads behind.

Our findings on poor contractor performance are corroborated by an internal review the OPP conducted on winter highway maintenance and public safety in winter 2013/14. Based on information from front-line police officers, the review reported that "road maintenance, as it pertains to snow and ice removal, has not been consistent across the province and road conditions have on occasions been one contributing factor to fatal collisions." The report included examples of the frustration with winter highway maintenance service levels experienced by OPP officers across the province, such as:

- OPP officers asking contractors to apply sand and salt to roads covered in ice, and waiting for hours for a response, with many collisions taking place in the meantime; and
- highways being covered in ice and snow for days at a time.

Refusal of Service by One Contractor

In one northern contract area, the contractor's performance went beyond providing poor service to actually refusing to provide service. The Ministry issued a Notice of Default to this contractor in winter 2013/14. This contractor was also fined after a ministry audit, which was triggered by a 14-tractor-trailer pileup in the contract area that had led to an extensive highway closure.

5.2.4 Procuring the Lowest-bidding Contractor Can Cost More in the Long Run

As **Figure 5** showed, procuring contractors based on the lowest-priced proposals did result in cost savings. In fact, the winning bids for 19 of the 20 performance-based AMCs were below what the Ministry estimated the AMCs would cost. Nine of the winning bids were lower than ministry estimates by 30% or more.

However, because service levels deteriorated after the lowest-bidding contractors were procured, the Ministry has incurred unforeseen costs. We discuss this in detail in **Section 5.3.7** and **Section 5.4**. We note here, however, the case of one area where the Ministry has incurred an annual cost of $1.7 million for 13 additional pieces of equipment. This equates to about $131,000 per piece of equipment. The contractor with the second-lowest bid for this area proposed maintaining the highways with 22 more pieces of equipment than the winning contractor did. This contractor's bid was only $700,000 more than the winning bid, which equates to about $32,000 per piece of equipment. A more prudent procurement process that focused on best overall value could have resulted in this area being serviced from the beginning with significantly more equipment at a significantly lower ultimate cost.

RECOMMENDATION 5

To ensure that the Ministry of Transportation (Ministry) procures contractors that can provide effective winter highway maintenance, the Ministry should:

- require tendering contractors to submit detailed and appropriate information in their proposals that demonstrates their ability to meet the required level of service;
- develop an evaluation process that appropriately weights critical factors and includes assessing proposals against the Ministry's historically proven best practices to ensure that the contractor can effectively deliver the required level of service; and

- select the winning proposal using a best-value approach that considers both the price and quality of the proposal.

MINISTRY RESPONSE

The Ministry agrees with the Auditor General that the best-value approach provides a better assessment of a contractor's ability to provide effective highway maintenance. This observation is in line with the Ministry's 2013 Winter Maintenance Review.

The recent RFP for the Kenora area already reflects this recommendation. It requires contractors to demonstrate their ability to meet the required level of service and evaluates critical factors by using a weighted scoring method. In addition, the winning proposal will be selected using a value-based approach.

All future performance-based contracts will include this requirement and will contain additional improvements to the procurement process based on the Auditor General's recommendations.

5.3 Ministry Oversight of Contractors Needs Improvement

Regional Maintenance Co-ordinators employed by the Ministry are responsible for overseeing contractors. They audit the performance of contractors in snowstorms against the outcome targets in the contracts (see **Appendix 1**). Most audits are conducted weeks after the storm, using data gathered during the storm and from contractors.

In the original AMCs, requirements for such things as how much equipment to use and how often to patrol were prescribed—the contractor was obligated to meet these requirements. The contractors further had to follow ministry operational procedures in carrying out the work. The Ministry's oversight responsibilities consisted of observing whether contractors were following these procedures.

These specific requirements are not included in performance-based AMCs, and contractors act autonomously to meet outcome targets. Good oversight of contractors is therefore all the more important to identify contractors that are not operating responsibly and to ensure that all highways throughout the province are adequately maintained in winter. The following subsections outline our concerns with ministry oversight of contractors under performance-based AMCs.

5.3.1 Audits Not Risk-based or the Most Effective

For audits to be most effective, there should be a process for selecting winter storms to audit where there is a greater risk that the service provided by the contractor has been inadequate. There should also be set standards and audit procedures to follow so all areas of the province are overseen consistently, with each area receiving the kind of scrutiny most appropriate to its characteristics and needs. However, we found the following:

- Risk factors, such as highway traffic volumes, weather patterns and the number of fines previously issued to a contractor, were not the basis for audit selection. Also, although contractors in northern Ontario have been found to have more past performance issues than those in southern Ontario, and so are more high-risk, these contractors are not as closely monitored as those in southern Ontario. This is due to the significantly longer highway distances that Co-ordinators in northern Ontario are assigned to monitor. Co-ordinators in northern Ontario can be responsible for as many as 670 kilometres of highway, while those in southern Ontario are responsible for about 250 kilometres.
- Although performance-based AMCs were introduced in 2009, the Ministry has not developed standards for conducting audits and documenting results. We noted great inconsistency in these areas. The average time

for completing an audit was four days, but some Co-ordinators completed audits in less than a day. Also, the documentation in some audit files was so sparse that we could not determine if the audit was adequately performed. Furthermore, areas differed widely in the number of audits that resulted in fines to contractors. In one area, only 31% of audits led to fines charged, while in another, over 80% of audits led to fines charged. Our review of files and our discussions with contractors determined that most of the variance in fines charged was due to inconsistencies in how Co-ordinators performed their audits.

- The number of audits conducted depends on the level of staff available at the time of the audit rather than on the need for audits. The target is for each Co-ordinator to conduct five snowstorm audits from October to April. However, since staffing levels fluctuate throughout the year, the number of audits will similarly fluctuate. In other words, the total number of audits conducted is heavily dependent on staffing levels that the Ministry cannot always control, when it should be set according to a pre-determined plan of audits to be completed based on each area's assessed level of need, with staffing managed to ensure that the plan is followed.

5.3.2 Audit Targets Not Being Met

Even though the main responsibility of each Co-ordinator is to oversee contractors through performing five audits from October to April, we found that more than one-quarter of Co-ordinators did not do so. Co-ordinators who did not meet the five-audit target conducted, on average, less than three audits, and one Co-ordinator performed only one audit over the winter season.

5.3.3 Over-reliance on Contractors' Self-reporting Their Performance

Figure 13 shows the information available to be used by Co-ordinators when conducting an audit.

To assess if a contractor has met an outcome target—for example, deploying salt spreaders within 30 minutes of the time when snow began to fall—Co-ordinators:

- can conduct their own field observation during the storm prior to conducting an audit; and/or
- consult weather radar data to assess when snow began to fall.

They then:

- consult the records of spreading activity submitted by the contractor; and/or
- check the data emitted from the Global Positioning System (GPS) installed in each piece

Figure 13: Information Used By Co-ordinators in Audits

Prepared by the Office of the Auditor General of Ontario

Information Submitted by the Contractor
• Patrol diaries: patrollers' notes on weather and road conditions during patrols
• Winter operations records: details of contractors' plowing and spreading activity
• Bare-pavement reports: the time at which bare pavement was lost and regained, compared with the time at which snowstorms began and ended
• Use of treatment material: total amounts of salt, sand and de-icing liquid used
• Automatic vehicle location: location of all winter vehicles provided by global-positioning-system (GPS) instruments installed in vehicles
Other Information Obtained
• In-field observations: information from the Co-ordinator's own observations during a snowstorm
• Weather data: Weather information obtained via radar
• Communications logs: transcripts of all calls the OPP and patrollers made to the Ministry

of equipment to assess if the spreader began applying salt at the right time.

Most audits are "desk audits," conducted a few weeks after a storm. Desk audits are an effective way to review contractors' performance, but whether contractors met certain outcome targets can be verified only through in-field observations made during and immediately after snowstorms. Examples include whether bare pavement was achieved on time and whether truck-climbing and passing lanes or shoulders were plowed before the storm ended.

We found that the use of in-field observations by Co-ordinators for audits was limited. Instead, Co-ordinators relied on information submitted by contractors. There is an obvious conflict of interest here: it is not in the contractors' interest to report that they have not achieved outcome targets, and contractors are aware that the Co-ordinators' in-field presence is limited. Ministry audits confirmed this: in winter 2013/14, audits identified over 200 instances where contractors submitted inaccurate information to the Ministry. With such a large number of instances of inaccurate information found from a small number of audits, it is highly likely that there have been many more reporting errors that were not caught.

5.3.4 Monitoring Tools Lacking

We noted the following with respect to the monitoring training and tools available to Co-ordinators:

- A comprehensive audit of the winter highway maintenance conducted by a contractor during a snowstorm requires that the Co-ordinator "re-create the storm." This involves making a timeline that includes items such as when snow started falling, when plows and spreaders were deployed and whether plowing was continuous. However, the Ministry provided minimal training to Co-ordinators that covered only how to assess certain outcome targets. Training on how to re-create storms was not provided.
- The Ministry also did not provide Co-ordinators with tools or guidance for making these timelines, and thus not all Co-ordinators made and used them. Of the timelines that were made by Co-ordinators, only some effectively captured all the details needed to reliably assess contractors' performance against outcome targets. Other timelines were much less detailed and incomplete. As a result, contractor performance is not being consistently assessed in all areas of the province.
- We also found that the Ministry did not supply most of its staff with dashboard cameras to use when carrying out in-field audit observations.

5.3.5 Waiving of Fines Inconsistent

Regional ministry staff have the discretion to waive the fines that Co-ordinators conclude should be levied against contractors for not meeting their outcome targets. This undermines the effectiveness of fines as a deterrent to prevent poor contractor performance. It has also resulted in inconsistencies in how the Ministry has responded to service failures throughout the province, which in turn affects service delivery, with contractors benefitting from ministry lenience. Contractors themselves confirmed that this was the case in our discussions with them.

We attempted to obtain from the Ministry the amounts of fines assessed and fines waived since the introduction of performance-based AMCs in 2009. However, as discussed in **Section 5.3.6**, due to the incompleteness of the information the Ministry collects and compiles, the Ministry was unable to provide us with these amounts.

The Ministry was able, however, to provide us with the amount of fines actually deducted from payments to contractors since 2009, shown in **Figure 14**.

We compiled information from a variety of sources to determine, for winter 2013/14, the total fines assessed and, from that total, the amounts that were actually deducted versus the amounts

Figure 14: Fines Deducted from Payments to Contractors Since the Introduction of Performance-based Contracts[1]

Source of data: Ministry of Transportation

	Amount ($)						
Region	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15[a]**	**Total**
Central	15,200	–	120,000	36,000	279,000	457,538	**907,738**
North Eastern	–	85,660	435,650	291,150	1,118,250	343,500	**2,274,210**
North Western	–	–	–	62,500	254,500	304,175	**621,175**
Eastern	–	–	–	75,000	1,064,000	223,500	**1,362,500**
Western	–	–	241,600	23,400	188,500	216,000	**669,500**
Total	**15,200**	**85,660**	**797,250**	**488,050**	**2,904,250**	**1,544,713**	**5,835,123**
# of contract areas under performance-based AMCs[2]	**1**	**4**	**6**	**13**	**19**	**20**	

1. Note that when fines are assessed in a given year, they are not necessarily deducted in that year. Actual fines deducted may reflect fines assessed in any previous year and might not include amounts assessed for deduction in that year but not deducted until the following year. Therefore, for example, the total 2013/14 amount of $2.9 million in this figure:
   - includes amounts actually deducted from fines assessed in years previous to 2013/14 and from fines assessed in 2013/14; but
   - does not include amounts from fines assessed in 2013/14 that were not actually deducted until 2014/15.
2. Performance-based AMCs were phased in over a six-year period. Each year from 2009/10, highway maintenance for a few more contract areas became performance-based.

a. Amounts are as of January 26, 2015.

that were waived and held. **Figure 15** shows the results by region. As **Figure 15** shows, a total of $4.9 million in fines was waived by regional ministry staff in winter 2013/14.

We found that regional ministry staff acted inconsistently in their waiving of fines. Some staff never waived fines, while others were more lenient in an attempt to promote better performance in their respective areas. In one contract area in the Northeastern Region, 75% of the total $700,000 in assessed fines was waived, whereas in other contract areas in both the Eastern and Western Regions, fines were not waived at all.

5.3.6 Information for Decision-making Lacking

At the time of our audit, the Ministry was in the process of completing the development of a central database to store the information gathered from audits. We were concerned that this vital tool for oversight was not yet functional years after the introduction of performance-based AMCs. A trial of the system was conducted in 2013/14, and the system was launched in 2014/15. Its data at the time of our audit was still incomplete and, in some cases, inaccurate.

We were also concerned that the Ministry does not have a system for processing and analyzing the automatic vehicle location information that contractors submit to the Ministry (see **Figure 13**). This information details contractors' plowing and spreading activity. Determining, for example, actual average vehicle speeds would greatly help the Ministry in its oversight of contractors and winter highway maintenance.

5.3.7 Potentially Increased Legal Costs Not Considered

Under the *Public Transportation and Highway Improvement Act*, the Ministry bears the legal responsibility to maintain and keep in repair provincial highways, and bears the legal liability for failure to do so. Under the performance-based AMCs, contractors may also be liable if they fail to

Figure 15: Breakdown of Fines Assessed from Winter 2013/14 Audits by Ministry Region

Source of data: Ministry of Transportation

Region	# of Contract Areas	Total Fines Assesed ($)	Amounts Deducted[1] ($)	Amounts Deducted[1] (%)	Amounts Waived[2] ($)	Amounts Waived[2] (%)	Amounts Under Review[3] ($)	Amounts Under Review[3] (%)
Central	4	2,187,000	816,500	37	1,017,500	47	353,000	16
Eastern	4	6,927,500	421,000	6	2,596,000	37	3,910,500	56
Western	3	1,375,000	895,000	65	95,000	7	385,000	28
Northeastern	4	1,940,625	541,975	28	776,400	40	622,250	32
Northwestern	4	918,175	524,675	57	393,500	43	—	0
Total	**18[a]**	**13,348,300**	**3,199,150**	**24**	**4,878,400**	**37**	**5,270,750**	**39**

1. As noted in Figure 13 footnote 1, some of the total fines assessed in 2013/14 were actually deducted in 2013/14, and some were carried over and deducted in 2014/15. The $3.2-million total amount deducted in this Figure includes both these amounts.
2. Amounts waived at the discretion of regional ministry staff.
3. Includes (i) fines where the Ministry is awaiting on, or reviewing additional information submitted by the contractor, (ii) fines held in abeyance as a result of negotiations with contractors as discussed in section 5.5.5, and (iii) fines being appealed by the contractor.

a. Two of the total 20 contract areas were not yet under performance-based contracts in winter 2013/14 (they transitioned into performance-based contracts in winter 2014/15).

be in material compliance with the contract. Under the government-operated road liability insurance program, primarily the Province, not contractors, may be exposed to paying damages if inadequate road maintenance was a contributing factor in vehicle collisions. To date, the Province has not held contractors liable for any such damages.

The Ministry informed us that it believed that the shift to performance-based AMCs in 2009 would not affect the Province's liability risk. It further believed that fines collected would be sufficient to cover the actual loss or damage that the Ministry could accrue as a result of failure to provide the service. Nevertheless, the deterioration in service under performance-based AMCs increases the risk of higher legal costs for the Province.

To give an idea of the magnitude of the liability risk involved, although the OPP identified that accidents have decreased since 2009, there have been 217 claims for damages against the Province since that same year because of vehicle accidents where inadequate winter highway maintenance was thought to be a factor. Of these claims, 23 have been settled, at a cost to the Province of $8.1 million.

RECOMMENDATION 6

To improve its oversight of contractors' performance and to ensure consistent oversight across the province, the Ministry of Transportation should:

- develop a standardized process for conducting audits (integrating in-storm observations) and issuing fines, and ensure that staff are adequately trained and equipped with all the tools needed to implement this process;
- ensure that decisions to waive fines are appropriately justified and documented, and are consistently applied throughout the province;
- establish a target number of audits for each contract area based on appropriate risk factors;
- develop and implement a robust centralized system that tracks the results of all audits and fines to better enable provincial analysis of contractors' performance; and
- consider incorporating contractor liability for inadequate winter highway maintenance in performance-based contracts to the extent that is reasonable and possible.

MINISTRY RESPONSE

The Ministry agrees with the Auditor General's observations regarding the oversight of contractors' performance and has already added 20 additional oversight staff (one per contract area). Other organizational changes were made and new training delivered to enhance and improve oversight consistency.

In September 2015, the Ministry will deliver an updated training course for staff on its new standardized process for conducting audits, including winter storm re-creation, documentation of non-conformance and required checklists. A revised process for assessing compliance with contract requirements, and assessing and consistently applying financial consequences is now in place.

The Ministry will develop a process that ensures that financial consequences (fines) that are waived are appropriately justified and documented, and consistent throughout the province.

The Ministry will also review the audit targets for each contract area and will assess whether audits will be selected based on appropriate risk factors.

As part of the Ministry's new contract management system, a centralized database system will be developed to track oversight targets, audit results and financial consequences (fines) waived or applied.

For future contracts, the Ministry will review the Area Maintenance Contract liability provisions.

5.4 Public Reporting on Highway Maintenance Does Not Tell the Whole Story

Since winter 2004/05, the Ministry has been publicly reporting on whether its target for achieving bare pavement was reached across the province. The target is that bare pavement be achieved within the time limit for each class of highway (see **Figure 2** in **Section 2.1**) for 90% of the storms in a winter season. The Ministry set the bare-pavement maximum time-limit standards and the performance target of 90% in the 1990s based on information obtained from its other jurisdiction analysis.

The Ministry has publicly reported that the performance target of 90% has been achieved every winter since 2004/05, including in winter 2013/14.

However, the 90% or higher achievement rate reported by the Ministry is the average for the province as a whole, and the achievement rates for individual contract areas are not publicly reported. As **Figure 16** shows, the bare pavement

Figure 16: Percentage of Winter 2013/14 Snowstorms Where Bare Pavement Achieved Within Target Time, By Contract Area

Source of data: Ministry of Transportation

	(%)
Northern Ontario	
Kenora	69
Thunder Bay West	79
Thunder Bay East	87
New Liskeard-Cochrane	94
Sault Ste. Marie	94
North Bay	95
Sudbury	97
Southern Ontario	
Niagara-Hamilton	no data*
Kingston West	87
Chatham	88
Simcoe	89
Ottawa	91
London	91
Kingston East	92
Peel-Halton	92
Bancroft	93
Huntsville	94
Durham	96
Toronto-York	97
Owen Sound	100

* The contractor did not submit any bare-pavement information to the Ministry. The Ministry did not take adequate steps to obtain this information before reporting publicly.

performance target of 90% was not achieved for six out of the 20 contract areas in winter 2013/14. In one additional contract area, the contractor did not submit any bare-pavement information to the Ministry. The performance target was achieved in the other contract areas. However, this target on its own is not a measure of whether the winter maintenance activities undertaken during a storm leading up to bare pavement being achieved have been effective.

We were also concerned about the accuracy of the information the Ministry receives from contractors on their performance against the bare-pavement target. In winter 2013/14, Co-ordinator audits identified over 200 instances of contractors submitting inaccurate information to the Ministry. In our audit, we noted instances where some contractors either failed to input bare-pavement data for an entire winter season or reported inaccurate information to the Ministry. We also noted instances where the Ministry, after identifying bare-pavement-data errors, did not correct the information in the system used for public reporting.

We further noted that Ontario's bare-pavement time limit of eight hours after storm end for Class 1 highways is longer than that of other jurisdictions, as shown in **Figure 17**.

Figure 17: Comparison of Bare-pavement Time Limits for Class 1 Highways*

Source of data: Ministry of Transportation

Jurisdiction	# of Hours After Storm End for Bare Pavement to be Achieved
Indiana	2
New York	2
Minnesota	5
Alberta	6
Saskatchewan	6
Ontario	**8**

* Because other jurisdictions define highways in classes 2 to 5 differently from Ontario, it is not possible to compare the bare-pavement time limits for these highways.

RECOMMENDATION 7

To monitor contractors' performance against its bare-pavement standard and to provide meaningful reports to the public on the effectiveness of winter highway maintenance, the Ministry of Transportation (Ministry) should:

- correct any information that it has determined is inaccurate before publicly reporting its results;
- consider publicly reporting contractors' performance against its bare-pavement standard by contract area;
- supplement its public reporting on the bare-pavement standard with information on how highways are being maintained during a storm; and
- assess the adequacy of its bare-pavement time limits in light of the more stringent time limits of other jurisdictions and update its time limits accordingly.

MINISTRY RESPONSE

While the Ministry has consistently met the province-wide bare-pavement performance standard, the Ministry agrees with the Auditor General that its reporting of the bare-pavement standard can be improved to be more meaningful.

Prior to winter 2015/16, the Ministry will deliver training on bare-pavement data management and accuracy, and will increase its oversight of bare-pavement monitoring, data entry and reporting. The Ministry will also correct any information it determines is inaccurate before publicly reporting its results.

The public reporting of bare pavement by contract area will be implemented beginning with the results for winter 2015/16.

The Ministry will continue and expand its outreach program to provide the public with additional information about safe driving and how highways are maintained during a storm.

While the Ministry believes that its current bare-pavement standard is appropriate for the range of weather conditions across the province, it will reassess the standard relative to other jurisdictions as well as the impacts of changing the standard.

5.5 Ministry Actions in Response to Poor Contractor Performance

The Ministry has made a number of attempts to resolve the issues with winter highways not being properly maintained and improve overall service.

5.5.1 Ministry Restored Service Levels for Truck-climbing and Passing Lanes

In 2012, the Ministry changed the outcome target for truck-climbing and passing lanes to address the previously reduced service levels for plowing (as we noted in **Section 5.1.1**, the reduced outcome target was to plow only after an accumulation of more than 15 cm of snow). The Ministry restored service levels, and the new target is to plow continuously during storms and not only when 15 centimetres of snow have accumulated.

5.5.2 Ministry Procured More Equipment for Truck-climbing-lane and Passing-lane Maintenance

To enable contractors to provide the increased plowing services for truck-climbing and passing lanes, the Ministry paid for contractors to procure 55 additional pieces of winter equipment for 11 contract areas. This equipment was procured through direct negotiations with the contractors for these 11 areas and has incurred an annual cost to the Ministry of $9 million (see **Figure 5**). Because the negotiation process took so long, most of the equipment was not deployed until winter 2013/14.

We were concerned that the Ministry paid more for this equipment than it estimated it would cost. Based on our calculations, the total overpayment over the remaining years on the performance-based AMCs will total about $8 million. When the Ministry asked the contractors to support the higher prices, the contractors did not do so, and the Ministry ended up agreeing to the unsupported prices.

As a result of being locked into these performance-based AMCs, the Ministry had to pay to procure these additional pieces of equipment through negotiations with the contractors. As we've noted, if the contracts had been awarded using a process that gave more consideration to whether there would be enough equipment in the first place, these additional units could have been procured competitively through the initial tendering process, resulting in a lower cost.

5.5.3 Ministry Conducted Program Review

Between July and November 2013, the Ministry conducted a high-level review of its own performance in the delivery of winter road maintenance services. The following findings from the program are in line with our audit findings:

- Poor contractor performance needed to be addressed.
  - Use of treatment material: In applying sand, salt and anti-icing liquids, contractors were being reactive rather than proactive. Because performance-based AMCs did not require contractors to reimburse the cost of unused materials, this created an incentive for reduced or risk-managed use of them.
  - Circuit times: Because of higher fine thresholds, circuit times were increased in performance-based AMCs above the times prescribed in the Ministry's Manual and the best-practice times used previously. But there were still chronic issues with some contractors not being able to meet circuit times.
  - Equipment reliability: Equipment age and availability of spare equipment impacted the delivery of winter operations in some areas. This was exacerbated by the reduction in total equipment, leading to reduced flexibility.

- The Province needed to increase plowing frequency on shoulders and ramps in southern Ontario for the sake of the travelling public's safety. The increase in plowing frequency should reflect the best practices found in the Ministry's Manual and the past practices under older AMCs.
- Winter service levels, and potentially highway safety, were negatively impacted by the low-bid procurement process whereby contractors focused on minimizing costs.
- Other findings included the inconsistencies in patrolling highways and the inconsistencies in contract administration and oversight (specifically with respect to audits and fine assessments).

5.5.4 Ministry Procured More Equipment for Freeway Shoulder and Ramp Maintenance

In response to the need for more plowing on freeway shoulders and ramps in southern Ontario, the Ministry paid contractors to procure 12 additional pieces of winter equipment in the 2013/14 fiscal year for the last two performance-based AMCs.

However, since most contracts had already been awarded by the time the Ministry decided to increase plowing frequency on freeway shoulders and ramps in southern Ontario, the Ministry also paid contractors to procure a further 38 pieces of equipment through separate negotiations (discussed in **Section 5.5.5**), for a total of 50 additional units to service freeway shoulders and ramps.

5.5.5 Ministry Negotiated With Contractors

In June 2014, the Ministry began individual negotiations with the five contractors. The key objective of the negotiations was to improve service levels on shoulders and ramps in southern Ontario, and address performance issues.

When we completed our audit in January 2015, the Ministry had signed contract amendments with three contractors. Negotiations with the two remaining contractors were ongoing at the completion of our audit.

The contract amendments signed with the three contractors resulted in the following changes:

- Overall service levels on specific highways in southern Ontario would increase with the addition of 38 more pieces of equipment to service freeway shoulders and ramps. The annual additional cost to the Ministry is $6 million (see **Figure 5**). These 38 pieces of shoulder and ramp equipment plus the 12 added pieces of shoulder and ramp equipment noted in **Section 5.5.4** bring the total additional equipment for shoulder and ramp maintenance to 50. The Ministry confirmed that all 50 pieces of equipments were in service in winter 2014/15.
- The cost-sharing formula for treatment material was retroactively changed. Requiring the contractor to reimburse the Ministry for unused salt and sand was reinstituted. Specifically, if the contractor uses less than 80% of the average amount of salt and sand it used over the past five years, it has to reimburse the Ministry for the cost of the unused salt and sand. Also, the Ministry would reimburse the contractor for the cost of amounts of salt and sand that were 5% more than the contractors' average salt and sand use over the past five years (in the original AMCs, the upper threshold for reimbursement was 10% over the five-year average). The reduction in the upper threshold for the Ministry reimbursing the contractor for higher salt and sand use (from 10% in the original AMCs to 5% in the new formula) led the Ministry to make a one-time retroactive payment to contractors of $4.4 million net of recoveries.
- In two contract areas, the Ministry waived some of the fines charged for poor contractor performance in winter 2013/14. The Ministry also placed an additional amount in abeyance in five contract areas—if the contractors

for these areas improved their performance in winter 2014/15, the fines could be fully waived. (We have not disclosed the specific dollar amounts because the Ministry's negotiations with these contractors were ongoing when we completed our audit, and disclosing the amounts would undermine the Ministry's negotiating position.)

- In response to the forgiven fines, the contractors for four contract areas agreed to add 21 more pieces of equipment at their own cost. The equipment was to be added to specifically address chronic failure to meet circuit times. The contractors for two other contract areas were also required to address equipment breakdowns.

The total cost to the Ministry of additional units of equipment negotiated with contractors was $15 million a year: about $9 million in more equipment for truck-climbing-lane and passing-lane maintenance (**Section 5.5.2**) and about $6 million in more equipment for southern Ontario, mostly for freeway shoulder and ramp maintenance (shown in **Figure 5**).

We found that, despite the additional equipment, nine out of the 20, or almost half, of the contract areas are still being serviced with less equipment than was being used before the performance-based AMCs. Specifically, 13% fewer spreaders and 8% fewer plows are in use.

Some contractors have redesigned their plow routes to find more efficient ways of achieving outcome targets with the available equipment. However, until winter maintenance performed in these areas is assessed in future years, it cannot be determined whether the added equipment and redesigned plow routes have resulted in winter highway maintenance being restored to effective levels.

5.5.6 Ministry Adds More Staff Positions

For winter 2014/15, the Ministry added one more Maintenance Co-ordinator to audit contractor performance, resulting in a total of 53 Maintenance Co-ordinators. In addition, it added 19 new staff positions to support the Maintenance Co-ordinators who conduct audits.

RECOMMENDATION 8

The Ministry should continue to monitor and assess the impact of the remedial measures taken to improve winter highway maintenance to determine whether additional measures are needed to restore highway maintenance and service to the levels delivered before the introduction of performance-based AMC's.

MINISTRY RESPONSE

As noted in the Report, the Ministry has made significant improvements to highway winter maintenance. The Ministry will continue to take steps to enhance winter maintenance, addressing the recommendations of the Auditor General and its own 2013 Winter Maintenance Review.

For the new contract in Kenora and the remedial measures made to the existing contracts, the Ministry will continue to monitor and assess the success of the changes and will assess each contract area for possible additional measures to meet current and future needs.

5.6 Subsequent Event

We substantially completed our fieldwork on January 31, 2015, after which the Ministry informed us that it had mutually agreed with a contractor to terminate one of its performance-based AMCs. As a result, the Ministry will need to procure highway maintenance services for the affected area (Kenora, in northern Ontario), for winter 2015/16.

Before doing so, the Ministry plans to redesign and update its procurement process and the performance-based contract, incorporating a number of our recommendations and findings from its internal review. The Ministry had only just begun incorporating these changes at the time we completed this special report.

Appendix 1—Initial Performance-based AMCs' Outcome Targets and Fines For Not Meeting Targets*

Prepared by the Office of the Auditor General of Ontario

Fines begin to be charged in the first minute after the outcome target is not met. For example, the outcome target for deploying salt spreaders is within 30 minutes after the start of snowfall (see row 2). If spreaders are not deployed any time within the subsequent 45 mintues (i.e., from minute 30 to minute 75 after the start of snowfall), the fine is $5,000. If spreaders are still not deployed any time within the subsequent 15 minutes (i.e., from minute 75 to minute 90 after the start of snowfall), $1,000 is added to the fine. For every 15-minute period from that point on, that spreaders continue to not be deployed, another $1,000 is added to the fine.

Outcome Category	Outcome Target	Fine for Not Meeting Target (initial amount + subsequent amount)
Reporting	All documents are submitted at the bi-weekly intervals set in the contract.	$1,000 for first week + $500/week thereafter
	All documents submitted are accurate and complete.	$1,000
Deployment	Deploy all salt spreaders within 30 minutes after the start of snowfall.	$5,000 for first 45 minutes + $1,000/15 minutes thereafter
	Deploy all plows upon 2 cm of snow or slush accumulation.	$5,000 + $1,000/30 minutes thereafter
Circuit Times	Meet following circuit times for plowing:	
	Class 1: 96 minutes	$5,000 for first 12 minutes + $1,000/10 minutes thereafter
	Class 2: 132 minutes	$5,000 for first 12 minutes + $1,000/13 minutes thereafter
	Class 3: 198 minutes	$5,000 for first 18 minutes + $1,000/20 minutes thereafter
	Class 4: 330 minutes	$5,000 for first 30 minutes + $1,000/30 minutes thereafter
	Class 5: 600 minutes	$5,000 for first 60 minutes + $1,000/45 minutes thereafter
	Meet following circuit times for salting:	
	Class 1: 96 minutes	$5,000 for first 12 minutes + $1,000/10 minutes thereafter
	Class 2: 132 minutes	$5,000 for first 12 minutes + $1,000/13 minutes thereafter
	Class 3: 198 minutes	$5,000 for first 18 minutes + $1,000/20 minutes thereafter
	Class 4: 330 minutes	$5,000 for first 30 minutes + $1,000/30 minutes thereafter
Salt and Sand Application	Slippery sections must be sanded within circuit time of 600 minutes for Class 5 highways.	$3,000 for first 60 minutes + $1,000/60 minutes thereafter
	Application of sand and salt must be at the prescribed application rates at a minimum.	$3,000
	All sand and salt spreader units are to be calibrated within 10% of the prescribed application rates for sand and salt.	$1,000 for first 24 hours + $500/24 hours thereafter
Continuous Plowing	Continuously plow until bare pavement is achieved.	$1,000 + $500/60 minutes thereafter

Outcome Category	Outcome Target	Fine for Not Meeting Target (initial amount + subsequent amount)
Echelon	All lanes on multi-lane highways must be plowed in unison using a staggered approach.	$5,000
Equipment and Utilization Breakdown	Utilize all winter equipment contracted for until bare pavement has been achieved.	$1,000 + $500/60 minutes thereafter
	A pause in plowing service should not exceed more than two hours in the case of equipment breakdowns.	$3,000 for first 18 minutes + $1,000/15 minutes thereafter
Bare Pavement	Achieve bare pavement within following hours after end of a snowstorm:	
	Class 1: 8 hours	$3,000 + $1,000/60 minutes thereafter
	Class 2: 16 hours	$3,000 + $1,000/60 minutes thereafter
	Class 3: 24 hours	$2,000 + $500/60 minutes thereafter
	Class 4: 24 hours	$1,000 + $500/60 minutes thereafter
	Class 5: 24 hours	$500 + $300/60 minutes thereafter
Frost and Slippery Conditions	Address all isolated slippery conditions.	$5,000 for first 120 minutes + $1,000/30 minutes thereafter
	No ground frost must form on road causing slippery conditions.	$5,000 for first 30 minutes + $1,000/30 minutes thereafter
Snow Accumulation	Shoulders and medians must be plowed within 24 hours after end of snow storm.	$1,000 for first 8 hours+ $500/4 hours thereafter
	Median barrier walls should be free from snow accumulation prior to end of snow storm.	$1,000 for first 4 hours + $500/4 hours thereafter
	Any ramping caused due to snow accumulation should be removed within 4 hours of detection.	$1,000 for first 4 hours + $500/4 hours thereafter
	Tall snow banks that impair visibility must be removed or lowered within 48 hours after detection.	$1,000 for first 12 hours + $1,000/12 hours thereafter

Outcome Category	Outcome Target	Fine for Not Meeting Target (initial amount + subsequent amount)
Other	Truck load check areas and truck inspection stations are plowed and salted/sanded within 24 hours after end of a snow storm.	$1,000 for first 8 hours + $500/4 hours thereafter
	Truck-climbing and passing lanes to be plowed when more than 15 cm is accumulated and to be cleared within following timeframes after end of snow storm:	15 cm accumulation target: $1,000 + $1,000/120 minutes
		Penalties for post-storm clearance:
	Class 1: 8 hours	$3,000 + $1,000/60 minutes thereafter
	Class 2: 16 hours	$3,000 + $1,000/60 minutes thereafter
	Class 3: 24 hours	$2,000 + $500/60 minutes thereafter
	Class 4: 24 hours	$1,000 + $500/60 minutes thereafter
	Class 5: 24 hours	$500 + $300/60 minutes thereafter
	All winter vehicles must conform to prescribed lighting specifications.	$500 + $500/day thereafter
	Sand and salt to be stored in covered buildings at all times.	$1,000 for first 120 minutes + $1,000/60 minutes thereafter
	Snow or ice should not cause flooding on roadway or private property due to drainage through culverts and ditches.	$1,000 + all repair costs to return infrastructure to original condition
	Where required, snow fences should meet specific requirements set out in contract.	$1,000 for first week + $500/week thereafter

* Some outcome targets were changed for some later contracts.

Appendix 2—Chronology of Key Events Relating to Winter Highway Maintenance

Prepared by the Office of the Auditor General of Ontario

Oct. 1996	Management Board of Cabinet approves business case submitted by the Ministry of Transportation (Ministry) in support of privatizing highway maintenance. The Ministry begins to privatize the remaining 50% of its in-house highway maintenance operations.
2000	Using the Managed Outsourcing (MO) and Area Maintenance Contract (AMC) contract models, the Ministry completes privatization of all highway maintenance operations across the province.
2009–14	The Ministry introduces a new performance-based AMC contract model and a plan to phase in the new model across the province as the MO contracts and original AMCs expire. As the first contracts are phased in, winter service levels decrease in some of those areas. Ministry continues to phase in performance-based AMCs across all contract areas in the province.
Oct. 2012	In response to concerns with decreased services levels in the northern parts of the province, the Ministry makes a decision to initiate direct negotiations with contractors for the addition of 55 units of winter equipment to specifically service truck-climbing and passing lanes more frequently.
Jan. 2013–Apr. 2014	Fifty-five units of additional winter equipment are phased in and begin servicing highways in mainly northern Ontario, at a total additional cost of $9 million annually.
Jul. 2013	As a result of poor highway maintenance throughout Ontario during winter 2011/12 and winter 2012/13, the Ministry initiates an internal review of its winter maintenance program.
Nov. 2013	Ministry completes its internal review.
Winter 2013/14	A harsh winter combined with poor winter highway maintenance across most areas of the province leads to public and media complaints.
Jan. 2014	Ministry requests additional funding to improve winter highway maintenance across the province.
Feb. 2014	A motion is passed for the Auditor General to conduct a review of the winter road maintenance program.
Jun. 2014	The Ministry obtains approval from Cabinet for an additional $8 million in funding to service shoulders and ramps more frequently in southern Ontario, as well as approval for 20 additional new staff positions to oversee contractor performance.
Jun. 2014–Present	The Ministry enters into direct negotiations with contractors to address poor winter highway maintenance. The Ministry creates 20 new staff positions to oversee contractor performance.
Winter 2014/15	The Ministry signed contract amendments with three out of five contractors to have a total of 59 additional units of winter equipment deployed (38 additional units of equipment allocated to plow freeway shoulders and highway off-ramps and 21 units to improve plowing frequency of highways [the 21 units were paid for by the contractor]).

Appendix 3—Criteria and Scoring for Evaluating Contractors' Winter Maintenance Strategies

Source: Ministry of Transportation

Sub-criteria	Total Points Available	Description of Rated Item
Highway and Route Identification: Provide maps identifying all proposed winter equipment routes including base yard starting and ending points and km for each route. Each route shall be identified by a number/letter.	10	All routes are clearly identified by letter/number and colour
		Kilometres for each route is identified and accurate
		All highways are covered by a route
		Base yards, starting and ending points clearly identified and without gaps
Ground Frost Strategy: Provide the proposed overall strategy to manage the outcome target of "No ground frost on roadway causing slippery conditions during Transition Periods". Identify if this strategy or other strategy will be used outside the Transition Periods.	10	Anti-icing liquid will be used
		Decision will be based on weather forecast
		Proactive salting (prewetting)
		Quality of overall strategy proposed
Isolated Slippery Conditions Strategy: How will the proponent address Isolated Slippery Conditions when all winter equipment is deployed?	10	Will use spares available
		Extra operators available on call
		Redeploy equipment from other routes
		Quality of overall strategy
Equipment Breakdown Strategy: Describe the strategy to address winter equipment breakdowns.	12	Minimum of 10% of winter fleet as spares
		Preventive maintenance progam
		Redeploy equipment from other routes or areas
		Other equipment available from other sources
		Mechanics on staff and available
Overall Strategy: Provide the overall strategy for managing the winter transition periods from fall to winter and winter to spring as it relates to staff and equipment coverage.	13	Dates for transition periods have been identified and are accurate
		Location (yards) of the equipment are identified and all yards have sufficient coverage
		Minimum of 50% of the winter fleet is identified
		Sufficient staff to operate equipment. How will they be deployed?
		How will they be knowledgeable of road and weather conditions during transition periods?
		How will they manage an event that requires more than the 50% of equipment available?
Winter Equipment: Provide the details of all winter equipment to be used on each route including type of equipment, material capacity, type and dimensions of attachments such as plows, reversibles, wings and tow plows.	15	All routes identified are included in list
		Equipment type (plow, spreader, combination unit) identified for each route
		Attachments clearly identified
Route Calculations: For each proposed route, the proponent shall provide on spreadsheets, the total calculated circuit time of each unit (plows, spreaders, combos). Travel speeds for deadheading, salting speeds and plowing speeds must be provided for each unit. The rationale for route calculations shall take actual operating field conditions into account and identify the overall rate of speed and how field conditions would impact the average speed.	30	All routes included in analysis
		Speeds clearly identified (deadhead, salting, plowing)
		Will the route analysis calculations allow the contractor to meet the actual circuit times in most of the cases?
		Have the routes been rationalized to account for field conditions?
		Number and type of equipment will be sufficient to clear all travelled lanes
	100	

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