OFFICE OF THE
City Auditor

Automated Photo Enforcement
Cost Analysis

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THE CITY OF
Edmonton

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

Automated Photo Enforcement Cost Analysis

1.   Introduction

The Office of the City Auditor (OCA) presented the *Automated Photo Enforcement Review* report as part of the September 8, 2014 Audit Committee meeting. That report relied on estimates for some of the financial analysis because actual data were not available in time to meet the report deadlines. At that meeting, Audit Committee passed the following motion:

> That the City Auditor work with Administration and provide a report to Audit Committee with an update on the actual numbers and costing for the Automated Photo Enforcement program up to the end of 2014.

This report provides an up-to-date, all-in cost comparison of the estimated and actual costs of fully absorbing the Automated Photo Enforcement program into City operations. Actual program costing data, including program enhancements, from 2007 through 2014 is included in this report.

2.   Background

The OCA issued the *Automated Photo Enforcement Review* report on August 27, 2014. That report evaluated the degree to which the City had achieved the expected outcomes from Council's 2007 decision to bring automated photo enforcement in-house rather than continue to contract it out. We found that the City achieved the majority of the expected outcomes.[1] However, the expected outcomes of cost savings, system replacement, and synergy between the Automated Photo Enforcement and Bylaw Ticket operations had not been achieved.

Our August 2014 report included an analysis to compare the expected costs with the actual costs. Using 2008 as a base year, we compared cost trends over a five-year period to evaluate the cost-recovery assumptions supporting the Council's 2007 decision.

For this report, we have extended the comparison to an eight-year period. As 2008 marks the year when the City began making expenditures to assume full responsibility for the program, 2007 serves as the benchmark year to which all successive years are compared.

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[1] The expected outcomes were detailed in the report, "Automated Traffic Enforcement – A Recommended Delivery Model for the City of Edmonton" issued in 2007.

3.   Methodology and Scope

We estimated the full cost of the Automated Photo Enforcement program to enhance the comparison between the contracted service provider and the City. This included calculating depreciation costs for some amortizable assets.

We included the annual depreciation costs for vehicles, photo radar and photo laser equipment, intersection safety devices, and ticket processing software using the City's 10-year straight line depreciation methodology.

We used the historical Municipal Price Index[2] to express all operating and capital expenditures in 2014-equivalent dollars.

All operating and capital expenditures of the Automated Photo Enforcement program were in scope, including speed-on-green and red light camera systems and mobile speed enforcement vehicles with their associated equipment. Operating and capital expenditures pertaining to speed management safety programs were excluded.

4.   Observations

We worked with the Administration to determine the program's capital and operating expenditures by year. For the purposes of this report, operating costs included violation processing costs and depreciation associated with the equipment and software. Tables 1 and 2 summarize the actual program capital and operating expenditures for 2007 through 2014. They also include the values originally presented to Council in 2007 to support the recommendation to bring the program in-house.

4.1.   Capital Costs

The costs to develop the City's ticket processing software and acquire units of photo enforcement equipment are shown in Table 1.

Table 1: Automated Photo Enforcement Capital Costs in 2014 Dollars ($000's)

Capital Expenditures	Report Expec-tation	Fiscal Year								Program to Date
		2007	2008	2009	2010	2011	2012	2013	2014	
Number of units of photo enforcement equipment	29	29	29	24	60	63	67	77	77	77
Automated enforcement equipment acquisition cost	$3,623	$0	$0	$4,474	$1,868	$440	$150	$327	$137	$7,396
System acquisition and delivery cost	$1,249	$0	$545	$208	$502	$1,467	$1,139	$664	$55	$4,580
Total Capital Expenditures	**$4,873**	**$0**	**$545**	**$4,682**	**$2,369**	**$1,908**	**$1,289**	**$992**	**$192**	**$11,976**

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[2] "The Municipal Price Index (MPI) serves to measure inflation for the mix of goods and services purchased by the City of Edmonton." Source: City of Edmonton 2014 Economic Insights.

Although the decision made in 2007 anticipated the cessation of contracted vendor services by 2009, program changes occurred over many years. The City began replacing the 29 units of automated enforcement equipment belonging to the contracted vendor after 2007. Twenty-four units were acquired in 2009, allowing the City to move from wet film to digital technology. An additional 53 units of automated photo enforcement equipment were acquired by the end of 2014 to enhance the program. According to the 2007 recommendation to Council, the additional units would assist achieving the program's goals based on the City's population, road system, and traffic history.

The recommendation to Council assumed that the violation processing software could be obtained by acquiring a commercially available "off-the-shelf" application. However, the City found that potential vendors would only make their software available as long as they received a share of the ticket revenue. As a result, the City decided to develop a custom software solution.

By the end of 2014, $4.6 million had been spent on costs related to the acquisition and delivery of a violation processing system. About $3.9 million (85 percent) of this amount was incurred to acquire and deliver the first version, which was implemented in August 2012. The remaining $719 thousand was spent to upgrade the software by adding new capabilities. As of the end of 2014, software upgrades to allow for processing of Bylaw tickets had still not been undertaken. We have been advised by the Administration that the legacy Bylaw ticket processing system will be replaced by using as much as 60 percent of the code from the traffic violation processing software.

4.2.   Violations

The number of violations captured in a given year is related to the number of units of photo enforcement equipment deployed. However, the type of equipment deployed can significantly impact the number of violations captured from year-to-year. Mobile photo laser and photo radar units accounted for 74 percent and 78 percent of the total violations captured in 2013 and 2014, respectively.

Table 2 shows an increase from 251,761 violations in 2007 to 779,726 in 2014. The introduction of speed-on-green technology for intersection safety devices in November 2009 influenced the large increase seen in 2010. Similarly, the introduction of photo laser cameras in November 2012 impacted the number of violations observed in 2013 and 2014.

Table 2 also shows significant decreases in the number of violations observed in 2009, 2011, and 2012. The transition from wet film to digital technology in 2009 impacted the number of violations as time was required to install, test, and train operators on the new equipment. In January 2011, a court-ordered refund of speed-on-green tickets resulted in a temporary suspension of the speed-on-green program until technical and processing issues were resolved. As a result, the overall violations and tickets issued in 2011 decreased over the previous year. This decrease in the number of violations

carried through into 2012 the new system of monitoring and violation review criteria were established.

Contracted violation processing costs continued to be partially incurred after 2012 when the City's own ticket processing software was implemented. The contracted costs were phased out in 2013 and 2014 as software capabilities were enhanced to include photo laser technology. In-house operating costs increased as the contracted services were phased out. However, the total operating expenditures overall have been decreasing since 2010.

Table 2: Automated Photo Enforcement Operating Costs in 2014 Dollars ($000's)

Operations	Report Expec-tation	Fiscal Year								Program to Date
		2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	
Number of units of photo enforcement equipment	29	29	29	24	60	63	67	77	77	77
Number of violations processed	217,000 *	251,761	289,677	231,401	526,731	374,539	374,768	714,822	779,726	3,543,425
Number of tickets issued	150,000	174,048	219,286	166,956	355,774	190,685	240,299	539,455	620,318	2,506,821
Contracted violation processing costs	$0	$3,757	$4,547	$4,372	$6,591	$3,346	$4,018	$1,591	$199	$28,420
In-house operating costs (including amortization)	$2,322	$1,227	$1,390	$3,630	$5,147	$5,643	$5,671	$7,374	$7,708	$37,790
Total operating expenditures	$2,322	$4,984	$5,937	$8,002	$11,738	$8,989	$9,689	$8,965	$7,907	$66,210
Operating Cost per Violation Processed	**$10.70**	**$19.80**	**$20.50**	**$34.58**	**$22.29**	**$24.00**	**$25.85**	**$12.54**	**$10.14**	**$18.69**

*Total Violations were not estimated in the 2007 report to Council. We calculated the ratio of actual violations to tickets for 2007 and applied that ratio to the number of tickets that was used to support the recommendation in that report.

Note: The significant reduction in number of violations captured in 2011 and 2012 was influenced by a temporary suspension of the speed-on-green program.

4.3.   Operating Cost Trend

The City's program has grown significantly since 2007 as seen in the increase in the both the number of photo enforcement units and violations. Since every violation photo has to be reviewed by multiple people, the number of violations captured is the primary driver of the City's operating costs. Therefore, to provide more meaningful year-to-year comparisons, we used the cost per violation to trend the operating costs.

Chart 1 depicts the behaviour of operating costs over the eight-year period. As shown, the cost per violation increased after changes to operations began, eventually peaking in 2009 before starting a downward trend. The peak experienced in 2009 would have been influenced by amortization costs associated with the acquisition of $4.5 million in automated enforcement equipment as well as the decrease in the number of violations as explained in Section 4.2.

By 2014, the actual cost per violation ($10.14) was 49 percent below the actual cost per violation in 2007 ($19.80) and marginally lower than the 2007 forecast cost ($10.70). However, it took six years for the program to achieve a cost per violation that was lower than in 2007, the last year of fully-outsourced operations.

The operating cost per violation is influenced by both the total operating costs incurred and the total number of violations observed for a given year. If, for example, safety programs continue to reduce drivers' speeds, the number of violations captured should decrease over time. If the operating costs remain the same or increase over the same period, the operating cost per violation would increase. Alternatively, if the operating costs are stable, then increasing numbers of violations processed would show lower costs per violation.

Chart 1: Operating Cost per Violation in 2014 Dollars

5.   Conclusion

The objective of this project was to provide an up-to-date, all-in cost comparison of the estimated and actual costs of fully absorbing the Automated Photo Enforcement program into City operations.

Instead of purchasing a commercial "off-the-shelf" application as assumed in 2007, a custom software solution had to be developed at a significantly higher cost. By the time the first version of the software was implemented in 2012, $3.9 million had been spent on system acquisition, delivery, and related costs. That cost was more than 200 percent

higher than the cost projected in 2007. By 2014, an additional $719 thousand had been spent on system enhancements. However, upgrades to allow Bylaw ticket processing were not yet complete.

The Automated Photo Enforcement program has grown significantly as demonstrated by the increase in the number of units deployed. Because the program has grown significantly since 2007 (166 percent more units than deployed in 2007), we used the operating cost per violation to compare the estimated cost in 2007 to the actual City program costs. We found that the current cost per violation is marginally lower than the expected cost in 2007. However, the program took six years to achieve an actual cost per violation that was lower than the last year of fully-outsourced operations.

We thank the management and staff of the Transportation Services and Financial Services and Utilities Departments who assisted us with this update.