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BUS LIFE ANALYSIS – YORK REGION TRANSIT BUS FLEET

The Transportation Services Committee recommends the adoption of the recommendation contained in the following report dated October 22, 2009, from the Commissioner of Transportation Services.

1. RECOMMENDATION

It is recommended that:

1. Council approve the retirement of conventional transit buses after 12 years of service instead of the current retirement standard of 18 years, subject to the continuation of the existing provincial subsidy program.

2. PURPOSE

This report reviews current Provincial guidelines and industry research which suggests the optimal retirement of buses is at 12 years of service. A life-cycle, financial, environmental and operational, analysis of the YRT fleet has been completed that is consistent with both Provincial and industry findings.

3. BACKGROUND

In 2007, the Ontario Ministry of Transportation amended their bus replacement subsidy program to encourage the retirement of buses after 12 years of service

Between 1974 and 1995, the Province of Ontario provided 75% capital funding to municipalities for the replacement of transit fleets at 18 years of age. The Province had also provided between 33% to 75% capital funding to perform major structural refurbishing to extend the bus life beyond the design life of 12 years. In recent years, the Province has introduced new programs for transit funding and currently supports the replacement of transit buses after 12 years (Ontario Bus Replacement Program). Also, the Province no longer provides subsidy to conduct major structural refurbishing to extend bus life beyond the normal 12 years.

As a result of Provincial subsidy changes and potential environmental benefits, YRT staff retained an industry-recognized fleet maintenance consultant to assist in the analysis of the impact of retiring YRT conventional transit buses after 12 years of service versus the current practise of 18 years.

There are currently 306 YRT conventional transit buses in the fleet. The fleet is relatively new with an average fleet age of 5 years. There have been 266 conventional buses which were purchased since amalgamation in 2001. This situation simplifies the potential transition to a 12-year bus life cycle, as the vast majority of the fleet is well within the 12-year period. Exhibit 1 illustrates the age and quantity of the current YRT conventional fleet.

Exhibit 1
Quantity of YRT Buses by Age



Does not include Viva Fleet vehicles which are designated to be replaced at 12 years.

4. ANALYSIS

Staff analyzed a number of factors to determine the benefit, if any, of decreasing the bus retirement age from 18 to 12 years

The following factors were used to determine if there are overall benefits to replacing buses after 12 years of service:

- Experience of other transit systems in Ontario.
- Life cycle cost analysis.
- Operating cost impact.
- Environmental considerations by reducing exhaust pollutants through the use of cleaner engine technology.

- Customer service factors.
- Impact on the 10-year capital budget.

Other major transit systems in Ontario are retiring conventional buses after a 12-year life which is further supported by research at the University of Toronto

The City of Hamilton completed an external consultant review of the life cycle costing for their transit fleet. This study concluded that a 12-year life cycle strategy is more cost-effective than an 18-year life cycle. Their new program was introduced in 2006 and they have reported that operating and maintenance cost savings are actually greater than originally estimated. Mississauga Transit is also retiring buses after 12 years of service with positive results. Grand River Transit (Region of Waterloo) has also completed their investigation which identified net savings over the old 18-year life practice, and will be seeking approval for a 12-year life cycle as part of their upcoming budget process.

The University of Toronto had conducted research in 2008 on optimizing the economic life for a municipal bus fleet. The results of the study indicate that the optimal timing to replace a bus is after 12 years of service.

A 12-year bus life results in approximately \$39,000 in overall per vehicle cost savings on a net present value (NPV) basis.

The life cycle cost for a YRT vehicle was calculated to compare the 18 vs. 12-year bus life cycle. Factors used in this analysis are as follows:

- Provincial subsidy provides funding of 1/3 the replacement bus cost.
- All heavy-duty buses are designed and tested for a 12-year life cycle. Major structural refurbishing is needed to extend the bus life to 18 years. This cost is avoided if the bus retires at 12 years.
- Overall improved service reliability is achieved with a younger average fleet age.
- After 18 years, buses are fully depreciated and resale of units generates only \$500 in revenue. Resale after 12 years generates approximately \$35,000 per bus.

A life cycle cost calculation over a 36-year timeframe is summarized in Exhibit 2. This summary is presented in two ways. While both are based on a debt financing scenario, the first table includes the impact of the existing subsidy from the province, while the second table reflects results without the subsidy.

Exhibit 2

Life Cycle Cost Comparison- with Subsidy

<u>Annual Taxpayer Cost Based on debt financing</u>	<u>Net Present Value</u>	<u>Constant Dollars</u>
18 year life with \$500 residual	1,089,788	1,539,062
Provincial subsidy	(338,096)	(451,302)
Major bus rebuild	171,534	265,904
Life cycle cost impact	923,226	1,353,665
12 year life with \$35000 residual	1,379,003	1,936,084
Provincial subsidy	(459,668)	(645,361)
operating savings	(34,985)	(49,412)
Life cycle cost impact	884,351	1,241,311
Cost(benefit) of 18 yr life	38,876	112,354
for all 306 buses	11,895,996	34,380,254

Life Cycle Cost Comparison- without Subsidy

<u>Annual Taxpayer Cost Based on debt financing</u>	<u>Net Present Value</u>	<u>Constant Dollars</u>
18 year life with \$500 residual	1,089,788	1,539,062
Major bus rebuild	171,534	265,904
annual budget impact	1,261,322	1,804,966
12 year life with \$35000 residual	1,379,003	1,936,084
operating savings	(34,985)	(49,412)
Annual cost	1,344,018	1,886,672
	(82,696)	(81,706)
for all 306 buses	(25,304,992)	(25,002,016)

Replacing YRT buses after 12 years of service will result in net savings of approximately \$420,000 per year in operating costs once fully implemented

A life-cycle operating cost analysis was conducted using the 2008 YRT conventional fleet data. It was determined the YRT bus fleet on a 12-year replacement cycle would have operated for approximately \$420,000 less than the current 18-year life cycle due to the following:

- Buses that are older than 12 years experience the highest per km maintenance cost on average.
- A 12-year life cycle avoids one engine and two transmission overhauls per bus.
- Newer model buses have better fuel economy than older buses.
- A greater percentage of bus kilometres are covered under warranty when buses are retired after 12 years.

The analysis adopted a hindsight view of where the fleet costs would be now if the conversion to a 12-year replacement cycle had been adopted in 1996. The annual savings in operating cost reaches \$420,000 when all buses in the fleet are retired after 12 years of service.

The Region utilizes three private sector contractors to operate YRT conventional services and maintain the fleet. The cost of bus maintenance is built into the hourly operating rate. The three contracts are expiring in 2010, 2011 and 2012 respectively. Prior to the expiry of each contract and subject to Council approval, the new bid procurement documents would include a 12-year bus life so that the Region can achieve the cost savings attributed to the reduced bus life discussed in this analysis. The contractors were consulted during this review and they concur that operating costs would be reduced with a 12-year bus replacement cycle.

Retiring buses earlier, at 12 years of service, will decrease emission levels

The *Canadian Environmental Protection Act, 1999* regulates engine emissions and is harmonized with regulations from the Environmental Protection Agency in the US. Over the past several years, there have been new engine emissions standards for heavy-duty transit buses (effective 2004 and 2007) and newer regulations will be in effect in 2010. Exhibit 3 indicates the year the new emissions standards were/are to be introduced and the limits of the key emissions.

Exhibit 3
Transit Diesel Engine Emission Regulations

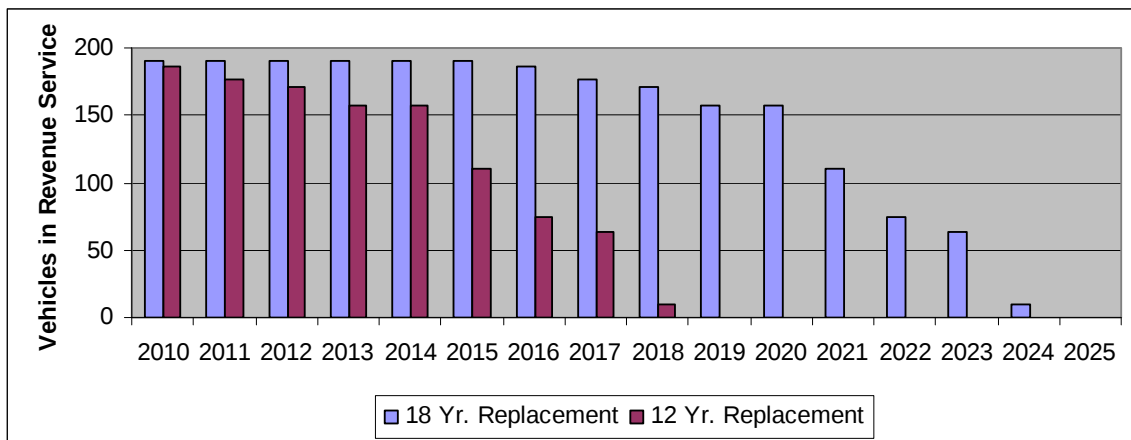
Year	Nitrogen Oxide	Particulate Matter
1998	4.0	0.5
2004	2.2	0.5
2007	1.2	0.1
2010	0.2	0.1

Note: All emissions in g/bhp-hr

Nitrogen oxide is produced during engine combustion and is a form of pollution that contributes to reducing the ozone layer and can pose a health risk. Particulate matter are fine particles emitted in the exhaust which can be inhaled and are a known health risk.

There is no requirement to retrofit older buses to meet current day standards. As such, replacement of buses after 12 years of service vs. 18 years reduces the level of air pollutants from bus exhaust. Exhibit 4 provides a comparison between 12 and 18 year life replacement program to 2007 emission standards.

Exhibit 4
Vehicles in Revenue Service That Do Not Meet 2007 Emission Standards



There are a number of additional factors, from a customer service and technical perspective, which support a 12-year replacement program

- Buses currently older than 12 years typically lack customer-friendly standards including low-floor accessibility, kneeling and ramp access and ergonomic cushion passenger seats.
- Buses are designed and tested for a 12-year life after which they require major structural refurbishing and removal from service for a minimum of three months.

- Reduced bus parts availability resulting in increased down-time.
- Reduced rate of service availability and in-service breakdowns due to a greater incidence of malfunctions.

5. FINANCIAL IMPLICATIONS

It is estimated that \$13.8 million in cost savings would be realized with a change to 12-year bus life standard compared to the current 18-year standard

In preparing the 2010 draft 10-year capital budget, staff analyzed the impact of a 12 and 18-year bus life program. Factors used in this analysis included:

- Provincial subsidy revenue is based on the existing Ontario Bus Replacement Program which provides funding of one-third of the replacement bus cost.
- All heavy-duty buses are designed and tested for a 12 year life cycle. Major structural refurbishing will be needed on 298 buses at a unit cost of \$105,000 each to extend the bus life to 18 years. This cost is avoided if the buses are retired at 12 years.
- After 18 years, the buses are fully depreciated and resale of YRT units generates only \$500 in revenue. Resale after 12 years generates approximately \$35,000 per bus.

Exhibit 5 summarizes the comparison of an 18 and 12-year bus life cycle over the upcoming 10-year planning period. The cost savings over 10 years totals approximately \$13.8 million. The 12-year life cycle program is currently included in the draft 2010 Business Plan and Budget.

This proposed standard would need to be flexible should existing funding arrangements be altered. Such a change would dictate a review of the financial viability resulting from implementation of revised parameters.

Exhibit 5
Ten Year YRT Capital Budget Cost Comparison
Bus Replacement

Item	18-year life cycle	12-year life cycle
Quantity of replacement buses 2010 to 2019	141	214
Total 10-year cost of replacement buses	\$72,900,000	\$110,260,000
Total 10-year cost to refurbish buses to extend life to 18 years	\$31,290,000	\$0
Total revenue from resale of retired buses	(\$71,000)	(\$7,490,000)

Total revenue from Provincial subsidy for bus replacement (1/3 subsidy)	(\$24,300,000)	(\$36,753,000)
Total 10-year net capital cost	\$79,819,000	\$66,017,000

Capital and operating cost savings are achieved when buses are retired after 12 years of service

Replacing buses after 12 years of service, as compared to an 18-year bus life, will result in a capital cost savings of approximately \$13.8 million over the next 10 years. Annual operating cost savings of approximately \$420,000 would be realized once the entire fleet is below the 12 year maximum life.

6. LOCAL MUNICIPAL IMPACT

The proposed retirement of buses after 12 years would provide a cost-effective strategy to upgrade the bus fleet while providing improved customer convenience, comfort and reduce environmental impact.

7. CONCLUSION

Replacing the conventional bus fleet after 12 years vs. the current 18 years will result in net cost savings as well as improved customer and environmental benefits.

For more information on this report, please contact Rick Takagi, Manager, Capital Assets at Ext. 5624.

The Senior Management Group has reviewed this report.