**STAFF REPORT**
**OPERATIONS SERVICES**

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|---|---|
| **Report Title:** | **Fleet Replacement Strategy** |
| **Report No.:** | **OPS 15-33** |
| **Author:** | **Kevin De Leebeeck, P.Eng., Director of Operations** |
| **Meeting Type:** | **REGULAR COUNCIL** |
| **Council Date:** | **SEPTEMBER 28, 2015** |
| **Attachments:** | **NONE** |

## RECOMMENDATION:

**THAT Council receive Report OPS 15-33 Fleet Replacement Strategy;**

**AND THAT Council adopts the Fleet Replacement Strategy as the standardized approach to identifying fleet and equipment replacement needs.**

## SUMMARY

Timely replacement of fleet assets is important for controlling the total cost of ownership and overall fleet performance (i.e. vehicle suitability, availability, safety, reliability, and efficiency). The economic theory of vehicle replacement, as illustrated in **Figure 1** indicates that from an economic perspective the optimal point to replace fleet assets is when the total cost of ownership is at its lowest. As a vehicle ages, its capital cost diminishes and its operating costs increase (i.e. maintenance, repair, and fuel). The combination of these two costs produces a U-shaped total cost curve that reflects the total cost of ownership. Ideally a vehicle or piece of equipment should be replaced when the capital and operating cost curves intersect and the total cost of ownership begins to increase. However, given that the bottom of the total cost curve is relatively flat suggests that there is not a single best time to replace a unit, but rather that a period of time exists as illustrated in **Figure 2**.

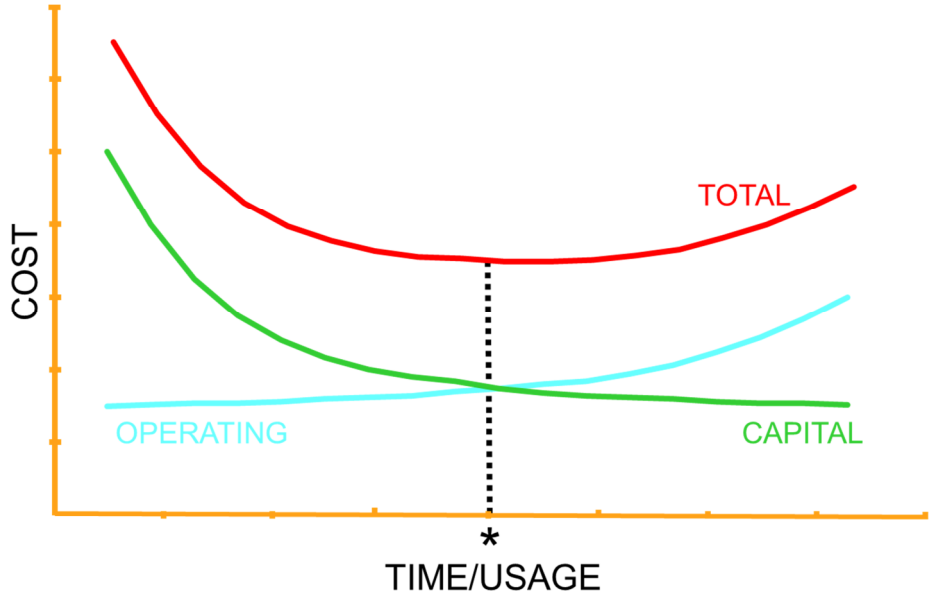


**Figure 1 – Economic Theory of Vehicle Replacement**

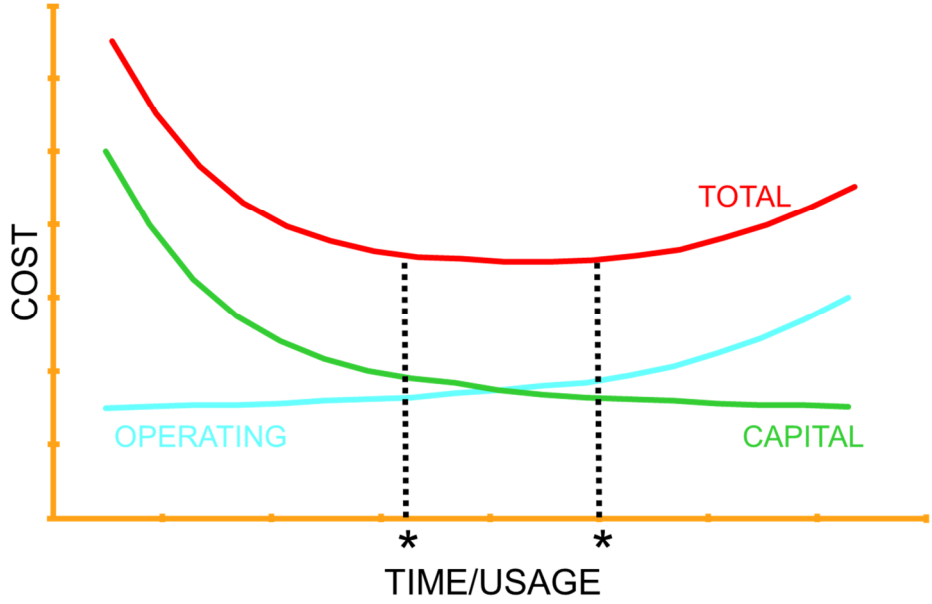


**Figure 2 – Economic Reality of Vehicle Replacement**

In order to ensure that the appropriate vehicle or piece of equipment is identified for replacement during the period of time when the total cost of ownership is lowest a quantitative condition scoring system has been established based on industry standards and fleet management best practices. However to ensure alignment with the uniform approach of the Town's Asset Management Plan for Condition & Performance a combination of the assets Estimated Service Life (ESL) and condition "score" will be used to estimate the Percentage of Remaining Service Life (%RSL) for each individual fleet asset. The %RSL is then used to place assets into one of five rating categories ranging from Very Good to Very Poor as shown in **Table 1**.

**Table 1: Rating Categories based on Estimated Service Life and Condition**

| Rating Category | % of Remaining Service Life (RSL) | Definition |
|---|---|---|
| Very Good | 81% - 100% | **Fit for the Future** - The asset is generally in very good condition, typically new or recently rehabilitated. A few elements show general signs of deterioration that require attention. |
| Good | 61% - 80% | **Adequate for Now** - Some asset elements show general signs of deterioration that require attention. A few elements exhibit significant deficiencies. |
| Fair | 41% - 60% | **Requires Attention** - The asset shows general signs of deterioration and requires attention with some elements exhibiting significant deficiencies. |
| Poor | 21% - 40% | **At Risk** – The asset is in poor condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the asset exhibits significant deterioration. |
| Very Poor | < 20% | **Unfit for Sustained Service** - The asset is in unacceptable condition with widespread signs of advanced deterioration. Many components of the asset exhibit signs of imminent failure, which is affecting service or has effectively exceeded its theoretical service life. |

An asset's ESL is the period of time that it is expected to be of use and fully functional to the Town. Once an asset reaches the end of its service life, it will be deemed to have deteriorated to a point that necessitates replacement. The ESL for each vehicle and piece of equipment specific to the Town of Tillsonburg, summarized in **Table 2**, has been developed based on staff's knowledge and experience, best practices, industry standards, MTO guidelines, and in consideration of the survey results of area municipalities (**Appendix 'A'**).

**Table 2 – Standard Vehicle & Equipment Guidelines**

| Fleet Asset Type | Tillsonburg (urban) | |
|---|---|---|
| | ESL | Km /Hrs |
| Cars, Mini Vans, SUV's | 8 | 200,000 |
| 1/2 Ton & 3/4 Ton Trucks | 8 | 200,000 |
| 1 Ton Trucks | 10 | 250,000 |
| Single Axle Plow Trucks | 10 | 300,000 |
| Tandem Axle Plow Trucks | 12 | 325,000 |
| Street Sweeper | 8 | 10,000 |
| Loader | 15 | 10,000 |
| Grader | 20 | 15,000 |
| Backhoe | 12 | 12,000 |
| Tractors | 15 | 5,000 |
| Sidewalk Machine | 10 | 5,000 |
| Utility Trailers | 15 | - |
| Wood Chipper | 15 | 2,000 |
| Mowers | 10 | 2,000 |

The quantitative condition scoring system will provide staff with additional information of fleet assets and is be based on the average of four different factors including mileage (or hours), lifecycle operating and maintenance costs, reliability, and the mechanical/body assessment. A description of each factor and the associated scoring matrix is provided below:

**Mileage/Hours (5 pts)**

The odometer or hour meter reading for the respective vehicle or piece of equipment is compared to the standard vehicle and equipment guidelines (**Table 2**) and assigned a score based on the extent of use as outlined in **Table 3**.

**Table 3 – Mileage/Hour Scoring Matrix**

| Km / Hours | Score |
|---|---|
| Km/Hrs are less than 20% of vehicle & equipment guideline | 1 |
| Km/Hrs are 21-40% of vehicle & equipment guideline | 2 |
| Km/Hrs are 41-60% of vehicle & equipment guideline | 3 |
| Km/Hrs are 61-80% of vehicle & equipment guideline | 4 |
| Km/Hrs are greater than 81% of vehicle & equipment guideline | 5 |

**Lifecycle Operation and Maintenance Cost (5 pts)**

The total lifecycle maintenance and repair costs (not including repair from accident damage, lube, oil changes, filters, tire rotations, annual inspections etc.) is expressed as a percentage of the original purchase price for the respective vehicle or piece of equipment. This data is extracted for each vehicle or piece of equipment from the Town's financial software system with points assigned as outlined in **Table 4**.

**Table 4 – Lifecycle O & M Scoring Matrix**

| Lifecycle Operation & Maintenance Cost | Score |
|---|---|
| Lifecycle O&M costs are less than 20% of original purchase cost | 1 |
| Lifecycle O&M costs are 21-40% of original purchase cost | 2 |
| Lifecycle O&M costs are 41-60% of original purchase cost | 3 |
| Lifecycle O&M costs are 61-80% of original purchase cost | 4 |
| Lifecycle O&M costs are greater than 81% of original purchase cost | 5 |

**Reliability (5 pts)**

Points are assigned depending on the frequency that a vehicle or piece of equipment is in the shop for repair as outlined in **Table 5**. The more frequent shop visits the higher the score. This data is extracted for each vehicle or piece of equipment from the service requests generated by fleet maintenance software.

**Table 5 – Reliability Scoring Matrix**

| Reliability | Score |
|---|---|
| less than 5 Service Requests per year | 1 |
| more than 5 but less than 10 Service Requests per year | 2 |
| more than 10 but less than 15 Service Requests per year | 3 |
| more than 15 but less than 20 Service Requests per year | 4 |
| more than 20 Service Requests per year | 5 |

**Mechanical / Body Assessment (5 pts)**

An annual assessment of each vehicle or piece of equipment is performed that takes into consideration body condition, rust, interior condition, accident history, steering and suspension, engine and transmission, hydraulic and electrical systems, brakes, chassis, etc. based on the applicable MTO inspection standards. The mechanical/body score is based on the outcome of the assessment evaluation as outlined in **Table 6**.

**Table 6 – Mechanical / Body Assessment Scoring Matrix**

| Mechanical / Body Assessment | Score |
|---|---|
| No visual damage or rust, good drivetrain & engine | 1 |
| Minor imperfections in body/paint, interior fair (no rips, tears, burns), good drivetrain | 2 |
| Noticeable imperfections in body/paint, minor rust, minor damage to body, worn interior (one or more rips, tears, burns), weak or noisy drivetrain or engine | 3 |
| Previous accident damage, poor paint and body condition, rust and rusted through areas, bad interior (rips, tears, cracked dash), major damage to body, drivetrain or engine worn or bad | 4 |
| Previous accident damage, poor paint and body condition, rust and rusted through areas, bad interior (rips, tears, cracked dash), major damage to body, drivetrain or engine inoperative or unsafe | 5 |

Implementing the process described above to determine the Condition & Performance ratings of fleet assets will likely produce a larger list of needs (i.e. assets in the Poor and Very Poor rating category) than available resources. Therefore project prioritization parameters must be developed to ensure that the right fleet assets come forward in the short-term and long range business plans. An important method of project prioritization is to rank each vehicle or piece of equipment on the basis of how much risk it represents to the Town. Prioritizing critical assets over lower risk assets ensures that the Town's fleet is protected against the most severe risks. Asset risk is defined by applying the following formula to each of the fleet assets.

*Asset Risk = Probability of Failure Score X Consequence of Failure Score*

The probability of failure relates to the current condition state of each asset, whether they are in Very Good, Good, Fair, Poor, or Very Poor condition. The %RSL score is inversely proportional to the probability of failure and serves as a good indicator regarding the future risk of failure of an asset as described in **Table 7**.

**Table 7 – Probability of Failure Score**

| %RSL Rating Category | Probability of Failure Description | Probability of Failure Score |
|---|---|---|
| Very Good | Improbable | 1 |
| Good | Unlikely | 2 |
| Fair | Possible | 3 |
| Poor | Likely | 4 |
| Very Poor | Highly Probable | 5 |

The consequence of failure relates to the magnitude or overall effect that an asset's failure will cause and can be characterized by the type of service the vehicle or piece of equipment is used for. For example failure of a Fire Services vehicle could have severe consequences, such as loss of life compared to the failure of a vehicle in Building or Engineering Services.

**Type of Service**

Points are assigned based on the type of service that the vehicle or piece of equipment is used for as outlined in **Table 8**. The more severe the type of service performed the higher the score.

**Table 8 – Type of Service Scoring Matrix**

| Type of Service | Consequence of Failure Score | Consequence of Failure Description |
|---|---|---|
| Any standard car, pickup, SUV, van, or equipment | 1 | Slight |
| Any vehicle or equipment with standard duties with attachments, service vehicle or dump body, with occasional off-road use | 2 | Minor |
| Any vehicle or equipment with multiple duties, that pulls trailers, hauls heavy loads, special purpose, or continued off-road use | 3 | Moderate |
| Hydro fleet & equipment, any vehicle or equipment involved in snow removal | 4 | Major |
| Emergency fleet & equipment | 5 | Severe |

With both the probability of failure and consequence of failure documented, the total risk of asset failure can be determined. A graphical representation of the risk scoring matrix is illustrated in **Table 9**. Total risk can be classified under the following categories:

- **Extreme Risk (>60%):** risk well beyond acceptable levels;
- **High Risk (45-60%):** risk beyond acceptable levels;
- **Medium Risk (30-45%):** risk at acceptable levels, monitoring required to ensure risk does not become high;
- **Low Risk (15-30%):** risk at or below acceptable levels.
- **Minimal Risk (<15%):** risk sufficiently below acceptable levels

**Table 9 – Asset Risk Scoring Matrix**

| Consequence | Probability | | | | |
|---|---|---|---|---|---|
| | Improbable | Unlikely | Possible | Likely | Highly Probable |
| Severe | Low | Medium | High | Extreme | Extreme |
| Major | Low | Medium | High | Extreme | Extreme |
| Moderate | Minimal | Low | Medium | High | High |
| Minor | Minimal | Low | Low | Medium | Medium |
| Slight | Minimal | Minimal | Minimal | Low | Low |

The objective of this fleet replacement strategy is to reduce risk levels that are deemed to be high, as well as to ensure assets are maintained in a way that sustains risk at acceptable levels. Staff recognizes that the general approach will need to be reviewed and refined over the upcoming years and will monitor asset risk scores to ensure in-house knowledge and experience is captured appropriately.

## CONSULTATION/COMMUNICATION

The following documents were consulted during the development of the proposed fleet replacement strategy as well as a survey of seven (7) nearby and/or similar sized municipalities.

1) APWA Vehicle Replacement Guide, 2001
2) Fleet Challenge Ontario, Best Practices Manual, 2008
3) Fleet Replacement Plan for the City of Prince George, 2014
4) City of Boise Fleet Management Strategic Plan, 2008

## FINANCIAL IMPACT/FUNDING SOURCE

The financial impact of the proposed fleet replacement strategy will be addressed through the annual budgeting process or through the creation and monitoring of a Fleet & Equipment Reserve.

**APPENDIX 'A'**

| Fleet Asset Type | MTO Guideline (rural) | | Norfolk County (rural) | | Oxford County (rural) | | Haldimand County (rural) | | Zorra (rural) | | Woodstock (urban) | | St. Mary's (urban) | | St. Thomas (urban) | | Tillsonburg (urban) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ESL | Km / Hrs | ESL | Km / Hrs | ESL | Km / Hrs | ESL | Km / Hrs | ESL | Km / Hrs | ESL | Km / Hrs | ESL | Km / Hrs | ESL | Km /Hrs | ESL | Km /Hrs |
| Cars, Mini Vans, SUV's | 7-12 | 200,000 - 350,000 | 7 | 200,000 | 5-7 | 200,000 | 10 | - | 10 | - | 10 | - | 8-10 | - | 8-12 | - | 8 | 200,000 |
| 1/2 Ton & 3/4 Ton Trucks | 7-12 | 200,000 - 350,000 | 7 | 200,000 | 5-7 | 200,000 | 4-10 | - | 5 | - | 10 | - | 7-9 | - | 8-12 | - | 8 | 200,000 |
| 1 Ton Trucks | 8-12 | 250,000 - 300,000 | 8 | 250,000 | 10 | 250,000 - 300,000 | 12 | - | 10 | - | 10 | - | 8-10 | - | 8-10 | - | 10 | 250,000 |
| Single Axle Plow Trucks | 7-12 | 200,000 - 320,000 | 10 | 300,000 | 10-12 | 200,000 - 250,000 | 12 | - | 10 | - | 10 | - | 8-10 | - | - | - | 10 | 300,000 |
| Tandem Axle Plow Trucks | 11-15 | 200,000 - 350,000 | 12 | 300,000 | 10 | 200,000 - 250,000 | 12 | - | 10 | - | 12 | - | 8-10 | - | 12 | - | 12 | 325,000 |
| Street Sweeper | 10-20 | 10,000 - 20,000 | 7 | 10,000 | 10-15 | 10,000 | 8 | - | - | - | 8 | - | 10-12 | - | 10 | - | 8 | 10,000 |
| Loader | 12-20 | 10,000 - 15,000 | 18 | 16,000 | 12-20 | 12,000 | 25 | - | 15 | - | 15 | - | 12-15 | - | 12-15 | - | 15 | 10,000 |
| Grader | 15 -20 | 10,000 - 15,000 | 20 | 15,000 | 20 | 12,000 - 20,000 | 20 | - | 15 | - | 20 | - | - | - | 20 | - | 20 | 15,000 |
| Backhoe | 12-20 | 12,000 - 20,000 | 12 | 12,000 | 12-20 | 10,000 - 12,000 | 15 | - | 12 | - | 12 | - | 10-12 | - | 8 | - | 12 | 12,000 |
| Tractors | 14-20 | 16,000 - 20,000 | 10 | 4,000 | 12-15 | 10,000 - 12,000 | 20 | - | 15 | - | 15-20 | - | - | - | 8-12 | - | 15 | 5,000 |
| Sidewalk Machine | - | - | 10 | 5,000 | - | - | 10 | - | - | - | 8 | - | 8-10 | - | 10 | - | 10 | 5,000 |
| Utility Trailers | 20 | - | 7 | - | 20 | - | 20 | - | - | - | 20 | - | 15 | - | 12-15 | - | 15 | - |
| Wood Chipper | 10-20 | - | 15 | 2,000 | 10-15 | 10,000 | 15 | - | 10 | - | 10 | - | 15 | - | 18 | - | 15 | 2,000 |
| Mowers | 7-20 | 1,000 | 8 | - | 7-10 | 1,000 | 10 | - | 10 | - | 8 | - | As required | | - | - | 10 | 2,000 |