Calgary Transit ZBR Final Report – ZBR Project Management Team

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May 27, 2016

File No 1150555

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1.0 INTRODUCTION

The Calgary Transit Zero-Based Review (ZBR) is a review that looks for cost savings and at ways to improve what transit customers and city taxpayers get for the money they give to the City.

The ZBR program started in 2012 and is working its way through all City departments. Each review focuses on evidence-based analysis of services with an objective to provide recommendations to address two fundamental service delivery questions:

- **Efficiency:** What changes could be made to services that would help to achieve greater results within available resources?
- **Effectiveness:** What changes could be made to improve the achievement of service goals or outcomes?

The Calgary Transit ZBR program is governed by the City's Corporate Initiatives Division with meaningful input from Calgary Transit (CT) and oversight provided by the interdepartmental Steering Committee. The analysis and recommendations were developed by Morrison Hershfield (MH), and approval of final recommendations will be made by City Council.

All areas of CT were reviewed by Corporate Initiatives and CT staff, and four areas were brought forward for further review by MH:

1. Procurement and Inventory Management
2. Fleet Maintenance for Buses and Light Rail Vehicles (LRVs)
3. Service Delivery Approach / Model Assessment (Vehicle Service Lane, Cleaning and Outside Maintenance and Rail Systems Communication)
4. Calgary Transit Revenues (R/C Ratio, Personal Safety and Security Review)

The detailed work plans for each service area include an integrated and interactive approach by working closely with Corporate Initiatives and CT staff, and at the same time ensuring objective and independent analysis and options development by the MH study team. The first three service areas directly follow the ZBR Method. As agreed, the scope of work in the Transit Revenues service area did not lend itself to business case development, so policy recommendations will be made.

The report includes a review of each of these service areas, with ZBR analyses and recommendations. The report also draws on the observations and analyses made by our team of executive and senior management transit experts, presenting a new approach to business planning by CT. The presentation of this new approach is outside the specific scope of the ZBR, but will provide a longer-range, more integrated framework for service, asset and financial planning for City and CT consideration. In the Study Team's view, this approach is an important step for Calgary Transit to approach all aspects of the business in a more comprehensive and consistent manner.

Morrison Hershfield is a Canadian, employee-owned, engineering firm with a market focus on Transit, Transportation, Buildings, Critical Facilities, Energy, Government, Telecom & Technology and Water & Wastewater. The company has offices in Calgary and 10 other cities across Canada, plus 6 cities in the U.S. MH's transit advisory service is headed by Jim Teeple, a transit industry expert and former executive with the Toronto Transit Commission (TTC), and supported by transit industry and business management experts with similar executive and senior management experience (Appendix A).

2. OVERVIEW OF THE CALGARY TRANSIT ZBR APPROACH

2.1 Study Approach

The MH Study Team prepared detailed work sheets for each of the four ZBR service areas. The purpose of the detailed work sheets was four-fold:

1. Confirm the Study Team's understanding of the reviews
2. Outline the required inputs and background information
3. Describe the approaches, activities and tools we would employ
4. Provide the key inputs to the Project Plan's staffing, scheduling and budgeted working hours

The detailed work sheets were built upon the standardized project activities developed by MH. This is to ensure consistent application of the ZBR Method in all areas, unless amended by agreement.

The detailed work sheets and standardized project activities were applied by the MH Study team in an integrated and interactive approach with Corporate Initiatives and Calgary Transit staff. This was done to streamline the business unit orientation process, enhance the MH Study Team's understanding of the business unit, and to build City and CT commitment to the ultimate recommendations and implementation.

The integrated and interactive approach was in evidence in our work with the ZBR Project Management Team and Steering Committee to confirm the work underway. It was further employed in individual and group meetings by the MH Study Team to receive information from, and to test developing options for, improvement with City and CT staff.

2.2 General Observations

We observed an open, no-blame, team environment with a very strong commitment to 'make service' - deliver 100% of scheduled service to its customers. The MH Study Team members were welcomed by the staff interviewed and during facility and work site visits. The project initiation's internal communications documents and briefings that were prepared and delivered by the ZBR Project Management Team, in consultation with the MH Study Team, contributed greatly to the availability and openness of staff and transfer of data and knowledge to the MH Study Team. James Robertson and Nicole Jensen in the ZBR Project Management Team were critical to this success.

2.3 Calgary Transit Rationale

The individual service reviews will explore issues of efficiency and effectiveness, and it is worthwhile to first note the overall rationale for transit in Calgary.

The provision of transit service is an integral part of a city's service delivery program, and is a key component of an integrated urban mobility system – vehicle movement and active transportation (walking, cycling and transit). Transit provides a valuable alternative to private vehicle use and access to jobs, school, services and socialization. It also contributes toward the health and safety of residents and visitors, and toward clean air (low carbon) and efficient urban form in the community. Transit is an essential requirement for sustainable urban development.

Transit service is provided under the direction of Council decision making and follows Calgary Transit's 106-year legacy. The City's own Corporate Economics group highlighted the importance of transit in its 2014 report, "Importance of Public Transit in Canada and Calgary, and Who Should Pay". It concludes "… public transit in Calgary provides exceptional value to all citizens."

There would be no positives if the City discontinued Transit, or any one of the functions in the ZBR service areas. The result would be higher road congestion, higher gaseous emissions, reduced access for all residents, increased pedestrian and vehicle accidents, and greater urban sprawl.

3. PROCUREMENT AND INVENTORY MANAGEMENT

3.1 Procurement & Inventory Management

Recommendation: MH recommends that Calgary Transit pursue the internal process improvements in Option 1 and develop an implementation strategy and timeline. The risks associated with Option 1 are believed to be far lower than with the Option 2 hybrid model that transfers control over procurement and/or inventory management from Calgary Supply to Calgary Transit.

3.1.1 Purpose

The zero-based review (ZBR) objective is to conduct a gap analysis to assess alignment between Calgary Transit (CT) and Calgary Supply's shared service / centre of excellence service philosophy, identify impacts and outcomes on Calgary Transit resources, assets and performance and assess alternative organizational options / processes.

3.1.2 Business Objectives

3.1.2.1 Business Unit Goals

The procurement and inventory goals of the CT business unit are to:

1. Receive sufficient parts and services to meet daily vehicle service levels and commitments.

The Calgary Supply business unit goals are to provide competent, professional and efficient materials management and contract services to meet the needs of its customers.[1] Specifically, Calgary Supply seeks to provide:

1. Achieve business unit cost savings by ensuring total lowest costs across the entire supply chain on a sustainable basis.
2. Maximize inventory management through Supply warehouses and procurement processes to achieve lowest costs.
3. Deliver supply chain services at lowest total cost to business unit clients.
4. Minimize business unit procurement risks through best practices in public procurement, industry code of ethics and compliance with legislative requirements and policies.

3.1.2.2 Relevant Business Unit Policies

The following policies (and plans) are relevant to the case; particularly, the procurement and purchasing policies administered by the Finance & Supply.

- 22 discrete procurement and purchasing policies
- Delegation of Authorities
- Calgary Transportation Plan

[1] http://www.calgary.ca/CA/FS/Pages/Home.aspx (2016)

- Municipal Development Plan

3.1.2.3 Contribution to Long-term Goals

This procurement and inventory management function contributes to long-term City of Calgary goals through:

- Financial control.
- Spending optimization achieved through economies of scale and competitive procurement practices and expertise.
- Labour and materials are available to CT when they are needed.
- Financing Transit Core Principles “take care of and optimize what we own”.
- Accountability and transparency

3.1.2.4 Customer & Citizen Needs Addressed by the Service

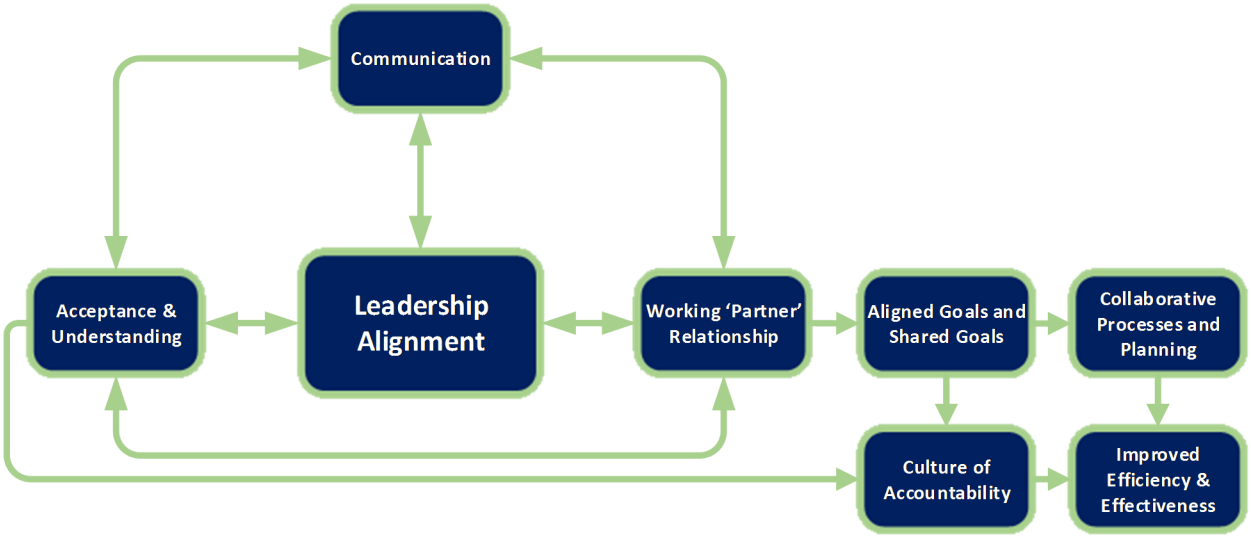
Customer and citizen needs addressed by the relationship between Calgary Transit and Calgary Supply P&I function include:

- Customer Experience core principles of ease of use, safe, accessible, clean, comfortable, reduce barriers to use by non-users for maintenance of assets.
- Financial transparency and accountability.
- Fiscal responsibility.

3.1.3 Case for Change

3.1.3.1 Cause and Effect Relationships in the Procurement & Inventory Focus Area

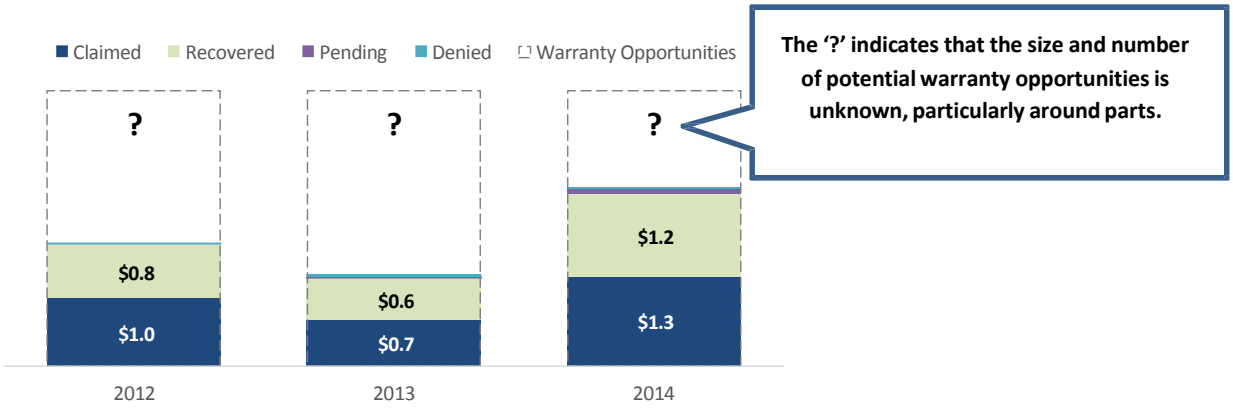
There are a number of cause-and-effect relationships relevant to the P&I business case. Several symptoms were observed as evidence of the need to change. These symptoms are discussed below, with the MHL Study Team’s assessment of root cause, related to the next chart. Symptoms will improve if the underlying root cause is addressed first. For P&I, the highest order root cause is believed to be Leadership Alignment, which cascades to a number of downstream cause-and-effect relationships.



3.1.3.2 Effectiveness Gaps

There is much rhetoric and anecdotal information from both CT and Calgary Supply, often contradictory, as evidenced by interviews and conversations throughout the process. A number of effectiveness gaps were noted, including:

- A lack of strategic alignment between CT and Calgary Supply believed to be caused by a gap in Leadership alignment between CT and Calgary Supply. A contributing factor is that the lowest cross-over point manager is structurally designed to be the City Manager, making alignment, escalation, and dispute resolution challenging.
- There are opportunities to improve the level of procurement and spending support provided by Calgary Supply. During staff interviews, some staff noted that it was easier to go outside the organization to establish parts and service contracts to have their service concerns addressed than working through the issues with Supply. In 2015, Calgary Supply reviewed p-card spending activities and subsequently implemented purchase orders for higher-value CT purchases made by -p-cards, as a way to drive savings and improve sourcing efficiency.
- Formal, collaborative business planning processes are not used. Each party (CT and Calgary Supply) noted that it was the other party's responsibility to define the business needs (e.g. bill of materials). CT's ad-hoc approach to the business drives ad-hoc spending.
- The two P&I systems (PeopleSoft and M5) do not integrate with each other. This point is believed to be a secondary issue relative to the gap in leadership alignment, accountability and communication.
- Warranty management, particularly around parts warranties, is likely to benefit from greater oversight. Ongoing maintenance parts warranties are not tracked and part of the underlying cause is believed to be ambiguous 'shared' accountability. A second cause is the lack of resources to support entry of data and extraction of data in M5. Part of the (potentially significant) opportunity comes from not knowing which parts are under warranty and what can be claimed.

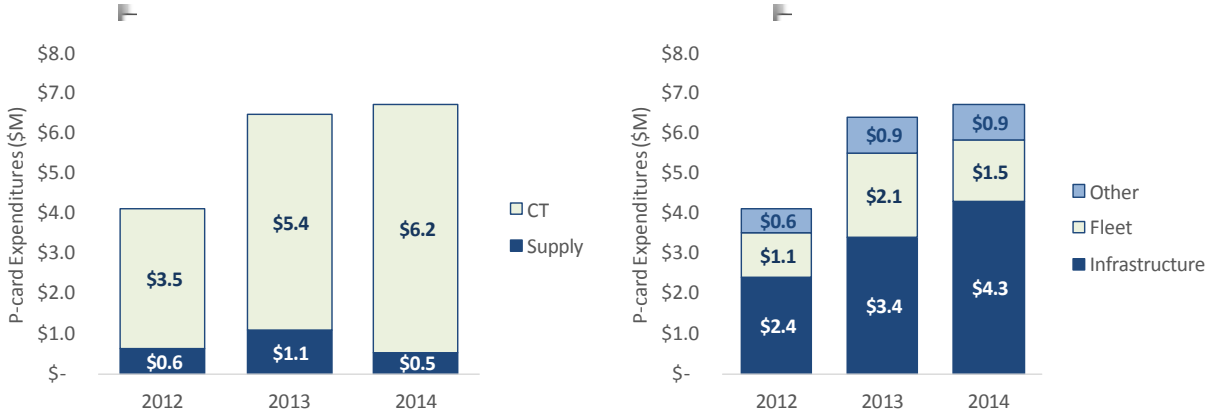


Source: CT Spreadsheet "2014 CT Warranty Summary" (2016)

3.1.3.3 Efficiency Gaps

A number of opportunities to improve efficiency were noted. An overall weakness in two-way communication contributes to the lack of long-range planning, which prevents CT from effectively expressing its needs to Calgary Supply and for Calgary Supply taking the right steps to address the needs to ensure service is met. While established practices are used to manage inventory (min/max levels, how critical spares and safety stock are determined/managed, etc.), targets have not necessarily been aligned with CT needs. Early 2016, CT requested a number of new parts be added to the inventory system to improve this alignment, which is seen as a progressive and healthy step towards building stronger alignment.

The following charts show the three-year CT spend using the purchasing card.

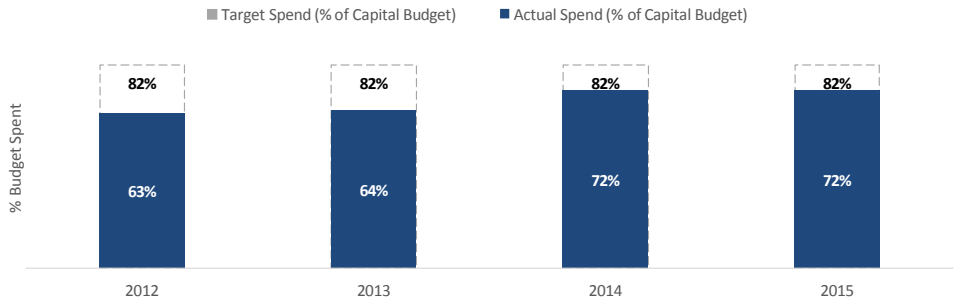


Calgary Supply receives periodic statements by the credit card companies about spending trends and split transactions. The group provides periodic reporting to CT, but does not measure spending compliance (reference: corporate credit card policy FA-CAP-008).

There is a three-year rising trend for P-card spending. It is acknowledged that Calgary Supply has taken recent steps to identify opportunities to displace common P-card transactions with inventoried parts

and the use of purchase orders. These measures will continue to drive availability of the right parts for when they are needed by CT staff.

The CT infrastructure group expressed concerns about lack of understanding or need for these procedures, seen as bureaucratic, time consuming, and unnecessary. Differing expectations for the use of procurement and purchasing procedures and required lead times can affect the ability to spend the approved capital budget. The following chart provides some evidence of historical underspending, though does not necessarily validate the cause-and-effect relationship.



Benchmarking of procurement policies and procedures with other municipalities revealed that the Calgary's twenty-two discrete policies with embedded procedures were quite complex.

3.1.3.4 Peer Models

Three different P&I organizational models were observed during the benchmarking review of other Canadian transit agencies.

1. Operations and maintenance functions report to the transit agency while the procurement function is aligned in a separate department, with all functions rolled up under the municipality. (e.g. Calgary Transit, OC Transpo, Winnipeg Transit)
2. Operations and some maintenance activities are part of the transit agency, but the transit fleet is aligned with other municipality's corporate fleet business unit and not directly with the transit function. Transit fleet maintenance is part of the fleet function and the procurement function is part of a separate department – all rolled up under the municipality. In practice, most fleet spending collaboration happens directly between the corporate fleet group and the corporate procurement group, rather than with the transit agency. (Edmonton Transit)
3. The transit agency is a separate entity from the municipality and includes its own operations, maintenance, and procurement functions with full accountability aligned under the head of the transit function. (e.g. TTC and Translink)

	CALGARY TRANSIT	EDMONTON TRANSIT	WINNIPEG TRANSIT	OC TRANSPO	TTC	TRANSLINK
Self-Perform Supply The stand-alone transit agency has its own procurement function and can operate in relative isolation from the municipality.						
Fleet Aligned Under Municipal Fleet Transit fleet is rolled up under the municipality's fleet business unit and so fleet spend does not directly involve the transit group.						
Municipal Supply The transit agency is part of the municipality and the procurement function operates within a separate division or department from the transit operations and maintenance.						

There is a clear functional split between the operations and maintenance functions and procurement functions with Calgary, Edmonton, Winnipeg, and Ottawa. Transit is clearly accountable for delivering service and for maintaining fleet and infrastructure, while the procurement groups are clearly accountable for driving and controlling spending. For Vancouver (TransLink) and Toronto (TTC), even though both agencies have core operations and maintenance functions and core procurement functions aligned under the head of the transit agency, these functions are separate.

Most benchmarked agencies note some tension between the transit function and the P&I function, particularly around procurement timelines and expectations. The agencies that appear to be most successful, such as OC Transpo, have clear and proactive two-way communication practices, supported by committed timelines.

The **appendix 3.1.9** includes tables that summarize the organizational and functional structure of the peer agencies and provide comments about the perceived relationships.

Transit autonomy and authority to make procurement decisions appear to be granted in four ways:

1. Structurally – through the alignment of operations, maintenance and procurement functions either as part of the municipality or as a stand alone agency (see above).
2. Procedurally – through the use of defined competitive and non-competitive procedures.
3. The requisite procurement policy AND delegation of authority policy which collectively define the authority limits.
4. The practical relationship between the operations, maintenance, and procurement functions that either support or detract from effective decision making.

3.1.3.5 Spectrum of Transit Autonomy

There is a common trend across all benchmarked transit agencies for a strong focus on the use of competitive bid procedures. This is expectation is explicit in the New West Partnership Trade Agreement as well most policies. Delegated authority as well as the accountabilities in procurement procedures encourage the use of competitive procedures and discourage the use of non-competitive procedures. If a competitive procedure is used, there appears to be more autonomy to spend. Procedures to guide non-competitive spending are generally more restrictive. The **appendix 3.1.9** includes tables that summarize the level of autonomy.

3.1.3.6 Clarity of documentation

The clarity of policies and procedures was reviewed because the Finance & Supply group has posted 22 discrete documents, perceived to be overly complex. The most easily understood procurement procedures appear to be those consolidated into a single document. Certain agencies / municipalities provide full transparency of their procurement policies and procedures. In particular, Ottawa and TTC have the best clarity. **Appendix 3.1.9** includes a summary table.

3.1.3.7 Procurement Cycle Times

Procurement turnaround times were compared with peer agencies for high-value spends to better understand the perceived issue of slow procurement delivery for CT. It was noted that Calgary's cycle times are about the same as Edmonton, Winnipeg and Ottawa. Perspectives were not available for Vancouver and Toronto. A table of procurement cycle times is included in **appendix 3.1.9.**

3.1.3.8 Other P&I Best Practices

Other key practices the transit agency and procurement use together to ensure: a) the best vendor is selected; b) costs are managed; c) procurement is completed quickly.

OC Transpo

- There are well defined policies and procedures and timelines.
- Supply Branch ensures the process approved by City Council is followed.
- There is no choice but to involve the supply partners when making a procurement and it is not viewed as a roadblock.
- Supply Branch will try to get creative to make sure needs are met. Certain rules need to be followed, which can add some delay.
- Supply Branch sets expectations clearly. They advise how much time is needed to complete the work - "our turnaround for this product x is this many days.", and deliver.
- Transit tries to involve Supply Branch from the beginning – including them in correspondence, in the thought process, and involving them from the beginning.

Translink

- Cross-functional integration and early engagement.
- Mutually supportive business planning.
- Mutual project, risk, schedule, marketplace, demand drivers, scope, best practices understanding.
- Detailed scope and clear requirements originating from operations.

Winnipeg

- Strong, in-house materials management system.
- Annual procurement and purchasing training.
- Longevity in the spending practices. Procedures are well-known.

TTC

- Dedicated procurement staff co-located with the maintenance and infrastructure staff to improve functional knowledge as well as to provide responsive support for purchasing procedures.

Edmonton

- The organization is structured so that Supply has people embedded in Transit, LRT and Fleet.
- Fleet is the primary customer of Supply because Fleet is organized to handle all the maintenance for transit (shared services approach). Edmonton Transit Service (ETS) is set up as the operator, Supply to ensure parts, materials, and procurement is provided for Transit and Fleet for when it is needed with focus on cost optimization.
- Supply is the inventory technology owner – sets policy and direction for spending.
- Focus by City Council is to reduce amount of sole sourcing and increased focus on competitive procedures.
- For non-inventory parts spending, they have set up Materials Master records to increase visibility of spending. Good visibility to aggregate spending across garages. Changes were made four years ago to drive spend optimization.
- Branch Managers for Fleet and Supply both report to Corporate Services with frequent collaboration and a common cross-over point manager to work through disputes.

3.1.3.9 Relevant Regulations and Legislation

- New West Trade Partnership Agreement
- Agreement on Internal Trade (1995)
- Collective agreement (applicable to some P&I staff functions)

3.1.4 Baseline

3.1.4.1 Description

Finance & Supply manages and administers the supply of all goods and services to Calgary Transit:

- Sourcing for Capital and Operational Budget projects
- Procurement of goods and services to support operations
- Inventory Management and Warehousing

Finance & Supply is a business unit within the CFO Department and is independent from CT and Transportation.

CT staff are required to follow the procurement and purchasing policies and procedures established by Finance & Supply. These policies and procedures define the responsibilities and accountabilities of Calgary Supply and the business units (internal 'customers' of Calgary Supply) as well as the authority limits of each group. This business practice is consistent across the other peer transit agencies consulted by the MHL Study Team.

Staffing Dedicated to Transit

- 4 sourcing and procurement staff
- 25 inventory management staff

3.1.5 Overview of Options

A number of options were explored, including a full alternate service deliver model to outsource the complete procurement and inventory management function that supports the transit business unit. There is no practical model or industry evidence for an ASD option available to replace the Supply function for Calgary Transit, and given the organizational risks associated with any attempt to contract-out, the MH Study Team has not continued with any work to develop such an option. Two other options are presented to ensure the procurement and inventory functions are properly executed to meet transit business needs. Because the most significant issues are based on leadership alignment, lack of shared goals, and a breakdown of a functional relationship between CT and Calgary Supply, these options are difficult to assess quantitatively.

3.1.6 Option 1 Internal Process Improvements

3.1.6.1 Option Description

Section 3.1.3.4 introduced three discrete P&I models. This option acknowledges that the current roles and accountabilities relationship between CT and Calgary Supply are generally consistent with Canadian peer-reviewed transit agencies, particularly Winnipeg and Ottawa. The CT organizational model differs from Vancouver and Toronto, which are much larger municipalities that have separated their respective transit agencies as autonomous, independent organizations. Translink (Vancouver) and TTC (Toronto) each have their own procurement functions, but continue to maintain separation from the operating and maintenance business units. One practical difference is the more direct oversight by the chief executive as the cross-over point manager. Option one acknowledges the City of Calgary's holistic strategic to centralize its P&I function.

Option one retains and strengthens the current structure through significant organizational change management and active, aligned participation of senior leadership. The steps that make up the option will drive a number of effectiveness benefits, likely to be tangible and enduring, but difficult to quantify.

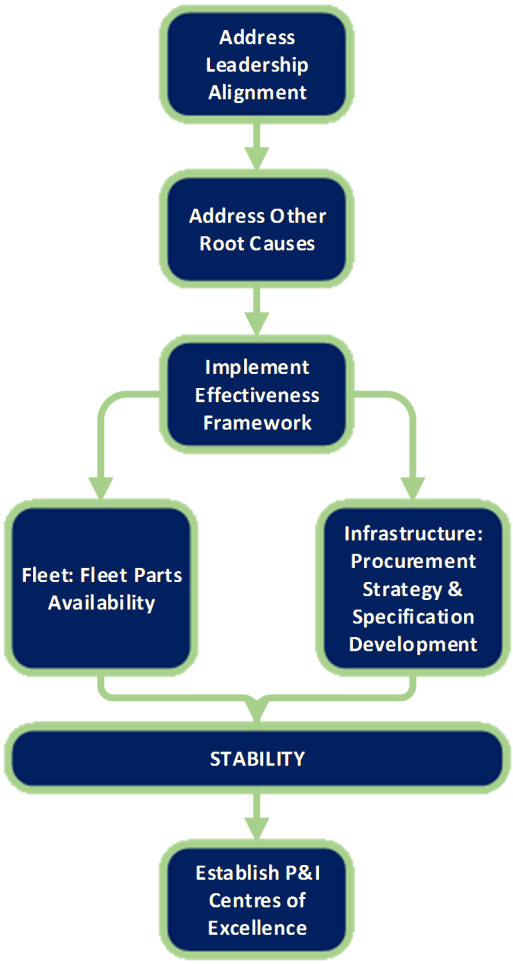


Figure: Sequential Steps for Option 1

The figure to the right summarizes the sequential steps, beginning with the alignment of leadership as the ultimate root cause that will drive improvements in communication and relationship management between CT and Calgary Supply.

CT can then work through other root causes previously described and then implement an effectiveness framework to drive rigor in planning and early communication of needs. CT can progress with discrete fleet and infrastructure initiatives to ensure parts are available as required and that procurement specifications are developed early. Once the relationship is more stable, CT works with Calgary Supply to develop P&I Centres of Excellence, a proven strategy at TTC for driving continual improvement.

Addressing Effectiveness Root Cause Issues First

In this option, CT immediately addresses the highest order root cause – the need to better align leadership between CT and Calgary Supply. As CT works to align its leadership objectives and activities, it can then work to improve the relationship with Calgary Supply. This step takes time and a number of quick wins to build trust between parties.

Peer coaching, mentoring, and active and visible leadership from senior leaders will accelerate relationship development. CT can improve cross-functional communication through the use of informal networks, active encouragement from Management to drive face-to-face interactions, collaborative technologies, and peer coaching, and implements a dispute resolution mechanism for the timely resolution of issues.

Other Effectiveness Framework Steps

Additional tactics can immediately follow to support the implementation of a new Effectiveness Framework.

- Senior management should clarify roles and accountabilities and drive a culture of accountability that reinforces aligned goals and strategic planning.
- Encourage improvements to spend procedure compliance.
- Introduce strategic business unit planning over multiple time horizons (less than 1 year; 1-3 years; 3-5 years; and 5-10 years), to drive consistent and common direction.
- Introduce change plans, and contract administration skills development.
- Introduce better data collection and cross-functional (shared) reporting and performance.
- Implement a continuous improvement process.

Performance Management

From its in-depth review of the procurement and inventory management function the MH Study Team found no formal joint business planning (Goals & Objectives, joint org charts, and process maps, etc.). The lack of any formal joint process has resulted in large part to the unproductive working relationship between departments due to misunderstanding and mistrust. Without knowledge of each other's challenges and opportunities joint problem solving cannot exist. Recent efforts by local management have accelerated efforts to overcome this barrier.

The MH Study Team also observed a lack of joint business metrics and reporting in use. In the absence of any joint formal business planning the development of business metrics and reporting has been slow. Joint metrics and reporting would give senior management visibility into chronic problems by reviewing trends and providing a baseline for managers to improve business performance.

A selection of overarching shared key performance indicators between the transit function and procurement and inventory functions can drive better alignment and confirm or dispel perceptions.

Calgary Supply's primary business objective is two-fold: to meet the needs of internal **customer** through supply of the necessary goods and services required, while at the same time exercising appropriate levels of **control** to meet its fiduciary responsibilities. The performance measurement system suggested for Supply includes customer focused KPI's and metrics in order to progress a shared sense of mission, in addition to measurements focused on the control aspects of the business while providing senior levels of the organization visibility into the relationship between Supply and Calgary Transit and the joint performance of the two organizations.

The KPI's provide a high level snapshot of critical departmental outcomes and should be tied to organizational or departmental goals and objectives, while the recommended metrics provide a more detailed look to highlight and identify opportunities for improvement and help communicate information to staff and employees. Again, the MH Study Team acknowledges recent efforts by management on the development and use of a performance management system.

While many of the following KPIs can provide a basis of benchmarking with peer agencies it is cautioned that the unique inputs and calculations vary agency to agency not always providing a direct "apples to apples" comparison. An overarching theme recommended as a starting position for CT and Calgary Supply is to focus on defining CT needs (parts, lead times) and for both parties to measure performance against those needs, using the principles of good performance measurement: **relevance**, **accuracy**, **transparency** and **timeliness**.

KPI's (Customer & Control)

- Total Inventory Value
- Inventory Turns
- Procurement Cycle Times
- Vehicles Held for Parts
- Customer Order Promised Cycle Time
- Customer Satisfaction (Survey)
- Metrics

Procurement

- Purchase Order Cycle Time
- Non-completed / Re-tendered Items (quantity)
- Compliance with Purchasing Policy
- Inventory vs. Non-Inventory Purchases (value)
- P-Card Use
- Material Requirement Planning – Compliance

Inventory

- Item Fill Rate
- Lost Sales
- Inventory Replenishment Cycle Time
- Inventory Record Accuracy
- Inventory ABC Classification (Criticality Rating)
- Obsolescence (Value, Quantity)

Logistics (Distribution, Warehousing, Transportation)

- Interdepartmental Transfers
- On-Time SKU Count
- Shipped without Damage
- Warehouse Pick Accuracy

Financial

- Total Value of Inventory
- Inventory Carrying Rate (storage, handling, damage, obsolete, loss)
- Inventory Carrying Costs
- Inventory Turns
- Warranty Claims
- Percent of services purchases handled by the purchasing department
- Procurement ROI as the (cost savings + cost avoidance) divided by cost of procurement operation

Fleet-Specific: Fleet Parts Availability

The objective of this tactic is to identify and resolve the root cause issues of lack of parts availability. A targeted process improvement initiative is applied to focus on the end-to-end sequence of activities that begin with identifying the need for fleet parts, communicating the need to those responsible for acquiring and stocking the part, through to the use of the part. Other key considerations include, but are not limited to:

- Sourcing and procurement activities including proactive communication by Calgary Supply and CT about perceived changes in markets and technology.
- Logistics and lead times.
- Inventory warehouse and stores activities such as adding, selecting and removing parts from the shelf to optimize warranty opportunities and turnover.
- Automated inventory controls such as reorder points and how these are set.
- Inventory information management.
- Spend and zero-based budget analysis.

- Performance tracking including cycle times and impacts to service.
- The differences and relationships between a long-range forecast and more tactical plan/budget.

Infrastructure-Specific: Procurement Strategy and Specification Development

The objective of this tactic is to improve the level of corporate planning activities over multiple time horizons, to: build line of sight to CT needs and expectations; ensure adequate time for planning, risk, and resource management; and ensure adequate time to optimize infrastructure spending.

Key considerations include, but are not limited to:

- Creating plans over multiple time horizons (less than 1 year; 1-3 years; 3-5 years; and 5-10 years)
- Integrated planning sessions where Calgary Supply is actively engaged at the beginning of the planning process to provide input and feedback.
- Periodic collaborative review of the plan assumptions.
- A review of infrastructure project specification development procedures and timelines.

Establishing Procurement and Inventory Centres of Excellence

When the previous steps are implemented and the relationship between CT and Calgary Supply begins to stabilize, the groups can jointly explore the design and implementation of P&I Centres of Excellence to drive continual improvement in efficiency and effectiveness for Transit. There are a few different designs for this model.

First, the model could operate under a shared services framework where employees are seconded from Calgary Supply into the fleet and infrastructure Transit groups.

Second, the model could establish a full time “Project Procurement” group housed within the Infrastructure group with dedicated resources directed towards:

- Sourcing, procurement and administration of professional services and construction contracts including materials.
- Professional services contract administration including progress payment admin.
- Works side by side with engineering / technical staff to expedite document preparation, purchasing process selection and administration.

Third, the model could establish semi-dedicated partnerships where Supply staff work one-on-one with Operations groups (Vehicle Engineers, Signals Engineers, Track Engineers etc.) to:

- Provide procurement advice, assistance and administrative support with complex services and supply issues.
- Provide contract administration services for system contracts and one-off supply contracts to various operating groups.

Both TTC and Edmonton have versions of P&I Centres of Excellence. For example, at TTC, the maintenance engineering function issued daily contracts for vendors and the process was impeded by the engineers' lack of understanding of procurement and purchasing procedures. The procurement group arranged for a dedicated resource to relocate three days each week and work with the maintenance engineering group, resulting in much greater knowledge transfer and responsiveness for both groups.

It is also noted that Calgary Supply has addressed part of the requirement for a Centre of Excellence by providing a dedicated resource to CT. Opportunities to build on the existing design might include:

- Assigning one or more procurement resources to the off-shift to address immediate maintenance needs.
- Co-locating dedicated resources with the infrastructure and fleet staff to build greater knowledge of CT sourcing requirements as well as to reinforce the use of preferred procurement and purchasing procedures.
- Creating opportunities for CT to be involved in the recruitment and selection of procurement and inventory staff.

There are several advantages to designing a fit-for-purpose Centre of Excellence:

- Improved procurement policy compliance.
- Strong segregation of responsibilities.
- Expedited procurement process.
- Significant improvement to budget and material controls.
- Relationship building between groups.
- Cross-training of staff.

3.1.6.2 Corporate/Business Unit Costs

Capital Costs

- No capital costs.

One-Time Project Costs

- OCM – 2-year change support: ongoing communication; process development; improvements to planning practices; facilitation; coaching; team building; prototype strategic P&I plan (100k pa if outsourced)
- Centres of Excellence design and implementation

Incremental Operating Costs

- Depending on the design for the Centres of Excellence, there is potential for modest incremental staffing increases. Otherwise, there are no other significant incremental operating costs identified.

Sunk or Absorbed Costs

The following activities will be required but will not drive incremental costs to Calgary Transit or the City of Calgary.

- Increased communication and relationship management at all levels should displace some other activity.
- Performance reporting and data collection.
- Peer coaching.
- Strategic planning.

3.1.6.3 Corporate/Business Unit Benefits

A break-even analysis was not completed for this option because:

- Most quantifiable benefits are believed to be low value.
- The significant effectiveness benefits are complex and not easily measured.
- Most costs are sunk, meaning they are already incurred by the City of Calgary and so are not relevant for this decision.

Efficiency Benefits

A number of improvements will result in nominal savings to CT and Calgary Supply.

- Reduction of “phantom” inventories.
- Reduction of P-card use in areas where a purchase order system is preferred. Calgary Supply has taken steps to improve this scenario by replacing common transactions with blanket purchase orders and improved spending support.
- Reduced carrying costs due to optimized inventory levels.
- Reduced inter-location transfers, currently believed to be about $1.5 million per year.
- Reduced need and associated costs to expedite parts. Calgary Supply arranges for expedited parts on behalf of CT.

Other opportunities for cost avoidance include:

- Reduced project costs stemming from delays / rework / lack of a procurement strategy.
- Improved use of financing from improvements in procurement cycle times.
- Avoided staffing increases due to shop mechanic productivity gains.

Effectiveness Benefits

- Ability to deliver transit projects in a timely manner.
- Improved Infrastructure and Fleet operations.
- Time savings
- Clear procurement strategy.
- Inventory values managed at appropriate levels.
- Improved Materials Control (optimized inventory turns).
- Improved material requirements planning.
- Improved parts availability.

3.1.6.4 Possible Risks and Management Strategies

Risk	Consequence	Probability	Impact	Preventative Control	Impact Mitigation Strategy
There are inadequate resources to manage the complex change	Full benefits potential is not realized or is realized more slowly	**M**	**M**	Change management and management prioritization; outsource some of the development work	Management intervention; measurement; may require incremental staffing
Current management and staff resist a performance culture shift	Procedural and behavioural changes do not allow for efficiency and effectiveness benefits to be realized	**L**	**M**	Change management	Management intervention

3.1.6.5 Implementation Considerations

2016

In 2016, the MH Study Team is suggesting an effectiveness framework development process be established with joint leadership by the GM Transportation and the Deputy City Manager and a Procurement and Inventory Management Working Group (PIM WG) to assist both business units to achieve individual and shared business objectives. The PIM WG should bring forward its effectiveness framework to its co-chairs for decision within 1 month of this approach being approved and a fast-tracked implementation strategy. The resolution of these effectiveness issues will allow the PIM WG to focus efforts on implementing process efficiencies.

The PIM WG should give consideration to the creation of number of discrete project teams with participation of staff from both departments to look specifically at fleet parts availability and procurement strategy and specification development. Initial efforts of the project teams will be to identify and resolve the root cause issues leading to the current challenges.

2017

The project teams start work developing project and change management plans and begin implementation of prioritized solutions;

- Develop specific project plans to identify and propose resolution of root cause issues for fleet parts availability and procurement strategy issues.
- Develop change management plans for root cause mitigation analysis and iterative change design. Include review and implementation of any outstanding mitigation plans from past studies. Emphasis on integration and use of data management across CMMS platforms (Peoplesoft / M5).

- Alignment of change plan to the strategic plan for PIM SG including performance management objectives.
- Development, socialization and execution of a project change plan supported by change analysis.
- Creation of an employee / stakeholder communication plan to share results and engage others with implementation and sustainability.
- Monitor and communicate progress through PIM SG including the use of KPI's and metrics.

2018-2019

- Iterative change focused on performance and continual improvement, identifying and correcting for the right behaviors and improved managerial communications.
- Performance Measurements, active management review, increased front-line accountability and continual improvements.

3.1.7 Option 2 Shift in Accountability for Procurement and/or Inventory

3.1.7.1 Option Description

This option acknowledges increasing the level of autonomy for CT by encouraging the implementation of a hybrid P&I model where some combination of P&I functions is transitioned with full accountability from Calgary Supply to CT. The scope of this option is strictly P&I and does not consider fleet or other maintenance functions. It is expected that increased formal accountability assigned to CT (e.g. ownership of the inventory) is accompanied by greater direct control over management and oversight with fewer required communication touchpoints with another group. Different approaches could be considered, and two are described below.

EXAMPLE #1: Migration of the Inventory Management Function to CT

Twenty-five partsmen are realigned under the CT organization. CT's ability to hire and manage the inventory staff, ensuring longevity, and driving greater control into min/max levels, reorder points, and heightened communication from being part of a common management structure will reduce the potential for stockouts, dependency on P-card spend and the existence of phantom inventories. Two key features drive benefit to CT:

1. Greater autonomy over staffing, knowledge retention and the development of a strong working relationship with other CT staff.
2. A common cross-over point manager within CT that can manage needs and availability of materials.

A manager of the inventory function will also need to be hired to maintain appropriate separation of responsibilities. Additionally, new inventory management and information technology (i.e. data management) procedures are required to manage risks and maintain oversight on financial and operational inventory data.

EXAMPLE #2: Migration of the Procurement Function to CT

Under this scenario, procurement specialists and buyers are repositioned from Calgary Supply to CT. To achieve this scenario, a duplication of the Calgary Supply procurement function is created, including:

- Incremental staffing – buyers, analysts and dedicated manager.
- Data requirements and a resource to manage the data.
- Peoplesoft expertise and other technical training to manage purchase orders, invoicing, and spend analysis.
- Segregation of responsibilities and new internal CT procedures that need to look similar to the ones defined by Calgary Supply, particularly around interfacing with Finance (Accounts Payable) and the public for external tendering.

3.1.7.2 Corporate/Business Unit Costs

Capital Costs

There are no capital costs identified.

One-Time Project Costs

There are no one-time project costs identified.

Incremental Operating Costs

- Increased CT staffing levels by a manager/supervisor position.
- Increased CT staffing budget by 25 inventory and stores positions ('partsmen') - ($2.85M)
- Decreased positive cost recovery from Calgary Supply budget.
- Increased procurement and sourcing spend (offset by reduced p-card)

Absorbed or Sunk Costs

- Increased CT training (recurring) in inventory management, warehousing, and inventory management software procedures. It is assumed this work will be completed by the internal training function.
- Annual CT cost recovery paid to Calgary Supply shifts to CT operating budget.
- Development of new procedures, and PeopleSoft access levels.

3.1.7.3 Corporate/Business Unit Benefits

Cost Savings

- Decreased Calgary Supply staffing budget by 25 inventory and stores positions ('partsmen' and 'inventory analysts') - ($2.85M)
- Decreased cost recovery payment from CT budget.
- Benefits from improved parts availability will show up as a positive compliance shift in spending practices.
- Reduced p-card spend (offset by increased procurement spend)
- Reduced expedited spend assumed to come from better alignment between inventory levels and transit needs.

Other Intangible Efficiency Benefits

- Cycle time improvements from reduced multi-party engagement, queuing, request hand-offs.

Other Intangible Effectiveness Benefits

- CT perceives greater control over achieving its goals
- Allows for the development and expertise of transit-focused inventory staff.
    - Fixes challenges of lack of parts, wrong parts etc.
    - Fixes stocking of various facilities

3.1.7.4 Break Even Analysis

A break-even analysis was not completed for this option because:

- Most quantifiable benefits are believed to be low value.
- The significant effectiveness benefits are complex and not easily measured.
- Most costs are sunk.

3.1.7.5 Possible Risks and Management Strategies

Risk	Consequence	Probability	Impact	Preventative Control	Impact Mitigation Strategy
Design is optimized for CT autonomy but could be sub-optimizing City of Calgary control over spending	Financial impacts	H	H	CT should hire and dedicate appropriate resources to effectively managing transit spending	Management intervention, particularly around reallocation of goals and resources to address adverse financial impacts
CT does not benefit from deep cross-functional sourcing experience that Calgary Supply has been building	Financial impacts	H	H	Training for P&I staff within CT; explore the use of a rotational apprenticeship program; ongoing dialogue with Calgary Supply and shared best practices	Increased training levels
Segregation of responsibilities must be protected.	Policy non-compliance risk and resulting impact to reputation	M	H	Procurement and/or inventory functions need to report to a different manager than the O&M functions; standard operating procedures; segregation of responsibilities; periodic analysis	Management intervention; discipline
Increased use of non-competitive sourcing procedures, non-PO contracts, P-card spending	Financial impacts	M	H	CT should implement a similar set of policies and procedures to manage spending and to show transparency for its due diligence	Management intervention, particularly around reallocation of goals and resources to address adverse financial impacts
Deterioration of internal working relationships between CT and other business partners (Accounts Payable, Calgary Supply, Fleet)	Financial impacts	M	H	Ongoing communication and relationship management; periodic accountability and process review	Management intervention

3.1.7.6 Implementation Considerations

Implementation Timeline

Regardless of the option selected from the two described above in section 3.1.7.1, we recommend that significant upfront planning and development work occur including the development of a labour relations strategy. We would expect that plan development and preparation for staff moves include a phased approach to implementation to the employee transfers would consume approximately one year from the start of implementation (mid 2017) with completion likely taking an additional two years for full assimilation (mid to end 2019) . Key considerations for effective change management include;

- Alignment of the change plan to the strategic plans for Supply / CT (vision, mission, goals, targets).
- Active and early dialogue between departments.
- Early recruitment, hiring, and training plans for staff.
- Creation of new, visual standards and standard operating procedures, and QA practices.
- Development, socialization and execution of a project change plan supported by change analysis.
- Creation of an implementation steering committee and supporting governance practices.
- Development of a communication plans tailored to key stakeholder groups.
- Creation of a labour relations strategy and contingency plans.

3.1.9 Recommendations

Of the two options, the Option 2 “Shift in Accountability for Procurement and/or Inventory” model is more complex and carries much higher risk because it is misaligned with the City of Calgary centralized approach to procurement. Significant design and development work is required to replicate the important governance features already embedded within the Calgary Supply function and some resources will need to be duplicated in order to create appropriate segregation of responsibilities. Option 1, by contrast, introduces fewer financial risks and the incremental changes are more likely to be successful in the short- and long-run.

3.1.10 Appendix

3.1.10.1 Benchmarking Summary Notes

Organizational and Functional structure

CALGARY TRANSIT	Transit: operates and maintains and is part of City of Calgary municipality Supply: drives most procurement and is part of City of Calgary municipality
EDMONTON TRANSIT	Transit: operates / non-fleet maintenance Fleet: transit fleet maintenance and reports to Corporate Services Materials Management: all municipal procurement except low value spend and reports to Corporate Services All are part of City of Edmonton municipality
WINNIPEG TRANSIT	Transit: operates and maintains Materials: drives most procurement
OC TRANSPO	Transit (OC Transpo): operates and maintains and is part of City of Ottawa municipality Supply Branch: drives most procurement and is part of City of Ottawa municipality OC is department of the City of Ottawa. The Transit Commission is made up city Councillors who report to the commission. There are shared services (HR, Finance, Supply, etc.) which are City branches.
TTC	Customer functions with the transit agency are separate from procurement functions, but all exist in stand-alone agency.
TRANSLINK	Customer functions with the transit agency are separate from procurement functions, but all exist in stand-alone agency. As typical with most organizations, very generally speaking, operations defines the requirements and scope, procurement undertakes the competitive solicitation process (including operations in the evaluation), negotiations and contract award. TransLink implemented category management and it is also planned that Contract Management capabilities will be enhanced.

Balance between financial stewardship and achieving transit results (Transit function perspective)

CALGARY TRANSIT	There is a perception that Calgary Supply is too rigid and limits spending. Not enough effort is spent understanding Transit needs.
EDMONTON TRANSIT	The transit function perspective was not obtained.
WINNIPEG TRANSIT	Materials Management is restrictive. Long process and for questionable benefit. MM has final decision authority and there is no dispute resolution protocol.
OC TRANSPO	Positive working relationships with Supply Branch, supported by well-defined policies and procedures and timelines. Timelines are communicated in advance, and the Supply Branch delivers to their commitments and proactively communicates to ensure Transit needs are met.
TTC	The transit function perspective was not obtained.
TRANSLINK	The transit function perspective was not obtained.

Balance between financial stewardship and achieving transit results (Supply function perspective)

CALGARY TRANSIT	There is a belief that CT does not follow approved policies and procedures to meet their service needs.
EDMONTON TRANSIT	Because the municipal Fleet business unit does the maintenance, the primary customer is not Transit and so the amount of fleet spend with ETS is small and regular, with a good working relationship. The infrastructure spend perspective was not available.
WINNIPEG TRANSIT	Materials Management has the right level of control and all spend goes through them. They perceive that all other departments find this restrictive.
OC TRANSPO	The procurement perspective was not obtained.
TTC	The procurement perspective was not obtained.
TRANSLINK	The two are mutually supportive. Procurement is an enabling agent

Transit Autonomy

CALGARY TRANSIT	Procurement and purchasing procedures are explicit and defined by a central supply group. CT's autonomy is low and due to leadership alignment, accountability, and communication challenges, there is weak support.
EDMONTON TRANSIT	Procurement and purchasing procedures are explicit and defined by a central supply group. ETS's autonomy is low, support is strong because there are Supply staff embedded directly in the transit function.
WINNIPEG TRANSIT	Low, but appears to be good internal support. Strong materials management system developed in-house. Long-standing purchasing practices and over time both groups are developed efficiencies. Supply offers annual procedures training.
OC TRANSPO	If competitive bid procedures are used, then transit function has a fair amount of autonomy. Strong support tied to good communication practices and clear procedures.
TTC	Autonomy is high because the transit agency is separately structured from the municipality. There is still some positive tension between the transit functions and P&I functions within the agency.
TRANSLINK	Autonomy is high because the transit agency is separately structured from the municipality. There is still some positive tension between the transit functions and P&I functions within the agency.

Policy and Procedure Documentation Clarity

CALGARY TRANSIT	Confusing Requires simplification and consolidation
WINNIPEG TRANSIT	Confusing and dated Only high-level policy is posted to web. Published procedures are hidden. Annual internal training on procedures provided.
OC TRANSPO	Policies and by-laws describing procurement procedures are clear and explicit. Published to web.
TTC	Procurement policy and procedures are clear and explicit. Published to web.
TRANSLINK	Only high-level policy is posted to web. Published procedures are hidden.

Procurement Cycle Times

CALGARY TRANSIT	8 weeks
EDMONTON TRANSIT	About 7 to 12 weeks
WINNIPEG TRANSIT	Less than 1 month for low complexity procurement but longer for high complexity spends.
OC TRANSPO	About 7 to 8 weeks
TTC	Cycle time perspective was not available.
TRANSLINK	Cycle time perspective was not available.

4. FLEET MAINTENANCE

4.1 Fleet Maintenance

Recommendation: MH recommends that Calgary Transit pursue the comprehensive internal change approach outlined in the multi-part solution and develop an implementation strategy and timeline.

4.1.1 Purpose

The zero-based review (ZBR) objectives are to explore:

- The Department's current business practices required to maintain buses and LRV in a state of good repair.
- Identify process changes to improve performance.

4.1.2 Business Objectives

4.1.2.1 Business Unit Goals

The primary goal of the fleet maintenance function is to ensure the fleet is available for service.

The secondary goals are:

- Efficient and effective procurement
- Preventative and corrective maintenance
- Rehabilitation and life extension of fleet of transit vehicles

4.1.2.2 Relevant Business Unit Policies

- Disposal of Surplus Assets (FA-053 (A))

4.1.2.3 Contribution to Long-term Goals

- Financial: optimization of assets we own
- Employee, customer and Calgary citizen safety
- Service reliability

4.1.2.4 Customer & Citizen Needs Addressed by the Service

- Service reliability
- Customer experience
- Customer and Calgary citizen safety

4.1.3 Case for Change

4.1.3.1 Effectiveness Gaps

- Formal operating and capital maintenance plans are incomplete and lack integration
- Lack of formal asset management plans
- Inconsistent application of budgets, metrics, KPIs
- Metrics are not actively and consistently used to support decisions and continuous improvement initiatives
- Incomplete maintenance systems
- Differing bus (run-to-fail) and LRV (condition- and time-based) maintenance philosophies
- Accounting economic life decisions influencing budgeted allocations for other fleet maintenance activities. The MHL Study Team had previously provided supporting comments.

4.1.3.2 Efficiency Gaps

- Lack of workforce / spatial optimization: maintenance facilities are constrained (particularly weekdays) and underutilized on off-shift.
    - High spare ratio
- Assignment of bus type (60-foot, 40-foot, shuttle) by route is not optimized.
- Vehicles entering service with temporary repairs due to lack of parts or time constraints
- Inconsistent workforce planning across shifts and sites – inefficient use of time and space

4.1.3.3 Workforce and Overtime

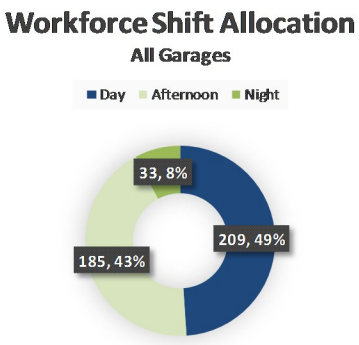
CT noted that the current maintenance labour force consistently meets its vehicle commitment, and though it has recently implemented exception tracking, service failures due to lack of vehicle availability are rare. The current composition of maintenance staff includes generalist and technical specialist positions to maintain buses and LRVs. Staff are distributed across the garages according to their function, the type of vehicle maintained, and the commitment volume. The bus facilities will be physically constrained until 2019 when the new Stoney Trail garage is commissioned.

Most unionized staff are allocated either to day shifts or afternoon shifts with less than 10% of the workforce working nights.

Garage	Day	Afternoon	Night	Total
Anderson (Bus)	23	28	0	**51**
Anderson (LRV)	41	33	8	**82**
Spring Garden (Bus)	79	49	12	**140**
Victoria Park (Bus)	31	38	13	**82**
OBMF (LRV)	35	37	0	**72**
Total	**209**	**185**	**33**	**427**

**Totals include only unionized maintenance staff and exclude foremen and management exempt employees*

Source: CT Spreadsheet "Fleet Org Chart" (2015)



Over the last four years, maintenance overtime was paid up to $1.03 million in a year (2014).

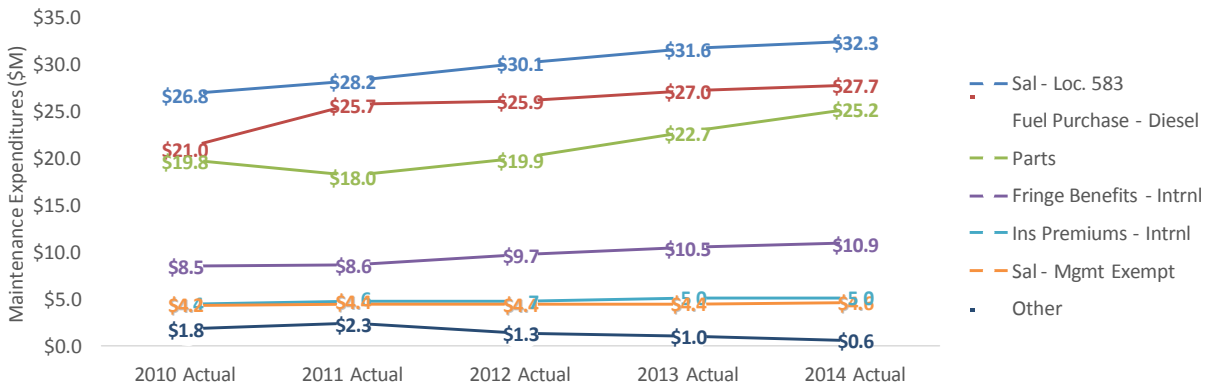
Maintenance Overtime - Union Staff

Garage	2011 Actual	2012 Actual	2013 Actual	2014 Actual
VP	$ 0.15	$ 0.03	$ 0.32	$ 0.47
SG	$ 0.14	$ 0.01	$ 0.23	$ 0.23
LRV - OBMF	$ 0.15	$ 0.08	$ 0.16	$ 0.10
LRV - AG	$ 0.10	$ 0.11	$ 0.09	$ 0.09
AG	$ 0.13	$ 0.02	$ 0.05	$ 0.11
OTHER	$ 0.10	$ 0.15	$ 0.02	$ 0.01
Total	**$ 0.77**	**$ 0.40**	**$ 0.87**	**$ 1.03**

Source: CT Spreadsheet "Financials - Supply and Parts Costs" (2015)

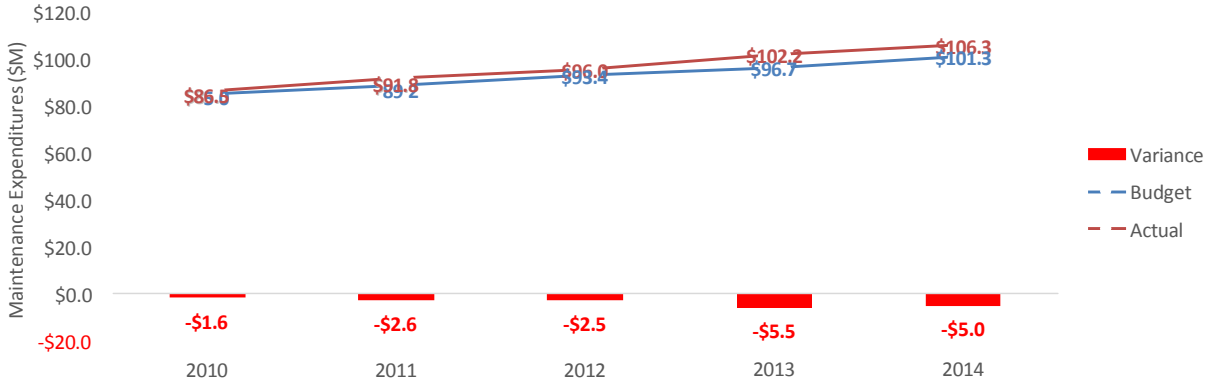
4.1.3.4 Maintenance Spend

The following chart shows the previous 5 years of fleet maintenance spend, excluding service lane costs. The chart is intended to provide a cost baseline.



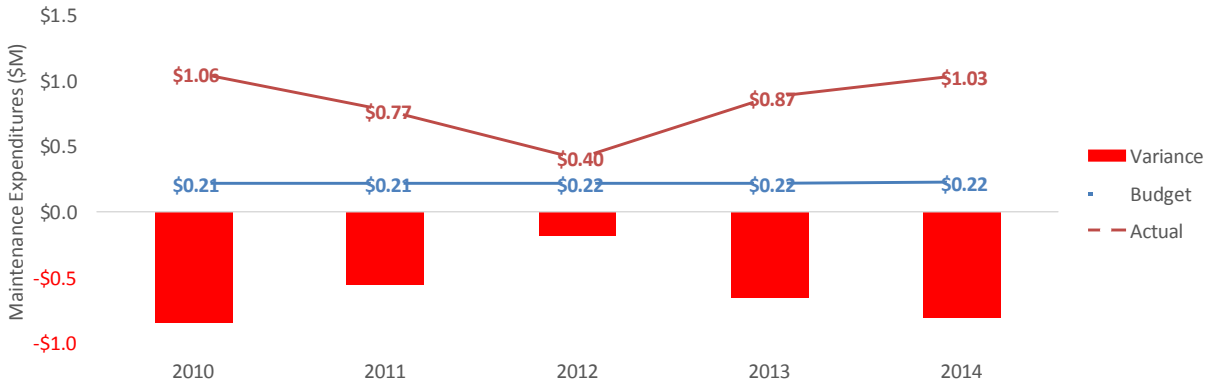
Source: CT Spreadsheet "Financials - Supply and Parts Costs" (2015)

The historical fleet maintenance planned and actual expenditures for buses and LRVs are provide in the following chart, and reflect a small but consistent cost overrun trend.



Source: CT Spreadsheet "Financials - Supply and Parts Costs" (2015)

The historical fleet maintenance planned and actual **overtime** expenditures for buses and LRVs are provide in the following chart, and reflect a consistent cost overrun trend.



Source: CT Spreadsheet "Financials - Supply and Parts Costs" (2015)

4.1.3.5 Trends

An industry scan **(ref. appendix)** was completed to gain an understanding of transit bus and rail fleet maintenance organization models used in peer transit agencies across North America to identity standard practices, trends and issues in maintenance service delivery models, and to recommend on the feasibility of the different models and their application in Calgary.

The work identified that there are three types of vehicle maintenance organizations models used to deliver core services, with variations on each theme across the industry. The three primary models used are:

- Self-Perform Vehicle Maintenance Model.
- Strategic / Shared Contract-out Vehicle Model (Calgary Transit).
- Contracted-out Vehicle Maintenance Model.

While most transit agencies within Canada and the US have “evolved” organization models, as opposed to purposely built, the largest percentage of the scanned agencies tended towards the strategic / shared contract-out vehicle model based largely on cost, quality of service and organizational risk.

Few agencies take advantage of, or consider the future use of any alternate service delivery (ASD) methods beyond contracting-out and or a shared services model within the vehicle maintenance context again in consideration of cost, quality and risk. The MHL study team explored two forms of ASD: 1) the consolidation of all vehicle maintenance within a municipality under a single authority, and 2) the use of vehicle leasing and maintenance contracts as a means of reducing vehicle mainteance and ownership costs. In both instances the review indicated that neither method was used as a best practice within the industry, largely supported by the lack of evidence of an apparent cost advantage.

The MHL study team does not feel that an organization change is required for the vehicle maintenance group inside Calgary Transit as a means to improve effectiveness or efficiency. The industry scan results to date show that Calgary Transit is on the right path and consistent with its industry peers in terms of vehicle maintenance organization models and delivery methods. It is recommended that Calgary Transit pursue a more aggressive approach to ASD / Contracting-out opportunities for other vehicle maintenance activities consistent with the current areas of the ZBR review.

One of the elements currently under exploration is clearer delineation between fleet and LRV maintenance oversight, which could be achieved by creating a complementary managerial position so that buses and LRVs each have a discrete manager.

4.1.3.6 Relevant Regulations and Legislation

- Collective agreement

4.1.4 Multi-Part Solution: Comprehensive Internal Change

4.1.4.1 Solution Description

The recommended mulit-part solution is largely comprised of threee elements;

- Changes to Planning and Fleet Maintenance
- Workforce Planning
- Fleet Changes

This solution will enable Calgary Transit to drive powerful internal changes that could lead to a number of gains in efficiency and effectiveness including reductions to fleet size. Successfully operating with a smaller fleet requires a shift in workforce planning and heightened rigor in planning, standards and standard operating procedures, and performance measurement. Fleet reduction, without these complementary changes, is likely to place the service at risk. CT begins by defining the overarching maintenance philosophy. Strategic asset plans are developed along with the introduction of preliminary spares ratios targets. Standards and standard operating procedures are developed and/or upgraded. Improving the availability of required parts (i.e. the parts process initiative in the chart to the right) was introduced in option one of the procurement and inventory business case.

Improvements in the relationship between CT and Calgary Supply, with changes focusing on better transparency of parts requirements and corresponding procurement and inventory response will improve CT's ability to successfully reduce the fleet size. The fleet maintenance workforce is optimized across shifts and garages and the shift transfer process is augmented to improve continuity of maintenance activities.

If staff are able to successfully change the way work is planned and executed, the proposed internal improvements will enable the reduction of bus and shuttle fleets.

Planning

Internal performance improvement is driven through better planning and execution of fleet maintenance activities. The approach is supported by a PLAN – DO – CHECK – ACT asset management system and the sequence of internal changes is expected to drive effectiveness improvements such as better availability and reliability of vehicles, better alignment in tactical planning and execution, and more consistent maintenance quality.

Plan

Maintenance Philosophy and Maintenance Plan

The framework begins with the establishment of a Maintenance Philosophy, and flows through to the business systems required to enact the philosophy. The maintenance philosophy is a high level document that including strategic planning statements (Vision, Mission, Goals, etc.), and technical analysis that establishes the economic life of the organization's assets and the principles of how an organization intends to maintain its assets over that life - the two are intricately related. For example, a 12-year bus life could be chosen with no significant bus heavy overhaul interventions. Conversely, a much longer bus life could be chosen with one or more significant bus heavy overhaul interventions. The right choice is based on Net Present Value (NPV) analysis of all asset lifecycle costs - procurement, maintenance and disposal.

Once a maintenance philosophy is established, the Maintenance Plan can be developed that is much more specific in nature. The Maintenance Plan, based on the principles found in the Maintenance Philosophy, establishes what will be done and when it will be done. This is the key document that establishes maintenance activities and ultimately the unit resource requirements. When combined with the Service Plan, resource requirements for fleet, facilities and workforce can be established.

Strategic Fleet Asset Plan

The Fleet Plan is integrated with these and other strategic documents. The Maintenance Philosophy and Plan establishes the vehicle procurement cycle as well as any capital investment (usually in the form of heavy vehicle overhaul) required to extend the life of an asset until the next procurement cycle. The Maintenance Spare Ratio can be mathematically determined based on the constituent components of the Maintenance Plan. For example, if inspections are performed during the peak service period, additional fleet in an amount equal to the number of inspections performed during the peak period will be required; however, if inspections are performed outside of the peak period, no additional fleet will be required for the activity. Often additional fleet beyond that required for service and maintenance is added to accommodate unexpected events, such as special events, construction activities or unplanned service growth. This is a policy decision. Once developed, a Fleet Plan informs the 10 Year Capital Plan, the Zero Based Budget and the Facility Plan.

Development of Standard Operating Procedures and Engineered Standards

A list of required standards and standard operating procedures is an output from the strategic asset plan and for fleet maintenance, new standard operating procedures are developed and approved, which address the:

- Functional scope of work.
- Specific tasks and accountabilities.
- Required tools and materials.
- Timing, intervals, and frequency.

Each standard operating procedure drives a set of engineered standards that support a more rigorous maintenance regime.

Designed Managerial Improvements and Culture Shift

Front-line managers receive training and ongoing coaching to drive a culture of performance and accountability. Training augments:

- Inspection and quality review.
- Communication and feedback.
- How to effectively coach.
- Understanding the relationships between operating behaviours and financial performance.
- Creating a sense of urgency in work activities.

Additionally, CT invests in developing a community of practice to share information and best practices across garages.

Driver-Based Budgeting

The driver-based approach to budget planning requires the estimation of operating drivers (e.g. labour hours, time, volume of materials, etc.), unit costs (e.g. hourly wage rates, etc.) and an understanding of supporting assumptions that build the budget from the ground up rather than rolling a budget over from year to year. The unit times (and materials) developed from SOP's for all planned work, along with the hours, kilometres and fleet size generated from the Service/Fleet Plan, workforce requirements can be generated. Lost and idle time needs to be accounted for, as well as employee availability. Unplanned work can be guided by historical ratios tempered by overtime profiles and work backlog.

Do

Field staff follow new standard operating procedures, particularly focused on maintaining 40-foot conventional and shuttle bus fleets with smaller spare pools. Field managers encourage correct behaviours, inspect the work, and actively coach their teams to correct undesirable behaviours.

Check

The consistent capture and review of critical fleet maintenance data drives short-term as well as long-term systemic improvements to efficiency and effectiveness.

Performance Management

Performance Management is critical to continuous improvement in effectiveness and efficiency. A full suite of metrics and KPI's needs to be developed and monitored to gauge the effectiveness and efficiency of the business. Based on the outcomes, adjustments to resources or to the maintenance plan need to continually be made. For example, to drive reliability higher, a campaign or increased scheduled maintenance interventions may be warranted on the system/subsystem with the lowest reliability. Continual fault/cause/remedy (FCR) analysis will also drive innovation and adjustments to the program. Performance Management requires information technology to capture data and report performance. A number of data elements are captured to improve the measurement of appropriate KPIs.

Cost savings, cost avoidance, and capacity management can be improved by capturing the following data:

Following is a recommended number of KPI's and metrics to assist the maintenance department manager and higher-level managers in assessing and communicating the effectiveness of the maintenance program.

The KPI's provide a high level snapshot of critical departmental outcomes and should be tied to organizational or departmental goals and objectives, while the recommended metrics provide a more detailed look to highlight and identify opportunities for improvement and help communicate information to staff and employees. Metrics can describe the department's workload, the ability to fix problems correctly the first time, the ability of preventive maintenance efforts to minimize vehicle breakdowns, etc. For example, the longer it takes to repair vehicles, the more vehicles that are not available for service, leading to a higher spare ratio requirement. Depending on the circumstances, a significant work backlog may indicate there is insufficient staff or repairs are taking longer than they should. No work backlog, on the other hand, may indicate a larger staff than is needed for the amount of work being generated.

However, as a whole, performance measures are used because they can provide perspective, understanding, and context to what has gone on and what is going on within the organization. A structured performance measurement system can help the department select and distill key data items in order to better understand how things are working and to more readily identify areas needing improvement. While many of the following can provide a basis of benchmarking with peer agencies it is cautioned that the unique inputs and calculations vary agency to agency, not always providing a direct "apples to apples" comparison.

Departmental KPI's

- Average age of fleet
- Spare Ratio
- Vehicle Availability
- Vehicle Reliability
- Total Maintenance Cost / Revenue Mile
- Commercial Vehicle Certificate and Insurance Regulation

Maintenance Program Effectiveness (Metrics)

- Spare Ratio (vehicle type, location)
- Vehicle Availability (by location)
- Adherence to Preventive Maintenance Schedules
- Numbers of Road Calls / Change Offs (breakdowns)
- Duration of Open Work Orders (by cause)
- Number of Repeater Work Orders
- Backlog of Corrective Maintenance (by cause)

- Warranty Recovery
- Direct Labor / Contracted Labor
- Stock Fill Rates / Stock outs / Not Available (by reason, by location)
- Logged asset issues and systemic issues
- Cycle times and queuing
- Throughput
- Staff productive and non-productive (slack) times
- Attribution of anomalies (wrong moves, materials waste, missed work, etc.)
- Fleet availability and parts availability

Employee Performance

- Absenteeism
- Number of Repeat Work Orders by Employee
- Average Labour Hours / Work Order
- Work Order Completion to Standard (CMMS)
- Lost Time / Non-lost Time Injuries

Vehicle Performance

- Vehicle Reliability (vehicle type, make, location)
- Vehicle Sub-system Reliability (Engine, Transmissions, Propulsion, Doors)
- Cleanliness - QA

Financial Performance

- Total Maintenance Budget (Actual vs. Budget)
- Labor Budget – Direct, Indirect, Premium Costs (Actual vs. Budget)
- Overtime – By Reason (Actual vs. Budget)
- Material Budget (Actual vs. Budget)
- Total Maintenance Cost / Service Hour or Revenue Mile
- Unit costs

Management Review

Captured data is transformed into a simple performance scorecard supported by performance trends, and integrated across the fleet maintenance function of all facilities. Periodically (i.e. quarterly), managers, foremen, and lead hands review the performance results together and discuss systemic issues, risks, and opportunities for continual improvement.

Act

Continual Improvement

Upon completion of the management review, leaders select opportunities for continual improvement and then allocate resources (time, people, funds) to drive performance gains. Three key efficiency gains will come from continual improvement:

- Incremental reduction of maintenance worker positions.
- Parts spend reduction and inventory reduction.
- Opportunities to reduce fleet size do to better planning and deployment.

Workforce Planning

This part of the solution describes changes to the allocation of maintenance staff across facilities and smooths the allocation across shifts by taking advantage of underutilized off-shift capacity. A review of the current workforce allocation identified challenges in shift overlap, differing start times, and vacant shifts, which contributed towards peak-volume dayshift facility constraints.

There are three workforce planning changes:

- Workforce redeployment to improve the utilization of afternoon and especially night shifts.
- Alignment and standardization of shift schedules across facilities.
- Enhanced reliability engineering to augment the existing function.

Workforce Redeployment

Table 4-2 **(ref: Interim Report, October 2015)** identified opportunities to redeploy preventative maintenance labourers away from the day shift to the afternoon and night shifts as well as to weekend shifts. The premise behind this recommendation is that day shifts are heavily staffed, all facilities are physically constrained, and facilities are not heavily used on nights and weekends. Four functions were identified for consideration and a key objective of shifting these functions to the non-peak volume shifts is to avoid tying up fleet required for service. Preventative maintenance inspections and light repairs could be completed on afternoons and night shifts on vehicles parked at each garage awaiting service the next day. Completing maintenance work on naturally-idle vehicles creates opportunities to reduce the overall fleet size from a reduction to the spare fleet. Two additional requirements are: 1) to revisit how work is planned and executed across shifts, and 2) to augment the use of a shift transfer to ensure continuity of work between shifts.

Preventative Maintenance Persons

Garage	Current Maximum Utilization	Dayshift	Unused Day Shift Capacity	Afternoon Shift	Unused Afternoon Shift Capacity	Night Shift	Unused Night Shift Capacity	Weekend Day Shift	Unused Weekend Day Shift Capacity	Weekend Afternoon Shift	Unused Weekend Afternoon Shift Capacity	Proposed Dayshift Change
Anderson (Bus)	2	2	0%	0	100%	0	100%	1	50%	0	100%	-2
Anderson (LRV)	5	5	0%	5	0%	5	0%	0	100%	0	100%	0
Spring Garden (Bus)	8	8	0%	1	88%	2	75%	0	100%	0	100%	-8
Victoria Park (Bus)	6	6	0%	0	100%	0	100%	0	100%	0	100%	-6
OBMF (LRV)	10	7	30%	10	0%	0	100%	0	100%	0	100%	0

Truck & Transport Mechanics

Garage	Current Maximum Utilization	Dayshift	Unused Day Shift Capacity	Afternoon Shift	Unused Afternoon Shift Capacity	Night Shift	Unused Night Shift Capacity	Weekend Day Shift	Unused Weekend Day Shift Capacity	Weekend Afternoon Shift	Unused Weekend Afternoon Shift Capacity	Proposed Dayshift Change
Anderson (Bus)	17	17	0%	11	35%	0	100%	5	71%	0	100%	-5
Spring Garden (Bus)	35	35	0%	14	60%	6	83%	10	71%	7	80%	-15
Victoria Park (Bus)	14	8	43%	5	64%	7	50%	14	0%	9	36%	-4

Autobody Mechanic

Garage	Current Maximum Utilization	Dayshift	Unused Day Shift Capacity	Afternoon Shift	Unused Afternoon Shift Capacity	Night Shift	Unused Night Shift Capacity	Weekend Day Shift	Unused Weekend Day Shift Capacity	Weekend Afternoon Shift	Unused Weekend Afternoon Shift Capacity	Proposed Dayshift Change
Anderson (Bus)	0	0	N/A	0	N/A	0	N/A	0	N/A	0	N/A	0
Anderson (LRV)	15	15	0%	0	100%	0	100%	0	100%	0	100%	-7
Spring Garden (Bus)	19	19	0%	0	100%	0	100%	0	100%	0	100%	-9
Victoria Park (Bus)	10	10	0%	0	100%	1	90%	1	90%	0	100%	-5
OBMF (LRV)	4	4	0%	0	100%	0	100%	0	100%	0	100%	0

Electro Mechanic

Garage	Current Maximum Utilization	Dayshift	Unused Day Shift Capacity	Afternoon Shift	Unused Afternoon Shift Capacity	Night Shift	Unused Night Shift Capacity	Weekend Day Shift	Unused Weekend Day Shift Capacity	Weekend Afternoon Shift	Unused Weekend Afternoon Shift Capacity	Proposed Dayshift Change
Anderson (LRV)	19	19	0%	10	47%	3	84%	0	100%	0	100%	-9
OBMF (LRV)	23	23	0%	11	52%	0	100%	0	100%	0	100%	-11

Shift Scheduling Standardization

Scheduled shifts vary across garage facilities, including across identical roles. For example, a Fleet Attendant at the Spring Gardens garage is scheduled from 16:00 to 01:00, whereas a Fleet Attendant at Victoria Park garage is scheduled from 15:00 to 23:59. Standardizing shift schedules creates flexible options for shift coverage within or across garages. There is evidence of overlapping shifts, which create unnecessary physical constraints on the facilities.

Generally, the Fleet Maintenance group should attempt to move away from a reactive, unplanned approach to work to a more planned and scheduled approach. This principle should be a cornerstone to the yet to be developed maintenance philosophy and flow into the asset and operating plans.

While there will always be a level of unscheduled or reactive type work stemming from breakdowns, accidents, etc. the vast majority of work conducted at an operating garage should be planned and scheduled. Two primary metrics should be at the center of this effort those being fleet availability and reliability. Both metrics will improve dramatically as the organization moves closer to a planned approach to its maintenance activities. Starting with an optimized fleet size and maintaining it though a constant vigil of the spare ratio will also aid this effort.

Of concern is the planning of work across shifts which in the instance of the garage typically only applies to the planned activities e.g. cleaning, inspections, program work, corrective repairs, and warranty management. Much of the work done in response to service / fleet requirements across all shifts and includes; service dispatch, running repairs, change-off' s, road calls, etc. is largely unscheduled but can be better planned to ensure the necessary resources, both physical and human, are in place and available when required. All work is planned or managed from a Swing / Hold sheet. Largely a manual process of recording on a shift by shift basis the status of each of the facilities vehicles. The Swing /Hold sheet is dynamic and constantly updated during and across shifts. It's the facility playbook.

Our recommendation to standardize shifts and to remove unnecessary overlap between shifts as a means of improving productivity and removing unnecessary physical constraints on facilities is a step towards this planned approach.

Work is typically transferred between shifts via two methods;

1) Swing / Hold Sheet, and or MMS Work Order
2) Foreperson to Foreperson communication.

As described above, in most operating garage facilities a swing sheet or a central registry is maintained manually or within a computerized MMS. The purpose of this process is to compile and communicate the status of the fleet located at the facility and detail where each vehicle is in process. The swing sheet is maintained either by the shift Supervisor or Foreperson and is very much a dynamic process of updates and revision to track vehicle status against demand.

The swing sheet also provides a means to transfer work between shifts as it is constantly updated with vehicle status for both incoming and departing shifts. A well-managed process removes the need for significant shift overlap as all work details are located on this central repository.

Foreperson communication with both peers and employees is also an important means of communication and planning work across shifts. Both the incumbent and arriving FP's at a shift change should have responsibility of effectively managing shift changes in order to smoothly transition the flow of work across the break without the requirements of overlap greater than ½ hour. In the instance of shop type work which typically follows a manufacturing type approach no shift overlap is typically required.

Removing these overlaps is likely to lead to improved productivity and other efficiency gains.

Dayshift

Garage	Shift 1	Shift 2	Shift 3	Shift 4
Anderson (Bus)	0600-1500			
Anderson (LRV)	0730-1600	0630-1530	0600-1500	
Spring Garden (Bus)	0600-1500	0700-1600	0545-1545	0500-1400
Victoria Park (Bus)	0600-1500	0700-1600		
OBMF (LRV)	0600-1500	0500-1500		

Afternoon Shift

Garage	Shift 1	Shift 2	Shift 3	Shift 4
Anderson (Bus)	1630-0130	1600-0100		
Anderson (LRV)	1700-0200	1715-0315	1400-2359	1500-2359
Spring Garden (Bus)	1600-0200	1600-0100	0900-1800	
Victoria Park (Bus)	1700-0200	1630-0230	1500-2359	1600-0100
OBMF (LRV)	1700-0300	1715-0315	1500-2359	1400-2359

Night Shift

Garage	Shift 1	Shift 2
Anderson (Bus)		
Anderson (LRV)	2200-0800	2200-0700
Spring Garden (Bus)	2300-0800	
Victoria Park (Bus)	2300-0800	
OBMF (LRV)	2200-0700	2000-0600

Augmentation of Reliability Engineering Function

CT has a Technical Services group responsible for the transit LRV reliability function, with less formal support provided for buses. The group produces a number of reports and prepares a variety of analyses to ensure reliable performance of the various fleets. Reporting to the Technical Services Coordinator, the Lead Technical Advisor LRV – Reliability has one technical advisor direct report and three electro mechanic direct reports located at the Anderson garage. The suggested approach is to augment the reliability engineering function to enhance the systems approach to fleet maintenance. Three net new engineers are added to the Technical Services group. The number was selected to be more than a token engineer; rather, a small team is expected to formalize the bus fleet reliability function, integrate with the LRV reliability function, and significantly augment the level of rigor looking across all fleets and facilities as a system.

Establishing a Preliminary Spares Ratio and Identifying Opportunities for Fleet Reduction

As part of the strategic fleet asset plan, CT establishes a preliminary spares ratio target for the conventional and shuttle fleets, each of which are believed to be relatively high. The current spare ratio for the 40-foot conventional bus fleet is 24% and for the shuttle bus fleet, 38%. The MHL Study Team recommends that CT **establish its own targets** to drive a reduction to its spare ratios, and suggests that a **20% target** for the 40-foot conventional bus fleet and a **25% target** for the shuttle bus fleet are a reasonable starting position. CT will need to complete additional work to set appropriate final targets and should identify additional opportunities to address improvements to the spare ratios, such as facility and workforce issues. While not explicitly modeled in this case because of its relatively low spares ratio, the fleet reduction methodology should be applicable to the 60-foot articulated bus fleet and the LRV fleet.

Field staff following new standard operating procedures, are particularly focused on maintaining 40-foot conventional and shuttle bus fleets with smaller spare pools. Field managers encourage correct behaviours, inspect the work, and actively coaching their teams to correct undesirable behaviours.

4.1.4.2 Corporate/Business Unit Costs

Capital Costs
There are no capital costs identified for this part of the solution.

One-Time Operating Expenses
There are a number of one-time project activities required to support this option. Each activity has been assigned a cost estimate, reflecting a financially conservative approach to ensuring appropriate resources are protected. It is understood that the City of Calgary has a number of internal support functions including project management, organizational change management, and training, that could provide some or all of these services to CT. If CT is able to arrange for these internal resources, the net benefit to the project will be higher than is currently presented in this business case.

- Project management services are $25,000 per year over 4 years, starting in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- Change management services are $100,000 per year over 4 years, starting in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- The development of a strategic asset plan and has been estimated at $100,000 in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- Standards and standard operating procedures (SOP) development has been estimated at $100,000 in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- Introduction of targeted managerial training, culture assessment, and materials development was priced at $100,000,
- Contingency costs have been established at 15%.

There are no additional one-time project costs associated with fleet reduction. Specifically, it is assumed that reduction to fleet will not require:

- Short-term storage with incremental storage costs.
- Long-term storage contingency if there is no resale market with incremental storage costs.

Sunk or Absorbed Costs

The following activities will be required but will not drive incremental costs to Calgary Transit or the City of Calgary.

- Consultation with internal labour relations and HR representatives to facilitate shift changes under the current collective agreement.
- Internal CT procedural changes.
- Internal CT quality management changes to measure and manage maintenance.
- Training / retraining / communication and cultural integration of new team members moving into and out of different shifts.
- Changes to operational performance measurement, particularly around capacity, availability, productivity and efficiency changes.
- Risk management.
- Periodic review of the strategic fleet asset plan, standard operating procedures and engineered maintenance standards.

Incremental, Recurring Operating Expenses

The introduction of **three** reliability engineers will add recurring, incremental operating costs. It is assumed the average cost per person will be $150,000 per year, but the new reliability engineering team could be staffed by a combination of senior (higher cost) engineer and junior (lower cost) engineers.

Three net new foremen positions have been earmarked for shifting resources from the day shift to the afternoon, night or weekend shifts, estimated at $100,000 each per year. A detailed staffing plan will be required to better understand the specific requirements of staff redeployment.

There are no additional recurring operating costs associated with fleet reduction, and the potentially higher maintenance costs from heavier use on remaining fleet assets are believed to be negligible.

Data capture, transformation, analysis and the preparation of regular performance reporting drives recurring operating costs, addressed by the incremental hiring of a business analyst at $80,000 per year starting in 2016.

4.1.4.3 Corporate/Business Unit Benefits

Operating Benefits

Operating cost savings will come from:

- A 25% reduction (estimated to be $0.2 million per year) in **unplanned** overtime expenses is estimated from changes to workforce planning. A balanced workforce operating under fewer physical constraints and time pressures is more likely to complete the full worklist without having to trigger overtime.

- A reduction to maintenance worker positions caused by reduced performance variation (standards and standard operating procedures), better planning, and a better understanding of cause/effect relationships between operating behaviours and financial outcomes. Average non-management labour costs for 2014 were estimated to be **$52**/hour including fringe benefits.
- A modest reduction to the cost of materials due to reduced waste and rework.

Key Assumptions

- Internal performance improvements will improve productivity of staff by at least 5%, with phased reductions introduced over three years (Year 1 – 50% benefit; Year 2 – 80% benefit; Year 3 and beyond full benefit)
- Base materials costs $57 million per year with a waste/rework assumption of 2%. It is assumed that process improvements will drive a 20% improvement to wasted materials.

There are no additional cost savings associated with fleet reduction.

Capital Benefits

Cost avoidance for future asset replacement and asset growth requirements due to a reduced spare ratio requirement is the most significant benefit associated with fleet reduction. There are three discrete ways that costs will be avoided by reducing fleet size through a spare ratio target. These have been included in the break-even analysis.

1. From the one-time reduction of active fleet down to a new level defined by the spare ratio target.
2. From the perpetual cost avoidance of annual fleet replacement requirements each year (assumes a baseline value with only inflationary growth).
3. From the cost avoidance of growing the fleet at a lower rate given increasing commitment levels over time.

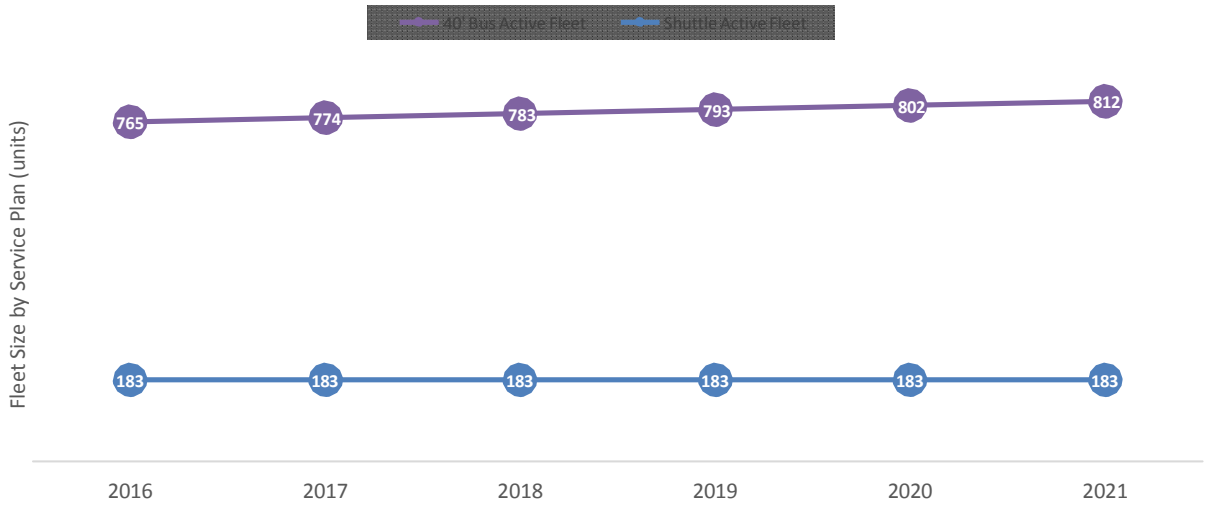
Appendix: Current Fleet Procurement Plan summarizes the current plan to retire and replace 40-foot conventional buses and shuttle buses. Reduction of the 40-foot conventional fleet size by **40 buses** will be timed for 2017 but the cost avoidance benefit will materialize over two years starting in 2018. Reduction of the shuttle bus fleet size by **31 buses** will be timed for 2016 but the cost avoidance benefit will materialize in 2018. The following table summarizes the spare ratio calculations for the current state and the preliminary targets for the 40-foot bus fleet and shuttle fleet under review. The estimated immediate fleet reduction is stated in the right column.

	Current – April 5, 2016				Preliminary Target			Δ
Fleet	Active Fleet	Commitment	Spare Fleet	Spare Ratio	Active Fleet	Spare Fleet	Spare Ratio	Fleet Change
40-foot Bus	**765**	**580**	**185**	**24%**	**725**	**145**	**20%**	**40**
Shuttle Bus	**183**	**114**	**69**	**38%**	**152**	**38**	**25%**	**31**

The annual cost avoidance is developed by taking the assumed economic life of the bus and baseline fleet size to calculate the annual replacement requirements. For this calculation, it is assumed that the commitment level is held constant over time.

Fleet	Baseline Fleet (Current Spare Ratio)	Economic Life (years)	Annual Replacement Requirement (Current Spare Ratio)	Adjusted Fleet (Target Spare Ratio)	Annual Replacement Requirement (Target Spare Ratio)	Annual Variance
40-foot Bus	765	22	34.8	725	33.0	1.8
Shuttles	183	12	15.3	152	12.7	2.6

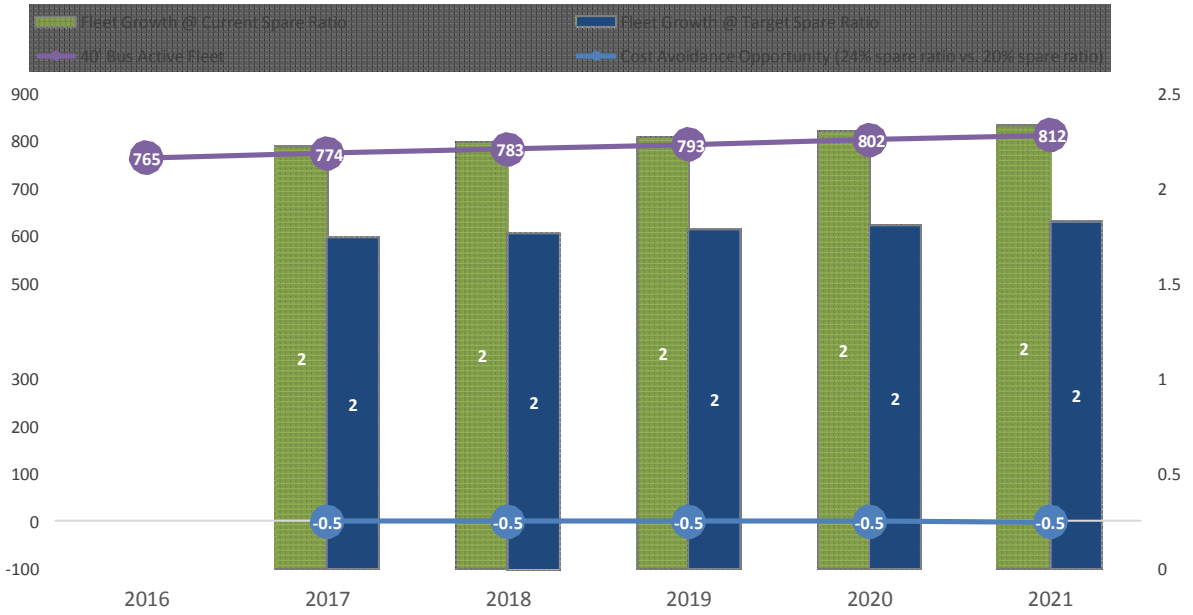
The cost avoidance from operating with a lower spare ratio with commitment growth drives the third benefit. The chart below reflects the current fleet growth projections through 2021. The 40-foot conventional bus fleet includes significant growth over the next ten years, while the shuttle fleet size is expected to remain relatively flat.



Source: Base commitment – Sep 2015; modeled growth rate

If it is assumed that current projected fleet growth includes the current 24% spare ratio, then a reduction of the spare ratio target will drive additional future cost avoidance (half a vehicle per year from 2018 to 2021), shown in the table and chart below.

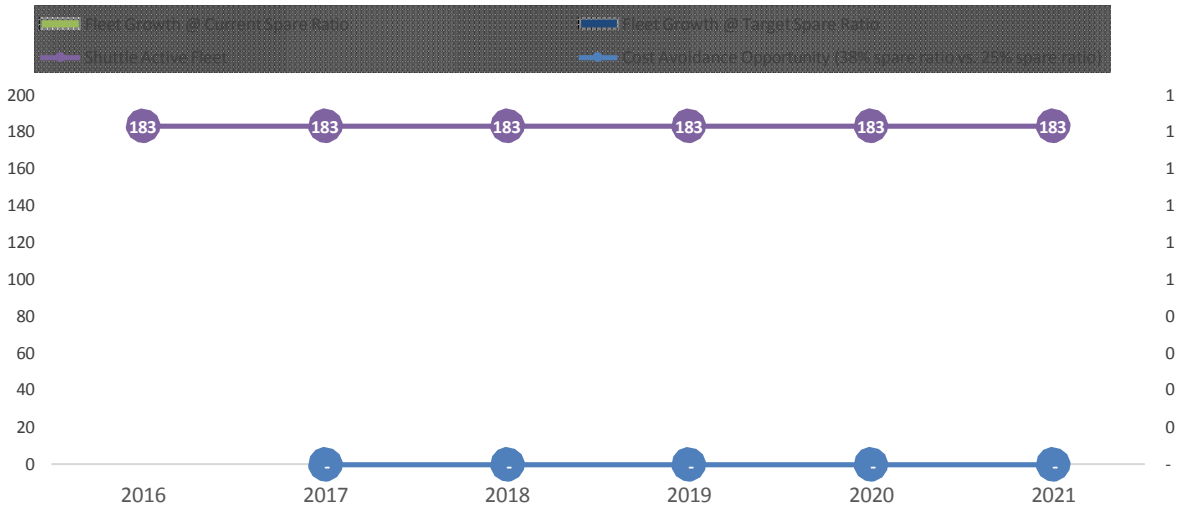
Year	40' Bus Requirements	Commitment	Current Spare Fleet	Spare Ratio	Target Spare Ratio	Variance	Target Implied Spare Fleet @ 20%	Fleet Growth @ Current Spare Ratio	Fleet Growth @ Target Spare Ratio	Cost Avoidance Opportunity (24% spare ratio vs. 20% spare ratio)
2016	765	580	185	24%	20%	40	145	-	-	0.0
2017	774	587	187	24%	20%	40	147	2	2	-0.5
2018	783	594	189	24%	20%	41	149	2	2	-0.5
2019	793	601	192	24%	20%	41	150	2	2	-0.5
2020	802	608	194	24%	20%	42	152	2	2	-0.5
2021	812	616	196	24%	20%	42	154	2	2	-0.5



Source: Base commitment – Sep 2015; modeled growth rate

There is unlikely to be a similar cost avoidance opportunity for the shuttle fleet because of the flat projected growth over the next five years.

Year	Actual Fleet	Commitment	Implied Spare Fleet	Spare Ratio	New Spare Ratio	Variance	Target Implied Spare Fleet @ 25%	Fleet Growth @ Current Spare Ratio	Fleet Growth @ Target Spare Ratio	Cost Avoidance Opportunity (38% spare ratio vs. 25% spare ratio)
2016	183	114	69	38%	25%	31	38	-	-	-
2017	183	114	69	38%	25%	31	38	-	-	-
2018	183	114	69	38%	25%	31	38	-	-	-
2019	183	114	69	38%	25%	31	38	-	-	-
2020	183	114	69	38%	25%	31	38	-	-	-
2021	183	114	69	38%	25%	31	38	-	-	-



Source: Base commitment – Sep 2015; modeled growth rate

Capital Benefits: Revenue Growth from Equipment Sales / Salvage

To reduce the spare ratios for the 40-foot conventional bus fleet and the shuttle fleet to 20% and 25% respectively, surplus vehicles will either be scrapped or sold on the open market generating a salvage value and positive, albeit minor, cash flows. The following key assumptions have been used in the base case:

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- All resale benefits are realized in 2017.
- **40** – 40-foot conventional buses will be sold.
- **31** – shuttle buses will be sold.

Other Intangible Efficiency Gains (Cost Savings and Cost Avoidance)

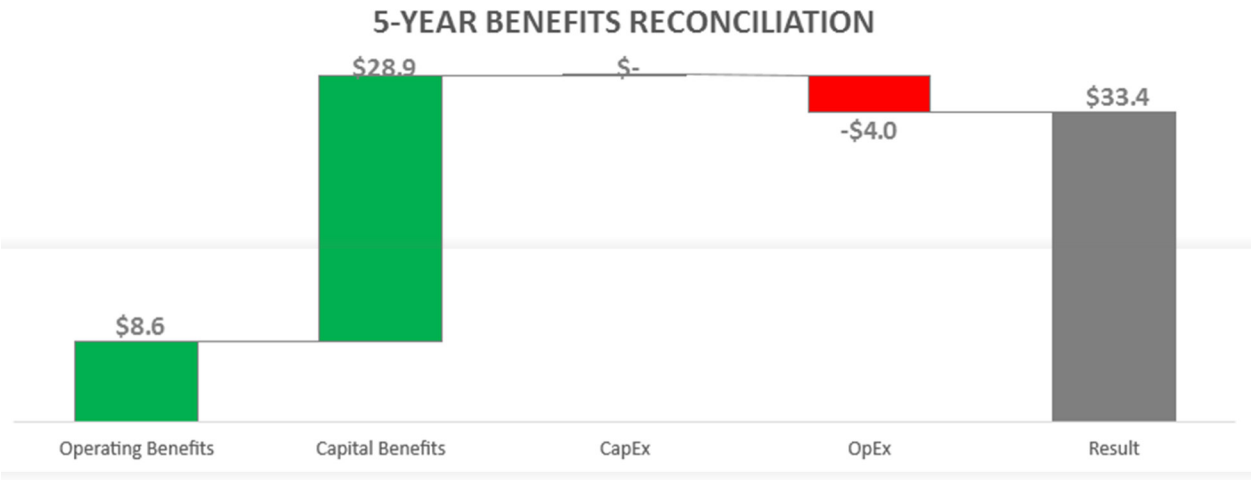
- Balancing the workforce across shifts and across facilities reduces pressure to meet service across the system and makes the system more resilient to recovering from unplanned events, reducing the potential for overtime cost impacts and risk of service erosion
- Reduced facility constraints due to a more equitable distribution of the workforce across shifts and reduced fleet - drives avoidance of future facility capacity expansion costs, realized through reduced capital cost requirements.
- Optimization of the workforce across shifts and facilities is likely to strengthen the CT knowledge and experience base, introduce new ideas, share performance information, and strengthen the maintenance culture across the function.
- Alleviating pressure on the constrained peak daytime labour is expected to improve the quality and productivity of current maintenance and inspection activities.
- Reduced cost of rework or missed work – this is difficult to quantify

- Over time, balancing the workforce across facilities and across shifts is expected to identify opportunities for workforce reduction and/or cost avoidance to bring on new staff.
- Culture shift to one of greater accountability and performance.
- Changes to the amount of lost time due to anomalies.
- Changes to the number of non-conformances.
- Improved fleet availability and reliability.

Other Intangible Effectiveness Gains

- Improved fleet performance reliability caused by the augmented reliability engineering resources.
- Reduced pressure on the day-shift
- Financial accountability
- Reduced environmental impacts because fewer vehicles are required to be scrapped / resold.
- Better maintenance quality and consistency from adhering to maintenance standards.
- Better system planning drives improved vehicle availability.
- Avoidance of cost overruns and adherence to annual operating budget.

4.1.4.4 Break Even Analysis



The NPV for this option is **+$33.4 million** over 5 years, driven primarily from cost savings due to a modest workforce reduction from productivity gains and avoidance of fleet replacement costs due to the lower spare ratio (3 different benefits streams). The City has typically used Year 5 financial results in ZBR reports. The cumulative net capital benefit is estimated to be **+36.8 million**, noting that several significant cost avoidance benefits are realized earlier than year 5. The net operating benefit is **+1.8 million** in year 5.

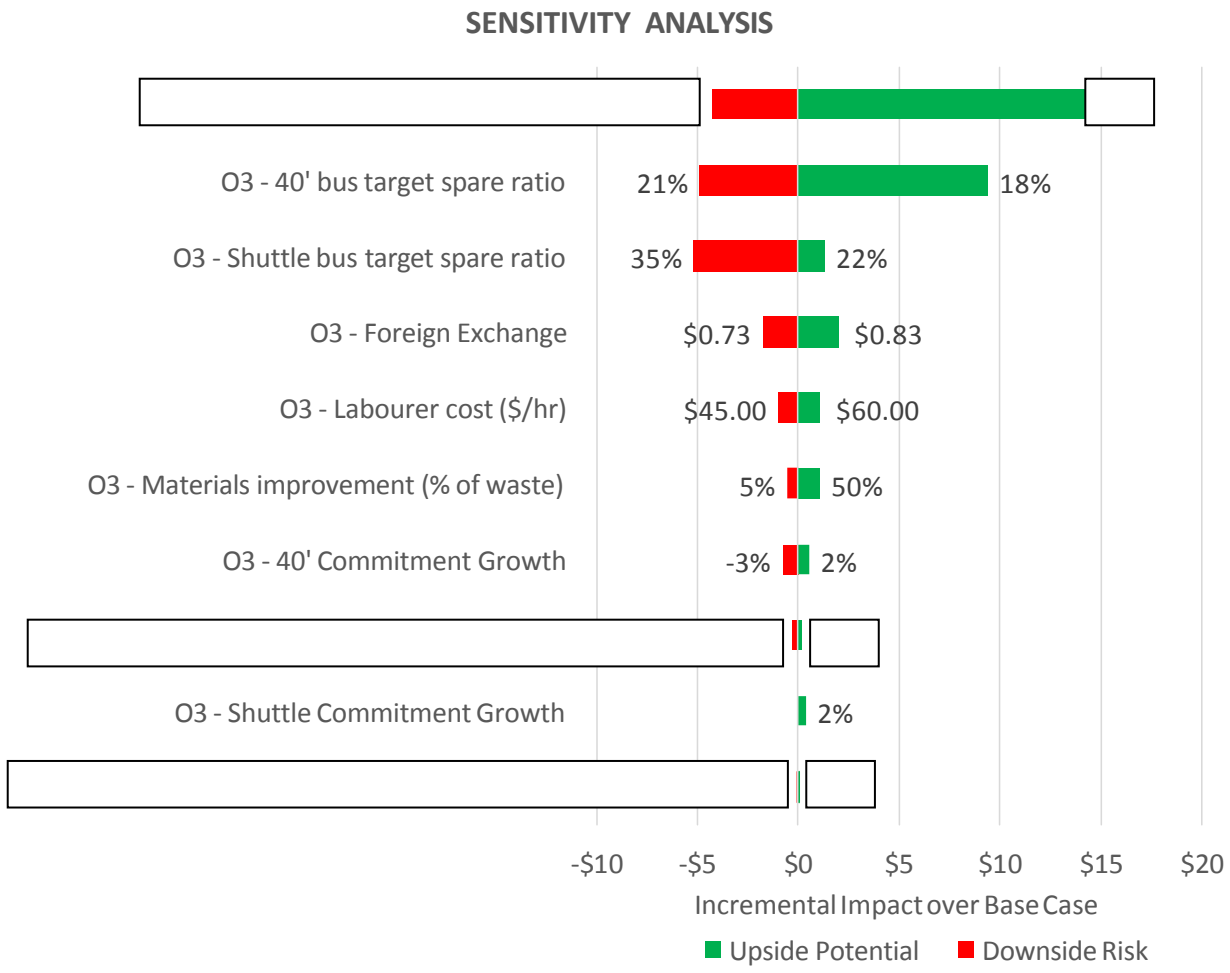
	0 2016	1 2017	2 2018	3 2019	4 2020	5 2021	Total
INFORMATION WITHHELD DUE TO CONFIDENTIALITY							
Net Operating Benefits *(E minus D minus C)*	$ (0.53)	$ 0.46	$ 1.20	$ 1.69	$ 1.84	$ 1.84	$ 6.50
Total Net Benefits	$ (0.53)	$ 2.48	$ 17.63	$ 16.53	$ 3.60	$ 3.60	$ 43.30
Cumulative Net Benefits	$ (0.53)	$ 1.95	$ 19.58	$ 36.10	$ 39.70	$ 43.30	
NPV	$ 33.40						

Sensitivity Analysis

Some decisions and variables can have a significant effect on the NPV of an investment decision, while others have nearly no effect at all. Forward-looking perspectives are imperfect and require an understanding of key assumptions supported by judgement and interpretation. The numbers in this business case are not intended to convey perfect accuracy, and a practical approach to improving the quality of decisions is to look at how sensitive the estimated NPV outcome is to changes in certain conditions.

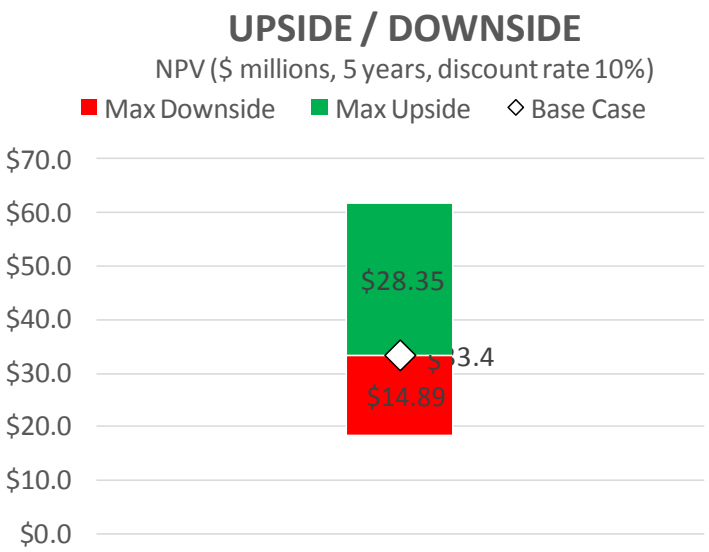
The following table summarizes the scenarios that were tested for the comprehensive internal changes (including fleet reduction) option.

Sensitivity Scenarios	Decision or Variable	Low	Base Case	High
Labour unit cost $/hr	Variable	45	52	60
INFORMATION WITHHELD DUE TO CONFIDENTIALITY				
Foreign Exchange CAD:USD	Variable	0.73	0.78	0.83
Materials improvement assumption	Variable	5	20	50
INFORMATION WITHHELD DUE TO CONFIDENTIALITY				
INFORMATION WITHHELD DUE TO CONFIDENTIALITY				
40-foot bus conventional target spares ratio	Decision	18	20	21
Shuttle bus target spares ratio	Decision	22	25	35
40-foot bus commitment growth %	Decision	-3.0	1.2	2.0



There is significant upside potential if CT is able to reduce its 40-foot conventional bus fleet size lower than the base case 20%, without adversely impacting its service. there is greater downside risk to achieving the shuttle bus spare ratio because the 25% base case target is significantly lower than the current 38%. Other variables shown in the chart have limited impact on the expected results.

The following chart shows the extreme maximum upside and downside scenarios that reflect multiple high cases or multiple low cases occurring together. With a base case (likeliest scenario) of $33.4million, the maximum upside is estimated to be $61 million and the maximum downside is estimated to be $19 million.


UPSIDE / DOWNSIDE
NPV ($ millions, 5 years, discount rate 10%)
Max Downside
Max Upside
Base Case
$70.0
$60.0
$50.0
$40.0
$30.0
$20.0
$10.0
$0.0
$28.35
$14.89

4.1.4.5 Risks and Suggested Management Strategies

The primary risks associated with changes to planning and maintenance practices are discussed in the following table. A common theme relates to change resistance, particularly around the potential complexity of integrating new planning systems. Most risks and impacts from this option will diminish over time as they are predominantly short-run risks.

Risk	Consequence	Probability	Impact	Preventative Control	Impact Mitigation Strategy
INFORMATION WITHHELD DUE TO CONFIDENTIALITY					
Complexity of planning changes drives short-run service erosion from reduced fleet availability	Reputation impacts; unplanned reduction to service levels; financial impacts from revenue loss, overtime	**M**	**H**	Management oversight; contingency planning	Communication and tactical resource management for service recovery
Impact to reputation caused by erosion of reliability / performance metrics	Reputation impacts	**M**	**H**	Management oversight; contingency planning	Communication
Maintenance quality erosion due to competing operating performance metrics	Employee stress; metrics gamesmanship; quality issues and rework – LOSS OF RELIABILITY AND AVAILABILITY	**M**	**M**	Strong leadership and performance measurement that spans the operations and maintenance functions; increased inspection rigor	Tactical resource management for service recovery
Not collecting / analyzing the right data will limit ability to drive optimization	Erosion of projected benefits, particularly for staff reductions	**M**	**M**	Management encourages active use of the IT systems	Management intervention

The primary risks associated with workforce planning are discussed in the following table. A common theme relates to change resistance, particularly around the adoption of new work assignments. Heightened fleet maintenance system focus through reliability engineering may drive short term resistance to new ideas, but is likely to be embraced over time. In the short-run, the excess supply in the labour market may alleviate some concerns with recruitment and retention but in the long-run, this needs to be addressed and carefully managed.

Risk	Consequence	Probability	Impact	Preventative Control	Impact Mitigation Strategy
INFORMATION WITHHELD DUE TO CONFIDENTIALITY					
Recruitment and retention for the off-shift	Difficulty staffing the off-shifts; absenteeism will increase; reduced fleet availability; benefits not fully realized; vacant positions	**M**	**M**	Apprenticeship program; needs to be managed effectively with proper accountability; active involvement with HR and Labour Relations to develop recruiting strategies	Management oversight; active involvement with HR and Labour Relations
Change resistance to systems integration approach by reliability engineering	Reduced fleet availability	**L**	**M**	Open dialogue; incremental change	Management oversight
Root cause analysis approach is likely to slow down the work in the short run	Reduced fleet availability	**L**	**M**	Open dialogue; incremental change	Management oversight

The following table presents risks related to transitioning and operating with a smaller spare pool. In the short-run, while maintenance workers transition operating procedures to manage a smaller fleet, there is increased risk of service erosion because the fleet is less resilient to unplanned outages.

Risk	Consequence	Probability	Impact	Preventative Control	Impact Mitigation Strategy
Service disruption caused by reduced fleet availability as maintenance workers learn to operate with a smaller spare pool	Reduced availability; reduced maintenance quality of vehicles; reputational impacts; financial impacts from lost revenue and/or increased overtime expenses	**M**	**H**	Change management	Management intervention
Major outage in the short-run may have a more extreme impact on service due to the smaller fleet size and less resiliency	Unplanned reduction to service levels; financial impacts from lost revenue and/or increased overtime expenses	**L**	**H**	Management oversight; contingency planning	Tactical resource management for service recovery

4.1.4.6 Implementation Considerations

The recommended mulit-part solution is largely comprised of threee elements;

- Changes to Planning and Fleet Maintenance
- Workforce Planning
- Fleet Changes

The implementation of this solution should consider the following points;

Implementation of the three initiatives should occur simultaneously rather than sequential to shorten implementation timeline and to gain momentum. Downturn in transit revenues stemming from the slowdown of the Alberta economy is a great impetus to move forward quickly to get costs in-line and prepare for the recovery in a more organized fashion. May also provide opportunity for increased success in key position recruitment (Reliability Engineers, Mechanics, etc.)

Given changes will impact every facet of the business need to strike an implementation committee chaired by the Director of Calgary Transit. Sponsorship comes from the GM of Transportation who provides corporate level support and guidance. Implementation committee should include other stakeholders such as staffers from Finance, Supply, and other areas of CT, etc.

Need to align the change management plan to the strategic plan for CT (vision, mission, goals, and targets). A target timeline for the complete implementation of all initiatives should be no greater than 2-years.

A first objective would be to get a revised capital and operating budget submission ready for the next immediate budget cycle. The timelines for submission would force discipline on the change process and provide focus on the changes needed to move the business forward for change. It would also engage staff throughout the maintenance organization.

First drafts of the maintenance philosophy and integrated fleet plans (LRV, Bus, non-revenue) should be targets of the first O&C budget submission. The entire process will be iterative with a continuous improvement loop. It is assumed that the changes in fleet size to obtain the initial spare ratio target of 20% are already occurring. Once asset management plans have been drafted the identification of gaps in equipment and maintenance standards will be easier, including a defined process for the detailed analysis of spares ration for each fleet type. The drafting and implementation of standards will set the stage for development of the zero based budget process that will identify resource requirements for all maintenance processes.

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Development of a communication plan tailored to key stakeholder and to elicit employee engagement. Development, socialization and execution of a project change plan supported by change analysis.

Weekly implementation meetings, chaired by the Director of Calgary Transit, should be initiated to plan strategy, plot progress and support the change process. KPI's and metrics should be selected and data management processes defined to gather the necessary info.

The entire change management process is a living process and will be refined and improved each and every year beyond implementation.

4.1.5 Recommendations

MH recommends that Calgary Transit pursue the comprehensive internal change approach outlined in the multi-part solution and develop an implementation strategy and timeline.

Sec 4.1 Appendix: Current Fleet Procurement Plan

The following table shows the current (Apr 2016) 40-foot conventional bus replacement schedule and procurement plan with the projected purchase costs.[2] The significance of the table is to show the timing of realized cost avoidance (ie: when CT had planned to spend capital to acquire new vehicles).

40' Conventional Bus Retirement and Procurement Schedule

Fleet	Vehicle Replacement Based on Retirement Age	Planned Procurement Timing	Projected Real* Cost ($'000,000)
2016	0	0	$ -
2017	-16	0	$ -
2018	-16	32	$ 19.2
2019	-28	28	$ 16.8
2020	0	0	$ -
2021	-44	44	$ 26.4

**Unadjusted for inflation*

Source: CT Fleet Plan – April 5, 2016

The following table shows the current (Apr 2016) shuttle bus replacement schedule and procurement plan with the projected purchase cost.

Shuttle Bus Retirement and Procurement Schedule

Fleet	Vehicle Replacement Based on Retirement Age	Planned Procurement Timing	Projected Real* Cost ($'000,000)
2016	-71	0	$ -
2017	-14	0	$ -
2018	-28	99	$ 19.8
2019	-11	25	$ 5.0
2020	-47	47	$ 9.4
2021	-12	12	$ 2.4

Unadjusted for inflation

Source: CT Fleet Plan – April 5, 2016

[2] Note: other related investment costs, such as cost of asset disposal, logistics, and other commissioning activities have not explicitly been accounted for and are assumed to be included in the purchase price.

5. SERVICE DELIVERY APPROACH

5.1 Vehicle Service Lane

Recommendation:
MH recommends that Calgary Transit pursue the alternative service delivery approach in **Option 1** and develop an implementation strategy and timeline.

5.1.1 Purpose

The ZBR objective is to assess internal efficiencies and Alternative Service Delivery (ASD) models of the CT service lane function.

5.1.2 Business Objectives

5.1.2.1 Business Unit Goals

The primary goals of the service lane function are to:

1. Ensure buses and light-rail vehicles (LRVs) are cleaned, fueled, and have replenished fluids.
2. Ensure buses and LRVs are available for use for the next day's service.
3. Maximize customer satisfaction, as measure by the periodic customer satisfaction survey.
4. Maximize operator satisfaction.
5. Operate efficiently.

5.1.2.2 Relevant Business Unit Policies

Collective Agreement

5.1.2.3 Contribution to Long-term Goals

A regular and prescribed cleaning regimen helps to:

1. Extend the useful life of capital assets such as buses and LRVs.
2. Improve the reputation of CT through sustained customer perception of quality and reliability.
3. Improve the perception of safety.
4. Create predictability through defined schedules, asset plans, and resource plans, which in turn leads to smoothed workforce levels, improved productivity, and cost optimization.

5.1.2.4 Customer & Citizen Needs Addressed by the Service

Calgary is a geographically-dispersed city, and Calgarians rely on public transportation to routinely travel into and out of the downtown core, as well as from area to area.

The Service Lane function drives five important outcomes that directly affect CT's customers:

1) Safety;

2) Reliability of service;

3) Availability of equipment to provide the service;

4) Quality and comfort; and,

5) Cost management (revenue to cost ratio).

5.1.3 Case for Change

5.1.3.1 Effectiveness Gaps

- There is no formal objective quality and quantity standards program in place, resulting in different-sized workforces per garage and per service lane
- Lack of a programmed or formal approach to a total vehicle cleaning solution (special cleans, heavy cleans)
- Detailed cleaning protocol for significantly dirty/unsanitary ('sick') buses results in vehicles often not available for next-day service
- Notwithstanding these gaps, the current high spare ratio permits staff to meet bus availability targets and record positive customer and Operator satisfaction rankings

5.1.3.2 Efficiency Gaps

- Costs are rising faster than service growth (Service lane operating costs increased 69% for buses and 93% for trains between 2005 and 2014.)
- Standard operating procedures (SOPs) need to be upgraded to better standards definitions.
- Labour costs are high relative to the open labour market.

5.1.3.3 Trends

CT has reorganized the Service Lane function and added resources in response to customer demands. A best practice agency in this field is the Toronto Transit Commission (TTC), and its ASD approach to its service lane. The TTC adopted an ASD service delivery model in three of its eight garages with positive results. This approach is unique among the benchmark publicly-operated transit systems. Based upon these results, one of the ASD transit management companies in nearby York Region Transit (YRT delivers all of its service with transit management companies) implemented an ASD service lane in its garage. These are leading edge, ASD best practices in an industry that generally self-performs this function.

Toronto Transit Commission Best Practice
Estimated Savings across both Vendors: 5% of total contact cost ($1.89M over 3 years).

The current TTC conventional bus fleet is comprised of approximately 1,735 40-foot buses, and 135 articulated 60-foot buses. The fleet is operated and maintained from seven operating garages located around the city. Each facility has a designed capacity and throughput of approximately 250 buses each.

Contracting the service lane had two primary objectives:

2. To improve the quality output, namely the cleanliness of the fleet.

A soft or slow roll-out of the contracting process began at two facilities, with two separate contractors selected after the release of a tender to the marketplace of a performance specification with options for extension of the service to the balance of the five remaining facilities. The roll-out was meant to validate the process and understand quality results, at which time the labor attrition process was begun. The soft roll-out lasted approximately four months where results were reviewed against objectives, and a decision was made to advance the process across the balance of the operating garages. At present, all seven operating garages are operating with contracted service lanes.

On a nightly basis the contractor picks up, fuels, checks fluids, cleans both the interior and exterior, and parks approximately 250 buses in an eight-hour shift. The cleanliness of the fleet has dramatically improved. Somewhat unexpectedly, the annual cost of vehicle and facility damage declined, though no figures are available.

Sec 5.1 Appendix: TTC ASD Service Lane Pilot provides a table summary of the TTC ASD service lane pilot project that was implemented at TTC, starting with a small test pilot and then expanding to cover a larger scope over a longer term.

5.1.3.4 Relevant Regulations and Legislation

Collective Agreement
Commercial Vehicle Safety

5.1.4 Baseline

5.1.4.1 Description

The Service Lane group is organized within the Fleet Maintenance division of CT. The department has the responsibility to provide a clean, safe and reliable fleet of transit vehicles daily, in sufficient numbers to meet service demand. Transit vehicles are maintained and stored at 4 facilities located around the city. Like other transit systems across North America, each CT facility employs a dedicated process to recover, clean, fuel and inspect each vehicle daily in preparation for the next day's service. While the scope of work performed may differ somewhat between transit agencies, this dedicated process is commonly referred to as a service lane.

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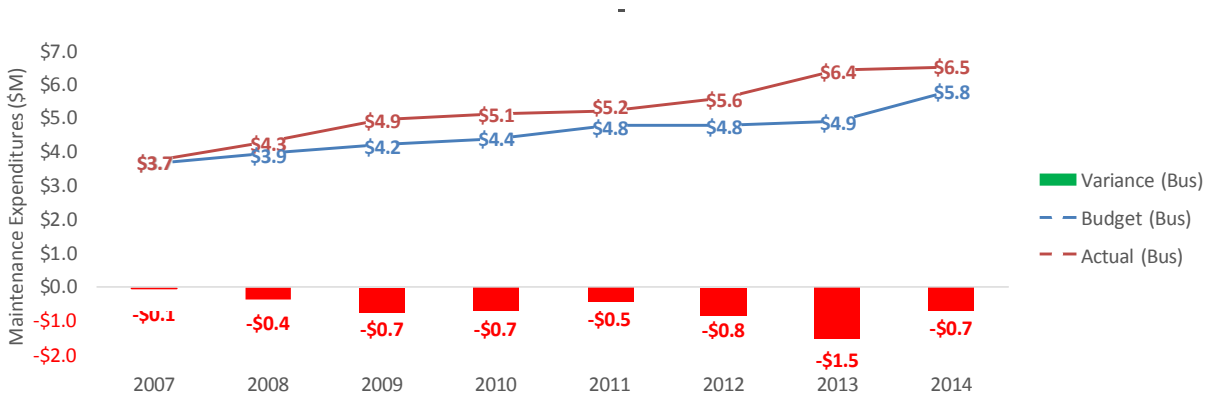
A typical service lane set of activities includes:

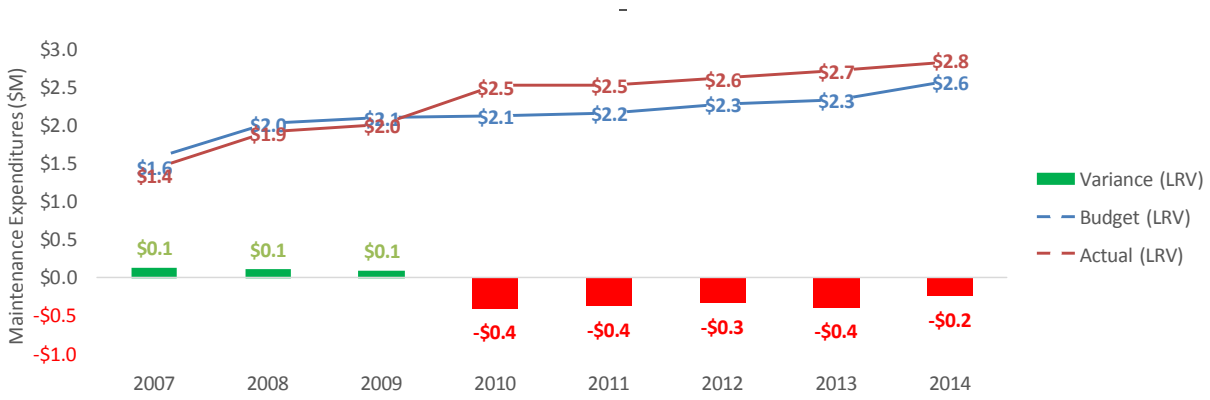
1. Reviewing the pick list for work instructions and vehicle movements and storage.
2. Transfer of control between the vehicle operating and the service lane staff.
3. A walk-through by the service lane labourer to close windows, pick up debris, etc.
4. Moving the vehicle to the service lane.
5. Completing the fueling and replenishing fluids.
6. Sweeping, mopping and cleaning the passenger and cabin area.
7. Washing the exterior vehicle components.
8. Parking the vehicle for next day's use.

Historical Cost

The historical service lane planned, and actual expenditures for buses and LRVs, are provide in the following charts. These reflect a consistent cost overrun trend for each type of service lane.



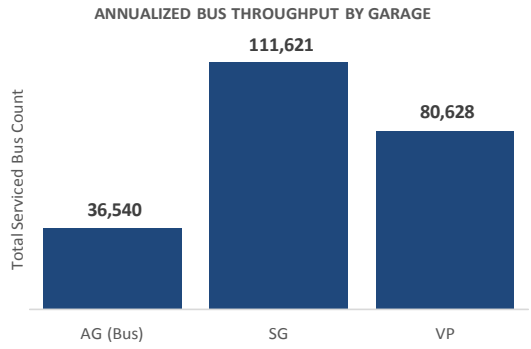
Source: CT Spreadsheet "Financials - Supply and Parts Costs" (2015)

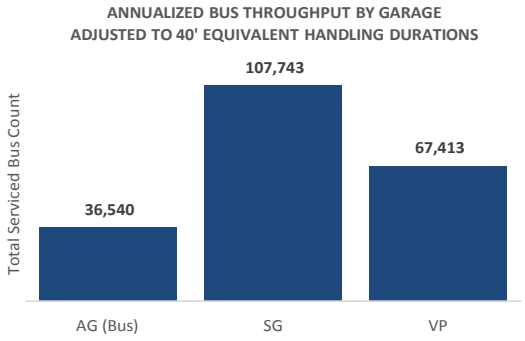


Source: CT Spreadsheet "Financials - Supply and Parts Costs" (2015)

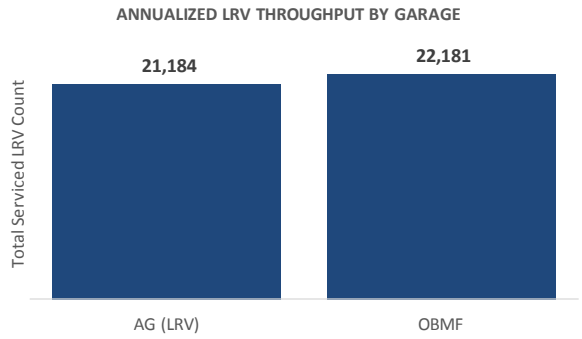
Garage Throughput

In 2015, service lane system throughput was estimated to be 271,000 vehicles (229,000 buses and 43,000 LRVs).[3] The charts below show the approximate throughput of buses and trains by garage and the throughput converted to 40-foot equivalent units based on the average servicing duration by vehicle type. For example, 40-foot buses take 32 minutes to service, while shuttle buses take 15 minutes to service.





Source: Derived from daily throughput figures by garage provided by CT



Source: Derived from daily throughput figures by garage provided by CT

Garage Productivity

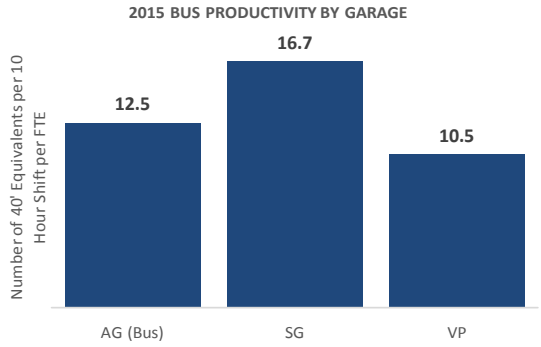
Each garage is staffed with a set number of employees, and there is a regular 17:00 to 03:00 shift each weekday and weekend day. For 2015, there were 108 service lane labourers (76 FTEs assigned to bus service lanes and 32 FTEs assigned to LRV service lanes).

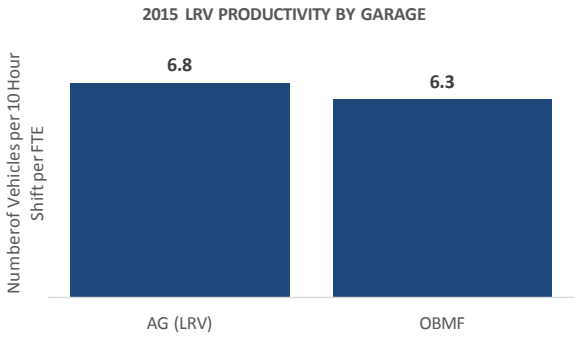
A number of factors can influence the productivity of a garage, including, but not limited to:

- Service schedule.
- Management's and the Lead Hand's optimization of scheduling and efficient flow.
- Team performance, experience, training, process maturity, and qualifications.
- Facility design and physical capacity as well as the presence of strong bottlenecks.
- The nature and volume of vehicles that regularly move through the service lanes.
- Garage culture and morale.

[3] Throughput figures assume regular cleans, but do not factor in deep cleans and special cleans.

The productivity at a garage can be derived by the number of vehicles serviced per 10-hour shift per FTE, and the charts below show estimated productivity levels by garage and by vehicle type.[4] Buses are converted to 40-foot equivalents, based on average servicing duration, to normalize for mix of fleet type.





Source: Derived from daily throughput figures by garage provided by CT

Garage Efficiency

Using the 2015 service lane operating expenses, historical unit costs could be derived for cost per bus serviced and cost per LRV serviced by garage. These figures show the relative efficiency across the garages by fleet type (e.g. 40-foot buses, 60-foot buses, shuttles, LRVs). As with productivity measures, the three bus types have been converted to 40-foot equivalent units based on average servicing duration. All costs are presented as fully allocated costs, and so one of the overarching efficiency key performance indicators is fully allocated cost per 40-foot equivalent unit (for buses) and per LRV.

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[4] Note: Productivity calculations derived from total labour hours include vacation, lost time, etc.

5.1.5 Option 1 Alternative Service Delivery

5.1.5.1 Option Description

The ASD model replaces [redacted] labour positions that execute the service lane work with staff employed by a contracted third party or parties. The scope of work for the contractor is comparable to the existing self-performed Service Lane function.

A single incremental contract administrator is established by CT for contract administration and compliance to quality standards. The oversight function requires an portion of incumbent managerial time, but is not likely to require more than a single dedicated staff member over the next five years.

There are two approaches to introducing this change, each with a different risk profile and benefits realization schedule:

- **Direct Cutover -** This approach coordinates the transition to reduce existing positions and select and onboard a new contractor for all existing service lanes.
- **Phased Approach -** Similar to TTC's best practice approach, this method introduces a pilot study to one or more garages by replacing the workforce at the chosen site with a third party contractor. The results across sites can easily be compared and this approach provides the added incentive for the contractors and staff to 'prove themselves by performance'.

An implementation strategy and timeline can be developed upon approval in principle of the option. The implementation strategy will highlight change management success factors.

Contracting with the external service provider could also be approached in a number of ways. For example, CT could contract a single service provider to provide service to all sites. Alternatively, multiple vendors could be hired to handle different sites, or could be introduced as primary and contingent contractors to ensure continuity of service. Contractual obligations could be supported by service level agreements governed by CT. A key feasibility assumption, which can be introduced through requirements gathering during procurement, is that third party contractors will be required to carry adequate insurance to operate CT vehicles.

5.1.5.2 Corporate/Business Unit Costs

Capital Costs

There are no incremental capital costs planned for this solution.

Key Assumptions:

- Capital equipment required to operate the service lane (eg: bus wash station) needs to be maintained and upgraded over time. It is assumed there are no incremental capital costs from the status quo related to acquiring new capital equipment.

One-Time Project Costs

There are three different one-time project costs:

1) Project management costs;

2) Change management costs; and

All three costs are likely to be incurred in 2016.

Project management and change management resources will be required to plan and execute the outsourcing project. Key activities of the project manager include:

- Preparing a project charter and schedule.
- Coordinating the procurement activities for the new vendor.
- Ensure timelines and budgets are compliant.

Key activities of the change manager include:

- Preparing and executing a change plan and communication plan.
- Interfacing with stakeholders such as Human Resources and Management.
- Supporting the transition from employee-led work to contractor-led work.
- Preparing service lane standards.

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Other Key Assumptions:

- Project management services are $25,000 per year over 4 years, starting in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- Change management services are $50,000 per year over 4 years, starting in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- Standards development has been estimated at $100,000 in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- Contingency costs have been established at 15% of the total project investment costs.

Incremental Operating Costs

Direct Costs are primarily salary and expenses for non-management staff responsible for performing the service or maintenance work. Direct costs are the most relevant costs for the service lane business case, and service lane costs were isolated from maintenance costs. Third party direct costs (ie: labour costs) will drive the majority of recurring incremental operating expenses with this option.

Key Assumptions:

- A net new contract administrator position is valued at $80,000 per year, starting in 2017, with some new shared oversight responsibilities absorbed by incumbent managers.
- Incremental external costs will be phased in over four years, reflecting a phased implementation starting in 2017 (Year 1 - 12.5% of the total vendor costs, reflecting the introduction of a single garage; Year 2 - 50%; Year 3 - 87.5%; Year 4 and beyond 100%).
- Total annual labour hours is used as a proxy for commitment (and assumes that staff are fully utilized and always busy).
- Growth is modeled in bus labour hours at 1% (base case) with a range of -3% to +1.5%.
- Growth is modeled in LRV labour hours at 8% (base case) with a range of -3% to +12%, acknowledging growth to accommodate 4-car trains over the next couple of years.
- External labour is assumed to have the same productivity as internal labour.

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- External labour volume is modeled using the same hours as internal labour.
- External labour unit costs are escalated by modeled inflation.

5.1.5.3 Corporate/Business Unit Benefits

The primary quantifiable and recurring benefits stream in this option is the elimination of staffed positions that execute the service lane functions.

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Other Key Assumptions:

- Capital equipment required to operate the service lane (eg: bus wash station) needs to be maintained and upgraded over time and so there are no identified cost savings from reduction to maintenance capital nor upgrade funding.
- Elimination of the bus and LRV service costs will follow the same phased approach as the introduction to incremental external costs.

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This option does not introduce any significant new sources of funding or revenue generation.

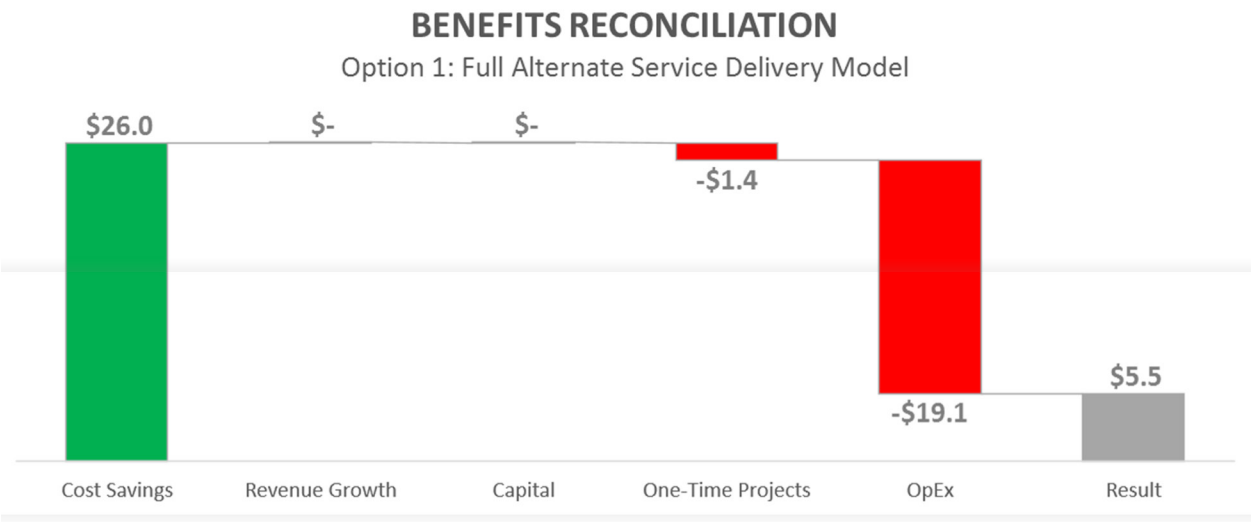
There are other intangible and not easily quantified benefits from this option:

- Development of new quality standards that will ensure contractors perform effectively.
- Large, third party vendors continuously invest in their own process improvements to drive profitability.
- Consistent, measurable levels of cleanliness.
- Better planning and system drives improved vehicle readiness / cleanliness.
- Scalable solution that can better accommodate fleet growth, complexity, age.
- Lower overall process costs.
- Minimal risk to the business.
- Same or improved levels of service quality delivered.
- Performance consequences introduced for non-performance to the external contractor.

5.1.5.4 Break Even Analysis

Net Present Value (NPV) is used to evaluate capital investment decisions but it is also a useful tool for operating expense evaluation. NPV is the difference between future cash inflows (cost savings, incremental revenue) and outflows (capital and project expenditures, and incremental operating expenditures) directly related to the project and expressed in present day values. In this analysis, a positive NPV means a net financial benefit to the City and a negative NPV means a net financial cost.

The NPV for this option is $5.5 million over 5 years, driven primarily from cost savings due to workforce reductions, offset by an increase in third party spending. The City has typically used Year 5 financial results in ZBR reports, which in the case of Option 1 is $3.1 million.



Option 1

	0 2016	1 2017	2 2018	3 2019	4 2020	5 2021	Total
INFORMATION WITHHELD DUE TO CONFIDENTIALITY							
Net Benefits *(G minus D minus C)*	$ (0.25)	$ (0.17)	$ 0.61	$ 2.01	$ 2.91	**$ 3.11**	
Cumulative Net Benefits	$ (0.25)	$ (0.42)	$ 0.19	$ 2.20	$ 5.11	$ 8.22	
NPV	$ 5.53						

Sensitivity Analysis

Some decisions and variables can have a significant effect on the NPV of an investment decision, while others have nearly no effect at all. Forward-looking perspectives are imperfect and require an understanding of key assumptions supported by judgement and interpretation. The numbers in this business case are not intended to convey perfect accuracy, and a practical approach to improving the quality of decisions is to look at how sensitive the estimated NPV outcome is to changes in certain conditions.

The variables reflected in the base case column of the following table were used to generate the NPV result in the previous break-even table. Scenarios were tested for the ASD option, with each scenario manipulated one variable at a time, holding all others constant, in order to isolate the impact on the final NPV. In reality, many variables are linked and not so easily isolated, but this exercise clarifies which factors should drive discussion about the factors that should be more tightly managed and which can safely be ignored.

Sensitivity Scenarios	Decision or Variable	Low	Base Case	High
INFORMATION WITHHELD DUE TO CONFIDENTIALITY				
Inflation %	Variable	2	3	6
Bus Commitment Growth Rate %	Variable	-3.0	1.0	1.5
LRV Commitment Growth Rate %	Variable	-3.0	8.0	12.0
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Interpretation of the Tornado Sensitivity Chart

The tornado sensitivity chart is intended to help the decision maker focus attention on the elements that are most uncertain and have the greatest impact on the final result. One of the objectives of the decision-maker is to improve the level of certainty in a decision, but some variables that are inherently uncertain, do not have a significant impact on the final outcome. The variables with the greatest impact on the final NPV are presented at the top of the chart. The left side of the red/green bar shows the extent of the potential downside risk should the worst case variable become the actual result.

For example, the O1 (Option 1) external vendor cost is the variable with the highest impact on the business case.

it will drive a large positive lift to the NPV relative to the base case.

Despite the uncertainty in the variable, the downside risk and upside potential are limited.

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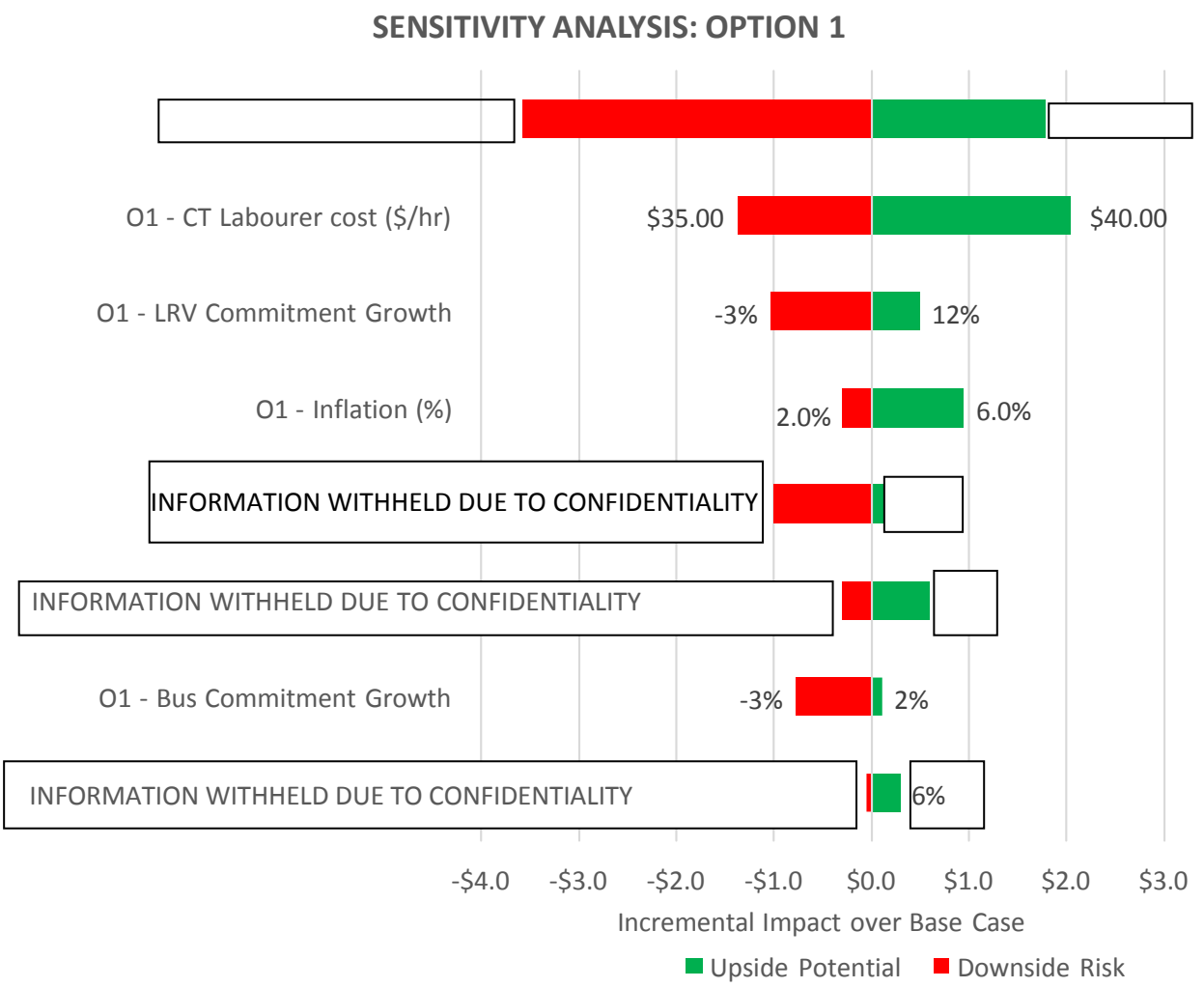

5.1.5.5 Possible Risks and Management Strategies

Risk	Consequence	Probability	Impact	Preventative Control	Impact Mitigation Strategy
Transition is complex	Full benefits potential is not realized	H	M	Project and change management	Communication and managerial involvement
INFORMATION WITHHELD DUE TO CONFIDENTIALITY					
Service disruption (fueling / fluids) due to contractor performance	Buses run out of fuel or fluids in transit; financial impacts	M	M	QA and QC	Quick response and prioritization using other maintenance labour
External contractors damage CT vehicles or facilities	Direct cost of the repair, human contact or impacts from service disruption if damage is significant	L	H	Mandatory CT training and standards	Required external insurance
Inflation escalates vendor costs	Excessive costs	L	M	Contracting terms and conditions	N/A
INFORMATION WITHHELD DUE TO CONFIDENTIALITY					
Customer impact	Dirty vehicles	L	L	Contracting terms and conditions, quality assurance (QA) and quality control (QC)	Effective contract oversight

5.1.5.6 Implementation Considerations

Implementation Timeline

It is recommended to phase in ASD to the four facilities over a three-year time period, starting with the smallest as a pilot site. The second half of 2016 provides time for effective planning, preparation and program design, particularly as it relates to labour relations implications. In the first year, there will be opportunities to gauge the impacts and make adjustments to the plan before phasing in other facilities. In the second year, the two bus facilities can be phased in followed by the remaining LRV facility in 2019.

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Change Considerations

Key considerations for effective change management include:

- Requiring third party vendors to have adequate insurance as a mandatory requirement for service lane work, particularly to operate the fleet.
- Alignment of the change plan to the strategic plan for CT (vision, mission, goals, targets).
- Creation of new, visual standards and standard operating procedures, and QA practices.
- Development, socialization and execution of a project change plan supported by change analysis.
- Creation of an implementation steering committee and supporting governance practices.
- Development of a communication plans tailored to key stakeholder groups.
- Creation of a labour relations strategy and contingency plans.
- Active and early dialogue with the Procurement team.

5.1.6 Option 2 Internal Performance Improvement

5.1.6.1 Option Description

Option 2 includes the introduction of an internal performance improvement plan, as recommended in Section 4 Fleet Maintenance. The plan is guided by a PLAN – DO – CHECK – ACT asset management system, supported by: improved procedural design; the creation of strategic asset plans; improved communication and coaching by site managers; and improved data capture and performance measurement to provide timely and relevant feedback that will lead to continual improvement. This approach was presented previously and the Service Lane-specific initiatives are outlined here.

Plan

Strategic Asset Plan

The strategic asset plan to be developed was previously described in Section 4 Fleet Maintenance.

Lean Process Review

The high-volume, repeatable and predictable characteristics of the service lane function make it a strong candidate for a lean[5] process review. CT staff would participate in a lean process review, supported by a trained facilitator and the development of a new culture of continual improvement.

The lean process review would focus on a combination of facility design and staff activities, specifically to identify and then address waste (low- or non-value activities) in the service lane function. The cyclical and systematic process identifies tangible opportunities for improvement, develops and executes actions to eliminate non-value added steps, measures the results, and creates action plans to improve efficiency and performance. It is rigorous, requires a trained specialist, and requires active engagement by front-line workers and their managers in order to successfully drive a sustained culture shift.

Development of Standard Operating Procedures and Engineered Standards

A list of required standards and operating procedures is an output from the strategic asset plan. For service lanes, new standard operating procedures will be developed and approved, which address the:

- Functional scope of work.
- Specific tasks and accountabilities.
- Required tools and materials.
- Timing, intervals, and frequency.

Each standard operating procedure will drive a set of engineered standards that support a more rigorous cleaning regime that will now include heavy cleans and special cleans.

Designed Managerial Improvements and Culture Shift

Front-line managers will receive training and ongoing coaching to drive a culture of performance and accountability. Training will augment:

- Inspection and quality review.
- Communication and feedback.
- How to effectively coach.
- Understanding the relationships between operating behaviours and financial performance.
- Creating a sense of urgency in work activities.

Additionally, investment will be made in developing a community of practice to share information and best practices across garages.

[5] Lean is a specialized type of process review where each step in an end-to-end process is considered for its value and potential waste of time and other resources.

Do

Key changes introduced in the execution step include:

- Field staff following new standard operating procedures.
- Field managers encouraging correct behaviours, inspecting the work, and actively coaching their teams to correct undesirable behaviours.

Check

Capture and review of critical service lane data will drive short-term as well as systemic improvements to efficiency and effectiveness.

Data Capture

Cost savings, cost avoidance, and capacity management can be improved by capturing the following data:

- Logged asset issues and systemic issues.
- Cycle times.
- Throughput.
- Unit costs.
- Productive and non-productive (slack) times.
- Attribution of anomalies (wrong moves, materials waste, missed work, etc.)

Management Review

Captured data will be transformed into a SIMPLE performance scorecard integrated across the service lanes of all facilities, supported by performance trends compared with budgeted goals. Periodically (quarterly), managers, foremen, and lead hands will review the performance results together and discuss systemic issues, risks, and opportunities for continual improvement.

Act

Continual Improvement

Upon completion of the management review, leaders will decide which opportunities for continual improvement to pursue and then allocate resources (time, people, funds) to driving performance gains.

5.1.6.2 Corporate/Business Unit Costs

Capital Costs

There are no capital costs identified with this option.

One-Time Project Costs

There are a number of one-time project costs:

1. Project management costs.
2. Change management costs (includes development of performance data capture practices, scorecard design, and management review design).
4. Strategic asset plan development.
5. Lean process review.
6. SOP and engineered standard development.
7. Managerial training and culture review.

Project management and change management resources will be required to plan and execute the project. Key activities of the project manager include:

- Preparing a project charter and schedule.
- Ensure timelines and budgets are compliant.

Key activities of the change manager include:

- Preparing and executing a change plan and communication plan.
- Interfacing with stakeholders such as Human Resources and Management.
- Supporting design and behavioural changes caused by the lean process review, asset plans, new operating procedures and standards, and the end-of-line initiative.
- Preparing business process documentation and training materials.
- Supporting ongoing management coaching and culture changes.

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Other Key Assumptions:

- Project management services are $25,000 per year over 4 years, starting in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- Change management services are $100,000 per year over 4 years, starting in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- The development of a strategic asset plan and has been estimated at $100,000 in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.

- The LEAN process review was priced at $150,000, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- Standards and standard operating procedures (SOP) development has been estimated at $100,000 in 2016, shown as an incremental cost to the City of Calgary either as an internal or external resource.
- Introduction of targeted managerial training, culture assessment, and materials development was priced at $100,000, acknowledging that there already exists an internal group responsible for training and development.
- Contingency costs have been established at 15% of the total project investment costs.

Incremental Operating Costs

There are only a few incremental operating expenses that will be introduced resulting from option 2 implementation. These include:

1. Recurring data capture, transformation, and analysis and the preparation of regular performance reporting.
2. Periodic review of the strategic asset plan, standard operating procedures and cleaning standards. (assumed once every 3 years at $100,000 per year)

Other Key Assumptions:

- The incremental hiring of a business analyst at $80,000 per year starting in 2017 would address the data capture, transformation, analysis and performance reporting requirements.

5.1.6.3 Corporate/Business Unit Benefits

The estimation of tangible benefits is particularly difficult for this option due to the lack of performance throughput data, cycle times, and quality. Where possible, conservative benefits are estimated below.

Cost Savings

Cost savings benefits will come from:

- A reduction to service lane labourer positions caused by reduced performance variation (standards and standard operating procedures), better planning, and a better understanding of cause/effect relationships between operating behaviours and financial outcomes.
- A modest reduction to the cost of materials due to reduced waste and rework.

Key Assumptions

- Internal performance improvements will improve productivity of staff by at least 10%, with phased reductions introduced over three years (Year 1 – 50% benefit; Year 2 – 80% benefit; Year 3 and beyond full benefit)
- Base materials costs $0.3M per year with a waste/rework assumption of 10%. It is assumed that process improvements will drive a 20% improvement to wasted materials.

Cost Avoidance[6]

Cost avoidance benefits will come from:

- Increased labourer productivity to handle more vehicles in a given shift, thereby avoiding costs of adding more labourers as volume grows over time.
- Increased facility capacity to handle more vehicles, thereby avoiding costs of expanding physical space, gained from systematically identifying and addressing throughput bottlenecks.

Other Intangible Efficiency Benefits

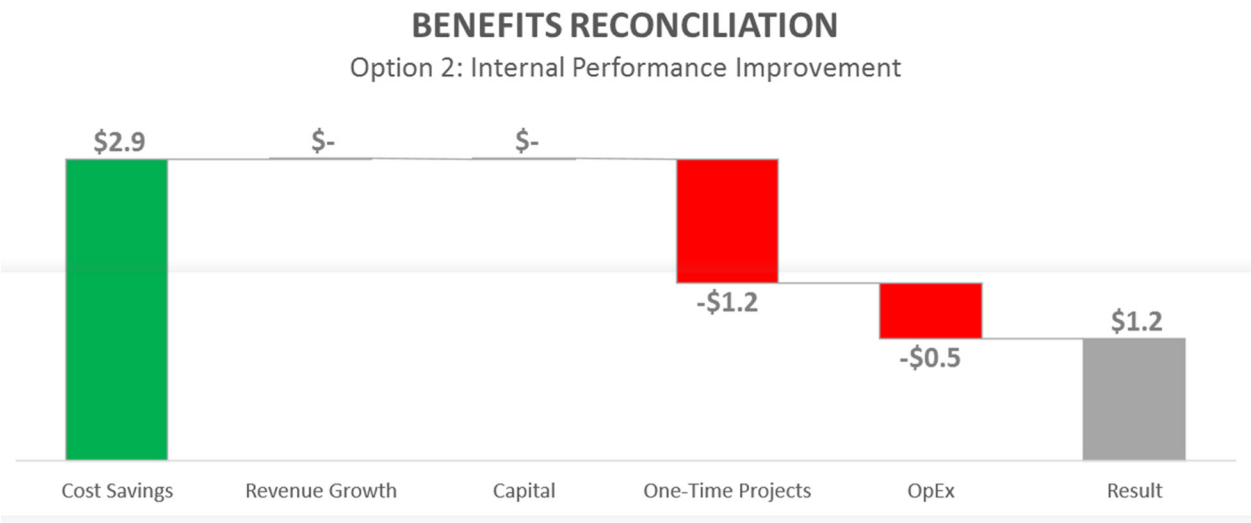
- Culture shift to one of greater accountability and performance.
- Changes to the amount of lost time due to anomalies.
- Changes to the number of non-conformances.

Other Intangible Effectiveness Benefits

- Better quality cleans and consistency from consistently adhering to cleaning standards.
- Better planning and system drives improved vehicle readiness / cleanliness.
- Some night shift employees moved to day/afternoon shift – union benefits

5.1.6.4 Break Even Analysis

The base case NPV for this option is $1.2 million over 5 years, driven primarily from cost savings from workforce reductions in the order of $1.0 million per year, which is enabled by a number of one-time projects and significant internal change and rigor. The City has typically used Year 5 financial results in ZBR reports, which in the case of Option 2 is $0.75 million.



[6] Cost avoidance items are excluded from the NPV analysis for option 2.

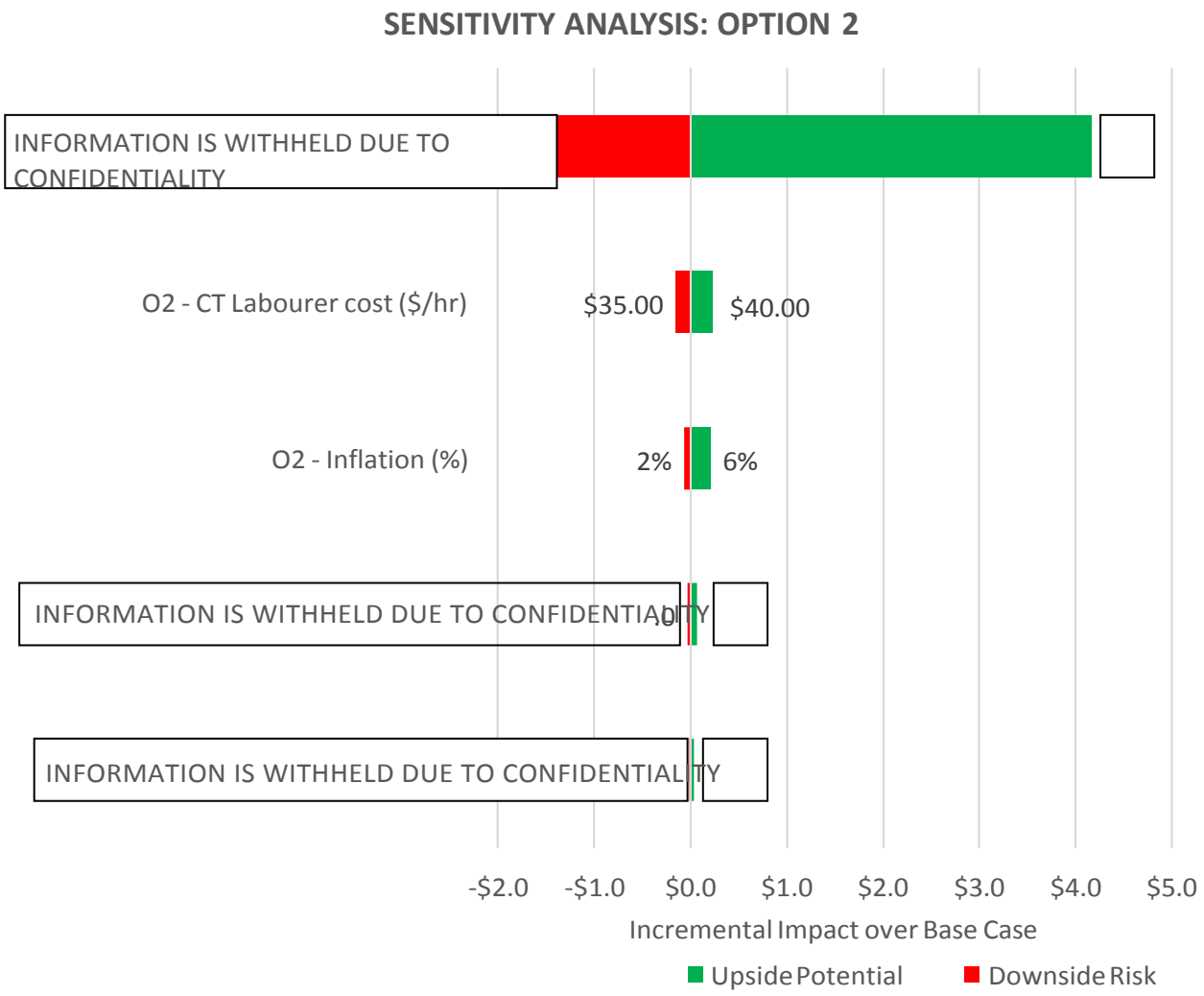
Option 2

	0 2016	1 2017	2 2018	3 2019	4 2020	5 2021	Total
WITHHELD DUE TO CONFIDENTIALITY							
Net Benefits *(G minus D minus C)*	$ (0.70)	$ 0.11	$ 0.31	$ 0.63	$ 0.84		**$ 0.75**
Cumulative Net Benefits	$ (0.70)	$ (0.59)	$ (0.28)	$ 0.35	$ 1.19	$ 1.95	
NPV	$ 1.17						

Sensitivity Analysis

The variables reflected in the base case column of the following table were used to generate the NPV result in the previous break-even table. The following table summarizes the scenarios that were tested for the internal performance improvement option. Each scenario is manipulated one variable at a time, holding all others constant, in order to isolate the impact on the final NPV. In reality, many variables are linked and not so easily isolated, but this exercise clarifies which factors should drive discussion and which can safely be ignored.

Sensitivity Scenarios	Decision or Variable	Low	Base Case	High
INFORMATION IS WITHHELD DUE TO CONFIDENTIALITY				
Inflation %	Variable	2	3	6
INFORMATION IS WITHHELD DUE TO CONFIDENTIALITY				



The changes introduced with this option have a highly uncertain effect on the 'quantifiable' projected benefits. The initial base case was modeled conservatively, with the sensitivity analysis reflecting significant upside potential. The variables with the highest impact are the number of staffed positions that can be released as a result of efficiency gains from the various internal management system improvements introduced with the option, as well as the introduction of the end-of-line service model modification. The balance of the decisions and variables tested have a nominal impact on the final outcome.

5.1.6.5 Possible Risks and Management Strategies

Risk	Consequence	Probability	Impact	Preventative Control	Impact Mitigation Strategy
INFORMATION IS WITHHELD DUE TO CONFIDENTIALITY					
Transition is complex	Full benefits potential is not realized	H	M	Project and change management	Communication and managerial involvement
INFORMATION IS WITHHELD DUE TO CONFIDENTIALITY					
Service disruption during behaviour transition	Reduced availability and quality of vehicles	M	L	Change management	Management intervention
INFORMATION IS WITHHELD DUE TO CONFIDENTIALITY					

5.1.6.6 Implementation Considerations

2016

In 2016, the following logical sequence of steps will position CT staff to move through a multi-year plan of incremental changes. These core steps should be supported by simple project and change plans.

2017 - 2019

- Iterative change focused on performance and continual improvement, identifying and correcting for the right behaviours, and improved managerial communication.
- Performance measurement, active management review, increased front-line accountability, and continual improvements.

Key considerations for effective change management include:

- Alignment of the change plan to the strategic plan for CT (vision, mission, goals, targets).
- Creation of new, visual standards and standard operating procedures, and QA practices.
- Development, socialization and execution of a project change plan supported by change analysis.
- Creation of an implementation steering committee and supporting governance practices.
- Development of a communication plans tailored to key stakeholder groups.
- Creation of a labour relations strategy and contingency plans.

End-of-Line Cleaning Best Practice Solution

A modification to the cleaning function could be introduced in order to smooth the staff workload and improve customer satisfaction throughout the day. A proposed change to the service model will add an end-of-line cleaning process. Conceptually, cleaning staff will be positioned at terminal stations after the morning peak traffic hours to complete a rapid clean of the LRVs. This best practice, currently used at TTC, was provided to illustrate a possible design outcome from complete a LEAN process review. The incremental costs and benefits from this solution were not included in the business case assessment.

Improvements to Cleaning Efficiency

- This is largely an effectiveness measure – trains are cleaned throughout the day while in service, providing immediate and lasting results, directly improving the customer experience. The solution could reduce the number of out of service trains from unsanitary conditions, spills, etc. and also provides opportunity for trouble and defect reporting to assist maintenance staff. Issues such as offensive graffiti, lighting, damage etc. can be reported in real time to complete an on-line repair or follow-up. At TTC, this initiative replaced the service line except for sanding and fluid top up.

Supervision

- In the TTC example, an end-of line crew was sized according to the train size – subway trains are made up of six-car consists so the base crew was six employees with one employee per car.
- Redundancy would typically add one more employee for a total crew size of seven.
- There was a Foreperson assigned to one crew on each shift (two- to eight-hour shifts per day) and the Foreperson supervised crew but also performed QC function on trains.

Quick Tasks

- End terminals are typical island or center platforms and trains would typically launch from both sides.
- Designed dwell in peak service would average about 2.5 minutes, but dependent on signal timing for launch longer in practice. Off-peak this would double, and double again in late evening.
- In a three- to four-minute gap, employees were expected to board the train, walk the entire length of the vehicle and collect all loose papers and garbage. The first shift would start outside of the peak and trains would get progressively cleaner as the day progressed.
- During peak service – garbage collection only.
- Off-peak dusting, mopping spills, door, mirror and modesty panel glass cleaning. Mopping contained to spills and some unsanitary situations, also barricades installed around broken seats etc.

Shift Duration and Facility Requirements

- Two shifts per day, eight hours per shift dictated by collective agreement.
- Amenities included: an area to store tools and cleaning supplies, running water, garbage / recycle drop off areas and a lunch / break room.

Passenger Interaction

- Cleaners waited for passengers to disembark from trains, and then board and clean while passengers were boarding. Cleaners would exit the train after the door chime. Passengers typically did not wait and a rule was established for cleaners not to hold trains.

5.1.7 Recommendations

It is recommended that Council approve in principle the phased, alternative service delivery approach of Option 1 and direct CT to develop an implementation strategy and timeline.

Sec 5.1 Appendix: Table of Assumptions

Assumption	Entire Case	Option 1 Full ASD Model	Option 2 Internal Performance Improvement
Recurring costs and cost savings were modeled with inflation			
Case duration	5 years based on City of Calgary expectations		
Discount value	10%		

Assumption	Entire Case	Option 1 Full ASD Model	Option 2 Internal Performance Improvement
Operating hours per year	2,080		
Base staff	108		
Labourer unit cost	$37/hour		
Project management costs		$100k over 4 years	$100k over 4 years
Change management costs		$200k over 4 years	$400k over 4 years
Contingencies for investment costs	15%		
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY			
Projected Commitment for Bus and LRV		Modeled ranges based on input by CT	
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY			
Cost of a BA (all in)			$80k pa
Material cost reductions (waste & rework)			10%
Material costs			$317k (2014)
Service costs (labour and support) modeled with labour hours as a proxy driver for service commitment			
Implementation will be phased in over 3 years			
Change will solidify over 2 years and full annualized benefits will be realized by 2019			

Sec 5.1 Appendix: TTC ASD Service Lane Pilot

	Topnotch Building Maintenance, Ltd.	Hallcon Corporation
Pilot Program		
Original Contract Date	Jan 2013	Jan 2013
Original Contact Duration	24 months plus 3-month start-up period	24 months plus 3-month start-up period
Original Contract Value	$3.2M (all taxes included)	$4M (all taxes included)
Number of Locations Serviced	1	1
Contract and Scope Extension #1		
Contract Extension Date	Nov 2013 to Dec 2014	Nov 2013 to Dec 2014
Contract Extension Value	$6.2M	$3.8M
Number of Locations Serviced	4	3
Contract Extension Date	Dec 2014 to Dec 2017	Dec 2014 to Dec 2017
Contract Extension #2		
Contract Extension Value	$23.0M	$15.5M
Cumulative Contract Values	$32.4M	$23.3M

Sec 5.1 Appendix: External Wage Benchmarks exclusive of overtime, benefits, and profit-sharing
Janitorial Services (Janitor)

The following external benchmarks were used to show an estimation of wages for comparable service lane labourer skills and experience.

Source	Low	Avg	High	Comments	Reference
Government of Alberta	P5 12.50	18.13	P95 30.28	Alberta-wide	http://occinfo.alis.alberta.ca (2016)
Monster.ca	P10 13.00	18.00	P90 25.00	Calgary	http://monsterca.salary.com (2016)
SalaryExpert		16.00		Calgary; 7% higher than national avg	https://www.salaryexpert.com (2016)
PayScale		16.25		Calgary	http://www.payscale.com (2016)
Glass Door		17.30		Calgary	https://www.glassdoor.ca (2016)

5.2 Janitorial and Outside Maintenance

Recommendation: MH recommends that Calgary Transit pursue the alternative service delivery approach in **Option 1** and develop an implementation strategy and timeline.

5.2.1 Purpose

ZBR objective is to assess internal efficiencies and ASD models of the CT janitorial services, outside maintenance, and snow and ice control functions.

5.2.2 Business Objectives

5.2.2.1 Business Unit Goals

The cleaning and outside maintenance group provides janitorial services, landscaping and snow and ice control at CT facilities (including LRT stations, bus loops, park and ride lots, garages and office buildings). This work is performed by a diverse mix of CT employees, other City of Calgary business units, and a number of external contractors. The ZBR objective is to assess internal efficiencies and alternative service delivery models.

The primary goals of the outside maintenance function are to:

1. Ensure CT LRT stations, bus loops, park and ride lots, garages, and office buildings are safe, in good repair and free of ice and snow.
2. Ensure CT facilities and services are clean and fully accessible to customers.
3. Maximize customer satisfaction, as measured by the periodic customer satisfaction survey.
4. Custodial and labour staff deployed as efficiently as possible and completing outside maintenance tasks as efficiently as possible to achieve the aforementioned goals.

5.2.2.2 Relevant Business Unit Policies

Collective Agreement

5.2.2.3 Contribution to Long-term Goals

A regular and prescribed outside cleaning and maintenance regimen helps to:

1. Extend the useful life of capital assets such as stations.
2. Improves the reputation of CT through sustained customer perception of quality, safety and reliability.
3. Creates predictability through defined schedules, asset plans, and resource plans, which in turn leads to smoothed workforce levels, improved productivity, and cost optimization.

5.2.2.4 Customer & Citizen Needs Addressed by the Service

Citizens of Calgary rely on public transportation to routinely travel into and out of the downtown core and around a geographically-dispersed city. The Outside Maintenance function drives four important outcomes that directly affect CT's customers:

1) Safety;

2) Reliability of service;

3) Quality and comfort; and

4) Cost management (R – C ratio).

5.2.3 Case for Change

The MH Study Team observed a very effective, well managed section which meets service and quality requirements on a consistent basis. The management has incrementally developed a mixed service delivery model. However, the MH Study Team viewed an internal report that described years of system expansion, ageing assets and continuing budget pressures is placing undue workload on the Section's staff, preventing timely response to its responsibilities. The present situation will make it very difficult for the Section to accept any further increases in workload (scalability) without some organizational / business process change implemented in the near future. In fact, the Section is already developing minor position changes in an attempt to address the issues noted above.

5.2.3.1 Effectiveness Gaps

- Lack of comprehensive asset management plans that address integrated asset maintenance and rehabilitation requirements and provide the required resources to maintain them in a state of good repair.
- Growth in the asset base (system expansion) without the corresponding growth in resources required to maintain the assets.
- Resources are constantly reassigned to shifting priorities.
- Staff is concerned with increasing volume of service requests and declining response times.
- Lack of objective quality and delivery standards.
- Lack of performance metrics and supporting data, as well as established data management practices.

5.2.3.2 Efficiency Gaps

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- Staff is concerned with operating in a perpetual staff of reactivity.

5.2.3.3 Trends

Janitorial Services

Activity	Edmonton Transit	OC Transpo (Ottawa)	Winnipeg Transit	TransLink (Vancouver)
Outsourced or In-House	LRT station and Bus Transit Centre custodial is outsourced but managed through shared services with Facilities Maintenance	Today: primarily in-house. 2018: adopt P3 model (OC operates; other group maintains facilities and track - entered into 30-year contract for maintenance. Agreements in place and signed off.	Outsource facilities janitorial services, and clean bus shelters in-house	Outsource
Service Providers	Bee Clean	N/A		Various
Key Reasons for Outsourcing	Cost savings	Requirement of new P3 contract related to funding decision	Cost savings	Cost effectiveness & core competencies
Generated Annual Cost Savings	In-house services – 38 FTE ($2.0M) compared to $1.7M Outsourced Savings: $0.3M (15.9%) In-House Custodial Worker: 2015 wage as per Local 30 Collective Agreement is $21.82/hr (incl fringe) Contract Custodial Worker: $20.50/hr, based on 2,080 hours including tax/administrative overheads & profit The City of Edmonton 30 separate custodial agreements in place (100k - $1.5M pa) Minimum standard usually eliminates small operators. There is an equal balance of Medium to Large companies performing this work for the City of Edmonton Janitorial services for Transit are managed by Facilities Maintenance rather than ETS ETS is happy that the contracts are managed by Facilities Maintenance Facilities Maintenance brings expertise and focus on quality management	Not a key focus of the P3 decision	Internal staff would make $16 – 21 / hour and external service providers can do it much cheaper. No recent cost analysis because the market rates vs. internal staff rates always make the business case easy. 3 year service contracts Want to do business with one full-service company with the infrastructure and qualifications to support the work (e.g.: supervisory staff) Never split the contracts because get poor results	Yes

Landscaping

Activity	Edmonton Transit	OC Transpo (Ottawa)	Winnipeg Transit	TransLink (Vancouver)
Outsourced or In-House	In-house	Today: primarily in-house. 2018: adopt P3 model (OC operates; other group maintains facilities and track - entered into 30-year contract for maintenance. Agreements in place and signed off.	In-house	Outsource
Service Providers	Turf maintenance, planting bed - work is done by City of Edmonton crews Parking lot maintenance/fence repairs - work is done by CoE staff Interlocking pavement construction and repairs - not applicable. Parking lot paving repairs is done by CoE staff	City partnerships with City Public Works OC Transpo cuts grass Public Works collects garbage	N/A	Various
Key Reasons for Outsourcing	N/A	Requirement of new P3 contract related to funding decision	Primary requirement is to keep the grounds clear. Same people do the grounds keeping as SNIC.	Cost effectiveness & core competencies
Generated Annual Cost Savings		Not a key focus of the P3 decision	Cost was believed to be at market rates and so neither more nor less costly than contracting the work.	Yes

Snow & Ice Control

Activity	Edmonton Transit	OC Transpo (Ottawa)	Winnipeg Transit	TransLink (Vancouver)
Outsourced or In-House	Parking lot snow clearing and sweeping work is outsourced	Today: in-house. 2018: adopt P3 model (OC operates; other group maintains facilities and track - entered into 30-year contract for maintenance Agreements in place and signed off	In-house	Outsource
Service Providers	CoE uses a number of contractors	OC Transpo clears roads	N/A	Various
Key Reasons for Outsourcing	CoE does not have the internal resources	Requirement of new P3 contract related to funding decision	Service provided in house for reliability. It was too great a risk for not being able to mobilize buses in a storm to have external contractors involved	Cost effectiveness & core competencies
Generated Annual Cost Savings	Cost to outsource is approximately the same as doing the work internally	Not a key focus of the P3 decision	Cost was believed to be at market rates and so neither more nor less costly than contracting the work Competitive market rates $100-120/hr for snow equipment and $25/hr for labour	Yes

Benchmarking Trends

Janitorial services are outsourced consistently across the benchmark properties, with the exception of OC Transpo, which plans to outsource by 2018 as part of its larger P3 initiative. The major reason for outsourcing was to drive cost savings. Landscaping services are provided in-house for Edmonton, Winnipeg, and Ottawa, with Edmonton and Ottawa relying on other internal city divisions to support much of the work. Translink outsources landscaping and snow and ice control primarily for cost savings and because it believes the functions are not part of its core competency. Snow and ice control has no consistent trend across the benchmark agencies. Edmonton's primary reason for using primary contractors is that it does not have the internal resources to support the work and the cost-to-serve is approximately the same whether outsourced or supported in-house. Winnipeg retains the snow and ice control in-house to maintain control over reliability and believes the cost-to-serve is equal between in-house and outsourced work.

5.2.3.4 Relevant Regulations and Legislation

Collective Agreement

5.2.4 Baseline

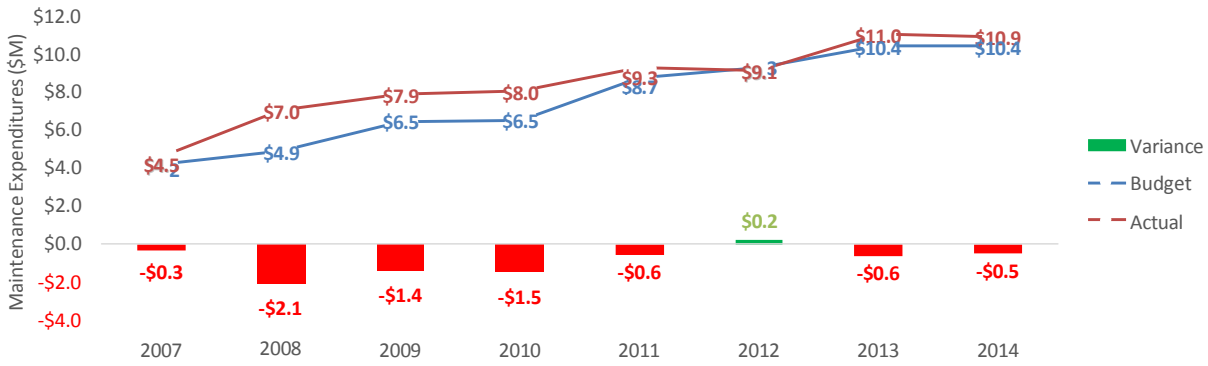
5.2.4.1 Description

The cleaning and outside maintenance group provides janitorial services, landscaping and snow and ice control at CT facilities (including LRT stations, bus loops, park and ride lots, garages and office buildings). This work is performed by a diverse mix of CT employees, other City of Calgary business units, and a number of external contractors.

5.2.4.2 Corporate/Business Unit Cost Analysis

Historical Cost

The historical outside maintenance planned and actual expenditures are provided in the following chart, and reflect a consistent cost overrun trend.

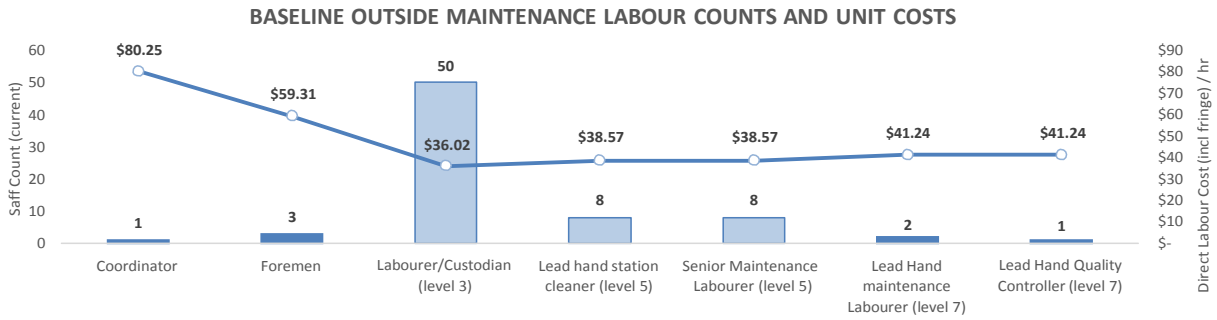


Current Allocation of Janitorial Services and Outside Maintenance Activities

X = majority of the work

O = emergency, as-needed, on retainer

	Activity	In-House	Other City of Calgary Business Unit	External Service Provider
Janitorial Services	Station cleaning	X		
	Office Cleaning			X
	Station Deep Cleans and Pressure Washing			X
	Cleaning and Gravel Sweeping Parking lots, bus loops and garages	O		X
	Graffiti Removal	X		O
	Garbage Removal	X		O
	Garbage Receptacle Installation	X		
Landscaping and Outside Maintenance	Signage placement and removal at stations and bus zones	X	O	
	Landscaping	X		O
	Damage to Bus Shelters	O		X
	Movement of Bus Benches	O		X
	Concrete and asphalt repair	O		X
	Bus Gate Repair and Maintenance	X		
	Fence Repair	X		
Snow and Ice Control	SNIC- Bus Zones	O	X	
	SNIC - LRT bridges, stairs and ramps	X	X	X
	SNIC - parking lots and bus loops	X		X
	SNIC – station platforms	X		
Quality Assurance and Control	Inspection of staff and contractors	X		



Source: CT Spreadsheet "Outside Mtn_Manpower Planning Actuals 2014"

Constraints

CT representatives have identified the following constraints in the current service model:

1. They like the quality of work performed through shared services by the Roads department, but Roads does not have the capacity to expand the scale of its services to cover all the transit lines or increase the current lower priority response level.

2. It has been challenging to convince contracted third parties to perform other work, therefore requiring flexible CT staff to complete a variety of tasks, reactively as required. Certain third party service providers have also refused to increase the scale and scope of coverage, requiring CT to use its own staff.

3. Growth of the asset based has not been appropriately resourced, and so CT staff feels their current resource levels are constrained and limited to reactive response.

5.2.5 Option 1 Alternative Service Delivery

5.2.5.1 Option Description

In the ASD model, CT would increase the usage of external service providers for each of the three areas:
1) Janitorial services;

2) Outside maintenance; and

3) Snow and ice control.

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A small team would remain to focus on such activities as contract administration, governance, and compliance to quality and standards, as well as for emergency response. Additionally, or alternatively, redundant retainer contracts can be put in place to ensure adequate service coverage with very little incremental cost.

Contracting with the external service provider could be approached in a number of ways. For example, CT could contract a single service provider to provide service to all sites. Alternatively, multiple vendors could be hired to handle different sites, or could be introduced as primary and contingent contractors to ensure continuity of service. Contractual obligations could be supported by service level agreements governed by CT.

The MH Study Team completed a regional market scan of service providers that can deliver the required services. Key conclusions from the scan include:

- Janitorial services, landscaping, and snow & ice removal industries are heavily fragmented in Alberta, have low barriers of entry, and appear to have healthy competition.
- Large concentration of 'micro' janitorial service companies in Alberta relative to the rest of Canada.
- Landscaping companies are highly fragmented with almost no consolidation into larger companies across Canada.
- Many landscaping companies have integrated snow and ice control into their service offerings in order to improve seasonal asset utilization.

Insights drawn from the market scan can help to determine the appropriate contracting approach, which would likely include multiple, seasonal contracts to cover a specific geographic area, similar to the City of Edmonton's custodial services.

Proposed Allocation of Janitorial Services and Outside Maintenance Services

The following table provides an illustrative example of key functions that could change under the ASD model. More work is required to develop the appropriate mix of in-house, other City of Calgary business unit services, and external service provider contracts to fulfill the outside maintenance function.

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5.2.5.2 Corporate/Business Unit Costs

Capital Costs

There are no incremental capital costs required for this solution.

One-Time Project Costs

There are four different one-time project costs: 1) project management costs; 2) change management costs; 3) strategic asset plan and standard development, and [redacted] All four costs are likely to span at least two years, with the project and change management costs spanning four years for complete coverage.

Project management and change management resources will be required to plan and execute the outsourcing project. Key activities of the project manager include:

- Preparing a project charter and schedule.
- Coordinating the procurement activities for the new vendors.
- Ensuring timelines and budgets are compliant.

Key activities of the change manager include:

- Preparing and executing a change plan and communication plan.
- Interfacing with stakeholders such as Human Resources and Management.
- Supporting the transition from employee-led work to contractor-led work.
- Preparing outside maintenance and cleaning standards.

Asset management resources will be required to develop and align asset plans with CT's asset management system, strategic priorities, and risk framework.

[redacted]

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Incremental Operating Costs

CT janitorial services wages are high, relative to a number of market-driven data points.

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The base case for outside maintenance was modeled at higher rates than the janitorial services due to:

1) The greater level of training and specialization required, and

2) The use of external equipment that is likely to be bundled in a contract.

The base case has been modeled at a conservative 20% productivity gain. In the MHL Study Team experience:

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It was assumed that all training will be absorbed by the internal training group and will not result in significant incremental costs.

5.2.5.3 Corporate/Business Unit Benefits

There are two tangible benefits streams introduced by this option.

Cost savings will result from the reduction of staff and therefore annual wages and fringe benefits. Approximately 130 thousand hours of staff labour will be removed per year, offset by a smaller portion (104 thousand) of externally contracted labour hours due to assumed productivity gains.

The MHL Study Team recommends that the changes be phased in over time, and so benefits and offsetting cost increases have been prorated to 30% in 2017.

This option does not introduce any significant new sources of funding or revenue generation.

There are other intangible and not easily quantified benefits from this option:

- Development of appropriate asset plans that will add clear direction to the outside maintenance program.
- Large, third party vendors continuously invest in their own process improvements to drive profitability.
- Consistent, measurable levels of cleanliness.
- Scalable solution that can better accommodate volume growth, complexity, age. This is particularly important given the growth forecasts for CT over the coming years.
- Lower overall process costs.
- Same or improved levels of service quality delivered.
- Performance consequences introduced for non-performance to the external contractor.
- Objective, measurable outcomes in the form of standards.

5.2.5.4 Break Even Analysis

The base case NPV for this option is $7.1 million over 5 years, The City has typically used Year 5 financial results in ZBR reports, which in the case of Option 1 is $2.7 million.

Option 1

0 2016	1 2017	2 2018	3 2019	4 2020	5 2021	Total
$ -	$ -	$ -	$ -	$ -	$ -	$ -

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Net Benefits *(G minus D minus C)*	$ (0.32)	$ 0.42	$ 1.95	$ 2.53	$ 2.70	$ 2.66
Cumulative Net Benefits	$ (0.32)	$ 0.11	$ 2.06	$ 4.59	$ 7.28	$ 9.94

NPV	$ 7.08

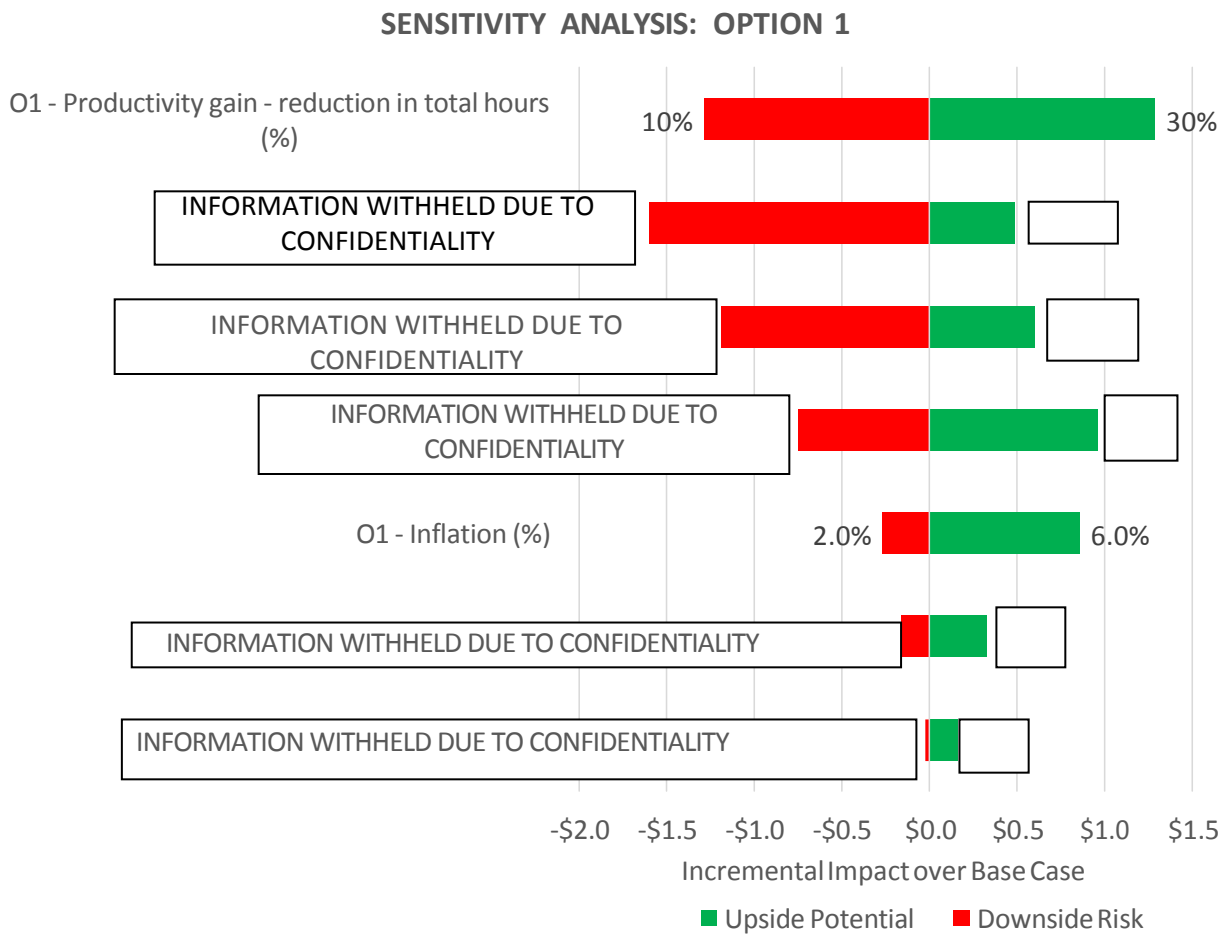
Sensitivity Analysis

Some decisions and variables can have a dramatic effect on the NPV of an investment decision, while others have nearly no effect at all. The future is uncertain and there is a large amount of (variable-quality) data from many sources. It is important to understand that forward-looking perspectives are imperfect and make a great many assumptions with judgement and interpretation. The numbers in this business case are not intended to convey perfect accuracy, and one approach to improving decision quality is to look at how sensitive the NPV outcome is to changes in certain conditions.

The variables reflected in the base case column of the following table were used to generate the NPV result in the previous break-even table. The following table summarizes the scenarios that were tested for the ASD option. Each scenario is manipulated one variable at a time, holding all others constant, in order to isolate the impact on the final NPV. In reality, many variables are linked and not so easily isolated, but this exercise clarifies which factors should drive discussion and which can safely be ignored.

Sensitivity Scenarios	Decision or Variable	Low	Base Case	High
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY				
external productivity gain	Variable	10%	20%	30%
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY				

The tornado sensitivity chart is intended to help the decision maker focus attention on the elements that are most uncertain and have the greatest impact on the final result. One of the objectives of the decision-maker is to improve the level of certainty in a decision, but some variables that are inherently uncertain, do not have a significant impact on the final outcome. The variables with the greatest impact on the final NPV are presented at the top of the chart. The left side of the red/green bar shows the limitation of the downside risk should worst case variable become the actual result.



The most significant uncertainty in the case is the amount of productivity, measured as a total reduction of required service hours, gained from moving to an outsourced model. The MHL Study Team's market scan indicated a highly fragmented market place for outside maintenance services in the Calgary area. The second variable with high uncertainty is the potential contract rates for one or more service providers. A related, but not modeled, variable is the level of availability and capacity of service providers in the local Calgary market. The remaining variables have relatively limited impact on the case.

5.2.5.5 Possible Risks and Management Strategies

Risk	Consequence	Probability	Impact	Preventative Control	Impact Mitigation Strategy
Citizens sue for damages of slipping on snow and ice	Damages and legal fees, reputational impacts	**M**	**H**	Managerial control; strong communication, and planned redundancies	Insurance; communication
Transition is complex	Full benefits potential is not realized	**H**	**M**	Project and change management	Communication and managerial involvement
Service disruption (particularly SNIC) due to contractor performance	Transit services and sites are not easily accessed during or after inclement weather	**M**	**M**	QA and QC	Quick response and prioritization and redundant contracts
INFORMATION WITHHELD DUE TO CONFIDENTIALITY					
Inflation escalates vendor costs	Excessive costs	**L**	**M**	Contracting terms and conditions	N/A
INFORMATION WITHHELD DUE TO CONFIDENTIALITY					
Customer impact	Substandard cleaning and maintenance performed by the contractors; reputational risk	**L**	**L**	Contracting terms and conditions, QA and QC	Effective contract oversight

5.2.5.6 Implementation Considerations

Implementation Timeline

It is recommended to phase in ASD over a two-year time period (2017/18). The second half of 2016 provides time for effective planning, preparation and program design, particularly as it relates to labour relations implications. In the first year, key functions can be addressed and there will be opportunities to gauge the impacts and make adjustments to the plan. In the second year, the remaining functions can be phased in.

Change Considerations

Key considerations for effective change management include:

- Alignment of the change plan to the strategic plan for CT (vision, mission, goals, targets).
- Creation of new, visual standards and standard operating procedures, and QA practices.
- Development, socialization and execution of a project change plan supported by change analysis.
- Creation of an implementation steering committee and supporting governance practices.
- Development of a communication plans tailored to key stakeholder groups.
- Creation of a labour relations strategy and contingency plans.
- Active and early dialogue with the Procurement team.

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5.2.6 Option 2 Internal Performance Improvement

5.2.6.1 Option Description

Option 2 acknowledges the advantage of flexibility with the current approach to direct labourers and custodians to address emergent needs. The option explores the introduction of a PLAN – DO – CHECK – ACT asset management system as recommended in Section 4 Fleet Maintenance, supported by: improved procedural design; the creation of strategic asset plans; improved communication and coaching by front-line managers; and improved data capture and performance measurement to provide timely and relevant feedback that will lead to continual improvement. This approach was presented previously and the Outside Maintenance-specific initiatives are outlined here.

Plan

Strategic Asset Plans

The strategic asset plan to be developed was previously described in Section 4 Fleet Maintenance.

Development of Standard Operating Procedures and Engineered Standards

A list of required standards and operating procedures is an output from the strategic asset plan. For janitorial services and outside maintenance, new standard operating procedures will be developed and approved, which address the:

- Functional scope of work.
- Specific tasks and accountabilities.
- Required tools and materials.
- Timing, intervals, and frequency.

Each standard operating procedure will drive a set of engineered standards that support a more productive and consistent maintenance practice in order to drive efficiency improvements.

Designed Managerial Improvements and Culture Shift

Front-line managers will receive training and ongoing coaching to drive a culture of performance and accountability. Training will augment:

- Inspection and quality review.
- Communication and feedback.
- How to effectively coach.
- Understanding the relationships between operating behaviours and financial performance.
- Creating a sense of urgency in work activities.

Do

Key changes introduced in the execution step include:

- Field staff following new standard operating procedures.
- Managers working with front-line staff to move from a costly reactive (i.e.: 'fire fighting') maintenance practice to become more proactive (where possible).
- Field managers encouraging correct behaviours, inspecting the work, and actively coaching their teams to correct undesirable behaviours.

Check

Capture and review of critical janitorial services and outside maintenance data will drive short-term as well as systemic improvements to efficiency and effectiveness.

Data Capture

Cost savings, cost avoidance, and capacity management can be improved by capturing the following data:

- Logged asset issues and systemic issues.
- Cycle times for various cleaning and maintenance jobs.
- Unit costs.
- Quality inspections results.
- Productive and non-productive (slack) times as well as paid travel time.
- Attribution of anomalies (materials waste, missed work, etc.)

Management Review

Captured data will be transformed into a SIMPLE performance scorecard, supported by performance trends compared with budgeted goals and shared with all staff. Periodically (quarterly), managers, foremen, and lead hands will review the performance results together and discuss systemic issues, risks, and opportunities for continual improvement.

Act

Continual Improvement

Upon completion of the management review, leaders will decide which opportunities for continual improvement to pursue and then allocate resources (time, people, funds) to driving performance gains.

5.2.6.2 Corporate/Business Unit Costs

Capital Costs

- There are no capital costs with this option.

One-Time Project Costs

There are a number of one-time project costs:

1. Project management costs.
2. Change management costs (includes development of performance data capture practices, scorecard design, and management review design).
3.
4. Strategic asset plan development.
5. SOP and engineered standard development.
6. Managerial training and culture review.

One-time costs are likely to be phased in over two years.

Project management and change management resources will be required to plan and execute the project. Key activities of the project manager include:

- Preparing a project charter and schedule.
- Ensure timelines and budgets are compliant.

Key activities of the change manager include:

- Preparing and executing a change plan and communication plan.
- Interfacing with stakeholders such as Human Resources and Management.
- Preparing business process documentation and training materials.
- Supporting ongoing management coaching and culture changes.

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Incremental Operating Costs

There are only few incremental operating expenses that will be introduced resulting from option 2 implementation. These include:

1. Recurring data capture, transformation, and analysis and the preparation of regular performance reporting.
2. Periodic review of the strategic asset plan, standard operating procedures and cleaning standards. (assumed once every 3 years)

5.2.6.3 Corporate/Business Unit Benefits

The estimation of tangible benefits is particularly difficult for this option due to the lack of performance throughput data, cycle times, and quality. Where possible, conservative benefits are estimated below.

Cost Savings

Cost savings benefits will come from:

- Staff reductions caused by efficiency gains from reduced performance variation (standards and standard operating procedures), better planning, and a better understanding of cause/effect relationships between operating behaviours and financial outcomes.
- A modest reduction to the cost of materials due to reduced waste and rework.

Cost Avoidance[7]

Cost avoidance benefits will come from:

- Increased labourer productivity to handle more outside maintenance work in a given shift, thereby avoiding costs of adding more labourers as volume grows over time.

Other Intangible Efficiency Benefits

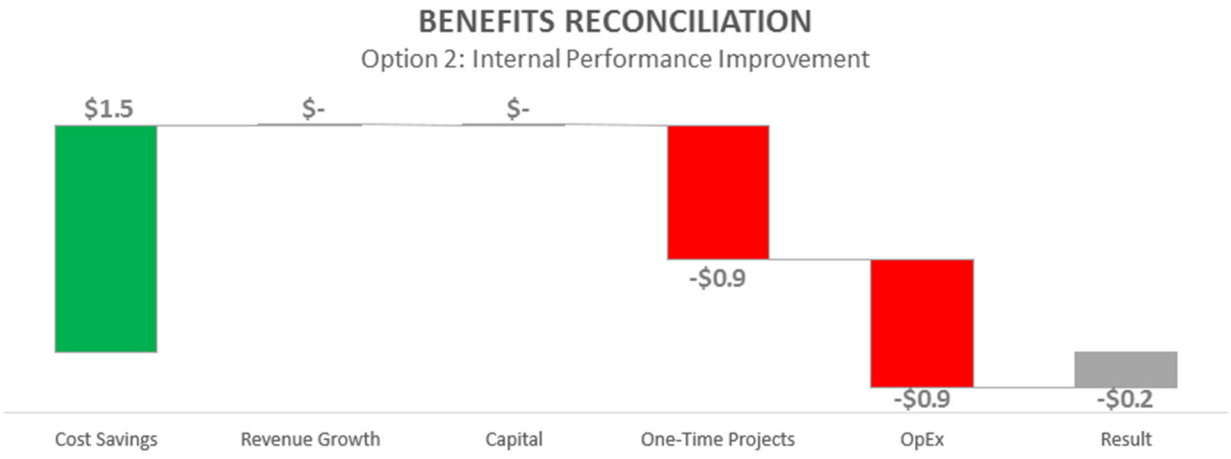
- Culture shift to one of greater accountability and performance.
- Changes to the amount of lost time due to anomalies.
- Changes to the number of non-conformances.

Other Intangible Effectiveness Benefits

- Better quality cleans and consistency from consistently adhering to cleaning and outside maintenance standards.
- Some night shift employees moved to day/afternoon shift – union benefits

5.2.6.4 Break Even Analysis

The base case NPV for this option is ($0.2) million over 5 years, driven primarily from cost savings from modest workforce reductions, which are enabled by a number of one-time projects and significant internal change and rigor. The City has typically used Year 5 financial results in ZBR reports, which in the case of Option 2 is $0.2 million.



[7] Cost avoidance items are excluded from the NPV analysis for option 2.

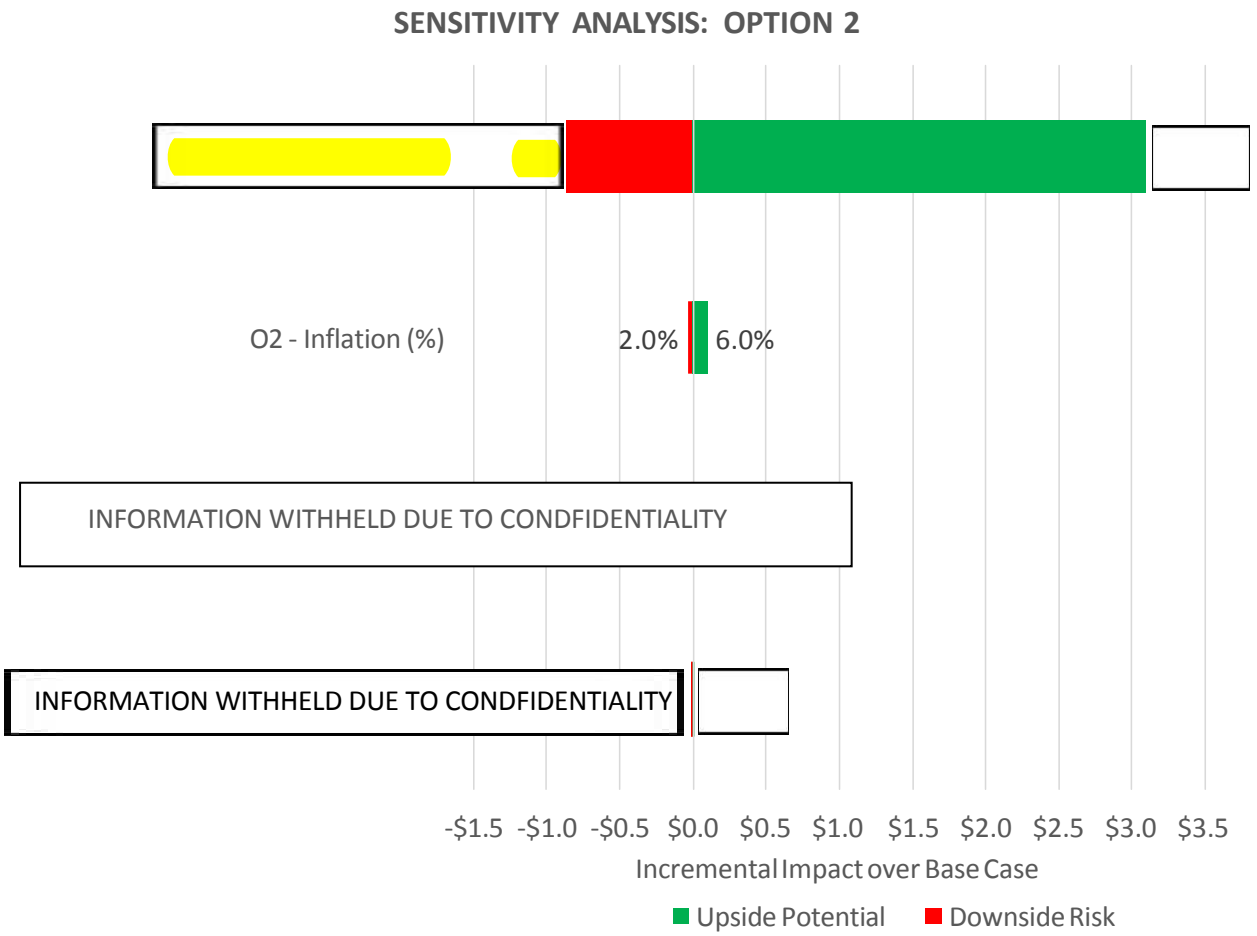
Option 2

	0 2016	1 2017	2 2018	3 2019	4 2020	5 2021	Total
INFORMATION WITHHELD DUE TO CONFIDENTIALITY							
Net Benefits *(G minus D minus C)*	$ (0.53)	$ (0.11)	$ (0.07)	$ 0.15	$ 0.32	**$ 0.21**	
Cumulative Net Benefits	$ (0.53)	$ (0.64)	$ (0.71)	$ (0.56)	$ (0.24)	$ (0.03)	
NPV	-$ 0.23						

Sensitivity Analysis

The following table summarizes the scenarios that were tested for the internal performance improvement option. Each scenario is manipulated one variable at a time, holding all others constant, in order to isolate the impact on the final NPV. In reality, many variables are linked and not so easily isolated, but this exercise clarifies which factors should drive discussion and which can safely be ignored.

Sensitivity Scenarios	Decision or Variable	Low	Base Case	High
INFORMATION WITHHELD DUE TO CONFIDENTIALITY				
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY				
Inflation %	Variable	2	3	6
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY				



The changes introduced with this option have an uncertain effect on the projected benefits. The initial base case was modeled conservatively, with the sensitivity analysis reflecting significant upside potential. The most uncertain variable is the number of staffed positions that can be released as a result of efficiency gains from the various internal management system improvements introduced with the option. The balance of the decisions and variables tested have a nominal impact on the final outcome and so should largely be ignore

5.2.6.5 Possible Risks and Management Strategies

Risk	Consequence	Probability	Impact	Preventative Control	Impact Mitigation Strategy
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY					
Transition is complex	Full benefits potential is not realized	**H**	**M**	Project and change management	Communication and managerial involvement
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY					
Service disruption during behaviour transition	Reduced quality of maintenance work	**M**	**L**	Change management	Management intervention
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY					

5.2.5.6 Implementation Considerations

2016

In 2016, the following logical sequence of steps will position CT staff to move through a multi-year plan of incremental changes. These core steps should be supported by simple project and change plans.

2017 - 2019

- Iterative change focused on performance and continual improvement, identifying and correcting for the right behaviours, and improved managerial communication.
- Performance measurement, active management review, increased front-line accountability, and continual improvements.

Key considerations for effective change management include:

- Alignment of the change plan to the strategic plan for CT (vision, mission, goals, targets).
- Creation of new, visual standards and standard operating procedures, and QA practices.
- Development, socialization and execution of a project change plan supported by change analysis.
- Creation of an implementation steering committee and supporting governance practices.
- Development of a communication plans tailored to key stakeholder groups.
- Creation of a labour relations strategy and contingency plans.

5.2.7 Recommendations

It is recommended that Council approve in principle the phased, alternative service delivery approach of Option 1 and direct CT to develop an implementation strategy and timeline.

Appendix Section 5.2: Table of Assumptions

Assumption	Entire Case	Option 1 Full ASD Model	Option 2 Internal Performance Improvement
Recurring costs and cost savings were modeled with inflation			
Case duration	5 years		
Discount value	10%		
Operating hours per year	2,080		
Base staff	73		
Labourer unit cost		$37/hour	$37/hour
Project management costs		$100k over 4 years	$100k over 4 years
Change management costs		$200k over 4 years	$400k over 4 years
Contingencies for investment costs	15%		
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY			
INFORMATION WITHHELD DUE TO CONDFIDENTIALITY			
Cost of a BA (all in)			$80k pa
Material cost reductions (waste & rework)			10%

Assumption	Entire Case	Option 1 Full ASD Model	Option 2 Internal Performance Improvement
Material costs			$695k (2014)
Implementation will be phased in over 2 years			
Change will solidify over 2 years and full annualized benefits will be realized by 2018			
External training redone every 3 years			
No expansion of the external QA / QC resources			
2017 external contracts (and staff reductions) phased in		30% in 2017	
Roads (other City of Calgary business units), external, and CT each shared a **third** of the SNIC volume			

External Wage Benchmarks exclusive of overtime, benefits, and profit-sharing

Janitorial Services (Janitor)

Source	Low	Avg	High	Comments	Reference
Government of Alberta	P5 12.50	18.13	P95 30.28	Alberta-wide	http://occinfo.alis.alberta.ca (2016)
Monster.ca	P10 13.00	18.00	P90 25.00	Calgary	http://monsterca.salary.com (2016)
SalaryExpert		16.00		Calgary; 7% higher than national avg	https://www.salaryexpert.com (2016)
PayScale		16.25		Calgary	http://www.payscale.com (2016)
Glass Door		17.30		Calgary	https://www.glassdoor.ca (2016)

Landscaping Services (Landscaper or General Maintenance Worker or Landscape Worker)

Source	Low	Avg	High	Comments	Reference
Government of Alberta	P5 13.00	20.24	P95 26.92	Alberta-wide	http://occinfo.alis.alberta.ca (2016)
Monster.ca	P10 10.00	26.00	P90 33.00	Calgary	http://monsterca.salary.com (2016)
SalaryExpert		15.00		Calgary; 6% higher than national avg	https://www.salaryexpert.com (2016)
PayScale		19.87		Calgary	http://www.payscale.com (2016)

5.3 Rail System Communication Maintenance

5.3.1 Purpose

The ZBR objective for Rail Communications is:

a. Conduct detailed review of CT's existing business case to self-perform this function and validate direction.
b. Peer review to include identification of detailed scope of function, strategic role of each element, cost, organizational capacity, transition issues.

The MH Study Team determined there was insufficient information to constitute a business case for self-performing the Rail Communications function. Upon careful review of all available options, it was determined that the ZBR of Rail Communications could not be undertaken as originally planned because the necessary documentation is not available.

Recommendation: It is recommended that Calgary Transit take into consideration the results of the benchmarking and industry trends outlined in section 5.3.4, as well as the other business planning considerations outlined in section 5.3.5 as Calgary Transit determines how it will proceed to implement a new approach to Rail System Communications Maintenance.

Rail systems communications is a critical function for safety and service delivery (efficiency, customer service).

Rail system communications includes:

- Help Phones at stations and stops to ensure customers have a way to communicate with Calgary Transit in the event of an emergency or if they require access to the elevators at certain stations.
- Ability for Calgary Transit to make passenger announcements at stations.
- Train tracking technology to assist in monitoring the location of trains and actively managing trains when there's an incident.
- Monitoring and communication of signals along the system – this is critical to ensuring efficient and safe movement of trains.
- Monitoring of traction power, which is critical to ensure that trains continue receiving the electricity from overhead wires in order to run.
- Radio systems to ensure communication between staff in the field and those in our operations control centre, to manage incidents.
- Cameras at the stations, to ensure our staff at the operations control centre can monitor the system for safety and security.
- Monitoring of items like elevators and escalators including the ability to turn them on and off.
- Ability to track and record communication in the Operations Control Centre in case review of a situation or incident is required.

The Infrastructure division of Calgary Transit has responsibility for design, construction, inspection and maintenance of all systems associated with the LRT network (track, signals, traction power, etc.) including rail communications. The rail system communications work is shared between in-house staff, 3rd party contractors (ENMAX, ARINC, Rockwell, TELUS, etc.) and other City of Calgary business units, such as IT and the Roads Signals group.

The components of Rail Systems Communication are highly critical to reliable transit operations and require a large background of knowledge to maintain and troubleshoot.

5.3.3 Opportunity and Why

Since start-up of the LRT system in 1981, Infrastructure has contracted the design, maintenance and repair of various pieces of the LRT Communication system (help phones, public address, SCADA equipment) to Enmax Power Service Corporation (EPSC), a subsidiary of Enmax Power. Service Level Agreements (SLA's) have been used since 1998 to contract this work. In the past couple of years, Calgary Transit has conducted some significant system upgrades making the communication systems more reliable reducing the amount of work in the SLA with Enmax. However, the total amount paid to Enmax has increased from $385,000 in 2013 to $495,000 in 2015 and is expected to be $609,000 in 2016. While there have been less call outs, there is still a need for 24/7 support when systems fail to ensure that trains are running reliably for customers.

Calgary Transit is questioning and value for money received from Enmax and Enmax has advised Calgary Transit that it is becoming more difficult/costly to keep the staff needed to provide rail communication maintenance services after the current SLA expires in 2018.

- The MH Team identified concerns to self-performing these services by CT Infrastructure staff:
- Unfamiliarity of staff with all equipment and technology
- Knowledge transfer is unknown
- Required skill sets and resource capacity are not currently available
- Short timing
- Having a pool of staff large enough to provide for a 24 hour, 7 day a week rotation

Additionally, the impending opening of the new Operations Control Centre and the logistics surrounding maintenance of its new communication equipment and technology adds new challenges. The opening of the OCC is expected to place further demand on departmental resources in terms of additional equipment and maintenance responsibilities that need to be considered in tandem with the issue of self-performing the Enmax scope of work.

The increasing difficulty/cost of the contract with Enmax and the end of the current term expiring in 2018 is the driving force to change the existing Infrastructure business model. The MH Study Team identified other issues that support the need for change in the interest of business effectiveness and efficiency. Specifically, the MH Study Team identified **performance** and **business continuity risks**.

5.3.4 Benchmarking

Benchmarking was completed across three Canadian properties selected for their similarity to Calgary Transit in technology, operations and market conditions. The three properties selected;

- City of Vancouver - TransLink – Skytrain - intermediate capacity light rail transit system.
- City of Edmonton - Edmonton Transit System – urban style light rail system
- City of Toronto – Toronto Transit Commission – mass transit heavy rail system

The benchmarking exercise consisted of interviews with key agency staff to understand the following issues associated with the use of ASD in the rail communications industry;

- Trends in service delivery models
- Functional scope of services under management at each agency
- Risk factors considered to assist with ASD decisions
- ASD experience and outcomes

A summary of finding for each of the above factors is provided below. The detailed results are included in Appendix C.

Trends in service delivery models

- Agencies are challenged to find balance between state of good repair maintenance and system expansion, all three systems are in municipalities facing growth – funding and resources are constrained.
- Engineering, technical support, asset management are self-performed – minor use of consultants, other City of Calgary business unit, and OEM.
- Trend towards the use of agency staff for preventive / corrective maintenance including QA/QC and emergency response
- Trend towards the contracting to third parties for major maintenance and construction activities – tendency to use OEM's for safety critical systems to mitigate risk. Two agencies considering self-performing work presently performed by contractors – due to greater control of resources, knowledge transfer, costs & contractor performance.

Functional Scope

- All agencies conduct virtually same scope of services to operate and maintain rail transit system.
- All agencies have mature engineering, asset management, maintenance functions in place. Two systems acknowledged more work required on asset management.
- Trends in service delivery models did not vary significantly between the various types of systems (e.g. signals, power, communications etc.)

Risk factors considered to assist with ASD decisions

- Level of control / accountability
- Public safety, availability and reliability of mission critical systems - reputational risk stemming from failures.
- Costs
- Knowledge transfer.
- Quantity and capability of internal resources required to perform the work.
- Availability of technical and specialized labor in marketplace.
- ASD often considered to level internal resource demands - value for money considerations

ASD experience and outcomes

- Mixed level of satisfaction with performance of external contractors
- Cost are typically higher for contracted vs. self-perform services – incomplete data to support
- Tendency to contract major upgrades / construction to OEM for safety critical systems to mitigate risk.
- Very tight market availability for both staff and contractors

5.3.5 Business Plan Approach

The Rail Communications function is exposed to performance and business continuity risks. The benchmarking demonstrated the existence or desire among those transit agencies to self perform this function because of its safety-critical role and absence of a mature and competitive ASD market.

It would be prudent for CT to commission a business plan to self-perform all or portions of rail communications. The Rail Communications Business Plan process should include these considerations:

- **Governance** – Identify a CT Project Manager, supported by a Rail Communications Steering Committee, to develop terms of reference for a consultant's report to develop a business case to self-perform all or portions of rail communications and to be responsible for successfully managing and delivering the project according to the approved Scope, Budget and Schedule
- **Scope** - The terms of reference should include, but not be limited to, the following scope of work elements:
    a. Organizational Model - develop options for Infrastructure to assume all or portions of the rail communications function. The options should consider current Infrastructure department competencies, skilled labour availability, marketplace maturity for supply of contracted services, business continuity.
    b. Implementation – Identify implementation and transition issues, especially those related to the interface with Enmax and with the CT Operations Control Centre.
    c. Resource Budget - Construct a detailed 5-year budget model to quantify and cost the labour, material, facility and equipment resources required for each option. This will require a detailed scope of work currently being completed by Enmax, detailed equipment inventories, equipment maintenance standards, maintenance plan, etc.
    d. Risk Assessment - develop a performance and business continuity risk model to identify risks and mitigation measures for each option.
    e. Evaluation Criteria – Customer and CT staff Safety, Cost, Scalability.

The project budget and schedule can be identified as part of the procurement process.

6. TRANSIT REVENUES

Recommendations:
It is recommended that Council endorse **Options 1 – 4** and direct CT staff to develop detailed implementation plans for approval by Council:

1. Assign low income transit pass funding responsibility to Calgary Neighbourhoods (CN), including the development of a low income transit pass revenue recovery plan (users, City subsidy, other sources) and phased-in revenue recovery contributions from CN to CT over a five-year period
2. Transition Seniors fares by eliminating the Senior annual pass and transitioning Senior cash, ticket and monthly pass pricing from Adult to no less than Youth rates
3. Increase transit advertising revenue by acting on the recommendations of the February 2015 Advertising Review
4. Amend the Park and Ride Policy and permit the demand-based approach to pricing of Parking Revenue Option 4 by converting free stalls to monthly reserved in lots that have a monthly reserved waiting list

If Recommendations 1 through 4 are adopted, coupled with a stringent annual review process of cost drivers, CT should produce R/C Ratio results within the policy range.

With the service levels of Route Ahead requiring an increase in the level of capital expenditures and operating costs and a recent downward trend in the Revenue / Cost (R/C) ratio, revenue-side options to stabilize or improve the R/C ratio will be examined. The revenue drivers of the R/C ratio include: Transit Fares (and associated discounts), Fare Collection (fare evasion and enforcement) and Non-farebox Revenues including parking and transit advertising. A second task considers the impact of the existing Proof-of-Payment (POP) system on the perception of personal security on the CTrain.

In addition, City of Calgary Corporate Economics has modeled the impact of selected options and the results are included in section 6.3 Efficiency and Effectiveness Options.

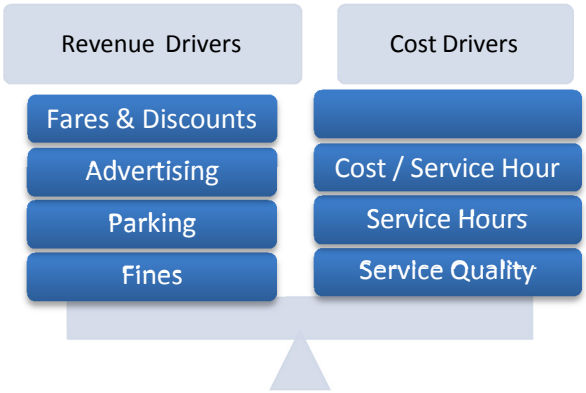
6.1 Revenue to Cost (R/C) Ratio

In recognition that transit benefits both users and non-users, all Canadian public transit agencies receive some form of subsidy towards transit system operating costs. Depending on the jurisdiction of the agency, the majority of these subsidies are funded through municipal or provincial taxes. Other common transit subsidy sources include: fuel tax, sales tax, parking tax and vehicle levy.

The R/C ratio, as defined by Canadian Urban Transit Association (CUTA), is total operating revenues divided by total direct operating expenses of the conventional transit system. Total operating revenues include all non-passenger revenue, including advertising, parking, and fines. Capital funding, regardless of source e.g. municipal property tax or other provincial or federal source, is not included. Similarly, funding for Access Transit (paratransit) is not included in the R/C ratio calculation.

The R/C ratio is most impacted by the annual operating costs associated with a particular service plan, and fare revenues (and to a much lesser extent non-farebox revenues i.e. parking, advertising, fines). In turn, fare revenues are a function of ridership, pricing and fare evasion rates.

Figure 6.1 - Revenue and Cost Drivers



Given the interrelationship of these factors, the ability to maintain a pre-determined R/C ratio in combination with a desire to increase service poses unique challenges. In order to maintain a set R/C ratio the transit agency must address both sides of the equation – revenue and costs - in any given year. This review will focus on revenue drivers and options to stabilize or improve the R/C ratio. The cost side is equally important and the MH Team strongly recommends CT take action to implement new approaches to business planning summarized in section 9.

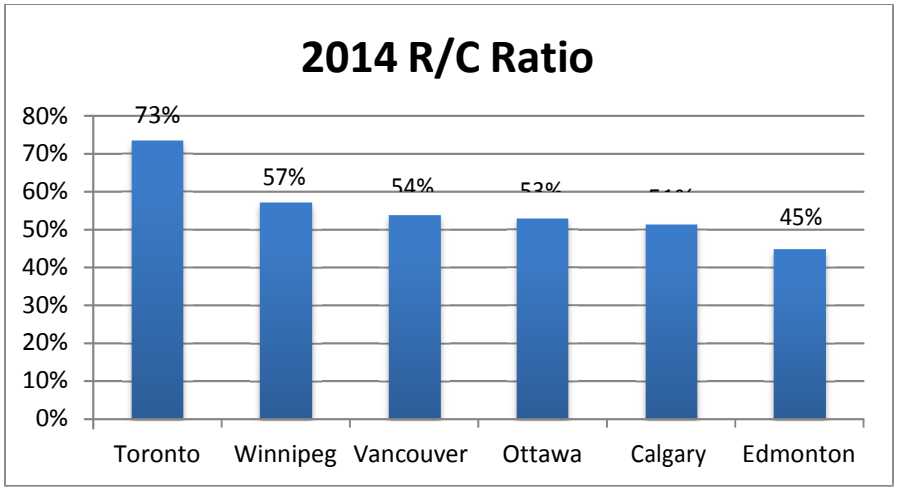
6.2 Current Situation

6.2.1 R/C Ratio

The City of Calgary Council has established a target R/C ratio of 50-55% for Calgary Transit (CT). This directs that at least half of the cost of operating the system must be covered by transit revenues. The R/C ratio has trended downward over the past decade from a high of 58% in 2006 to 50% in 2015.

Direct comparison between transit systems is somewhat difficult as the unique circumstances of each community and agency influence cost inputs (land use, road congestion, the mix of transit modes, passenger crowding standards, etc.) and revenue inputs. As shown in the table below, the R/C ratio of six Canadian systems ranges from a low of 45% in Edmonton to a high of 73% in Toronto, using the most recent available CUTA data. Benchmarking shows the position of Calgary Transit among its peers in 2014, the latest available industry data. The 2015 Calgary R/C ratio is 50%.

Figure 6.2 - Canadian R/C Ratios 2014: Benchmarking



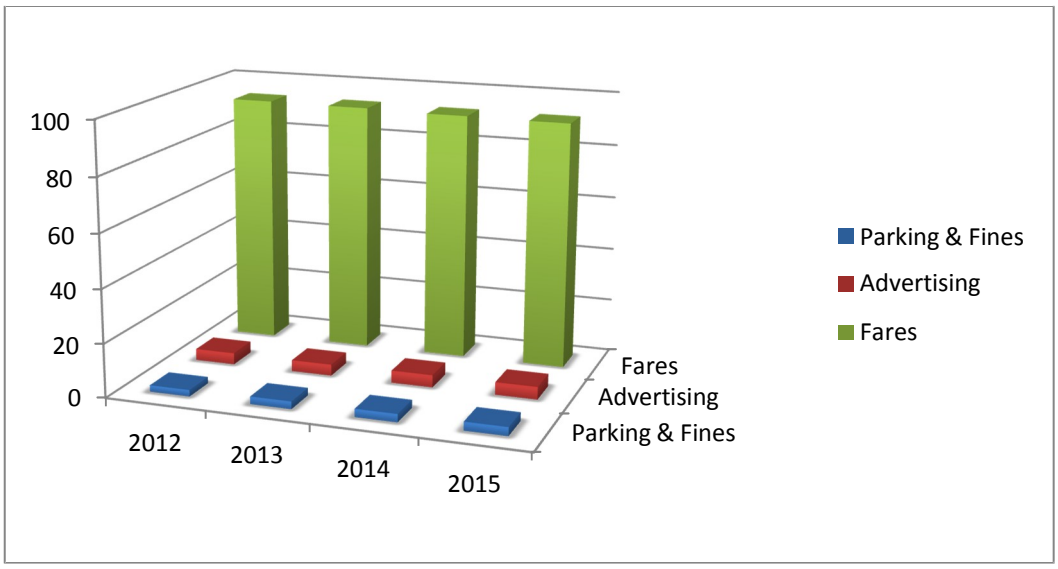
Source CUTA

The previously mentioned downward trend in CT R/C Ratio raises a concern with the MH Team that the current fare and discount structure cannot support the service levels envisioned in Route Ahead and meet council's 50-55% R/C target.

6.2.2 R/C Revenue Sources

Fares are the most significant revenue source for CT, accounting for an average of 93% of total revenues. Advertising is the next largest source at just over 4%; parking, charters and fines account for the remaining 3%. These figures have been stable in recent years.

Figure 6.3 - CT Revenue Sources



Accordingly, any policy decision that impacts fare revenue has the most direct and significant impacts on the R/C ratio.

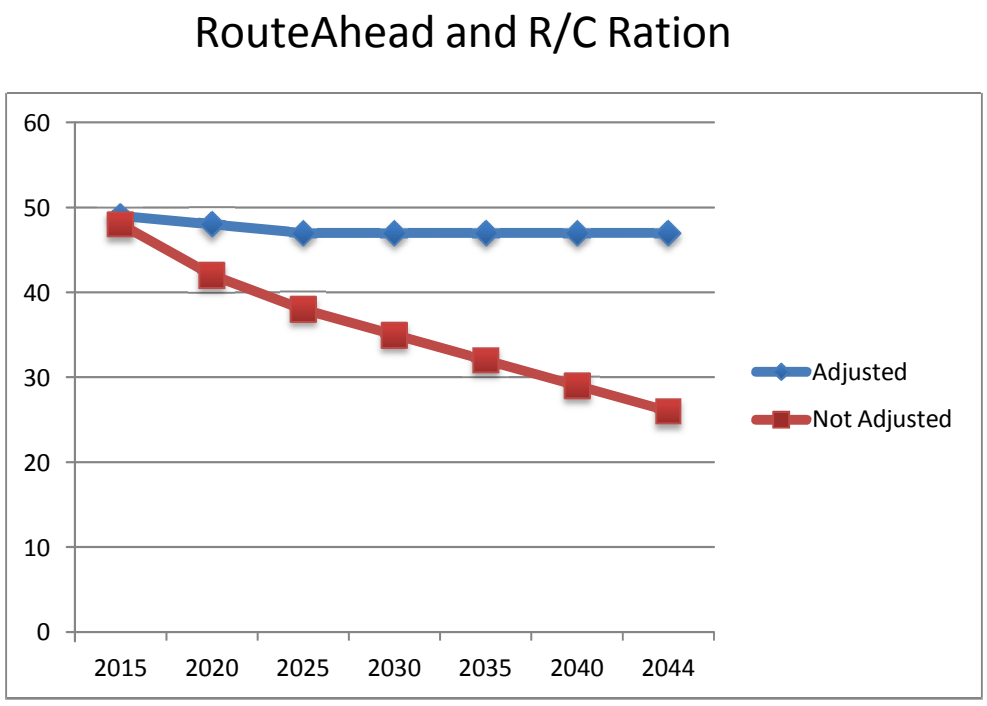
6.2.2.1 Fares and Fare Policies

CT fares have been increased on a somewhat irregular frequency over the last 10 years and have met or exceeded inflation.

Corporate Economics (in the Chief Financial Officers Department) completed an extensive review of funding options for transit in the near term (2015-2018) and long term (2044)8. The report states that presuming service capacity is increased as envisioned in RouteAhead; increases in inflation, interest rates, wages, materials costs, and fuel will increase the cost to operate CT more than four fold over the next 30 years. The analysis included modeling the impact of fares options. The report concluded it is not possible to maintain the 50% R/C ratio minimum and achieve the RouteAhead service levels over the next 30 years by indexing all Calgary Transit fares to inflation (without indexing the 2044 RC ratio will fall to 26.6%).

[8] 2015-2018 Calgary Transit Fare Review – Long Term Outlook

Figure 6.4 – CT RouteAhead and R/C Ratio



Note: 'Adjusted' – includes annual inflationary fare increases, 'Not Adjusted' – no inflation adjustment

6.2.2.2 Fare Discounts

The use of discounts for pre-paid fare purchase and defined user groups is common practise among most transit systems. Typically the degree of discount is linked to the degree/level of advance commitment to transit use, a means to recognize more loyal riders (higher system use) or grow ridership and ability to pay. Equity between transit user groups is a key policy criteria.

In Calgary, adult-category riders and cash/ticket paying students and seniors cross-subsidize all other users in order to achieve the target R/C ratio. For example, at $3.15, the cost of an adult single ride fare returns 95% of the average cost per trip – well above the R/C ratio target of 50-55%.

CT fares that recover below the target RC ratio include: 7th Avenue Free Fare and Senior, Student, U-Pass, Low Income, and Youth Passes. These fare discounts are 50% or more, their users represent 39% of total ridership and they generate 19% of CT's total revenue. The percentage of riders paying deep discount fares increased to 42% in 2015. A significant number of those customers who qualify for the highest fare discount levels are transit dependent, nevertheless, the imbalance in R/C ratio contribution by user groups deserves attention.

Table 6.1 - CT Ridership and Revenue: Equity Analysis

Fare Discount Amount	Percent Ridership	Percent Revenue
50 percent or more	39%	19%
12 – 50 percent	40%	43%
12 percent or less	21%	38%

Source – Adapted from Calgary Transit Funding and Fare Strategy Review 2014 February using 2013 data

Benchmarking shows that CT's deep discount Low Income monthly pass ($44), Low Income Senior annual pass ($15) and Senior annual pass ($95) are not common (Table 6.2). Only Edmonton provides a similar low income monthly pass ($35). The BC Bus Pass program in British Columbia is fully funded by the provincial government and is available in Vancouver and throughout the province. This program currently provides an annual transit pass at a cost of $45 to eligible low-income residents but in its Budget 2016, the Province of BC announced an additional increase of $52 per month, effective September 1, 2016, for a 12-month cost of $669. Transit agencies are paid the equivalent of adult and concession fares for the number of customers using their service. Only Edmonton offers a Senior annual pass ($125).

The U-Pass terms, conditions and pricing is developed with post-secondary institution stakeholders. Data indicates the per trip fare discount exceeds 50%. Benchmarking below shows it is one of the lowest priced passes among its peers. CT staff have negotiated increased rates that will eventually result in a semester rate of $151 by September 2019.

All agencies offer a discount for frequent travelers who purchase pre-paid fares. Discounts range from a low of 14% on Adult monthly passes in Toronto to over 90% on seniors' annual passes in Calgary.

Table 6.2- Fare Classes and Discounts 2015: Benchmarking

		Vancouver	Calgary	Edmonton	Winnipeg	Toronto	Ottawa
Adult	**Cash**	2.75	3.15	3.20	2.60	3.00	3.55
	Ticket (Book of 10)	21.00	31.50	24.00	22.50	28.00	32.00
	Day Pass	9.75	9.50	9.00	9.00	11.50	8.30
	Monthly Pass	91.00	99.00	89.00	86.65	141.50	103.25
Youth	**Cash**	1.75	2.10	3.20	2.10	2.00	1.90
	Ticket (Book of 10)	17.50	21.00	21.00	15.70	19.50	16.00
	Day Pass	7.50	6.75	n/a	n/a	n/a	8.30
	Monthly Pass	52.00	65.00	69.00	60.45	112.00	82.25
Senior	**Cash**	1.75	3.15	3.20	2.10	2.00	2.70
	Ticket (Book of 10)	17.50	31.50	21.00	11.30	19.50	32.00
	Day Pass	7.50	9.50	n/a	n/a	n/a	8.30
	Monthly Pass	52.00	99.00	14.00	43.35	112.00	41.75
	Annual Pass	n/a	95.00	125.00	n/a	n/a	n/a
Low Income	**Monthly Pass**	n/a	44.00	35.00	n/a	n/a	n/a
	Annual Pass	45 plus 52/mo†	15 Senior	n/a	n/a	n/a	n/a
Post Secondary U-Pass	**Semester Pass**	152.00	130.00	135.00	No U-Pass but 70.85 monthly pass	n/a	195.00

† effective Sep 1, 2016

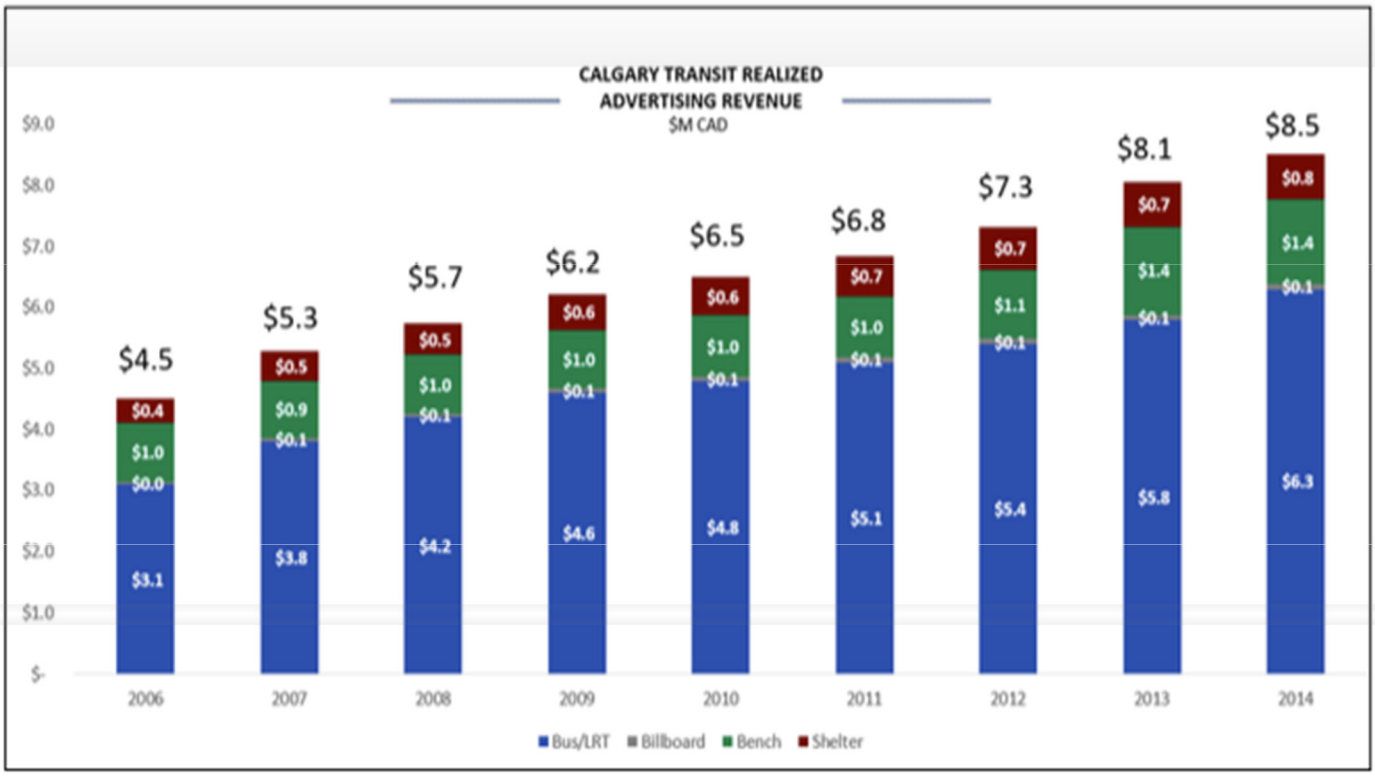
CT's discounts benchmark reasonably well with its peers except for the most deeply discounted fare products (highlighted with shaded cell borders) – **low income monthly pass, low income Senior annual pass, Senior annual pass, and the U-Pass.**

6.2.2.3 Advertising

Advertising on CT vehicles and property contributed $8.7 million in annual non-farebox revenues and represented 4.6% of total revenues in 2014. By 2015 advertising revenue was $9.3M. This is the largest source of non-farebox revenue.

A CUTA analysis of advertising revenues for the period 2009 – 2013 reports that at 4.2 %, CT enjoys one of the highest revenue contributions from advertising amongst level 2 systems (population 400,000 to 2 million) with Edmonton slightly ahead at 4.6%.

Figure 6.5 - CT Advertising Non Farebox Revenue Contribution



Source: CT Internal data

CT completed a detailed review of the Transit Advertising Contract in February 2015.
The report identified that the most significant additional opportunities for increasing CT's advertising revenue are the following[9]:

- Improve collaboration between the transit agency and its advertising sales contractors;
- Increase the number of billboards;
- Add digital media opportunities;
- Increase the number of large format opportunities in addition to billboards;
- Increase flexibility and establish guidelines for allowable format exceptions.

The recommendations have been referred to CT staff.

6.2.2.4 Parking Revenues

There have been three different CT parking prices/policies in the past six years. The current Park & Ride Policy mandates a minimum percentage of free spaces. CT currently has 16,083 parking spaces located at CTrain stations and bus loops. Of these 6,252 are offered for monthly reservations at a price of $80 per month (2015 rate is used in all figures, 2016 rate is now $85). The reservation system was implemented in 2011 and replaced the $3 daily rate previously adopted in 2009. Reservations revenues contribute approximately $4 million per year, however uptake varies by parking lot with many of those in the west, south and northwest lines oversubscribed and others with unused capacity. Every park and ride lot can have up to a maximum of 50% of the spaces reserved for monthly paid parking, based on demand.

Benchmarking with other transit systems shows that CT's reservation program is the largest among its peers. The benchmarking suggests there is an opportunity to re-assess parking fees and increase parking revenue in Calgary, targeted to specific parking lots, given the variable market demand between lots.

Table 6.3 - Parking Supply and Charges: Benchmarking

	Total Stalls	Reserved	Pricing	Percent Paid
Vancouver	7,155	56	Free/$2/$3	91%
Toronto	12,074	n/a	$3/$4/$5/$6/$7	100%
Calgary	16,083	6,252	Free/$80	39%
Edmonton	5,050	556	Free/$42	11%
Ottawa	7,587	683	Free/$24/$54.75	9%
Winnipeg	462	n/a	Free	0%

[9] Review of Calgary Transit Advertising Program February 2015

6.2.2.5 Fare Evasion and Fines

Like LRT systems around the world, the CTrain is a proof of payment [POP] 'open' system e.g. there is no barrier, gate or permanent personnel checking or collecting fares prior to customers boarding the trains. Fare evasion rates on CTrain in 2011 were estimated at 4.5%. In 2015 this number had dropped to 1.7%[10]. Fare evasion rates vary by time of day with highest rates reported after 6:00 pm and modest variations by CTrain line. This evasion rate represents approximately $2.0 – 2.5 million in lost revenue – and is offset by approximately $1 million in annual fine collections.

Policing the transit system is a shared responsibility between the Calgary Police Service and Calgary Transit Peace Officers. The primary objectives of the Calgary Transit Peace Officers deployment model are to: reduce violent crime on transit, improve upon customer perceptions of safety during evenings and weekends, and to mitigate reputational damage when serious anti-social and violent crime occurs, reduce the length of time negative incidents remain an issue, and leverage the use of all transit personnel in a comprehensive safety and security model.

Only a portion of Peace Officer efforts are devoted to fare evasion, however findings from the 2015 Fare Compliance Study state that visibility of Transit Peace Officers on CTrain is the most significant deterrent to fare evasion (86% of fare evaders said they would always pay a fare "if I saw more peace officers on the train")[11].

CT reports approximately 40% of transit summons issued are paid, this compares favourably to the 8% collection rate reported by the Vancouver system[12].

Certainty of detection, as opposed to severity of punishment is likely to perform a greater role as a determinant of purchasing a fare or not purchasing a fare among individuals who conduct a risk (of getting caught) vs. reward (using transit for free) calculation.

The Public Safety and Enforcement section has proposed a series of pilot initiatives to increase the visibility of Transit Peace Officers and decrease evasion rates. These initiatives include the establishment of a new targeted enforcement unit with primary responsibility for fare enforcement and ongoing midpoint fare checkpoints; all of the foregoing are intended to result in checking of 10% of all trips per year. Results of the High Enforcement Unit initiative appear to be having good results. During the period the High Enforcement Unit conducted checks across all city quadrants and in the process checked approximately 5% of daily CT ridership.

[10] 2015 Fare Compliance Study
[11] 2015 Fare Compliance Study
[12] PWC 2007 TransLink Fare Evasion Internal Audit

Table 6.4 - Fine Amounts and Evasion Rates: Benchmarking

System	Fine Amount	Evasion Rate
TTC	$235	1.6%
Ottawa	$150	4.1%
Calgary	$250	1.7%
Edmonton	$250	3%
Vancouver	$175	2.5%

CT benchmarks favourably with its low fare evasion rate. While the transit services eligible for POP vary between the benchmark transit systems (LRT only, LRT plus articulated buses, streetcar only, etc.) the percentages reflect fare evasion rates for boardings on those specific POP-eligible services.

6.3 Efficiency and Effectiveness Options

The MH Team developed five options based upon our detailed analysis and industry benchmarking of the following issues affecting the revenue-side of the R/C Ratio. The subjects of the five options are:

1. Low income transit pass program
2. Senior fares
3. Transit advertising revenue
4. Transit parking revenue
5. R/C ratio policy amendment

6.3.1 Low Income Transit Pass Program

Income support for low-income Calgarians using the low income transit pass program is $13.2 million. This includes the low income monthly pass discount of $6.4 million (the discount below the regular monthly pass) plus the low income Senior annual pass of $6.8 million (the discount below the current adult monthly pass equivalent). The low income transit pass application process is administered by CT and passes are sold at designated pass sales outlets. CT covers the cost of the program through cross-subsidization from higher-priced fares.

The low income pass program is unique among the benchmark transit systems, except for Edmonton. It is generally understood in the public transit industry that a transit agency is poorly positioned to administer income subsidy programs, particularly as mass transit is taking on a greater and greater role in supporting efficient, modern urban centres. In BC, income support for low-income residents using transit is administered by a social service agency. The transit system is compensated by the social

service agency for transit use by these low-income residents at regular monthly pass fares. Elsewhere, there are not low income transit pass programs, except Edmonton

This unique CT deep discount distorts the R/C Ratio calculation and peer benchmarking accuracy. The discount represents an approximate 3.2 percentage-point reduction in the R/C ratio. This is because the $13.2 million in low income benefits is unfunded. The revenue impact is forecast to increase to $42.8 million and the same R/C ratio impact increases to 3.6 percentage-points by the target forecast year of 2044 due to demographic change.

A change in the administration of the application process for the low income program from CT to the Calgary Neighbourhoods (CN) Department is planned for 2017. It is recommended to restructure the low income transit pass program at the same time –assign funding responsibility to CN and introduce a phased introduction of low income transit pass program revenue from CN to CT over a five-year period. Under this model, CT would provide the appropriate adult or senior transit passes to CN and, by Year 5, CN would compensate CT for the face value of the passes. In turn, CN would be empowered to establish cost recovery streams from low income users, City grants or other sources (corporate sponsorship, senior order of governments). With the above recommendation, setting users fees will shift from CT to CN and that department will be best positioned to balance user needs, manage the subsidy level between the low income pass rates and the approved fare structure and the City's financial mandate. The intent of the recommendation is not to supplant the existing "Fair Calgary Social Policy" outcomes for Low Income Calgarians. Rather it is to place the funding and costs for achieving the Fair Entry outcomes in a more appropriate place within the corporation.

6.3.2 Senior Fares

Once the needs of the low-income members of the seniors' community are addressed, it is recommended that CT should discount the Senior pricing structure no more than Youth discounts. This includes eliminating the Senior annual pass, offset by offering discounted cash, ticket and monthly pass prices at no less than Youth fares. No other benchmark transit system has a Senior annual pass, except for Edmonton, and the Calgary pass price is the lower of the two. The Senior annual pass discount, excluding low income-eligible users, is estimated at $2.9 million (annual) which represents a 0.7-percentage-point impact on the R/C ratio. The offsetting revenue loss from the transition of the current Adult pricing for Senior to Youth pricing is estimated to be negligible. Demographic change/aging population increases the revenue impact to $10.0 million and a R/C ration impact of 0.8 percentage-points by the target forecast year of 2044. In 2015, seniors are among the most affluent age cohorts in the province.

Providing a Senior pricing structure at no less than Youth fares will bring CT in line with peer agencies across Canada.

6.3.3 Transit Advertising Revenue

CT currently earns more than $8.5 million in transit advertising revenues and is in the top quartile for performance relative to other transit agencies. A number of opportunities to expand the advertising platform and secure additional transit advertising revenues of between $850,000 and $2.25 million were identified in 2015.

The 2015 Advertising Review options for increasing transit advertising revenue are generally accepted practices in large Canadian cities and, in the case of Calgary, are guided by a comprehensive policy framework. The MH Team endorses its recommendations. A $1 million increase in advertising revenue was modeled and the R/C ratio increases by a modest 0.3 percentage-points.

6.3.4 Transit Parking Revenue

The detailed analysis of parking revenue pointed to a potential for increased daily parking revenue, with special reference to demand by location. There have been three different parking prices/policies in the past six years, signaling a requirement for due diligence and a prudent approach to change.

Four options for changes to the current parking strategy were modeled by the MH study team. The options considered estimated incremental revenues ranging from $1.1 million (convert free stalls to monthly reserved if lot has a monthly reserved waiting list) or $1.4 million (convert free stalls to daily charge if lot has a monthly reserved waiting list) up to $5.0 million (Retain existing monthly reserved, convert free to daily charge) or $5.5 million (cancel all monthly reserved, convert all stalls to daily charge). All options consider elasticity/demand by lot with variable pricing.

The MH Team recommends that the Park and Ride Policy be amended to permit the demand-based approach to pricing of Option 4 by converting free stalls to monthly reserved in seven lots that have a monthly reserved waiting list.

This option can be readily implemented using the current system and additional signage. This will increase satisfaction for customers who are willing to pay and have registered on a waiting list. Less time is spent hunting for spots as those with monthly parking can travel at their preferred time. Having fully dedicated monthly parking lots will also reduce traffic from those hunting for free spots. By providing some lots with free spots (where there are no wait lists) ability to park at no charge is still an option for those who travel early. Maintaining the whole lot as free after 10am also provides another window of opportunity for those willing to travel later.

A $1 million increase in increased parking revenue was modeled and the R/C ratio increases by a modest 0.3 percentage-points. This is a conservative outcome for a targeted, demand-based approach to charge for parking (monthly reserved or daily charge) in selected lots where there is ‘demand’ (a monthly reserved waiting list).

Principle 4 of the City's User Fees and Subsidies Policy13 provides precedent to consider the adoption of increased monthly reserved spaces:

- *Principle 4 - Allocation of Resources Principle: in an environment with limited resources available and increasing public demand for goods and services, user fees have value as a mechanism for allocating scarce resources.*

Table 6.5 - Parking Revenue Scenarios

Option	Incremental Revenue
1.Retain existing monthly reserved, convert free to daily charge	**$5,016,850**
2. Cancel all monthly reserved, convert all stalls to daily charge	**$5,466,571**
3. Convert free stalls to daily charge if lot has a monthly reserved waiting list	**$1,376,000**
4. Convert free stalls to monthly reserved if lot has a monthly reserved waiting list	**$1,088,640**

6.3.5 R/C Ratio Policy amendment

Proceeding with Route Ahead targets presents challenges to maintaining the R/C ratio in the 50 – 55% policy range. Targeting fare increase in line with inflation plus targeted reductions in deep fare discounts as modeled here will produce R/C results by 2044 that are close to the target range (46%). In the opinion of the MH Team, these revenue measures, coupled with a stringent annual review process of cost drivers, as noted elsewhere in the report and summarized in Section 9 New Approach to Business Planning, should produce R/C Ratio results within the policy range. Benchmarking of similar-sized and larger transit systems supports this conclusion. The MH study team concludes there is no need to amend the R/C Ratio policy target of 50 – 55% if recommendations 1 – 4 are adopted.

6.3.6 Potential Opportunities

There are other best practice fare strategies that can increase the R/C Ratio. They are part of a toolkit of best practice strategies which can be considered in the future. Planning data was not available at this time but these options can be pursued as part of future detailed planning studies or upon the implementation of an electronic fare payment system with data collection capabilities:

- Peak/off peak fares

[13] City of Calgary User Fees and Subsidies Policy

- Zone fares for CTrain
- Premium service and fares
- U-Pass benefit-cost terms and conditions

These options are described in Appendix D, for reference.

6.4 Personal Safety and Security

A second task of this review considers the impact of the existing Proof-of-Payment (POP) system on the perception of personal security on the CTrain. Findings from the 2012 Transportation Research Board TCRP Report 96 suggest that the majority of agencies with POP systems believe their customers to be comfortable with their feeling of safety and security. This information was collected from 31 North American agencies with POP fare collection systems (and included CT).

Table 6.6 – Riders' Feeling of Safety (North America)

TABLE 35
RIDERS' FEELINGS OF SAFETY AND SECURITY

Feeling	*n*	%
Very comfortable	9	29.0
Moderately comfortable	15	48.4
Not too comfortable or uncomfortable	4	12.9
Not very comfortable	2	6.5
Very uncomfortable	1	3.2
Total responding agencies	31	100.0

CT conducts two annual surveys that include the measurement of perceptions of safety and security. The 2014 Safety, Security and Cleanliness survey found the average safety rating provided for Calgary Transit services (in general) was 7.92, based on a scale of 1 feeling very unsafe and 10 feeling very safe. These ratings are virtually the same for feelings of safety on buses (8.0) and CTrain (7.8). However, for both bus and CTrain the feelings of safety are lower after 6pm; this applies to during travel and while waiting for the service. Of note is the 2014 study shows a higher percentage of customers report having seen a Peace Officer on CT in the non rush hour than in previous years.

Table 6.7 – Riders' Feelings of Safety (Calgary)

Before 6pm	
Onboard Bus	**Onboard CTrain**
99%	97%
Waiting at Bus Stop	**Waiting at CTrain Station**
99%	97%

After 6pm	
Onboard	**Onboard CTrain**
86%	76%
Waiting at Bus Stop	**Waiting at CTrain Station**
75%	73%

In addition to the presence of HELP intercoms, security surveillance or video cameras, and Calgary Transit personal the number one factor customers report as making them feel more secure is being in a

large group of people/having people around. This is reflected in the after 6pm perceptions when the system is less busy.

The second source of customer feedback on feelings or safety is collected in the annual Customer Satisfaction and Non User survey. In 2014 customers ranked feelings of safety and security as the third most important service feature behind being on time and service frequency. Approximately 14% of customers expressed dissatisfaction with CTs performance on this service feature however the data does not break out findings between buses vs. CTrain customers or by time of day.

The presence of a transit operator on all buses evidently contributes to a higher percentage of customers who feel safe and secure both before and after 6pm; perhaps what is more surprising is, given the relatively low incidence of transit personnel on the CTrain, the feelings of safety and security are almost the same as bus during the day and only slightly lower after 6pm.

The MH Study Team concludes that an increase in visible transit personnel at CTrain stations, particularly after 6pm could increase feelings of safety and security amongst customers on the POP system; these personnel could be uniformed security personnel (but not necessarily Transit Peace Officers) or other uniformed services personnel i.e. cleaning or maintenance crews.

6.5 Transit Revenues Recommendations

Options 1 – 4 result in a conservative estimate of $4.9 million in net annual revenue, including a $13.2 million offsetting funding/revenue transfer low income passes, for a combined 4.5 percentage-point increase in the R/C ratio.

Table 6.8 –R/C Ratio Improvement Options

Option	Revenue	CT Funding	R/C Ration Impact
1. Restructure Low Income Transit Pass Program	$13.2 M	($13.2 M)	3.2%
2. Transition Seniors to Youth Discount	$ 2.9 M		0.7
3. Advertising	$ 1.0 M		0.3
4. Parking	$ 1.0 M		0.3

Recommendations:

It is recommended that Council endorse Options 1 – 4 and direct CT staff to develop detailed implementation plans for approval by Council:

1. Assign low income transit pass funding responsibility to Calgary Neighbourhoods (CN), including the development of a low income transit pass revenue recovery plan (users, City subsidy, other sources) and phased-in revenue recovery contributions from CN to CT over a five-year period
2. Transition Seniors fares by eliminating the Senior annual pass and transitioning Senior cash, ticket and monthly pass pricing from Adult to no less than Youth rates
3. Increase transit advertising revenue by acting on the recommendations of the February 2015 Advertising Review
4. Amend the Park and Ride Policy and permit the demand-based approach to pricing of Parking Revenue Option 4 by converting free stalls to monthly reserved in seven lots that have a monthly reserved waiting list

7. NEW APPROACH TO BUSINESS PLANNING

Recommendation: It is recommended that CT leadership consider the Five Management Tools business planning model and implement needed improvements to the CT business planning process.

The MH Team observed that the Calgary Transit business planning process included individual strategic documents and processes but they were not fully developed and integrated. The overall business planning process is not part of the ZBR scope but the MH Team concluded that some commentary on this management process would be beneficial for consideration by CT leadership.

The MH Team includes former executives of the Toronto Transit Commission (TTC) who recognized that the Calgary Transit business planning was similar to the TTC approach in the mid-1990's before its current business planning process was developed. The TTC's new approach to business planning was triggered by senior management and, in part, by a major subway accident, with three fatalities, and a subsequent independent audit. Management identified weaknesses and gaps in the TTC's approach which lacked a systems approach and integration between strategic documents. This section describes the TTC's Five Management Tools which is the heart of its business planning approach.

7.1 Five Management Tools

The TTC's approach to business planning has five management tools which function as an integrated system in a comprehensive approach to business:

1. Goals and Objectives- corporate and departmental as input to Capital and Operating Budgets
2. Operating Budget-multi-year
   - ✓ Integrated approach to forecasts of ridership, revenue, expenses and subsidies
   - ✓ Development of foundation documents; Service Standards Policy and Annual Service Plan
3. Capital Budget-multi-year
   - ✓ Asset Management Plan is input to the Capital Budget
4. Organization Charts
   - ✓ Org charts are control documents
5. Monthly CEO Report
   - ✓ Public reporting on budget status, KPI's, projects etc.

The value of this approach to business planning is that it clearly sets out the transit system's needs. It does not guarantee that all of the funding needs will be met, but there is a higher likelihood of this when an integrated plan has been developed and presented prior to final funding decisions.

7.1.1 Goals and Objectives

Goals and Objectives, whether corporate or departmental become inputs to the Operating and Capital budgets.

The need for a comprehensive System Safety Management Plan (SSMP) ensures that safety is the top priority for the system, its customers, its employees and the public at large. Given that it includes other plans, e.g. emergency response plans and asset hardening plans, the SSMP also is an input to the Operating and Capital budgets.

7.1.2 Operating Budget

Given the size and complexity of the annual operating budget, its impact on customers, the City and its taxpayers, a multi-year approach is necessary. A 3 to 5 year timeframe is recommended. The four factors that need to be considered in developing an annual operating budget are:

- ridership projections
- revenue expectations
- expense estimates
- subsidy requirements

In order to populate the resulting multi-year table, the following needs to be considered as inputs to the four factors.

- Ridership Projections
  - the base year, say 2015 will have a clear ridership expectation/result, i.e. xM customers in that year
  - in order to project ridership in subsequent years, the following needs to be taken into account:
    - recent ridership trends, i.e. % growth/decline in the last several years
    - economic forecasts, particularly employment projections with a focus on local impacts
    - maintaining service consistent with Service Standards, i.e. providing the same level of service for customers does not promote ridership growth, but it does support the ridership resulting from other factors
    - planned service changes, i.e. if service is being added to attract more ridership, i.e. better than the Service Standards, then ridership growth should be expected. This growth will be consistent with service elasticities, i.e. % of growth in ridership vs. % of service added. The planned service improvements as set out in Route Ahead would be included here.
    - planned fare increases will discourage ridership consistent with fare elasticities, i.e. % of ridership losses vs. % of fare increase

All of the above needs to be considered when projecting ridership. Many external factors can affect ridership; the biggest influence is employment trends. Regarding internal factors, customers are more sensitive to service than to fares. In other words, the ridership impacts due to service changes are greater than the impact of a comparable fare increase.

Customers would prefer a fare increase over a service reduction.

- Revenue Expectations
  - revenue for the base year would be either the annual result or a projection of the current year
  - revenue projections for subsequent years need to account for:
    - once the ridership forecast is finalized, the revenue expectation is determined by applying the average fare revenue/customer
    - a User or Customer Fair Share Policy should be in place that supports regular annual fare increases. This is consistent with the philosophy that customers benefit from transit as do City taxpayers, so both should share in the cost of transit
    - the net impacts of a fare increase need to be estimated, i.e. the average fare revenue/customer increases, but the modest losses related to a fare increase need also to be taken into account
    - the impact of a change in the fare structure needs to be estimated. There may be some customer losses and there may be customers who shift to a different fare media which can result in a change to the average fare revenue/customer
    - changes in non-farebox revenues

- Expense Estimates
  - the base year expenses is either an actual result or an estimate of the current year
  - before estimates for subsequent year's expenses can be made, there needs to be a mechanism to explain/defend the expenses related to service. So, there needs to be a rationale for how much service is operated. This is largely a policy matter and as such a Service Standards Policy needs to be in place. This policy which should be approved by Council establishes a fair and objective standard for service decisions. As summarized in the Fleet Study Area, its scope should include:
    - % of service community that should be within convenient access to transit
    - the frequency of service
    - the span of service, i.e. operating hours of service
    - productivity standards , i.e. average customers per vehicle per peak direction or customers per operating hour
    - how new service is introduced
    - what vehicle types are allocated
    - when service is added/ reduced/eliminated

    Calgary Transit has no Service Standards Policy; the current practices should be formalized and structured in a policy. The level of service consistent with this policy forms the base for the annual Service Plan and as stated above is the biggest driver of expenses
  - in addition to the cost of service that is consistent with approved standards, the expenses related to initiatives to encourage ridership growth also form part of the expense part of the budget. This is where the proposed service increases as set out in the approved Route Ahead Plan need to be specified and costs estimated. Other transit systems adopted similar ridership growth strategies; the Toronto plan was called, Ridership Growth Strategy. It set out a multi-year network of routes that would have service frequency improved to a minimum headway of a bus every 10 minutes. These costs were spread over several years with implementation action taken when it was affordable.

- The Route Ahead Plan should be more specific, i.e. routes should be specified and service improvements identified.
- the Revenue information above referred to the average fare revenue/customer. Similarly, there is also an average cost/customer that is unique to Calgary Transit. These two pieces of information are important as they educate the customer and the taxpayer about the cost of transit and why it does not pay for itself. This leads to the need for subsidy to balance the Operating Budget.

- Subsidy Requirements
  - As set out above, Calgary Transit has an average cost per customer trip and an average fare revenue per customer trip. Given that transit systems do not cover their expenses with the revenue they generate, they also have a subsidy per customer trip. This subsidy per customer trip multiplied by the annual ridership equates to the total subsidy required to balance the Operating Budget. so, the subsidy line on the multi-year table is the final input to the table.
  - the budget process may be iterative, i.e. if the resultant subsidy need is unacceptably high, then the expenses may need to be reduced, i.e. less service possibly and /or the revenue may need to increase possibly through a fare increase.

The interaction between these four factors, i.e. ridership, revenue, expenses and subsidy needs to be understood as part of the Operating Budget. The ability to explain how this relationship works is very helpful for the customer and the taxpayer. For example, whether ridership increases or not, if more service is operated, expenses go up which results in the need to generate more revenue, probably through a fare increase. If this is done using the approach suggested in this section, the resultant subsidy per customer can be relatively stable as can be the revenue/cost ratio (R/C) for the transit system.

Further to this, even with regular fare increases consistent with a Customer/User Fair Share Policy, if ridership is growing, even if the subsidy per customer is stable, the resultant total subsidy required will increase. So, action should be taken to thoughtfully manage these relationships to develop acceptable budgets with stable subsidies per customer. Even if that is done well, a ridership increase, which is often considered a success in the transit business, will put pressure on the total subsidy need and pressure on the R/C ratio.

An understanding of these relationships helps to build support for transit investment from a broader perspective, i.e. a City perspective. The investment in the transit system determines how effectively and efficiently the City functions.

7.1.3 Capital Budget

Like the Operating Budget, the Capital Budget needs to be considered as a multi-year plan. A 10 year plan is recommended.

Before a comprehensive Capital Budget can be prepared, an Asset Management Plan (AMP) needs to be in place. An AMP consists of a complete asset inventory of rolling stock and infrastructure including plans to maintain, rebuild, life extend and replace these assets. This AMP is the input to the Capital

Budget where these plans have cost requirements now included and a schedule when these funds are required.

Additionally these "budget projects" need to be categorized in priority order as follows:

- state of good repair and safety project needs
- legislative project needs
- improvement project needs
- expansion project needs

In other words the first source of funding should be for the highest priority, i.e. maintaining an asset in a state of good repair.

Summary information is included that sets out funding needs by year and by each 5 year period. It would identify the funding shortfalls by year and over a 5 and 10 year period. It would most importantly identify funding shortfalls in the state of good repair projects and allow discussion on how expansion projects could be funded as well as having state of good repair projects funded.

The impact on the Operating Budget is also an important aspect of the Capital Budget. This could be workforce required to provide running maintenance on a life extended asset or more operating subsidy required when an expansion project becomes part of the transit system. So, while the approaches to the Operating and Capital Budgets are quite different and often the funding sources differ as well, there is still a relationship between these two budgets that needs to be recognized.

7.1.4 Organization Charts

The Organization Charts are a control document where the total workforce is allocated and tracked to ensure all workforce requirements are approved. This is important as labour costs form a high percentage of the transit system's expenses.

7.1.5 Monthly CEO Report

The Monthly CEO report allows the transit system to report publicly on how money is being managed by budget type and by project, as well as report on key performance indicators or anything else which demonstrates transparency and good management practices.

7.2 Recommendations

Calgary Transit has a series of strategic documents that are compiled in support of its business planning process. The MH Team noted that the strategic documents were not fully developed and integrated.

Recommendation:
It is recommended that CT leadership consider the Five Management Tools business planning process and implement needed improvements to the CT business planning process.

8. CONCLUSIONS

The MH Team observed an open, no-blame, team environment with a very strong commitment to 'make service' - deliver 100% of scheduled service to its customers. The detailed analysis and business case development have produced ten practical recommendations to further improve Calgary Transit's efficiency and effectiveness and generate up to $18.1 million in additional revenue and save $44.4 million in cost savings and avoidance. In addition to the subject areas that were defined at the outset of the study, the MH Team also identified improvements which will further develop and integrate Calgary Transit business planning process.

The study was based upon rigorous benchmarking with Calgary Transit peers and the expert advice of the MH Team which included former executives of large transit agencies in Canada. It benefited from a very structured review process with City staff and the ZBR Steering Committee throughout the study and a peer review of the final report draft.

Procurement and Inventory Management

This function is a shared service between Calgary Transit and Calgary Supply. The study's objective was to assess alignment between Calgary Transit and Calgary Supply's shared service/centre of excellence service philosophy, identify impacts/outcomes on Calgary Transit resources, assets and performance and assess alternative organizational options/processes.

Recommended Option 1 generates a number of difficult-to-quantify benefits and so a break-even analysis was not completed for this case.

Procurement and Inventory Management Recommendation	Annual Savings (Yr 5)	NPV over 5 years
Section 3 Recommendation: That Calgary Transit pursue the internal process improvements in Option 1 and develop an implementation strategy and timeline.	N/A	N/A

NPV – Net Present Value

Fleet Maintenance

The maintenance of buses and light rail vehicles (LRVs) is a crucial component of service delivery in Calgary Transit and accounts for 18% of Transit's operating expenditures. Fleet maintenance includes regularly scheduled maintenance, refurbishment, and unscheduled repairs. The study examined current business practices and developed options to improve the organization and processes, now and in the future. The analysis resulted in a multi-part solution for improvement rather than discrete options.

Recommended pursuit of the multi-part solution generates annual operating net benefits of $1.8 million due to a modest workforce reduction from productivity gains as well as a cumulative net capital benefit of $36.8 million from avoidance of fleet replacement costs due to the lower spare ratio (3 different benefits streams).

Fleet Maintenance Recommendation	Annual Operating Savings (Yr 5)	Capital Savings over 5 years	NPV over 5 years
Section 4 Recommendation: That Calgary Transit pursue the comprehensive internal change approach outlined in Option 3 and develop an implementation strategy and timeline. a. Implement a PLAN-DO-CHECK-ACT asset management system b. Implement workforce planning improvements c. Reduce the conventional bus fleet spare ratio to 20% and the shuttle fleet to 25%	$1.8M	+ $36.8M	+ $33.4M

NPV – Net Present Value

Vehicle Service Lane

The Calgary Transit service lane group is responsible for cleaning, fuelling, replenishing fluids and lining up buses and trains in the maintenance and storage facilities to prepare them for the next day's service. Recent process changes have resulted in an improvement in customer and Operator satisfaction but with increases in costs. The ZBR objective is to assess internal efficiencies and alternative service delivery models. The analysis resulted in two options for evaluation – Option 1 – Alternative Service Delivery and Option 2 - Internal Performance Improvement.

The recommended Option 1 generates annual cost savings of $3.1 million.

Vehicle Service Lane Recommendation	Annual Savings (Yr 5)	NPV over 5 years
Section 5.1 Recommendation: That Calgary Transit pursue the alternative service delivery approach in **Option 1** and develop an implementation strategy and timeline.	$3.1M	+ $5.5M

Janitorial and Outside Maintenance

The cleaning and outside maintenance group provides janitorial services, landscaping and snow and ice control at Calgary Transit facilities (including LRT stations, bus loops, park and ride lots, garages and office buildings). This work is performed by a diverse mix of Calgary Transit employees, other City of Calgary business units, and a number of external contractors. The ZBR objective is to assess internal efficiencies and alternative service delivery models. The analysis resulted in two options for evaluation – Option 1 – Alternative Service Delivery and Option 2 - Internal Performance Improvement.

The recommended Option 1 generates annual cost savings of $2.7 million.

Janitorial and Outside Maintenance Recommendation	Annual Savings (Yr 5)	NPV over 5 years
Section 5.2 Recommendation: That Calgary Transit pursue the alternative service delivery approach in **Option 1** and develop an implementation strategy and timeline.	$2.7M	+ $7.1M

Rail System Communication

The Infrastructure division is responsible for inspecting and maintaining rail system communications and is working to optimize the balance of in-house versus contracted work. The ZBR objective for Rail Communications was to validate Calgary Transit's internal business case to self-perform this function and to benchmark with peers. The latter objective could not be undertaken as originally planned because the necessary documentation was not available. Instead, benchmarking was conducted and an approach was outlined to undertake business planning for rail communications transition.

Rail System Communications Maintenance Recommendation	Annual Savings (Yr 5)	NPV over 5 years
Section 5.3 Recommendation: That Calgary Transit take into consideration the benchmarking results and the business planning approach outlined in this report to determine how it will proceed to implement a new approach to Rail System Communications Maintenance.	n/a	n/a

Transit Revenues

The service levels of Route Ahead require an increase in capital expenditures and operating costs and more revenue if CT Transit is to maintain City Council's mandated Revenue / Cost (R/C) ratio target of 50-55%. In addition, there has been a recent downward trend in the R/C ratio. Revenue-side options to stabilize or improve the R/C ratio were examined.

Four recommendations are made which will generate an estimate of $18.1 million in net annual revenue, for a combined 4.5 percentage-point increase in the R/C ratio.

Transit Revenues Recommendations	Annual Revenue	R/C Ration Impact
Section 6 Recommendations: 6.1 Restructure Low Income Transit Pass Program Assign low income transit pass funding responsibility to Calgary Neighbourhoods (CN), including the development of a low income transit pass revenue recovery plan (users, City subsidy, other sources) and phased-in revenue recovery contributions from CN to CT over a five-year period	$13.2 M	3.2%
6.2 Transition Seniors to Youth Discount Transition Seniors fares to Youth discount levels by eliminating the Senior annual pass and transitioning Senior cash, ticket and monthly pass pricing from Adult to Youth rates	$ 2.9 M	0.7
6.3 Advertising Increase transit advertising revenue by acting on the recommendations of the February 2015 Advertising Review	$ 1.0 M	0.3
6.4 Parking Amend the Park and Ride Policy and permit the demand-based approach to pricing of Parking Revenue Option 4 by converting free stalls to monthly reserved in seven lots that have a monthly reserved waiting list	$ 1.0 M	0.3

Improved Approach to Business Planning

The MH Team observed that the Calgary Transit business planning process included individual strategic documents and processes but they were not fully developed and integrated. The overall business planning process is not part of the ZBR scope but the MH Team concluded that some commentary on this management process would be beneficial for consideration by CT leadership. The Five Management Tools business planning model is described and recommended for consideration by CT.

Improved Approach to Business Planning Recommendation	Annual Savings (Yr 5)	NPV over 5 years
Section 7 Recommendation: That CT leadership consider the Five Management Tools business planning model and implement needed improvements to the CT business planning process.	n/a	n/a

APPENDIX A – CALGARY TRANSIT ZBR STUDY TEAM

CALGARY TRANSIT ZBR - STEERING COMMITTEE MEMBERS

Stuart Dalgleish, Chair	GM, Community Services & Protective Services
Mac Logan	GM, Transportation
Doug Morgan	Director, Transit
Trevor Daroux	Deputy Chief of Police
Elizabeth Dewart	Manager, Corporate Initiatives

CALGARY TRANSIT ZBR - PROJECT MANAGEMENT TEAM

James Robertson	Project Manager, Senior Corporate Consultant, Corporate Initiatives
Nicole Jensen	Project Lead, ZBR Service Review, Calgary Transit

CALGARY TRANSIT ZBR - MORRISON HERSHFIELD STUDY TEAM

Duncan Pringle, Project Sponsor	Morrison Hershfield
Ryan Gidluck, Project Manager	Morrison Hershfield
Steve New, Study Lead	Steve New & Associates Ltd.
Gary Webster, Senior Project Advisor	Morrison Hershfield
Jim Teeple, Working Group Lead	Morrison Hershfield
Jan Pezarro, SME	Lucent Quay Consulting Inc
Pat DiPasquale, SME	Morrison Hershfield
Ken Titley, SME	Morrison Hershfield
Dave Dixon, SME	Morrison Hershfield
Franc Cioffi, SME	Western Management Consultants
Jeff Peterson, SME	Western Management Consultants
Gord Harris, SME	Western Management Consultants

SME = Subject Matter Expert

APPENDIX B – INDUSTRY SCAN OF FLEET MAINTENANCE MODELS

Table of Content

B1. Project Purpose and Approach

B1.1 Project Context

This overview is conducted for Calgary Transit under a zero based review on vehicle fleet maintenance organizational models and forms part of a peer review of select Canadian transit agencies to understand organizational issues and trends associated with vehicle maintenance. The objectives are to conduct an industry scan of transit bus and rail fleet maintenance organization models to identity standard practices, trends and issues in maintenance service delivery models, and to recommend on the feasibility of the different models and their application in Calgary.

Options which are to be considered in the business cases are:

1. Contracting out fleet maintenance or parts of it;
2. Implementing a vehicle lease or maintenance agreement;
3. Consolidating maintenance with other corporate fleet maintenance activities;
4. Identify any other maintenance organization models in use including those agencies that self-perform maintenance, similar to the City of Calgary.

B1.2 Project Deliverables

- An overview of fleet maintenance organizational model standard practices, trends and issues in Canada including:
    - An inventory of fleet maintenance organizational models in Canadian transit system population Group 1 (population > 2 million) and Group 2 (population between 0.4 million and 2 million) with commentary on models most relevant to Calgary
- Up to four case studies on best practice examples to demonstrate the fleet maintenance organization models
    - Alternative Service Delivery (ASD) case studies will include transit system description, fleet maintenance organization model, overall and ASD scope of fleet maintenance, history of the organizational model, success factors and other issues
- High level selection/evaluation criteria that will be applied in evaluating each model type

B1.3 Project Approach

The following methodologies will be deployed by the study team to conduct the study:

1. Literature Review:
    - The study team will research and review relevant reports from the Canadian Urban Transit Association (CUTA), American Public Transportation Association (APTA), Transportation Research Board (TRB), U.S. Government Accountability Office (GAO), National Center for Transit Research (NCTR) and others.

2. Primary Research:
    - The study team will conduct research to develop an inventory of fleet maintenance organizational models in Canada's 16 largest transit systems, using CUTA statistics and interviews with Fleet department leaders. Follow-up interviews will be held with Fleet department leaders in Canadian systems selected for case study.

3. Thought Leader Interviews:
    - The study team will interview thought leaders – recognized industry experts – in order to identify trends and issues in fleet maintenance organizational models and to identify best practice fleet maintenance ASD case studies.

B2. Setting the Context

B2.1 Maintenance Organizations

B2.1.1 Transit & Vehicle Maintenance Organizations

In an effort to provide some context to various vehicle maintenance department organizations in use across the industry, and their relative use of alternate service delivery methods (ASD) or contracting out, it's helpful to first consider the various types of parent transit organizations models across the industry.

Most transit agencies within Canada and the US have "evolved" organization models, as opposed to purposely built, as a result of such things as municipal amalgamation, organic fleet growth and/or mode addition. The make-up or list of activities and functions undertaken by an agency can be influenced by a number of internal and external factors which over time have worked to shape both the organization and its inherent effectiveness and efficiency. Some of these factors include;

a) City / Region / Municipal Context
b) Funding
c) Fleet size / number of modes operated / systems /technology / age
d) Organizational Culture

Transit Organizations

There are basically four types of transit organizations among the various transit agencies:

a) Distributed Municipal Department
Some key transit functions are managed by dispersed city departments (e.g. contracting out the bus fleet maintenance to corporate fleet services department). In other words, certain core transit business is handled by other parties. The organizational structure is illustrated in Figure 1.

b) Consolidated Municipal Department (e.g. Calgary Transit)
All key transit functions are managed by a consolidated municipal department itself which in other words is in charge of the entire transit maintenance activities, a self-performing model. The organization structure is illustrated in Figure 2.

c) Independent Agency
An integrated agency rather than a municipal department, it is responsible for all the core transit functions. The organization structure is illustrated in Figure 3.

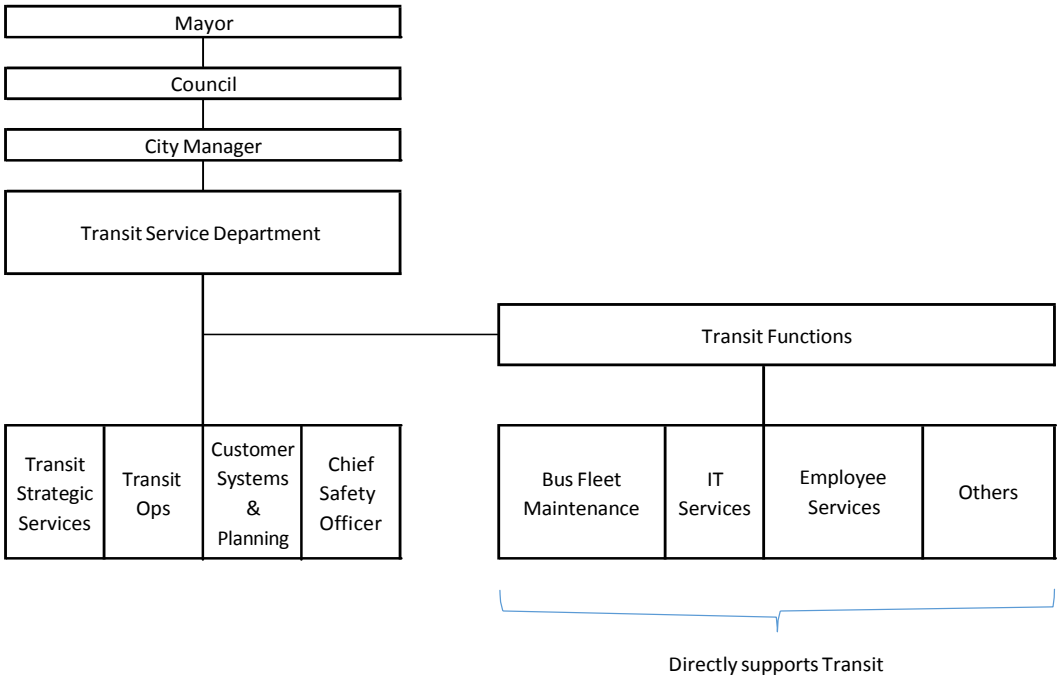
d) Regional Agency
A regional based transit agency that manages all core transit functions. The organization structure is illustrated in Figure 4.

The following figures illustrate the four types of transit organizations.

Figure 1

Distributed Municipal Department

Some key transit functions are managed by dispersed city departments



The Distributed Municipal Department model that was a fad in Ontario (and other provinces) some 15 years ago. It was tried and eventually rejected. (Hamilton and Ottawa are the best examples of this model)

Figure 2 (e.g. Calgary Transit)

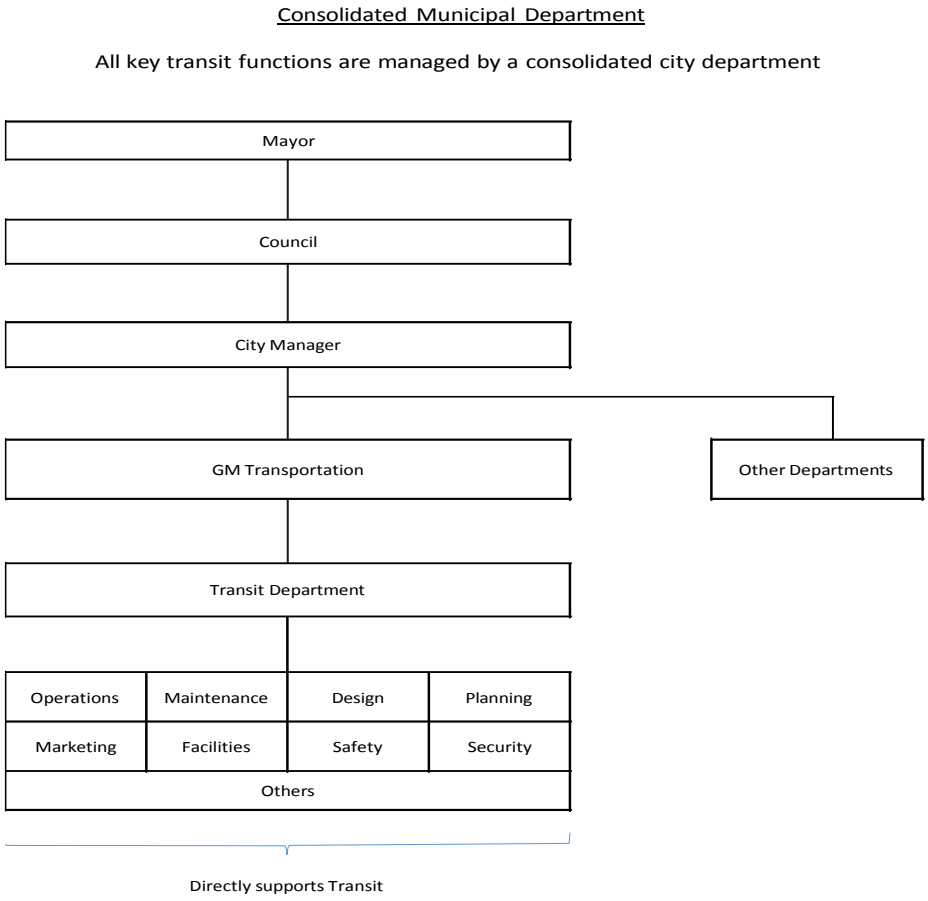


Figure 3

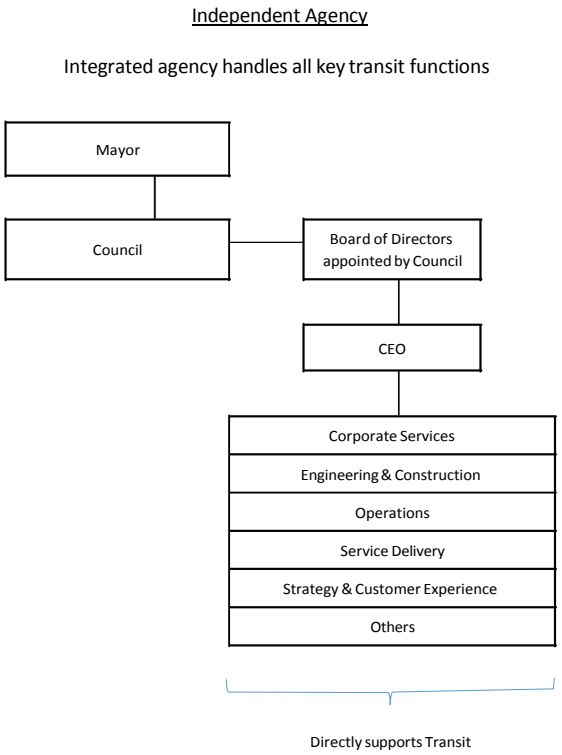
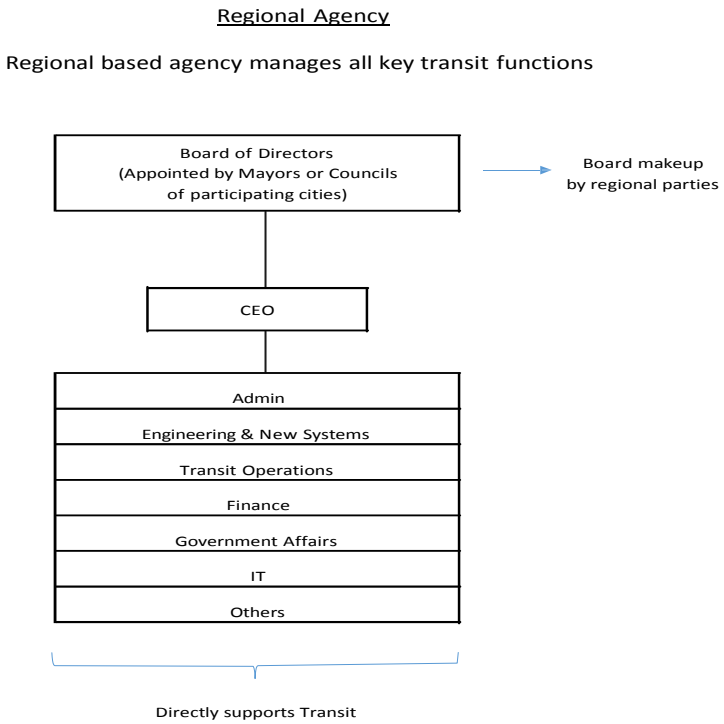


Figure 4



Vehicle Maintenance Organizations

Our industry scan has identified that there are basically three types of vehicle maintenance organizations use to deliver core services, with variations on each theme across the industry. The three primary models used are;

a) Self-Perform Vehicle Maintenance Organization
All vehicle maintenance activities are performed in-house. The self-contained maintenance environment allows direct control over the reliability and availability performance. The organization structure is illustrated in Figure 5.

b) Strategic / Shared Contract-Out Vehicle Maintenance Organization (e.g. Calgary Transit)
Some maintenance activities are strategically contracted-out to the private sector. The Industry Scan has identified this model as the most common across the Canadian transit industry. The contracted-out activities are chosen for various justifications among different transit agencies, including but not limited to cost effectiveness, quality and organizational efficiency. The organization structure is illustrated in Figure 6.

c) Contract-Out Vehicle Maintenance Organization
All vehicle maintenance activities are contracted-out to the private sector, meaning that the transit agency is transferring certain organizational risks to the private contractor. Other valid reasons behind this setup are improved cost effectiveness, increased flexibility in contract management through continual renewals of contracts, etc. We could only find one organization among the 16 transit agencies, York Region Transit, which has applied this model. The York Region Transit model is further examined inside the Case Studies section. This model is also very common in small systems (up to 150 buses) in BC and in the local and commuter transit systems in the Montreal region (off the island, called CITs). The organization structure is illustrated in Figure 7.

Figure 5

Self-Perform Vehicle Maintenance Organization Model

All vehicle maintenance activities are performed in-house

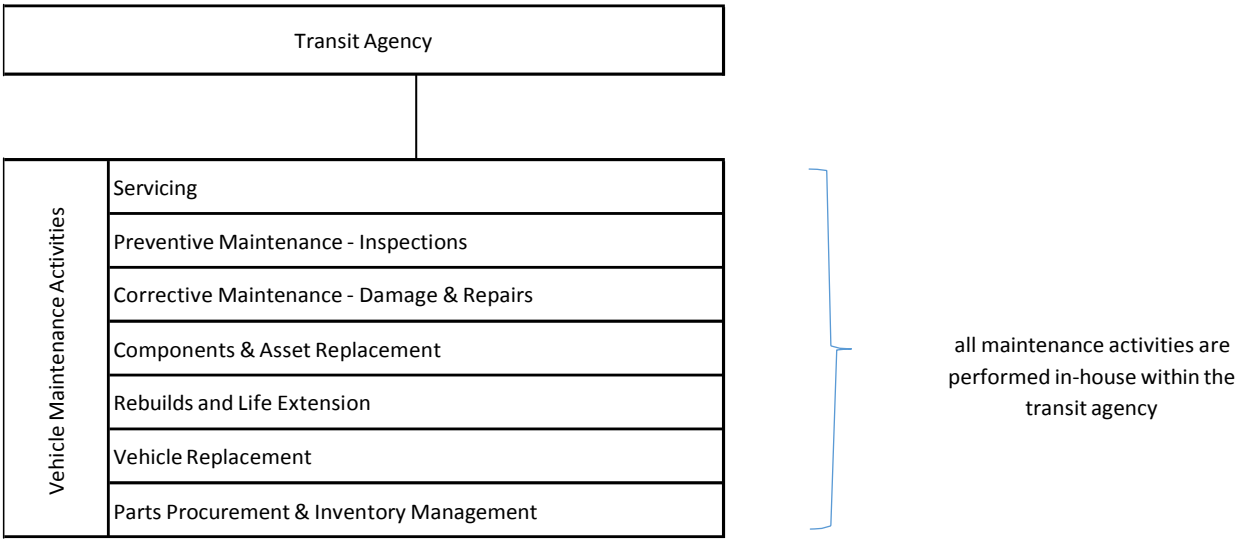


Figure 6 (e.g. Calgary Transit)

Strategic Contract-Out Vehicle Maintenance Organization Model

Some vehicle maintenance activities are contracted-out

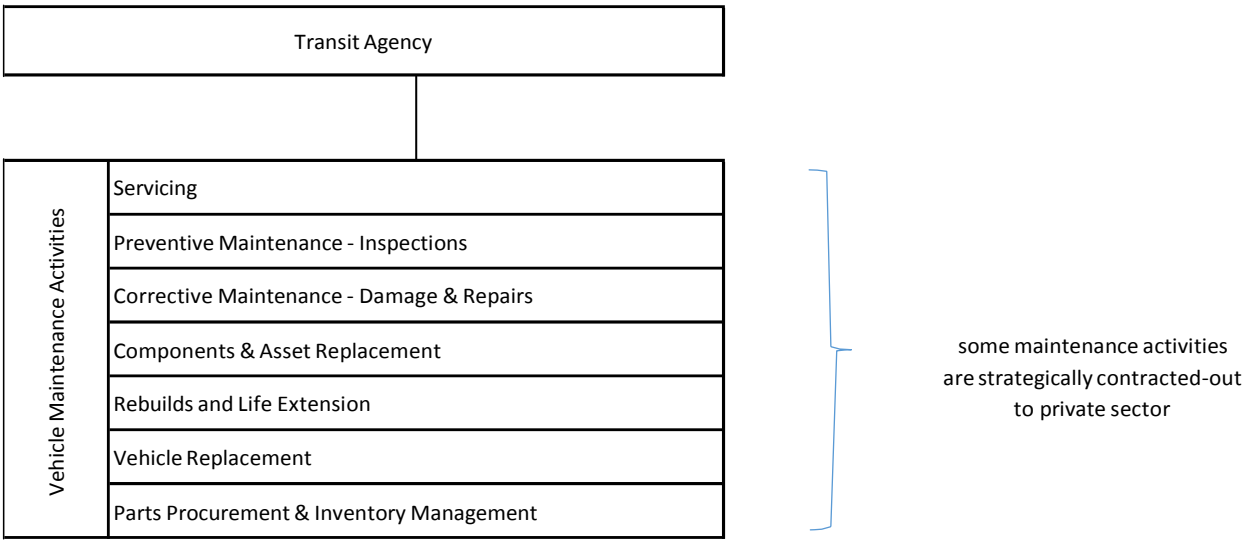
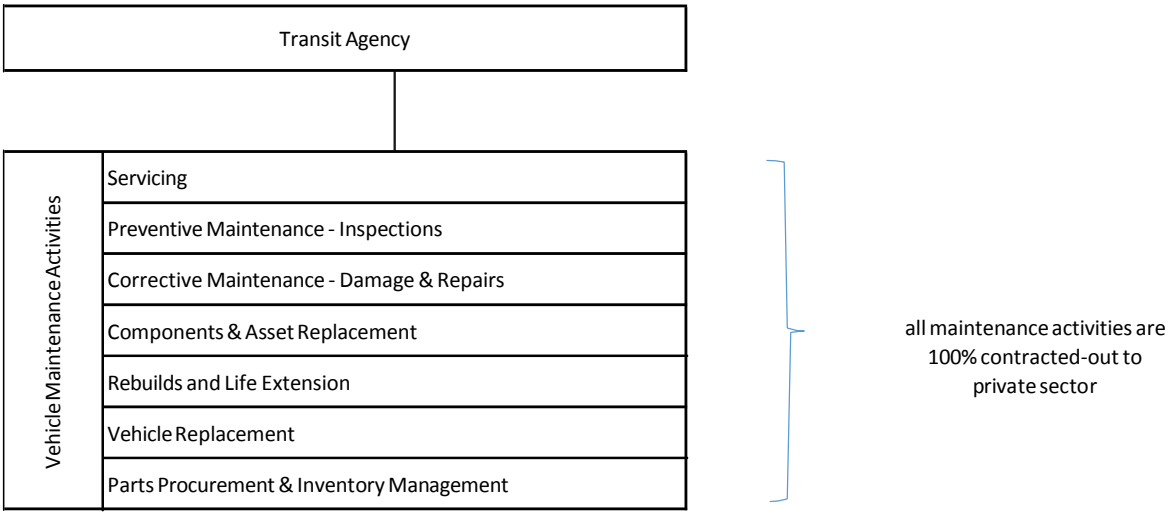


Figure 7

Contract-Out Vehicle Maintenance Organization Model

All vehicle maintenance activities are contracted-out



B2.1.2 Typical Vehicle Maintenance, Admin and Technical Activities

The department accountable for vehicle maintenance is typically organized around a number of vehicle life-cycle maintenance activities and a number of administrative and technical functions which include;

Major vehicle maintenance activities;

a) Servicing
b) Preventative Maintenance - Inspections
c) Corrective Maintenance - Damage, Repairs
d) Component & Asset Replacement
e) Rebuilds & Life-Extension
f) Vehicle Replacement
g) Parts Procurement & Inventory Management

Major administrative and technical activities;

a) Administration – management, finance, department and employee
b) Fleet Management – fleet and facility administration
c) Operations – garage, shop, car-house
d) Technical Support – reliability and asset management
e) Engineering – vehicle system additions, retrofits, modifications
f) Vehicle Procurement – new vehicle procurement and warranty administration

B2.2 ASD / Contracting Out, Trends, Issues

Before discussing the various types of Alternate Service Delivery (ASD) methods relative to the transit vehicle maintenance industry it may be helpful to define for those that may be unfamiliar with the term, what ASD actually is.

The Institute of Public Administration of Canada in its 1997 study *"Alternative Service Delivery: Sharing Governance in Canada"* gave much consideration to defining ASD for the government context. A workable definition was offered after much debate by practitioners, academics, and public administrators.

"Alternative Service Delivery is a creative and dynamic process of public sector restructuring that improves the delivery of services to clients ..."

The primary goal of ASD is to improve services to the organization's clients or stakeholders. In the vehicle maintenance context of a municipal transit agency clients or stakeholders typically include, transit riders, taxpayers, funding partners, along with the broader transit and city organization itself.

While a number of ASD models exist only a small number are relevant and/or practical within the vehicle maintenance context.

B2.2.1 ASD Types

Typical industry ASD models include;

Direct Delivery – transit agency delivers the service directly through its own organization, maintains accountability, control and accepts all risk associated with its activities. (e.g. Calgary Transit)

Agencies – transit agency would delegates the service delivery to an arms-length service provider typically owned by the agency (subsidiary) but maintain control though policy, MOU, etc. The remote agency becomes responsible for the day-to-day delivery of the service.

Devolution – transfer the responsibility for service delivery to another level of government who receive payment through transfer payments. Agency controls policy but service provider responsible for day to day operations.

External Purchase – agency purchases the service from an external supplier / service provider retaining accountability for the service. This is really contracting-out or outsourcing of services to external or internal third parties. (e.g. Calgary Transit)

Partnership – agency would enter into a partnership with an external service provider with both partners contributing resources and shares risk / reward. Many new transit projects are being delivered through a public –private partnership arrangement.

Franchising / Licensing – the agency confers to a private entity the right to sell a product / service under prescribed conditions. These services are typically oriented around a retail type business, therefore, this model is not applicable to a transit setting.

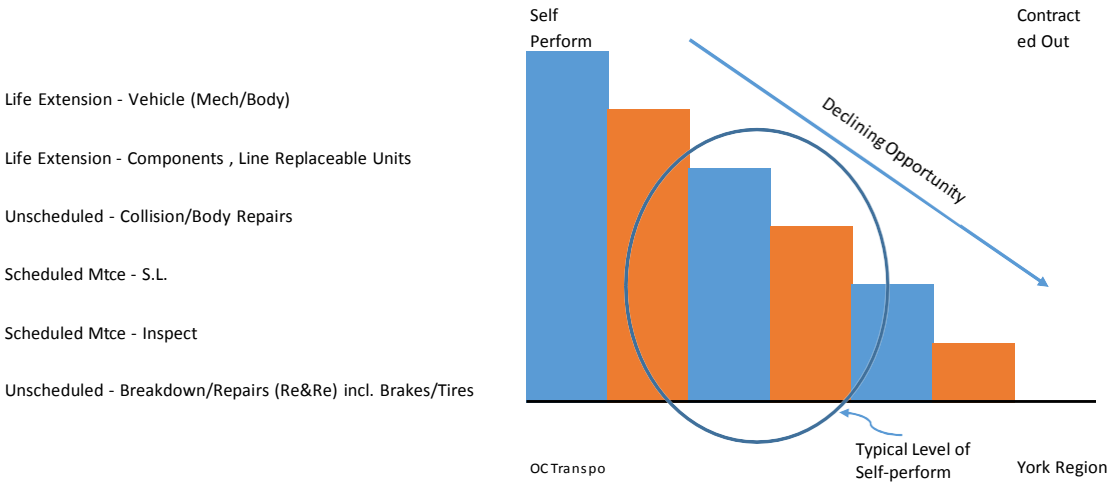
Privatization – agency divests its assets to a private entity who assumes control and responsibility for operations. Agency controls its interest through legislation / regulation. Private Service provide has full autonomy over service delivery.

B2.2.2 Contracting Out - Trends

Our review has indicated that very few transit agencies are taking advantage of, or considering the future use of any alternate service delivery methods beyond contracting-out and or a other City of Calgary business units model within the vehicle maintenance context.

Calgary Transit's Fleet Services is no exception and is currently taking advantage of contracting-out opportunities for select maintenance activities and wishes to explore further opportunities to improve both effectiveness and efficiency of their operation. A more complete description of the the Calgary experince is included in the next section.

The following graphic is intended to provide an overview of typical contracting-out opportunities across the range of vehicle maintenance activities. Defining the two extremes of the contracting-out continuum are the full self-perform model with OC Transpo as an example, and the fully contracted model with York Region Transit as the only example using this model across the Canadian transit industry. The prospect or opportunity for an agency to move from their current situation to a more full use of contracting-out declines as you move through the continuum from left to right between the extremes.



There are a number of reasons for this decline in opportunity:

- Separation of accountability / responsibility
- Practicality or ease of implementation (Union constraints)
- Diminishing cost savings (internal vs. external)
- Availability of external markets
- Increasing organizational risks such as labor relations

B2.2.3 Contracting Out Issues – Union, Markets

Each transit agency has its own concern over the various factors that require considerations on contracting out any maintenance activities. Apart from cost considerations, the risk involved and the quality of work received are also major issues in this regard. Union constraints are critical and are often handled very cautiously before any contracting-out decision is made. Similarly the quality of work performed by the 3rd party in the external market may pose certain extent of risk to the transit agency.

INFORMATION WITHHELD DUE TO CONFIDENTIALITY

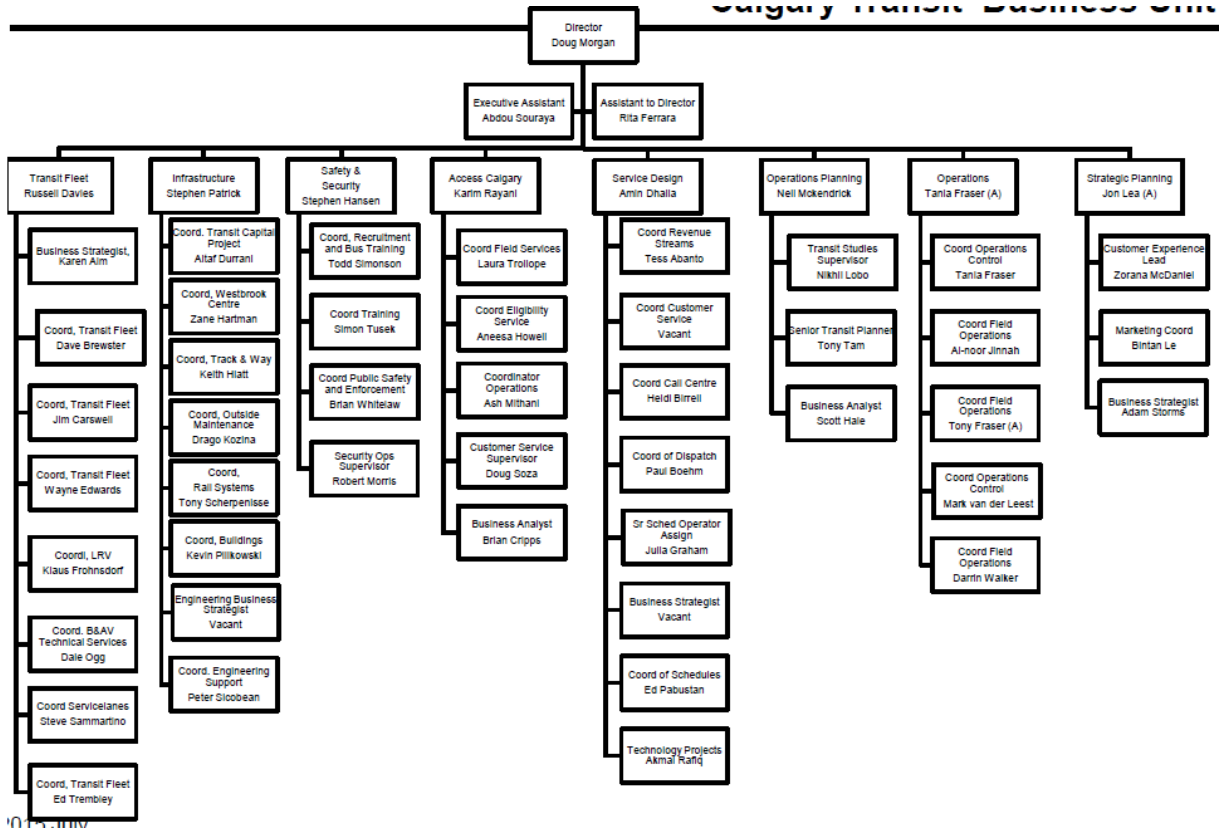
To evaluate opportunities and assist with decision making in terms of where on the continuum an agency best fits, the consultant has developed high level evaluation criteria, included in Section 4 of this report. Each opportunity can be evaluated with these factors in mind which necessarily must include decisions based on the relative importance of each criterion to both the vehicle maintenance group and its parent transit agency.

B2.3 Calgary Experience

B2.3.1 Calgary Transit and Transit Fleet

Calgary Transit Organization

Calgary Transit, a department within the Transportation Branch is a typical example of a consolidated municipal department organization structure. Relative to other organization models, specifically a distributed department model, this structure is more simplified and offers a more controllable delivery model with minimal requirement to navigate silos within the City structure. All components of service delivery are working towards the same ends.



Transit Fleet Organization

Similarly, the Transit Fleet group within Calgary Transit is a consolidated group containing all of the requisite functionality required to supply and deliver a clean, safe reliable fleet of transit vehicles in accordance with service demand. The organization's simple structure offers single point accountability and provides all the elements responsible for the effective and efficient delivery of its mission. The department utilizes the *Strategic Contract-Out Vehicle Maintenance Organization* model as illustrated in Figure 6, utilizing both the Direct Delivery and External Purchase ASD (i.e. contracting-out) methods described above.

B2.3.2 Current Use of ASD / Contracting Out

The Transit Fleet group has responsibility for a large (4th largest in Canada) bi-modal fleet of transit buses and light rail vehicles along with a support fleet of non-revenue vehicles.

At present Transit Fleet conducts the full range of industry standard maintenance activities required to maintain the fleet in a state of good repair. The list of activities includes;

1) Servicing – Service Lane
2) Scheduled Maintenance
3) Unscheduled Maintenance

4) Component replacement / install (campaigns)
5) Vehicle rebuild / life extend
6) Vehicle Procurement

In addition, Transit Fleet currently self-performs the following list of industry standard administrative and technical functions in support of its fleet maintenance activities. This list includes;

a) Administration – management, department, employee, budgeting, etc.
b) Fleet Management – fleet and facility asset management
c) Operations – day to day operations of fleet and facility maintenance activities including, garages, shops and carhouses.
d) Technical Support – reliability and asset management.
e) Engineering – vehicle system additions, retrofits, modifications.
f) Vehicle Procurement – new vehicle procurement and warranty administration.

At present, Calgary Transit makes use of the Direct Delivery and External Purchase (i.e. Contracting –out) alternate service delivery methods. This approach is very comparable with the approach taken by the vast majority of Calgary's Canadian peer properties in terms of the types of functions and activities being conducted.

While the vast majority of maintenance activities are self-performed, a few are contracted out to the private sector. The following table illustrates the extent of contracting out;

Bus Maintenance

Maintenance Activity	Tasks	Frequency	Reasons
Unscheduled	Brake Repairs	Irregular	Time consuming activity – completed on an overflow basis, space constrained, cost neutral, good quality, warranty
Unscheduled	Engine & Transmission	Frequent	Lack of resources, sig. cost benefit, good quality, warranty
Unscheduled	Small Parts Rehab / Replacement (make vs. buy)	Frequent	Cost effective, better reliability, warranty
Scheduled	Bus rebuild	Infrequent	Cost effective, good quality, space constrained

LRV Maintenance

Maintenance Activity	Tasks	Frequency	Reasons
Unscheduled	Rebuild of AC Units	Infrequent	Lack of skills and facilities, good quality, cost competitive
Unscheduled	Rebuild of Traction Motors	Infrequent	Lack of skills and facilities, good quality, cost competitive
Scheduled	Vehicle Life Extension	Infrequent	Lack of skills and facilities, good quality, cost competitive

During our review, staff did indicate a desire to increase the number of activities and tasks contracted-out. This largely included [redacted] items such as cleaning and servicing given the mature external market opportunities for these services and the expected improvements in both cost, quality and residual resource reallocation.

Like many of its Canadian peers, Calgary Transit appears to be taking a balanced approach towards the use of contracting-out, concerned with achieving private market efficiencies while maintaining constructive relationships with Unions and bargaining unit employees. While not a strict impediment to ASD / contracting-out most of the industry's collective agreements, including Calgary Transit, involve an onerous process to achieve Union consensus with most providing job guarantees for those employees impacted by the outsourcing of the work.

B3. Models & Case Studies

B3.1 Consolidating Vehicle Maintenance with other Corporate Fleet Maintenance

The consultant was asked to conduct an industry review of the transit industry's experience with the consolidated model in an effort to inform the City of Calgary on the potential of combining the Transit Fleet maintenance group with Corporate Fleet services.

B3.1.1 Industry Experience

During the industry scan we found only one agency that is currently using the consolidated model, that being the City of Edmonton. However, we found two other agencies that at one point in their history had experimented with the model but had reverted back to a transit self-perform model. None of the other agencies are anticipating the use of the model within the foreseeable future.

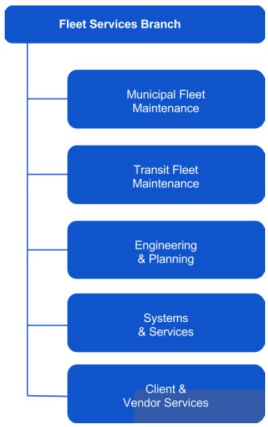
In an attempt to obtain an unbiased opinion the consultant interviewed managers from both sides of the issue to understand the history behind the organization model, organization design, operations, performance, pros and cons to both service provider (City) and customer (Transit Agency).

City of Edmonton

Edmonton Transit is a department of the City of Edmonton operating both bus and light rail transit. Operating under a shared services model, the City's Fleet Services department has overall maintenance responsibility for all City fleet including the maintenance activities associated with Edmonton Transit's bus fleet, both conventional and paratransit. Edmonton Transit retains maintenance responsibility for all rail vehicle maintenance. This maintenance model is unique to the Canadian transit industry.

The current organization model was established in 1998, when a shared services enterprise model was adopted and implemented by the City. Both Fleet Services and Edmonton Transit are organized under and report to the City Operations group at the same level allowing for an integrated management team approach.

Fleet Services offers their clients, including Edmonton Transit, a full life-cycle suite of service from fleet planning through to vehicle disposal and operate under a “center of excellence” model. Edmonton Transit facilities operate and are functionally separate from other Fleet Services facilities and customers.



Relationship and business performance expectations between customer and service provider are established and maintained jointly inside a department level partnership agreement. The agreement sets out a collaborative framework between the parties for achieving business objectives which is managed and enforced through the integrated management team of the City Operations group.

The Fleet Services group cites a number of positive outcomes in support of the organizational model for both the City of Edmonton and Edmonton Transit;

- Efficiency: greater economies of scale, reduced departmental duplication
- Effectiveness: common management approach, centers of excellence (engineering, fleet maintenance) Improved product quality (reliability, availability)

The Transit Management group also cite a number of positive outcomes related to their business

City of Ottawa

The provincial government ordered the amalgamation of the Regional Municipality of Ottawa-Carleton and its component municipalities into a single City of Ottawa municipality.

On January 1, 2001, Municipal Amalgamation took place in Ottawa-Carleton. As a result, the R.M.O.C. and the 11 "lower-tier" municipal governments were amalgamated into one municipal government known as the "City of Ottawa". OC Transpo became a department of the new city. This did not affect OC Transpo as much as it did with other municipal services, since transit was already a regional service.

As OC Transpo became part of the newly amalgamated City of Ottawa, bus fleet maintenance became the responsibility of the municipality, a centralized model with one single director with the objective of improved accountability, significant cost savings and enhanced efficiency under a municipal fleet maintenance model.

The fleet maintenance model was later reverted back to the responsibility of OC Transpo self-perform model around 2008/2009 based on the argument of single-point accountability holding the General Manager of Transit Services directly accountable for all planning, administration, operations and maintenance of the transit system.

The Transit Management group cites a number of positive outcomes related to their business under a self-perform model:

- Efficiency: a single manager overseeing responsibility, accountability and financial aspects; elimination of cross-departmental procedures
- Effectiveness: single management approach, greater control over many issues

The Fleet Services group cites a number of positive outcomes in support of a centralized model on the other hand:

- Efficiency: greater economies of scale, reduced departmental duplication
- Effectiveness: focused resources such as engineering support and training

City of Hamilton

The City of Hamilton has undergone a significant change in history in terms of shared services in maintenance organizational structure.

The formerly separate municipalities of Dundas, Stoney Creek, Flamborough, Ancaster, and Glanbrook, and the regional municipality of Hamilton-Wentworth, were merged to form the City of Hamilton in January 2001. As a result of the reorganization Transit Fleet a department of Hamilton Street Railway (HSR) was realigned under the responsibility of Public Works Fleet department.

In 2005 City Council again reversed this decision aligning Transit Fleet back under HSR declaring that Transit was an essential everyday service which was very specialized requiring its own management structure to oversee the maintenance of the vehicle fleet.

The Transit Management group and the Corporate Fleet Services group cite a number of positive outcomes related to their business using a self-perform model:

- Efficiency: reduced departmental duplication, elimination of bureaucracy (i.e. silos)
- Effectiveness: single management approach, direct control

B3.1.2 Calgary Experience

Being the largest business unit in the City of Calgary, Calgary Transit has over 3000 employees to provide and support the backbone of public transit within the city. Calgary Transit ensures that the transit fleet is well maintained and clean to meet the expectation of the city.

City organization type:	Municipal
City organization history:	Original
Transit vs Corp fleet ratio:	1000 vs 4500
Maintenance model:	Self-perform
No. of employees (part/full time):	3300
Annual ridership:	110 million

The Fleet Services group of The City of Calgary manages and maintains the fleet of vehicles and equipment, excluding Transit, Fire, Police and Development & Building Approvals. The Fleet Services group delivers necessary support to the various business units that are responsible for providing front-line services to the citizens, such as: waste and recycling, repairing and cleaning roads, repairing water mains and general maintenance for parks and public spaces.

The services provided by the Fleet Services group include:

- Acquisition, leasing, hired trucks and equipment
- Maintenance and repair
- Fabrication and welding
- Driver safety and training services
- Field service, quick lube and tire service
- Vehicle inspection and disposal

The Transit Management group cites a number of positive outcomes related to their business under a self-perform model:

- Efficiency: a single manager overseeing responsibility, accountability and financial aspects; elimination of cross-departmental procedures
- Effectiveness: single management approach, greater control over many issues

The Fleet Services group is in support of a centralized model on the other hand and cites a number of positive outcomes:

- Efficiency: greater economies of scale, reduced departmental duplication
- Effectiveness: integrated administration cost

B3.1.3 Consolidated Model Evaluation Criteria

A prime objective of the industry scan was to gain an understanding of the factors and decision points considered and used by industry peers for the adoption or rejection of the consolidated model. These factors would then allow the creation of evaluation criteria that can then be applied to assist Calgary with its decision making regarding the adoption or rejection of the model.

Across the sampling of both Canadian and US peers only the City of Edmonton / Edmonton Transit employs the consolidated model. Two further cities within the sample group, namely the City of Ottawa / OC Transpo and the City of Hamilton / Hamilton Street Railway, were identified as having employed the model at one point in their history but had reverted back to a transit self-perform maintenance model.

Throughout the course of agency interviews a small number of factors or criteria were continually referenced by both transit fleet managers and corporate fleet managers when describing the attributes of any particular model and when considered would necessarily become model evaluation criteria.

Characteristics	Edmonton	Ottawa	Hamilton
City organization type	Municipal	Municipal	Municipal
City organization history	Original	Amalgamated	Amalgamated
Transit vs Corp fleet ratio	900 vs 4000	900 vs 4500	200 vs 800
Maintenance model	Centralized	Self-perform	Self-perform

A summary of the interviews and the cited evaluation criteria of cost, risk and organizational effectiveness being considered by these agencies is presented in the table below. In this table, the factors that the transit agency, either the Transit Management group or the Corporate Fleet group, perceive having substantial significance in the evaluation criteria of a consolidated model are denoted by an "x".

Evaluation Criteria	Edmonton		Ottawa		Hamilton	
	Transit Management	Corporate Fleet	Transit Management	Corporate Fleet	Transit Management	Corporate Fleet
Cost – economy of scale	x	x		x		
Cost – purchasing power				x		x
Cost – duplication of effort				x		
Risk – product quality		x	x		x	
Risk – customer impact			x		x	
Risk – labor issues	x	x	x	x	x	x
Effectiveness – centre of excellence		x		x		x
Effectiveness – accountability	x	x	x		x	
Effectiveness - control	x	x	x		x	

B3.1.4 Recommendations

The table above illustrates that the vehicle maintenance model chosen by each transit agency was selected using different considerations, applied weighting and emphasis over cost, risk and effectiveness. In considering this decision it is recommended that the City of Calgary apply a weighting system of its own across the various evaluation criteria which reflects the organisation's emphasis on the factors most important to it in reaching its operational needs and business objectives.

B3.2 Vehicle Lease / Maintenance Agreements

B3.2.1 Background

As a part of the industry scan the consultant explored the use of transit vehicle leasing and maintenance agreements as another form of an alternate service delivery method (ASD) and as a potential means of improving the effectiveness of transit Fleet Services mission delivery. The concept investigated the potential of leasing vehicles and maintenance agreements from original equipment manufacturers (OEM's) to understand any opportunities to lower the overall cost of maintenance and vehicle ownership.

The examination of this topic is looked at broadly from the perspective of organizational design and maintenance practices and is not a rigorous examination of the financials associated with lease vs. buy in a municipal setting. The choice of lease vs. buy for Calgary's transit fleet must be made largely as a policy decision that will need to consider amongst other things the overall financial implications of such a decision. Our review confirmed that Calgary's practice of vehicle purchase and ownership is consistent with its Canadian peer group of bus and rail operators. At present, no Canadian transit system is leasing their transit vehicles or making large scale use of OEM maintenance contracts. The leasing option has not been widely explored by the industry due to no apparent cost advantages or tax incentives.

While it does not appear that leasing of transit vehicle makes sense strictly from a financial perspective it may provide some effectiveness benefits when tied or bundled with maintenance contracts.

B3.2.2 The Leasing Concept

To better understand the pros / cons of leasing it is thought that a brief explanation of the lease concept itself would be helpful. Leasing is simply paying the owner of an asset for its use for some period of time then retuning it. The difference between renting and leasing is the length of time of use of the asset. Rentals tend to be for very short periods of time with leases usually running a minimum of a year.

There are two broad categories of lease agreements, namely a closed-end and an open-ended lease. The essential difference between them is where the risk/reward for the value of the vehicle lies. In the closed-end lease the lessor bears the risk of the residual value; in an open end lease, the lessee.

While there are several iterations of the two basic lease types the goal of a lease transaction is not to obtain or transfer ownership of the vehicle but to pay for its use for a period of time then return it to the owner.

Original equipment manufacturers offer what is often called a "bundled" program —that is, with a master lease agreement, they can tie in any number or iteration of fleet maintenance options or programs (e.g., maintenance and asset management, parts & warranty, safety programs, fuel cards, etc.) into a single source agreement. Bundled maintenance options are not exclusive to lease agreements only and are also available to agencies that opt to purchase vehicles instead.

B3.2.3 Marketplace Scan

A marketplace scan was conducted to understand the range of maintenance services available to both bus and rail fleet managers at the time of vehicle acquisition. The marketplace scan included a sampling of market place leaders of original equipment manufacturers for both the bus and rail vehicle industry. Sample firms included;

- New Flyer Industries – a manufacturer of heavy-duty buses in the U.S. and Canada.
- Nova Bus- a manufacturer of heavy-duty transit buses and a wholly-owned subsidiary of the Volvo Bus Corporation.
- Siemens – an international manufacturer of rail vehicles (LRV's). (Calgary Fleet)
- Bombardier – an international manufacturer of rail vehicles.

The OEM's of both bus and light rail vehicles offer a broad array of maintenance and operation services to fleet owners both at the time of vehicle acquisition (lease or purchase) as well as anytime throughout the service life of the fleet. Typically, rail vehicle manufactures offer a much broader and more comprehensive list of services given the very specialized, safety critical nature of the asset.

Typical Services Include;

Total Fleet Maintenance

- Shop & Warehouse Management
- Planning & Performing of all Maintenance Activities (Agency or Contracted Employees)
- Condition Based Monitoring / Asset Management Systems
- Preventative Maintenance
- Corrective Maintenance
- Accident Damage
- Obsolescence Management
- Warranty Management

Asset Life Management

- Mechanical Upgrades
- Electrical Upgrades
- Body Upgrades
- Retrofit Packages (campaigns)
- Life Extension, Heavy Overhaul

Component Reengineering / Overhaul

- Engineering / Rebuilding of Core Vehicle Components
- Control Systems
- High / Low Voltage Systems
- Pneumatic / Hydraulic Components
- Trucks / Bogies /Traction Motors / Gear Boxes
- Propulsion Systems
- Software Systems
- HVAC
- Interiors
- Passenger Information Systems

Material / Parts Inventory Solutions

- Material & Logistics Management
- Parts Planning & Optimization
- Component Repair / Upgrade
- Spares Supply (single items, replacement kits)

Support

- Consulting
- Project Management
- Training
- On-board and Remote Diagnostics

Most OEM's offer a menu type approach to their maintenance services stemming from a complete turn ley system approach to the selection of minor services or parts. Most North American transit systems avail themselves of OEM services throughout the life cycle of their fleet given the OEM's intimate knowledge of systems, compatibility, and quality. As noted above, while leasing is not prevalent in the industry most rail operators elect to have OEM's maintain and supply safety critical parts including control software as a means of mitigating risk of error on behalf of their own processes.

B3.2.4 Industry Scan Results

Of the Canadian properties selected for the peer review none were currently leasing their transit fleet and subsequently not taking advantage of a bundled maintenance package. Further, none of the properties sampled were contemplating the leasing of their transit fleet in the near future. The leasing option has not been widely explored by the industry due to no apparent cost advantages or tax incentives.

The U.S. experience largely mirrors the Canadian experience with only one of the three American properties reporting the use of leases. In the one instance reported a complicated transaction called a lease –back was used wherein the agencies fleet was purchased by an insurance company / bank and then leased back to the transit agency. Given the difference in funding, regulatory models and tax treatments the US model is likely not a fair comparator to that of the Canadian model.

B3.2.5 Conclusions and Recommendations

Aside from the financial considerations, and while every municipal setting is unique the leasing of transit vehicles may offer the following benefits;

1) Fixed Cash Flow - Predictable Ownership Costs
2) Less Administration
3) Lessor Acquisition / Disposal
4) Greater Flexibility on Replacement / End of Lease
5) Opportunity for Bundled Parts & Maintenance (also available with purchase)

With the goal of improving the overall effectiveness and efficiency of transit fleet services several issues need analysis when considering lease vs. buy;

- What functions will the lessor assume that are currently performed in-house i.e. order processing,
- What other fleet maintenance functions might be outsourced as part of the lease arrangement i.e. vehicle procurement, maintenance management,
- What will the lessor charge for services not included in the lease rate?

From the industry scan there is currently no best practice in place that suggests the leasing of transit vehicles makes sense from a financial perspective. The fact that maintenance bundling and opportunities for ASD exist outside the lease model would suggest the two issues should likely be considered separately. With a wide array of products and services available in the marketplace from the OEM's, aside from any leasing consideration, significant opportunities exist to improve the effectiveness of the vehicle fleet maintenance organization of Calgary Transit.

In this regard, Calgary Transit is already making use of maintenance services from the light rail vehicle

OEM, Siemens. A life extension program of the earliest version of Siemen's cars is being prototyped with rail cars being shipped to the Siemens maintenance facility in Sacramento, California. In many instances transit Fleet Services is applying the industry best practices.

B3.3 Contracting Out Continuum

The table below illustrates among the transit agencies being interviewed a summary of maintenance activity types that are either contracted out, shared with others or self-performed by the transit agency itself.

INDUSTRY OVERVIEW OF CONTRACTING OUT

Legend
- Contracted-Out
- Shared - Agency / Contractor
- Self-Perform

No.	Maintenance Activities	ACTIVITIES CONTRACTED OUT TO A 3rd PARTY / AGENCY																		
		OC Transpo Ottawa	Calgary Transit	Toronto Transit Commission	STM Montreal	Brampton Transit	Durham Region Transit	STL Laval	RTL Longueuil	Mississauga Transit	RTC Quebec	Grannd River Transit Waterloo	London Transit	Translink Vancouver	Edmonton Corp Fleet Services	HSR Hamilton	York Region Transit	TrimetOregon	WMATA Washington	MBTA Massachusetts
		Canadian Transit Agencies																American Transit Agencies		
1	Service Lane																			
2	Inspections																			
3	Mechanical Repairs																			
4	Body Repairs																			
5	Brakes																			
6	Components / Line Replaceable Units																			
7	Mechanical Life Extension																			
8	Body Life Extension																			
9	Repair Facilities (any location)																			

B3.4 Case Studies

Our industry scan has identified that there are basically three types of delivery models that vehicle maintenance organizations use to deliver core services, with variations on each theme across the industry. The three primary models used are;

- Self-Perform Vehicle Maintenance Organization – all maintenance work is performed internal to the organisation
- Strategic / Shared Contract-Out Vehicle Maintenance Organization (e.g. Calgary Transit) – strategic elements of maintenance are contracted out to a third party.
- Contract-Out Vehicle Maintenance Organization - the entire maintenance function except for management and administration has been contracted out to a third party.

The following case studies have been completed to provide additional information of Canadian Transit agencies that provide practice examples for each delivery model above. The Case Studies include;

- **York Region Transit** – Contract-Out Vehicle Maintenance Organization
- **OC Transpo** – Self-Perform Vehicle Maintenance Organization
- **Edmonton Transit** – Shared Service Contract-Out Maintenance Organization
- **Toronto Transit Commission** – Strategic Contract-Out Vehicle Maintenance Organization

The case studies attempt to draw out difference in terms of each organization's makes-up, history, operations, and also include some overall perceived success factors. The four case studies also highlight the extreme conditions in terms of organization delivery models (OC Transpo, York Region) as well as the median position (TTC, Edmonton) which include the vast majority of the peer agencies sampled, including Calgary Transit.

What seems apparent is that there has been no common thread identified for the selection of a particular model type across the entire peer population. The decisions for organization or model selection range from policy, organization history (i.e. evolution), and operational factors such as number of modes operated, fleet size, systems, technology, fleet age, etc.

Like any benchmarking exercise it is very difficult to apply an "apples to apples" comparison of the various agencies and organizational models given these same factors and others including regulation, funding, and municipal influence such as culture and organization design. For these reasons we are cautious against drawing comparisons on the efficacy of any particular maintenance organization model from the case studies provided.

B3.4.1 York Region Transit

Introduction

York Region Transit is unique amongst its Canadian peers and was chosen for a case study given it's the only known transit property to fully contract-out all of its vehicle operation and maintenance activities to the private sector.

Transit System Description

York Region is located in the heart of the Greater Toronto Area ("GTA") in Southern Ontario. The Region is comprised of nine area municipalities covering approximately 1,776 square kilometres (686 square miles), stretching from the City of Toronto in the south to Lake Simcoe and the Holland Marsh in the north, and bounded by Peel Region in the west and Durham Region in the east. The Region has rapidly grown from 166,060 residents in 1971 to an estimated population of 1,140,655 as of 2014.

York Region Transit YRT/Viva offers local and bus rapid transit services in all nine York Region municipalities. More than 120 routes keep residents connected within York Region, as well as connecting services in the City of Toronto and the Region of Peel. In addition, Mobility Plus provides door-to-door shared-ride accessible public transit service for people with disabilities. The YRT / Viva system is fully accessible and programs are in place to give Mobility Plus clients the option to access the entire system.

The Transit – YRT / Viva branch directly provides transit – related services, including planning and scheduling, fare enforcement, marketing and communications, operates two customer service call centers and negotiates and manages contracts for operating and maintaining buses and other transit vehicles and major transit facilities.

Fast Facts

Service Area Population: 1,002,824

Service Area Size: 1,776 sq. km

Modes Operated: Conventional Bus and Bus Rapid Transit

Number of Fixed Routes: 128

Ridership: 22,445,497

Active Fleet (avg. bus age: 6.3 years)

Community Buses:	19
Standard Buses	460
Articulated Buses	41
Total Fleet	520

Fleet Maintenance Organization Model

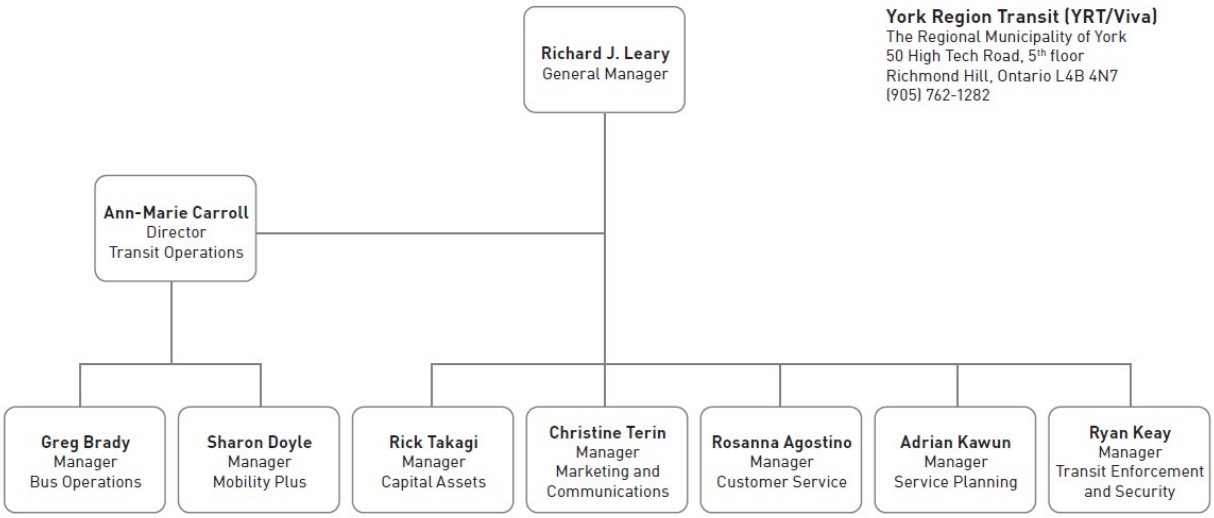
To provide context for the fleet maintenance organizational model a brief description and overview of York's regional organization has been included.

The Region is led by the Regional Chair and Council and is organized into six departments:

- The Office of the CAO;
- Community and Health Services;
- Corporate Services;
- Finance;
- Transportation Services
- Environmental Services

The Transportation Services Department is responsible for more than 1,000 kilometres of Regional arterial roads, the management of the York Regional Forest and York Region Transit (YRT & Viva) (hereinafter referred to as "YRT").

YORK REGION TRANSIT



The YRT / Viva service and maintenance model is unique to the Canadian transit industry. Under this model YRT maintains overall accountability for transit service delivery with responsibility being passed to private contractors (Unionized) each of who provide vehicle operators and complete vehicle and MSF maintenance services through a 10-year incentivized outcome based contract.

Services are delivered from four large storage and maintenance facilities strategically located throughout the service area. Each of these YRT owned facilities becomes the base of operation for an individual contractor to perform all vehicle operation and maintenance.

Within the maintenance organization model YRT has responsibility for overall vehicle design and procurement, maintenance standards development, engineering and asset management support including fleet and facility planning with the contractor performing all life-cycle maintenance activities. Asset management and contractor performance are administered and closely monitored by YRT staff through a robust quality assurance program which includes on-site inspections, work order audits and monthly performance target assessments.

Overall and ASD scope of Fleet Maintenance

Like most transit organizations YRT employs a comprehensive life-cycle management approach to all its assets to maximize return on investment. The YRT maintenance organization model utilizes a full or complete alternate service delivery model for all life-cycle maintenance activities, except for vehicle procurement.

The YRT contracted model assigns responsibility for the following list of maintenance activities and processes to a third party, external contractor;

- Vehicle Servicing
- Scheduled Maintenance
- Unscheduled Maintenance
- Component Installation and Replacement (Campaigns)

- Systems Installation & Upgrade (i.e. AVL, NSA)
- Rebuilds & Life Extension
- Parts and Inventory Management
- Contract & Performance Reporting

The contractor is expected to provide all necessary labor, tools, parts and equipment according to contract specifications to clean, inspect, diagnose, repair, upgrade and rebuild the assigned fleet The contractor is free to use other contracted services to conduct these activities. Further, the contractor is also made responsible for the upkeep and maintenance of their assigned YRT maintenance facility including fixed equipment such as hoists, compressors, overhead doors, etc. Maintenance and asset management documentation and reporting is completed through the YRT maintenance management system, M5.

History of the org model

Relative to most of its peer systems YRT is a fairly young organization. In 2001, five municipal transit systems amalgamated to form York Region Transit. These five smaller municipalities each began their transit operations largely as contract operations to other larger systems such a GO Transit and the Toronto Transit Commission, filling in service gaps with their own smaller contracted routes and services.

Post amalgamation YRT began to purchase its own vehicles, terminals and maintenance facilities and began to consolidate operations into the system it operates today. The maintenance organization and the continued use of the ASD model evolved out of this consolidation process establishing over time its own operation and maintenance contracts. Over time YRT continues to evolve the ASD model to improve maintenance outcomes primarily through adjustments to the performance based O&M contracts. Contracts have evolved from very prescriptive to largely performance based while increasing the use of incentives and moving away from disincentives. YRT staff cite improved contractor compliance and positive trends to KPI's such as reliability and availability while maintaining costs.

Success factors

The primary objectives of a full ASD model would be improved cost efficiency and certainty while minimizing and transferring certain organizational risks to the private contractor.

From recent CUTA and OMBI data it's clear that YRT is not an industry leader in terms of vehicle maintenance costs per revenue service hour, however, an apples to apples comparison from this data is very difficult to achieve given varying and differing policy, legislative, labor and maintenance standards which exists between agencies.

The contracted model does add a degree of operational flexibility to the owner given the ability to continually evolve and improve maintenance contracts through term renewals. Understanding the positive and negative features during the term of the contract allows adjustments and improvements to be applied to subsequent contract terms.

B3.4.2 OC Transpo of Ottawa

Introduction

The City of Ottawa's OC Transpo is an example of a consolidated municipal department organization structure that largely self-performs all vehicle maintenance functions making very little use of ASD models. Since its creation, OC Transpo has experienced ongoing change in both its governance and organization model moving from a standalone transit commission to a distributed municipal department to the current organization structure.

Transit System Description

OC Transpo is the urban transit service of the City of Ottawa, consisting of (1) regular buses travelling on fixed routes in mixed traffic; (2) a bus rapid transit (BRT) system, a high frequency bus service operating on mostly grade-separated dedicated bus lanes within their own right-of-way supported by on-road reserved bus lanes and priority traffic signal controls; (3) a light rail transit (LRT) system known as the O-Train operating on one north-south route, the Trillium Line; and (4) a door-to-door bus service for the disabled, the ParaTranspo. OC Transpo provides comprehensive transit services to nearly one million people in Ottawa with a fleet size of over 900 buses and 6 trains serving nearly 340,000 daily riders.

In December 2012, Ottawa City Council approved a major infrastructure project to build a 12.5 km east-west LRT line, the Confederation Line through the downtown to replace the existing BRT by 2018.

Fast Facts

Service Area Population: 857,890

Service Area Size: 466 sq. km.

Modes Operated: Conventional Bus, Bus Rapid Transit, Light Rail Transit

Number of Fixed Routes: 145

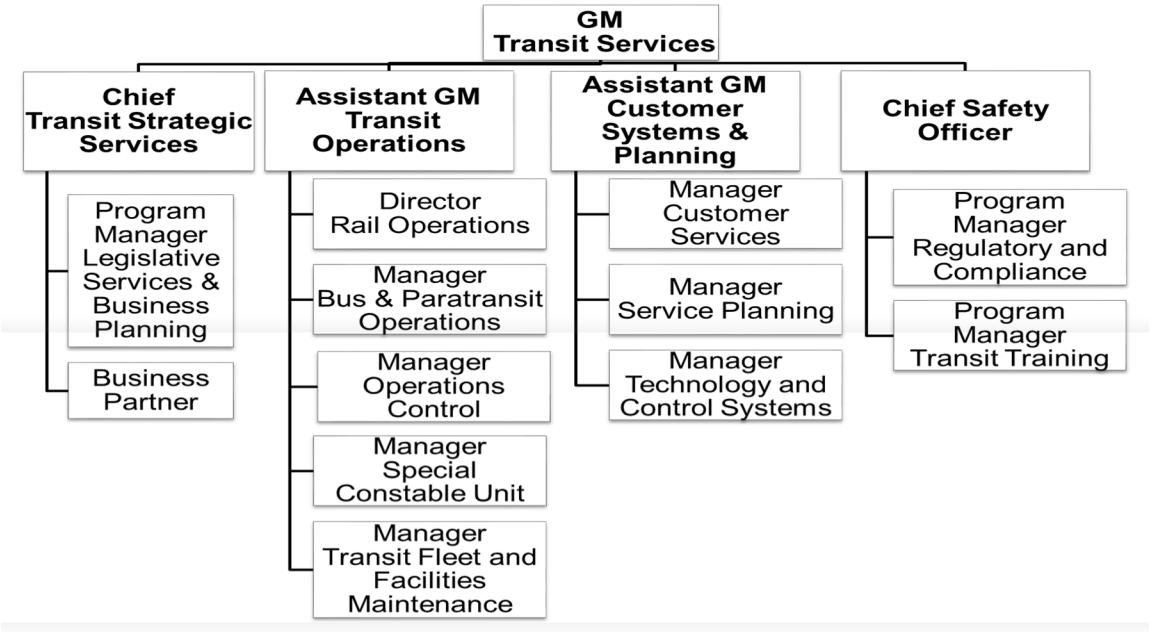
Ridership: 97,076,835

Active Fleet (avg. bus age: 6.2 years)

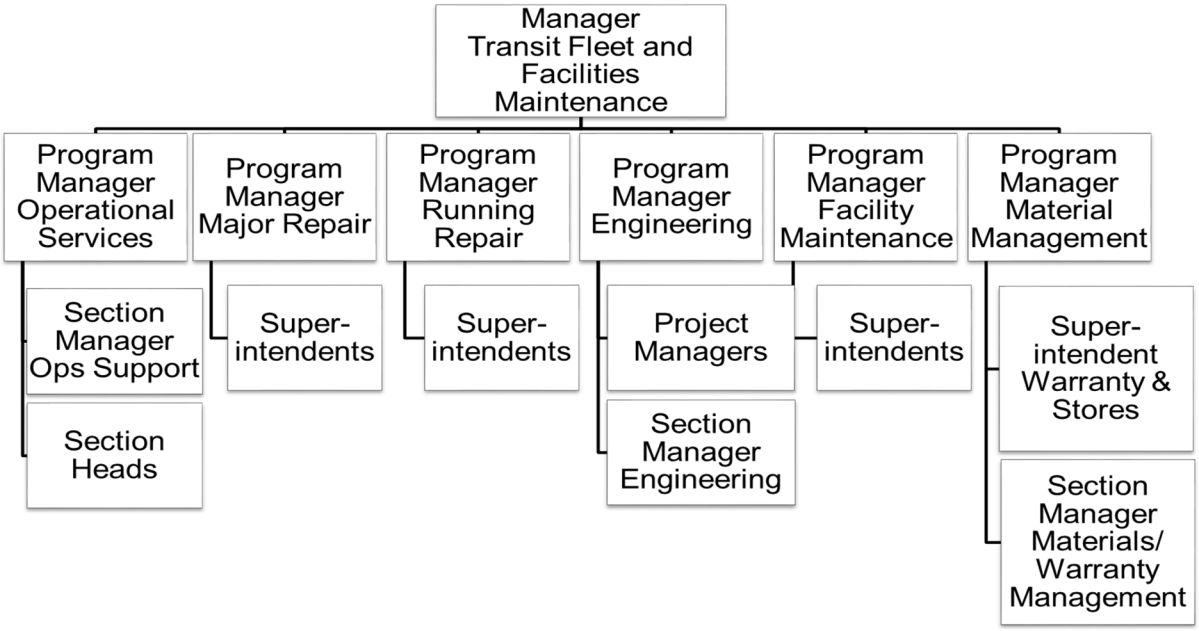
Light Rail Vehicles	3
Standard Buses	502
Articulated Buses	359
Double Decker Buses	75
Total Fleet	939

Fleet Maintenance Organization Model

The Transit Services Department, headed by the General Manager of Transit Services, is one of seven city departments reporting to the City Manager. As department head the GM Transit Services has overall accountability for the planning, administration and delivery of all OC Transpo services.



The Manger Transit Fleet and Facilities Maintenance has responsibility for OC Transpo' s conventional and Paratransit bus fleet with all maintenance activities being self-performed by department employees. O-train vehicle maintenance is currently contracted to an external service provider at an OC Transpo owned storage and maintenance facility.



Overall and ASD scope of Fleet Maintenance

All major vehicle maintenance activities such as servicing, scheduled and unscheduled maintenance including rebuilds and life extension, parts and inventory management are self-performed, with management satisfied with both cost and quality of output.

Further, the department is fully self-supported in terms of administration, asset management, engineering and technical support including operations management. New vehicle procurement is managed in a collaborative effort with the City's Procurement function with the department responsible for specification writing and warranty administration.

As mentioned, there is very little use of ASD with senior management in favor of retaining maintenance work in-house. Labour relations is considered a high importance.

O-Train vehicle maintenance was and continues to be conducted by an external supplier since the service's inception. The primary reason was the agency's inexperience with rail vehicle maintenance and the relatively small fleet under management.

The OC Transpo Confederation Line LRT is currently under construction and is being delivered under a design, build, finance and maintain, public-private partnership (P3). It's expected that OC Transpo will be responsible for the operation of the line utilizing its own staff along with the administration of the private maintenance concession.

History of the org model

In 1969, Carleton County was made a Regional Municipality and as a result, took on additional responsibilities that were better served on a regional basis (drinking water & sanitation sewers, arterial roads). The Regional Municipality of Ottawa-Carleton (R.M.O.C.) was formed. They intended on making transit "regional" from the creation of Ottawa-Carleton. This was achieved on August 1, 1972. The R.M.O.C. also had the eventual goal of creating a regional rapid transit network, starting with the first report on regional rapid transit in 1973. This came in the form of the Transitway in 1983 after 10 years of planning and debating.

On January 1, 2001, Municipal Amalgamation took place in Ottawa-Carleton. As a result, the R.M.O.C. and the 11 "lower-tier" municipal governments were amalgamated into one municipal government known as the "City of Ottawa". This did not affect OC Transpo as much as it did with other municipal services, since transit was already a regional service.

OC Transpo became part of the newly amalgamated City of Ottawa. Vehicle maintenance became the responsibility of the municipality, a centralized model with one single director for improved accountability, significant cost savings and enhanced efficiency under a municipal fleet maintenance model.

The fleet maintenance model was later reverted back to the responsibility of OC Transpo self-perform model based on the argument of single-point accountability holding the General Manager of Transit Services directly accountable for all planning, administration, operations and maintenance of the transit system.

Success factors

Strong labour relations has become an issue of significant importance to the management of OC Transpo over the past few years with an emphasis on creating a close collaboration between Management and Union resulting with most of the vehicle maintenance work being self-performed. Department management is very satisfied with both the cost and quality of work performed with instances of contracting- in to achieve better cost savings, quality and better turnaround times for various items. Management cited a harmonious working relationship between Management and Union, with the current ASD model with accrued benefit to both OC Transpo and Union.

Other Issues

It is of interest that the vehicle maintenance organization was changed from a centralized model back to a self –perform model during the last decade. Not only has it reverted back to a decentralized model, it is apparent that most maintenance activities are currently kept inhouse by OC Transpo. This arrangement is well-supported by both the management of OC Transpo and the unionized staff, unions satisfied that all the jobs are kept internal and performed by agency staff, with management being assured of a harmonious working U/M relationship.

B3.4.3 Edmonton Transit

Introduction

The City of Edmonton was selected for a case study out of the many other transit agencies as it employs a unique organizational model for bus maintenance, which is a responsibility of a centralized corporate fleet group rather than a self-perform model by Edmonton Transit System.

Transit System Description

Edmonton Transit Service is a department within the City of Edmonton responsible for delivery of bus, LRT and paratransit transit services to the city in addition to a limited number of regional routes and connections to suburban systems in the City of St. Albert and Strathcona County.

Serving a large service area and municipal population Edmonton Transit has 25 transit centres, 9 of which are paired with LRT Stations. Located throughout the city to provide destination and transfer locations for transit customers, the transit centre's facilitate the use of a timed-transfer system, where suburban feeder routes run to a transit center, and passengers can then transfer to a base route/LRT to the city center or the university. Some feeder routes provide direct express service to and from the city center.

A large, fully accessible bus fleet using low-floor technology includes conventional forty-foot buses, sixty-foot articulated buses and smaller community buses. While primarily a diesel propelled bus fleet ETS has trialed a number of alternate fuel methods including hybrid diesel-electric, CNG and a fully electric bus.

The LRT system comprises two lines with a total system length of 24 km serving some eighteen stations. The Capital Line, comprising the bulk of the network runs from northeast Edmonton to south Edmonton via the city center. A second line, the Metro Line, connecting the downtown with northwest Edmonton, began limited operations in September 2015. In addition, there are further projects to create a new 27-kilometre line that will extend to Mill Woods Town Centre in the southeast part of the city and to Lewis Farms in the west end of the city.

The rolling stock of both Capital Line and Metro Line comprises trains of either Siemens-Duewag U2 or Siemens SD-160 cars. ETS operates 37 U2 cars, some of which have been in operation since the system opened in 1978. ETS also operates 57 SD-160 cars, of which 37 were ordered between 2005 and 2007, with the first cars entering revenue service on January 27, 2009. An additional 20 cars was purchased in 2010 and 2011 for use in the Metro Line and were delivered from March 2012 to April 2013.

Fast Facts

Service Area Population: 877,926

Service Area Size: 700 sq. km

Modes Operated: Conventional Bus, Light Rail Transit, Transportation of the Disabled

Number of Fixed Routes: 205

Ridership: 89,283,008

Active Fleet

Light Rail Vehicles:	73
Standard Buses	903
Articulated Buses	33
Total Fleet	1,009

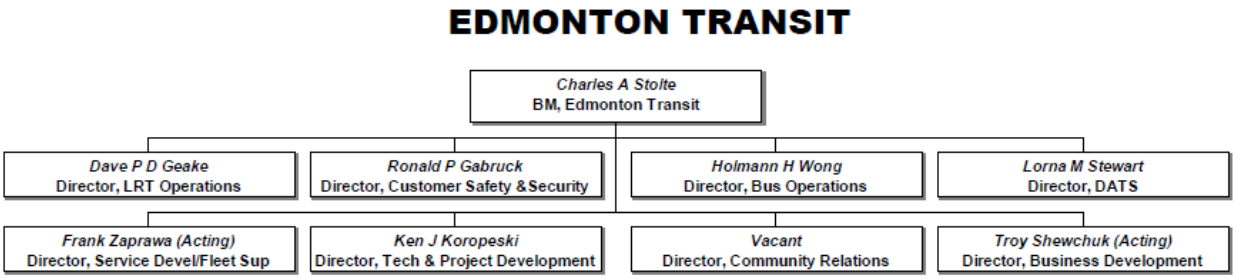
Fleet Maintenance Organization Model

As a corporation, the City of Edmonton serves a population of over 750,000 residents, governed by The Mayor and Council, setting policy, budget and direction to the City Manager who ensures Administration carries out Council's direction and administers public services. City administration is divided into different departments, each responsible for a particular aspect of public service. These departments include:

- Community Services
- Corporate Services
- Financial Services and Utilities
- Office of the City Manager
- Sustainable Development
- Transportation Services

As a department of the Corporate Services Department, Fleet Services is responsible for the municipal fleet operations in the City of Edmonton, including transit bus maintenance. Fleet Services manages vehicle and equipment procurement, maintenance, fleet engineering, fabrication services, fuel management and fleet safety.

As a department of the Transportation Services Department, Edmonton Transit System (ETS) operates a variety of public transportation services including bus operations, Light Rail Transit (LRT) and Disabled Adult Transportation Services (DATS).



The ETS conventional bus service is dispatched and maintained from five operating garages located throughout the city providing covered storage and running-maintenance to both the standard and articulated bus fleets. The paratransit service, DATS, is dispatched and maintained from its own dedicated facility which provides administration, dispatch and maintenance support to the fleet of 98 shuttle buses. DATS fleet is also maintained by the Fleet Services group.

The LRT service is dispatched and maintained from a single maintenance and storage facility located on the Capital Line in the city's north east side. The facility provides vehicle servicing, scheduled and unscheduled maintenance including heavy repair and rebuild for the entire fleet of 73 LRV's.

Overall and ASD scope of Fleet Maintenance

The Fleet Services Branch of the City of Edmonton is one of the most diverse and integrated municipal fleet services maintenance providers in Canada. Fleet Services is accountable that utility vehicles, transit buses and essential equipment are well maintained for the required day-to-day operations. Fleet Services Branch manages about $630 million worth of fleet and associated infrastructure, and is the city's center of excellence in vehicle procurement, maintenance, fleet engineering, fabrication services, parts management, fuel management and safety.

In our course of study the consultant uncovered that the city has its own strategy of contracting out part of their fleet maintenance services to the external market.

- Tires
- Corrective maintenance on damages and repairs
- Bus rebuild

Under the establishment that it has the ability or flexibility to contract out as much as 13% of their maintenance work to the external market, the justifications behind these ASD activities are that for instance tires management is a relatively high risk activity and contracting the entire service out will transfer all risks to the 3rd party as well. In terms of major damage due to accidents, having the damaged vehicle sent out to a contractor for repairs frees up garage or body shop space for other maintenance jobs. Outsourcing bus rebuilds guarantees a provision of warranty from the original equipment manufacturer.

History of the org model

Maintenance work of the entire bus fleet of Edmonton Transit System is under the responsibility of Fleet Services Branch of Corporate Services Department.

The shared organization model was created in 1998 when a shared services enterprise model was adopted. All fleet maintenance was then placed under a single manager for reasons of improved quality of product being delivered under its responsibility, including fleet from fire services, police, ambulance, and all other utilities vehicles within the city. Fleet Services Branch manages all stages of a vehicle life cycle, from strategic planning and acquisition to maintenance, investigation, safety training, engineering analysis, and disposal.

Success factors

The managers interviewed suggested that this partial ASD model improves cost efficiency while minimizing and transferring operational risks to the contractors. While the extent of ASD is supported by the business case of Fleet Services, executive sponsorship is a crucial factor in bringing the most benefit to the city as a whole. Good working relationships between Edmonton Transit System and Fleet Services Branch are essential, and managed through a partnership agreement, making things less complicated and bureaucratic.

Fleet Services Branch views this is an effective way to allow Edmonton Transit to focus more on operations by having the benefit of a 3rd party taking care of the bus fleet maintenance.

Other Issues

Edmonton Transit System is unique amongst the other transit agencies in a sense that its bus fleet is maintained and serviced by another city department, Corporate Services. Two other transit agencies, Ottawa and Hamilton, were once under the same organizational structure in history, but reverted back to the self-perform structure after a few years' of operation. The balance of advantages and disadvantages of this vehicle maintenance organization weighs differently across the industry, and the success of Edmonton's model is built upon many factors based on cost and risk management.

B3.4.4 Toronto Transit Commission

Introduction

The Toronto Transit Commission (TTC) is the 3rd largest and heavily-used public transit system in North America. The TTC has a unique characteristic amongst other transit agencies in Canada, and was chosen for a case study given it is a transit property which has adopted to strategically contract-out its vehicle maintenance activities to the private sector.

Transit System Description

The TTC is governed by a Board of Commissioners which ensures that service and fare levels are set so that passenger demand is met and budgets are balanced. The TTC is a public transport agency that operates bus, streetcar, rapid transit services (subway) in Toronto in addition to paratransit service (Wheel Trans), serving this area with a grid network of:

1. •4 subway lines;
2. •11 streetcar routes; and
3. •more than 140 bus routes.

The TTC also operates 13 bus routes into neighbouring municipalities adjacent to the City of Toronto. Neighbouring transit agencies operate more than 30 bus routes which connect directly with the TTC subway system or other surface routes. There are also transfer opportunities between several TTC services and the GO Transit commuter rail services. The TTC also operates a fully-accessible door-to-door specialized system, called Wheel-Trans, for people with significant mobility difficulties.

The TTC carries approximately 535 million passengers per year, or about 1.6 million passengers on a typical weekday. This ridership accounts for nearly 85% of all transit ridership in the Greater Toronto Area.

The TTC's fleet consists of:

1. •about 800 subway cars;
2. •about 250 streetcars, of which an ever-increasing number are new low-floor streetcars; and
3. •about 1,800 low-floor buses

The TTC operates a north-south, east-west grid of routes conforming, to the greatest extent possible, with the grid of major arterial roads in the City. All these routes feed a grid of rapid transit routes. Many TTC bus and streetcar routes operate all day, every day. The density of this grid is largely unchanged for 18 operating hours per day, thus providing transit services within a 5 to 7 minute walk of most areas within Toronto.

One of the TTC's most important features is efficient, convenient, and free transfers between all services and modes: this is critical for a grid-based system that feeds riders from surface vehicles to subways for high-speed trips into the downtown core and throughout the network.

Fast Facts

Service Area Population: 2,808,503

Service Area Size: 632 sq. km

Modes Operated: Conventional Bus, Streetcar, Subway

Number of Fixed Routes: 158

Ridership: 534,815,000

Active Fleet

Subway Cars: 724

Street Cars 252

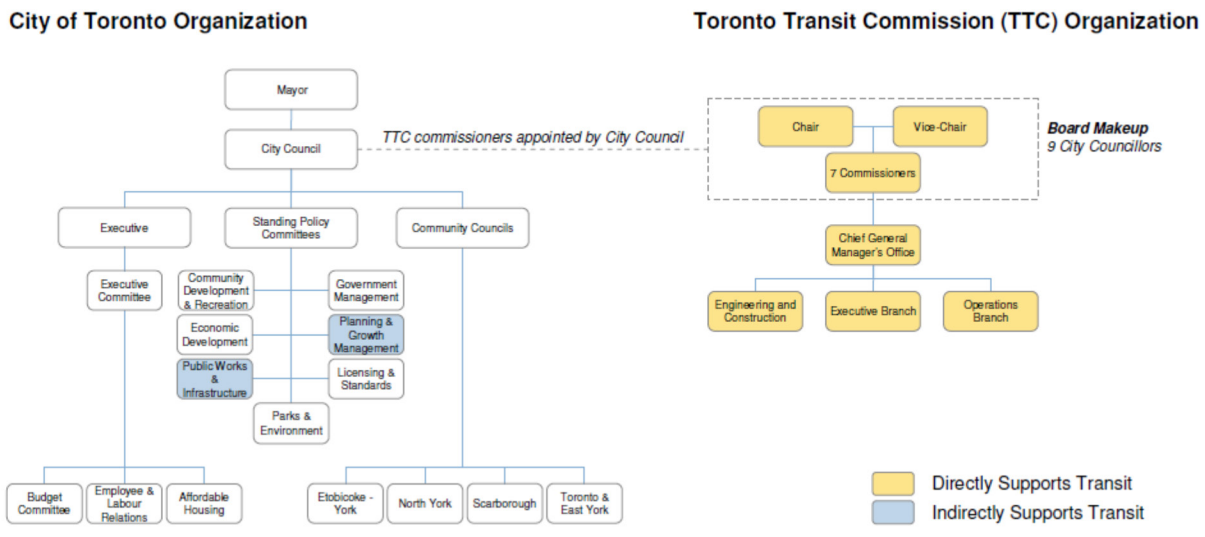
Standard Buses 1735

Articulated Buses 134

Total Fleet 2845

Fleet Maintenance Organization Model

The TTC operates as an independent commission which plans, constructs, operates and maintains the public transit infrastructure. It also operates independently from City Council, but is dependent on it to fill funding gaps.



There are 5 major groups carrying out individual core functions of the commission, which are:

1. Corporate Services Group
2. Engineering, Construction & Expansion Group
3. Operations Group
4. Service Delivery Group
5. Strategy & Customer Experience Group

Directly under the CEO of TTC just like any other groups, the Operations Group is responsible for delivering reliable, punctual subway service, and maintains the transit network and fleet, both bus and rail, to stringent safety and customer service standards to meet budget targets.

In terms of fleet maintenance activities, each type of fleet comes under the accountability of respective Heads, namely Bus Maintenance and Shops, Streetcar Maintenance, and Rail Cars & Shops.

Overall and ASD scope of Fleet Maintenance

- Vehicle Servicing (Contracted – out)
- Scheduled Maintenance
- Unscheduled Maintenance
- Component Installation and Replacement (Replacement purchases)
- Systems Installation & Upgrade
- Rebuilds & Life Extension
- Parts and Inventory Management
- Contract & Performance Reporting

History of the org model

In the early days of Toronto's first public transit, passengers were carried in horse drawn stagecoaches along Yonge Street between the St. Lawrence Market and the Village of Yorkville in 1849. The city granted the first franchise for a street car operation in 1861.

In 1920, the Toronto Transportation Commission (TTC) was established and, in 1921, the Commission took over and amalgamated nine existing fare systems within the city. Between 1921 and 1953, the TTC added 35 new routes and extended 20 routes altogether.

Toronto's first subway, Union Station-to-Eglinton section of the Yonge Street subway, opened in 1954, and the Toronto Transportation Commission was renamed the Toronto Transit Commission. The TTC then became the sole provider of public transportation services in Toronto.

There have been reorganizations of the TTC in recent history in order to deliver continuous improvement in its transit service. The TTC went through a significant reorganization in 1997 to reflect a typical railway organization structure. Then in 2013, the reorganization of its structure not only aimed to reinforce the functions of each group, it also established the importance of customer service, business process improvement and professionalization of inter-governmental relations.

Success factors

The TTC has embarked on a program of strategic contracting-out of [redacted] activities within the vehicle and infrastructure maintenance areas and was the first agency in Canada to contract out the bus service line. Other areas considered for contracting-out are components, engines and transmissions and line replaceable units.

The TTC has a very mature and effective process of gathering and analysing maintenance data and reliability engineering. Both the Bus Maintenance and Rail Cars and Shops departments have large comprehensive maintenance engineering and reliability engineering groups within the departments which is an industry best practice.

B3.5 Inventory of Fleet Maintenance Org Models - Matrix

Inventory of Fleet Maintenance Org Models – the inventory of transit agencies and some of their characteristics are appended as a matrix in this report. (Appendix 1)

B4. Evaluation Criteria

Our industry scan has identified that there are basically three types of vehicle maintenance organizations models used to deliver core services, with variations on each theme across the industry. The three primary models used are;

- Self-Perform Vehicle Maintenance Model
- Strategic / Shared Contract-out Vehicle Model
- Contracted-out Vehicle Maintenance Model

As evidenced by the industry scan above the majority of the Canadian transit agencies surveyed, including Calgary Transit, have evolved or adopted the Strategic / Shared Contract-out Vehicle Model.

Throughout the course of agency interviews a small number of factors or criteria were continually referenced by industry leaders when describing the attributes of any particular model and when considered would necessarily become model evaluation criteria. These evaluation criteria are;

- Cost – the direct and process costs of the vehicle maintenance operation.
- Quality – typically measured in terms of availability and reliability of the products and/or services.
- Organizational Risk – the inherent risk of the model to such things as reputation, labour relations, etc.

The choice of a model can be evaluated with these factors in mind which must include decisions based on the relative importance of each criterion to both the vehicle maintenance group and its parent transit agency. In most instances much of this has been decided by policy makers at the governance level of the transit organization.

From our industry scan it appears that the optimal vehicle maintenance delivery model is one that blends both the benefits of the public sector (e.g. stability) while taking advantage of the private marketplace (e.g. competition). ASD / contracting – out is generally considered when;

- A clear direct cost / process cost advantage exists; internal vs. external
- Abundant supply for services exist within local marketplace
- Highly specialized services exist within local marketplace (high skill, high risk tasks)

In the instance of Calgary Transit, the industry scan suggests that their current or evolved model choice (e.g. Strategic / Shared Contract- out Vehicle Maintenance Model) is appropriate and consistent with the majority of its Canadian peers. To further evolve the model, decisions regarding the further more aggressive use of ASD and contracting- out are appropriate in its desire to become more effective and efficient.

The following matrices set out factors and evaluation criteria that can be used when deciding which specific areas of both bus and LRV vehicle maintenance to contract out.

In this regard, contracting out decisions need to consider;

- Total organizational / process costs to contract out a function (increased CA, QA, performance management)
- Product Quality
- Loss of control over the asset being contracted
- Risk of change to the organization (service quality, reputation, labor unrest)
- Vagaries of skilled labor availability
- Contractor productivity
- Contractor quality / reliability
- Safety - transfer of liability from public to private (accidents, damage)
- Availability of warranties / guarantees
- Performance vs. Technical Specifications - incentives / disincentives

Bus Maintenance & LRV Maintenance Evaluation Criteria

In the illustration matrix below on the evaluation criteria for bus and LRV maintenance, against each major maintenance activity we try to identify the measurement, the risks involved, and the outcome result which should give an idea on which activities are likely for consideration or to pursue of contracting-out.

In terms of measurement, cost and quality being the major concerns, we would want LOW external cost but HIGH quality standard to be provided. This is a simple concept of cost effectiveness.

Risk factors to be put into consideration for any contracting-out activities would include product reliability, any challenges for the agency to re-enter the trade, as well as impact on labour relations. Different agencies may have different levels of risk tolerations; however a LOW risk approach will always better justify to push forward any contracting-out activities.

In summary, the evaluation criteria involve measuring the cost and the product quality, followed by analyzing the risks. As an illustration from the two tables below, it is apparent that the scheduled maintenance on service lanes “Schedule Mtce – Service Lane”, item number with asterisk (***) in the two tables, turns out to be the optimum scenario in pursuing a contracting-out decision in any transit agency.

No.	**Bus Maintenance**	Measurement		Organisational Risk			Result	Notes
		Cost Comparison (internal vs external)	Product Quality	Reputational Availability / Reliability (Contractor Failure)	Challenges to Re-Entry	On-going Labour Relations	Residual Organizational Effectiveness / Efficiency	
1	Life Extension - Vehicle (Mech/Body)	NEUTRAL	NEUTRAL	MEDIUM	HIGH	VARIABLE	IMPROVED	Consider buying new - adjusting vehicle service life (e.g. 12-years)
		Limited Marketplace	*Warranty*		*Skilled workforce*	*Labour relations - CO/JFL*		
					Facility & Equipment			
2	Life Extension - Component	NEUTRAL	GOOD	LOW	MEDIUM	LOW	IMPROVED	Consider buying new
		Limited Marketplace	*Warranty*		*Skilled workforce*			
					Facility & Equipment			
3	Unscheduled - Collision/Body Repairs	NEUTRAL	GOOD	LOW	LOW	LOW	IMPROVED	Assume Fleet is transferred to contracted facility
		Mature local market			*Skilled workforce*			
					Facility & Equipment			
4***	Scheduled Mtce - Service Lane	HIGHER	HIGHER	LOW	LOW	LOW	IMPROVED	Assume work conducted at CT facility
					Unskilled workforce	*Segregated WS*		
					Mature local market			
5	Scheduled Mtce - Inspect	LOWER	NEUTRAL	SIGNIFICANT	HIGH	HIGH	INFERIOR	Assume Fleet is transferred to contracted facility
					Skilled workforce	*Core business*		
					Very limited marketplace	*Labour relations - CO/JFL*		
6	Unscheduled - Breakdown/Repairs (Re&Re)	LOWER	GOOD	SIGNIFICANT	HIGH	SIGNIFICANT	INFERIOR	Assume work conducted at CT facility
	Incl. Brakes / Tires		*Warranty*		*Skilled workforce*	*Non-Segregated*		
					Limited marketplace	*Core business*		
						Labour relations - CO/JFL		
7	Part Supply and Inventory Management	HIGHER	GOOD	SIGNIFICANT	LOW	VARIABLE	IMPROVED	Assume work conducted at CT facility
			Guarantees		*Limited marketplace*			

No.	LRV Maintenance	Measurement		Organisational Risk			Result	Notes
		Cost Comparison (internal vs external)	Product Quality	Reputational Availability / Reliability (Contractor Failure)	Challenges to Re-Entry	On-going Labour Relations	Residual Organizational Effectiveness / Efficiency	
1	Life Extension - Vehicle (Mech/Body)	HIGHER	GOOD	LOW	HIGH	LOW	IMPROVED	Assume Fleet is transferred to contracted facility
					Skilled workforce			
					Facility & Equipment			
					Very Limited Marketplace			
2	Life Extension - Line Replaceable Units	HIGHER	Good	MEDIUM	HIGH	LOW	IMPROVED	
					Skilled workforce			
					Facility & Equipment			
					Very Limited Marketplace			
3***	Scheduled Mtce - Service Lane	HIGHER	HIGHER	LOW	LOW	LOW	IMPROVED	Assume work conducted at CT facility
					Unskilled workforce	*Segregated WS*		
					Mature local market			
					Labour relations - CO/JFL			
4	Scheduled Mtce - Inspect	LOWER	NEUTRAL	SIGNIFICANAT	HIGH	HIGH	INFERIOR	Assume work conducted at CT facility
					Skilled workforce	*Core business*		
					Very limited marketplace	*Non-Segregated*		
					Labour relations - CO/JFL			
5	Unscheduled - Breakdown/Repairs (Re&Re)	LOWER	NEUTRAL	SIGNIFICANAT	HIGH	HIGH	INFERIOR	Assume work conducted at CT facility
					Skilled workforce	*Core business*		
					Very limited marketplace	*Non-Segregated*		
					Labour relations - CO/JFL			
6	Part Supply and Inventory Management	HIGHER	GOOD	SIGNIFICANAT	MEDIUM	VARIABLE	IMPROVED	Assume work conducted at CT facility
			Guarantees		*Very limited marketplace*			

B5. Recommendations / Next Steps

The objective of the industry scan was to gain an understanding of transit bus and rail fleet maintenance organization models to identity standard practices, trends and issues in maintenance service delivery models, and to recommend on the feasibility of the different models and their application in Calgary.

Our work identified that there are basically three types of vehicle maintenance organizations models used to deliver core services, with variations on each theme across the industry. The three primary models used are;

- Self-Perform Vehicle Maintenance Model
- Strategic / Shared Contract-out Vehicle Model (Calgary Transit)
- Contracted-out Vehicle Maintenance Model

While most transit agencies within Canada and the US have “evolved” organization models, as opposed to purposely built, the largest percentage of the agencies scanned tended towards the strategic / shared contract-out vehicle model based largely on cost, quality of service and organizational risk.

Few agencies are taking advantage of, or considering the future use of any alternate service delivery methods beyond contracting-out and or a shared services model within the vehicle maintenance context again in consideration of cost, quality and risk. We looked specially at two forms of ASD namely the consolidation of all vehicle maintenance within a municipality under a single authority, and the use of vehicle leasing and maintenance contracts as a means of reducing vehicle mainteance and ownership costs. In both instances our review indicated that neither method was used as a best practice within the industry largely supported by the lack of evidence of an apparent cost advantage.

We do not feel that an organization change is required for the vehicle maintenance group inside Calgary Transit as a means to improve effectiveness or efficiency. The industry scan results to date show that Calgary Transit is on the right path and consistent with its industry peers in terms of vehicle maintenance organization models and delivery methods. It is recommended that Calgary Transit pursue a more aggressive approach to ASD / Contracting-out opportunities for other vehicle maintenance activities consistent with the current areas of the ZBR review.

APPENDIX C – RAIL COMMUNICATIONS BENCHMARKING

Transit Questionnaire – Rail Communications

Rail Communications

1. What is the functional scope of assets under management? (rail communications, signals, power distribution, track, ancillary structures such as bridges, tunnels, and retaining walls)
2. What are some of the key industry trends with respect to the management of safety critical systems?
3. Are the rail communications service(s) provided in-house our outsourced?
4. What key risks were identified for either self-performing the rail communications services or outsourcing them?
5. What were the primary outcomes and results?

Derrick Cheung	VP – Strategic Sourcing & Real Estate - TransLink	Derrick.cheung@translink.ca
Scope	Advance Train Control - Thales SelTrac System	Engineering, asset mgmt. & SOGR maintenance completed by TransLink. Major upgrades / system changes outsourced to OEM- Thales
	Traction Power System - including power rail and cabling	Engineering, asset mgmt. & SOGR maintenance completed by TransLink. Step changes, upgrades contracted to external contractor
	Data Comms. & SCADA including Fiber backbone and PABX's	Engineering, asset mgmt. & SOGR maintenance completed by TransLink. Step changes, upgrades contracted to external contractor
	Fire & Life Safety Systems	Engineering, asset mgmt. & SOGR maintenance completed by TransLink. Step changes, upgrades contracted to external contractor
	Intrusion Monitoring & CCTV, Security Systems, PA's.	Engineering, asset mgmt. & SOGR maintenance completed by TransLink. Step changes, upgrades contracted to external contractor
	Tunnel Ventilation Systems	Engineering, asset mgmt. & SOGR maintenance completed by TransLink. Step changes, upgrades contracted to external contractor

Industry trends	• Trying to find balance between state of good repair maintenance and system expansion • Segmented approach to maintenance given funding and human resource constraints. • Greater reliance on contracted resources for system upgrades and major construction work. • Proprietary Systems - System changes / major upgrades contracted back to OEM to mitigate safety / mission critical risks. • Availability challenges within marketplace for competent, reliable contractors – scare resource • Availability and recruitment challenges for engineering and maintenance staff – scare resources leading to HR constraints • Lack of system wide asset management system – poor planning	
Key Risks Considered for in-house vs. outsourcing	• Comprehensive, integrated risk management / assessment system in place – adding value. • Marketplace - maintaining healthy tension between internal & external - maintain a balance based on market forces • Focus on reliability and safety • Response time for outages	
Pros and Cons from current approach	**Pros** • Healthy tension between internal vs. external • Generally satisfied with quality and results of contracted work • Good reliability and safety (not able to quantify benefits)	**Cons** • Too reliant on contractors in present state – needing to address internal vs. external resources • Growth trend in use of contractors due to system expansion.

Dan Lawrysyn	Director, E&M	780-496-5920
Scope	Radio, backbone – fiber, servers	ETS E&M mgmt., outsourced maintenance
	Signals	ETS E&M mgmt., outsourced maintenance (EPCOR) Design and changes to signalling systems is done in house
	Track & Power	ETS E&M mgmt., outsourced maintenance (EPCOR) OCS tear-downs, line inspections But in-house engineering makes the call and controls the budget
	Ancillary	ETS – in house and E&M predominantly 'identifiers' – use City of Edm shared services who in turn may use consultants ETS PM the work and bring in outside consultants for design of the track Staff size limits Technical expertise (esp. bridges) – City has senior engineers for bridges and sometimes uses outside consultants

Industry trends	• Escalators – bring in maintenance staff in house or outsource?
	• Industry getting large enough to bring maintainers in house – need to be a specific size
	• Key concerns:
	  ○ Staff retention in transit across the board – E&M in particular
	  ○ Track and Power engineers are like gold and like having them in house
	• Resiliency	

Key Risks Considered for in-house vs. outsourcing	• Historical agreement reasons for EPCOR doing part of the work.
	• Original agreement before EPCOR became a stand-alone entity – they ported the legacy work with them.
	• ETS currently evaluating if they want to bring in house because of cost
	  ○ Costs are up and down
	  ○ EPCOR staff changes, which introduces 'green guys'
	• Need a critical mass (volume) before can make the case to bring in house
	• Recent improvement in service for EPCOR	

Pros and Cons from current approach	**Pros** • No capital costs of bringing equipment online • If budgets reduced, have flexibility to defer maintenance and/or downsize staff, but once get to a critical size then staff are always doing something	**Cons** • Lose control over how work accomplished • High cost – drive tougher budget choices (eg: not able to meet full implementation of whatever project) • Difficulty controlling EPCOR staffing (knowledge management, green crews) • EPCOR required to meet standards – but if not met, ETS is the public face

- E&M management oversight
  - Defines the planned maintenance program
  - Standing agreement with EPCOR to complete the work

Rahat Khandakar	Sr. Communications Systems Engineer	7804963501
Scope	CCTV	Back-end: Genetek (local deal in Edm) Field: various contractors / vendors for hardware and maintenance
	Building management systems	ESC Automation (local) (Delta Equipment – Vancouver-based)
	Network Systems	IBM (hardware) – in-house troubleshooting
	Telephone systems	Telus
	Radio systems	EDAC Systems – provided by Harris (Whyte Communications)
	Login recording	
	Access Cards	Managed by City of Edm corporate security
Industry trends	• Smartfare systems – RFP in progress • SmartBus system – complete pilot project (technology for the location and tracking of buses) • Upgrading the radio system (EFRAC radio system comparable to CT?)	
Key Risks Considered for in-house vs. outsourcing	• Assess the technical resources in-house – not too many available for these types of systems • Look at the value provided for the services – focus on reliability and safety • 24/7 support (no staff in house to provide this service) • Response time for outages	
Pros and Cons from current approach	**Pros** • 24/7 support and 4-hour response time • Good reliability and safety (not able to quantify benefits)	**Cons** • Higher direct costs tied to external contractors (cheaper to do it in-house) • Overhead time spend managing contractor relationships • Less direct control over the work but contractors still need to adhere to internal standards

Jim Teeple	Former Deputy Chief Operating Officer	289.926.0566
Scope	Signals & Train Control	Engineering, asset mgmt. SOGR and major maintenance completed by TTC. Technical support provided by OEM's where applicable (software).
	Power Distribution & Traction Power System	Engineering, asset mgmt. SOGR and major maintenance completed by TTC.
	Data & Voice Communication Systems including SCADA, Fiber backbone and emergency trips	Engineering, asset mgmt. SOGR and major maintenance completed by TTC.
	Fire & Life Safety Systems	Engineering, asset mgmt. SOGR and major maintenance completed by TTC.
	Intrusion Monitoring & CCTV, Security Systems, PA's.	Engineering, asset mgmt. SOGR and major maintenance completed by TTC.
	Tunnel Ventilation Systems	Engineering, asset mgmt. SOGR and major maintenance completed by TTC.
Industry trends	• TTC self-performs all engineering, asset management, and maintenance and construction activities associated with safety or mission critical systems / facilities. • Obtains technical & engineering support from OEM's on major system changes (software). • Mature, comprehensive internal training and apprenticeship programs for skilled trades to maintain competency. • Availability and recruitment challenges for technical, engineering and supervisory staff – scare resources leading to HR constraints • Availability challenges within marketplace for competent, reliable contractors – scare resource.	
Key Risks Considered for in-house vs. outsourcing	• Reputational risk from service failure. • Safety, availability and reliability of mission critical systems • Difficult marketplace availability for competent contractors for mission critical systems. Historical quality challenges.	
Pros and Cons from current approach	**Pros** • Control over all system elements. Single point accountability • Excellent response and repair times (availability) • Good reliability and safety (not able to quantify benefits)	**Cons** • Increasingly difficult internal resource balance between SOGR / system expansion. • Higher costs for [redacted] likely not competitive with external marketplace.

APPENDIX D – POTENTIAL TRANSIT REVENUE OPPORTUNITIES

Peak/Off Peak Fares

The introduction of Peak and Off Peak fares provides an opportunity to shift demand on the system (which may also help to address overcrowding) and introduce a fare premium for peak hour travel. There are two ways in which this policy is implemented; either the peak price is inflated to discourage travel during peak hours or the off-peak price is decreased to encourage new customers during off-peak hours.

Toronto's TTC has recently considered the introduction of Peak/Off Peak fares to manage peak period demand and overcrowding. The current proposal (Dec 2015), subject to detailed modeling, includes a peak period increase of 5, 15 or 25 cents and a 5 cent decrease in off-peak fares. Vancouver has had a Peak/Off Peak fare structure in place since 1986 and numerous systems in the US and Europe offer Peak/Off Peak fares. The Peak fare premium in Vancouver varies from 45% to 100% depending on the distance travelled in Peak periods.

Principle 4 of the City's User Fees and Subsidies Policy[14] provides precedent to consider the adoption of peak/off peak fares

- *Principle 4 - Allocation of Resources Principle: in an environment with limited resources available and increasing public demand for goods and services, user fees have value as a mechanism for allocating scarce resources.*

Charging a fee can also be used to manage the timing of demand for a service. Many goods offered by The City have higher demand during peak periods. Building capacity to meet peak demand implies there is under-utilized capacity during the off-peak periods. Implementing price differentials can help to balance the demand for goods between peak and off-peak periods. Charging higher prices during peak periods can encourage people to consume during off-peak times while generating greater efficiency in the use of infrastructure.

Zone Fares for CTrain

Recent developments in Vancouver may have created precedent for a new fare structure in Calgary; that being the introduction of a third fare zone on CTrain only. This is also a form of premium pricing for the more rapid CTrain while maintaining core pricing for bus services. Vancouver has adopted a one-zone fare for all bus travel while maintaining zone fares on rail services. An equitable distance based formula could be evaluated that splits each of the C Train lines as follows: zone one is the existing free zone; zone two would extend some distance along each line, and the third zone would extend to the terminus station. Data collection, modelling and public consultation would be required to assess the feasibility and revenue impact of such a strategy.

Further fare revenues might be possible with the adoption of a nominal fare for the 7th Avenue free fare zone. Anecdotal evidence suggests that most customers who use the free fare zone are already monthly

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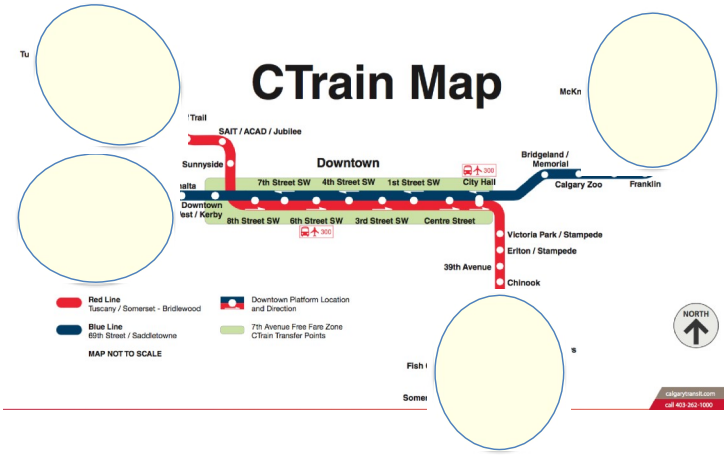
pass holders and tourists and casual customers make up the balance. There is a need for improved ridership data to support the analysis of this potential opportunity.

Figure 6.6 - CTrain Zone Fare Conceptual Illustration



Concept: Some equivalent number of stations a defined distance from CBD become the 3rd zone at the end of each leg

Premium Service & Fares

Both Toronto and Ottawa collect a premium for express services. The premium surcharge is 100% for all fare types in Toronto, and 41% for adults and students and 85% for seniors in Ottawa. While not entirely similar, the West Coast Express Commuter Rail system in Vancouver and Go Transit in the Greater Toronto and Hamilton Area have had premium fare structures in place since start up.

Table 6.9 - Premium Fare Structures: Benchmarking

	Regular	Express	Premium surcharge
Toronto			
Adult	**$3.25**	**$6.50**	**100%**
Student	**$2.00**	**$4.00**	**100%**
Senior	**$2.00**	**$4.00**	**100%**

	Regular	Express	Premium surcharge
Ottawa			
Adult	**$3.55**	**$5.00**	**41%**
Student	**$3.55**	**$5.00**	**41%**
Senior	**$2.70**	**$5.00**	**85%**

Toronto TTC operates five downtown express service routes. The TTC offers a Downtown Express $41.50 'top-up Express Sticker for monthly bus pass holders for these five routes. Ottawa OCTranspo Green express routes require premium fare and provide direct, quick trips from suburban communities to downtown and back, during rush hour. Seniors are exempt from the Premium 'top up' when traveling on a monthly pass.

Further analysis by CT Planning is required to identify markets for express service, the capital and operating costs of the service and premium fares to ensure a zero impact or net increase in R/C ratio.

U-Pass benefit-cost terms and conditions

Benchmarking shows the Calgary U-Pass has the lowest price of all benchmark transit systems. Internal City analysis (2013 data) indicates UPass rider average fares are approximately $1.00 lower that the system-wide average ($1.61, 2013 data). This deep discount warrants investigation. Data collection and analysis by CT Planning is required to determine if the original 'revenue-neutral' principle of the U-Pass program is still valid and to determine the cost of additional service to handle growth in transit use by U-Pass users. This research can be conducted to support the U-Pass renewal agreement, effective 2019.