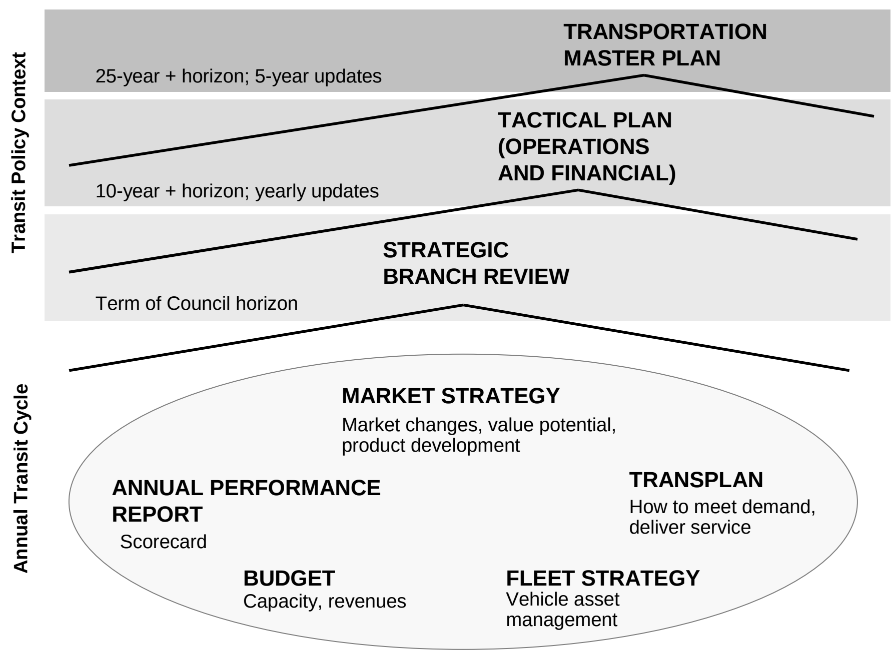
CITY OF OTTAWA TRANSIT SERVICES
2009 TACTICAL PLAN
FOR TRANSIT OPERATIONS AND FINANCES

INTRODUCTION

Positioning the Tactical Plan

As shown in Figure 1, the Transportation Master Plan (TMP) sets out a long-term vision and goals for transit in the City of Ottawa, while the Strategic Branch Review of Transit Services establishes a shorter-term accountability framework to Council on delivery standards. The Tactical Plan is designed to fill a critical gap over the medium term. Together, these three reference documents provide the policy context for what constitutes a cycle of transit business components recurring every year.

Figure 1 – Positioning the Transit Tactical Plan



Objective and Content of the Tactical Plan

The objective of the Tactical Plan is to provide a direction for both service delivery (Operations aspect of the Plan) and capital asset management (Financial aspect of the Plan) over the next decade. The Tactical Plan explores an alternative service delivery model for Transit Services. This is based upon a comprehensive understanding of transit planning essentials, a rigourous examination of travel demand over time, an analysis of variations in our policy standards and their financial and ridership consequences. The Tactical Plan also sets the course for the management of our capital assets in the future.

Inter-Provincial Transit

As part of the work involved in the development of the Transportation Master Plan, a panel of international experts urged us to think of transit in our region as one truly regional transit system. Accordingly, inter-provincial trips and services have been included throughout the analysis process supporting the Tactical Plan. Like any other travellers, transit users readily cross both provincial and municipal boundaries, as well as transit agencies' service areas.

The Context Set by Rapid Transit Network Plans

When Council approved the TMP update in November 2008, it gave the go-ahead to the Rail Implementation Project, focussed over the next decade on the conversion of the Transitway to a core rail line between Blair Station and Tunney's Pasture Station via a tunnel in downtown Ottawa. Meanwhile, the Société de transport de l'Outaouais (STO) is leading the implementation of the Rapibus, a Bus Rapid Transit (BRT) infrastructure to run between the Northeast of Gatineau and its downtown.

An Alternative Service Delivery Model for the 10-Year Horizon

The Tactical Plan explores an Alternative Service Delivery Model for Transit Services. The development of this alternative service delivery model has involved the creation of multiple scenarios for a horizon of 10 years and their comparison with each other. These scenarios reflect future travel demand about the years 2019-2021 and are anchored upon the key element of the rapid transit network expansion context described above, namely the core rail line between Blair and Tunney's Pasture, as well as the Rapibus between Gatineau and Bayview. Existing conditions analyzed as part of this report reflect the 2005-level travel demand applied to the 2008 network of bus routes.

TRANSIT PLANNING ESSENTIALS

Analytical Foundation for the Plan

The Tactical Plan results from the analysis of three key areas, reported in each of the main sections further below: travel demand, policy standards and alternative service delivery models. But first, transit planning essentials relating to transit network configurations need to be discussed. They have guided this analysis, as well as the interpretation of customer survey results.

Transit Network Configurations

Irrespective of the transit mode or modes used, the configuration of a transit network features different types of lines and different types of operation. Transit lines may be regrouped under the following main types:

1. Radial lines: directly linking neighbourhoods or suburbs with downtown (whether as regular or express services);
2. Circulators: short-haul local lines that are configured in a circular pattern; and
3. Cross-town lines: linking other lines and/or neighbourhoods without serving downtown.

Radial lines that merge together along a trunk – the common section closer to downtown – operate as branches of that trunk (Figure 4). Local lines that serve neighbourhoods or suburbs and terminate at or go by a station of a higher-service trunk line operate as feeders to that trunk (Figure 5).

Figure 4 – Trunk Line with Branches (Fewer Transfers)

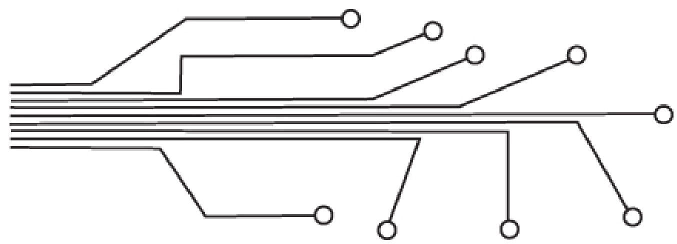
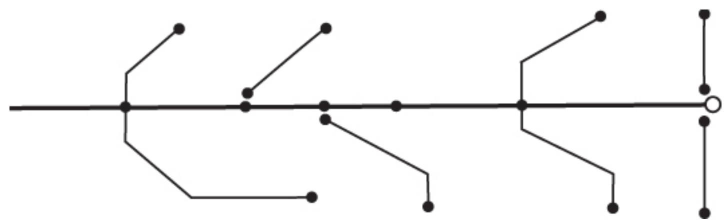


Figure 5 – Trunk Line with Feeders (More Transfers)



Original Trunk-and-Branches Bus Operation on the Transitway

Since its opening, the Transitway has been operated as a trunk with branches. The characteristics of the bus mode, the design of the Transitway itself and the level of travel demand have been conducive to that operating choice, which has translated in an approach aimed at minimizing transfers for transit users. Buses are very flexible for operation in any level of segregation, from mixed traffic to fully exclusive right-of-way such as the Transitway. Long platforms and passing lanes at every Transitway station preserve and enhance this flexibility. As long as the overall transit demand on the trunk (the Transitway here) is lower than capacity, it remains possible to merge buses from multiple branches with varying levels of demand and to make adjustments as necessary.

Customers' Disposition for a Shift to Trunk-and-Feeders Bus Operation

As the frequency of buses along the downtown corridor of Albert and Slater Streets approaches capacity, however, average operating speed is reduced and the reliability of service toward each branch is impacted. In practice, transit users are then exposed to the uncertainty of delays and the discomfort of congestion, leading them to trade off their preferred, direct service for an earlier-arriving service with a transfer. Recent customer surveys suggest this trade-off between transferring and service quality. Having faced long waiting times and high congestion on certain routes during service resumption following the labour strike, respondents' likelihood of using transit more did not seem to depend as much on direct service or short access distance as it did before the strike. The results of both focus groups and customer surveys over the past 2 years consistently link customers' resistance to transfers with a concern about long waiting times between buses.

Managing Transfers

The most celebrated transit systems in the world manage transfers successfully. Customers transferring to a high-frequency line will not experience a long wait for the next service. The waiting time associated with transferring between two low-frequency lines may be minimized through appropriate bus schedule development (timed transfers). The most challenging situation occurs when customers transfer from a high-frequency line to a low-frequency line, e.g. from a trunk to a feeder. The best strategy then would be to consider maintaining as high a frequency of service as possible on the feeder line, given the passenger volumes to carry.

Table 1 – Transferring Situations

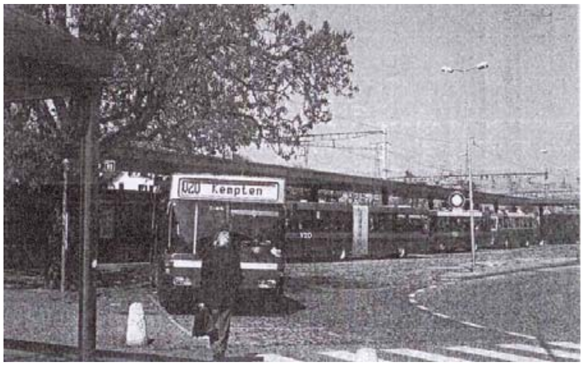
To / From	High Frequency	Low Frequency
High Frequency	√	**?**
Low Frequency	√	√

Managing Transfer Points

Given any of the transferring situations described above, the design of the transfer points themselves should focus on minimizing walk time between transit services (Figures 6 and 7) and, where suitable, provide amenities to turn transfers into opportunities for customers. Large systems such as London or Sydney have retail outlets such as convenience stores, flower shops and dry cleaners right onto the platform of limited-size stations in the suburbs.

Figure 6 – Across-the-platform inter-modal transfer in Cologne

Figure 7 – Minimized distance between rail and bus services in Zurich.



Merits of Trunk-and-Feeders Bus Operation for Capacity
Before 2004, a maximum number of routes branched onto the Transitway and a maximum number of buses operated along its downtown section. The facility could be observed to fail regularly – that is, buses would be backed up and the volumes carried passed any particular point at such times would fall well below capacity. Operating a limited number of very high-frequency trunk routes on the Transitway could reduce pressure on the capacity of curb stops downtown by improving the boarding flow of passengers arriving at the stops. Trunk-only services would lead to better capacity utilization, by improving the distribution of passenger loads on buses and by avoiding the issue of different branches – and the buses that serve them – catering to different volumes of demand.

Merits of Trunk-and-Feeders Bus Operation for Reliability
By improving the boarding flow of passengers at curb stops along the downtown section of the Transitway, trunk-and-feeders operation could reduce delays on the Transitway. Buses serving trunk routes and buses serving feeder routes would mostly operate independently from each other, on and off the Transitway respectively. Like firewalls, separating the operation in this fashion would protect each type of service from issues experienced on the other, be they delays, breakdowns, accidents, etc. The result would be increased on-time performance and increased reliability of scheduled transfers at Transitway stations. Where Transit Services has introduced this model of higher-frequency local feeders off the Transitway (Elmvale, St. Laurent, Smyth-Hospital corridor), service reliability and ridership have improved.

Merits of Trunk-and-Feeders Bus Operation for Operating Cost
Through improvements in bus capacity utilization on the Transitway and increased on-time performance, buses would be made more productive. As a result, the total number of buses required to serve on the Transitway could be less than that operated with a trunk-and-branches structure. Feeder routes would replace local routes and the duplicating portion of longer express branches, and because of their short length, offering higher frequency of service could be more affordable. This would help address transferring from high-frequency trunk services to lower-frequency feeder services.

The Alternative Service Delivery Model: Integrating Inter-Modality

The introduction of a new mode in a transit system is an opportunity to review its network configuration. Other cities have gone through this experience and turned what had become a complex trunk-and-branches network into a simpler trunk-and-feeders network. Vancouver, Seattle and Sacramento significantly reduced the number of distinct routes they operated through such a process. From the discussion in this main section of the report, the alternative service delivery model favoured for the City of Ottawa Transit Services is one featuring a trunk with feeders, supplemented by a system of cross-town routes approaching a grid structure. The resulting transit network reflects both the continuum of transit modes – from lower capacity and operating speed to higher capacity and operating speed – and the hierarchy of service types. In so doing, it preserves high area coverage, offers superior connectivity and achieves increased efficiency, including improved occupancy. These characteristics of this model will be demonstrated further below.

TRAVEL DEMAND, TODAY AND IN THE FUTURE

Background

Understanding future travel demand is a fundamental requirement upon which to base an operations and financial plan. Good travel demand forecasting requires comprehensive travel demand data and rigourous modelling tools. The City of Ottawa enjoys both. The 2005 Origin-Destination (O-D) Survey has been referred to as the Census of transportation as it represents the most crucial source of information on travel patterns. The TRANS regional travel demand forecasting model went through an in-depth overhaul in 2007 on the strength of the O-D Survey. Both have actually received enthusiastic accolades from the national and international transportation planning community. The calibration of the travel demand model was further fine-tuned as part of the work involved in developing this Transit Tactical Plan (Appendix for details).

What Does a Regional Travel Demand Forecasting Model Do?

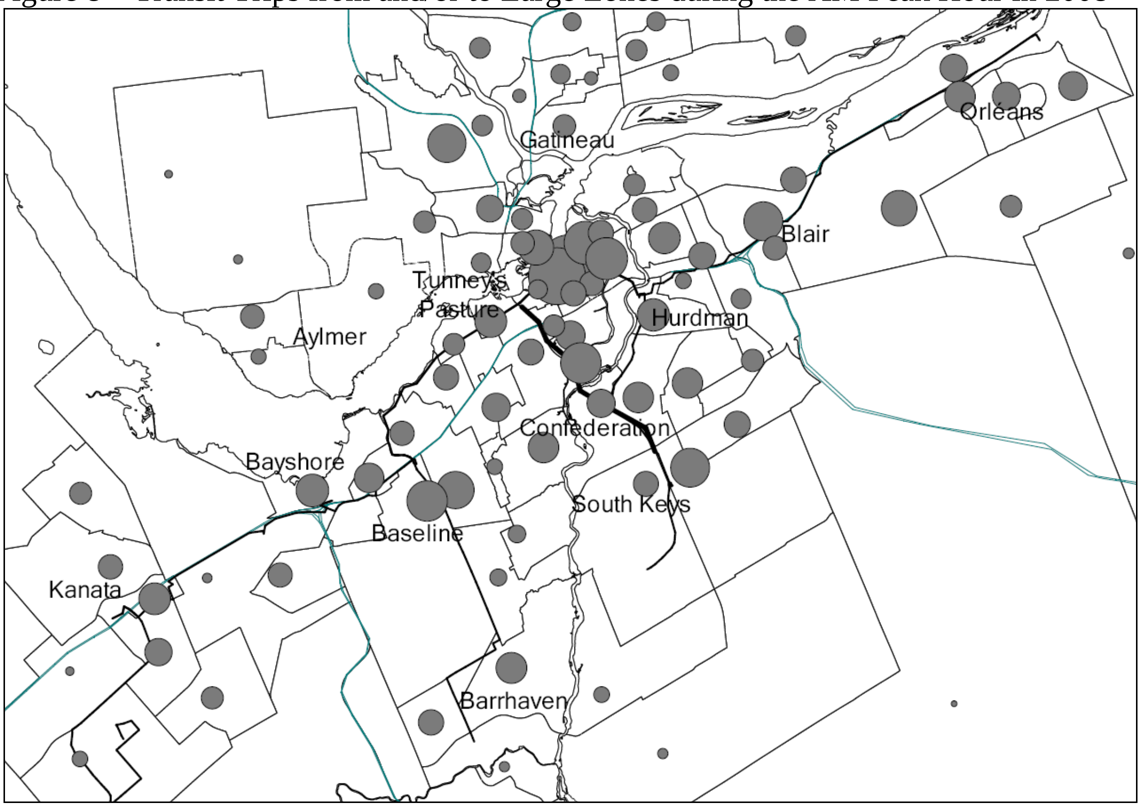
The travel demand model simulates the person trips made by all modes in the National Capital Region during the morning peak, both today and in the future. The driving input of the state-of-the-art model is based on the population forecasts prepared by staff and approved by Council. The model reflects important factors that determine trip-making patterns such as the evolution in the make-up of households (including the aging of population) and the availability of cars to household members, the growth in and distribution of employment by type, how individuals sometimes organize their trips in sequences, the deterrent effect of traffic congestion on use of the car and the relative attractiveness of the Transitway as a fast and reliable infrastructure, etc.

Where Transit Trips Are Produced from and Attracted to

The travel demand forecasting model helps understand where transit trips are generated from and where they go to. Figure 8 shows the focal areas where transit trips either start or end. Some of the major focal points outside of the Inner Urban Area (that area between the Ottawa River, the Rideau River and the O-Train corridor) include:

- Carleton /St. Paul's
- Blair/Ogilvie
- Longfields/Davidson Heights
- Centrepointe and Algonquin
- South Keys/Bank/Conroy
- Tunney's/Westboro/Hintonburg
- Blackburn/Chapel Hill/Orléans Village
- Riverside/Hospital
- Bayshore/Lincoln Heights
- etc.

Figure 8 – Transit Trips from and/or to Large Zones during the AM Peak Hour in 2008



<u>Where Growth in Transit Trips Will Occur</u>

Figure 9 shows that downtown Ottawa will continue to be a strong magnet of transit trips over the years. The Inner Urban Area will attract over 42% of all morning peak transit trips by 2019. Figure 9 also shows how the growth at focal areas where transit trips either start or end will be unevenly distributed across the region. Of 92 large zones dividing up the region, the top 12 listed in Table 2 will produce 30% of the transit trips to take place in 2019 during the morning peak hour. The bottom 51% of those large zones will produce only 25% of all transit trips. Looking at trip destinations, the top 11 large zones will attract 49% of the transit trips to take place during the morning peak hour. The bottom 64% will attract only 25% of the transit trips.

Figure 9 – Transit Trips from and/or to Large Zones during the AM Peak Hour by 2019

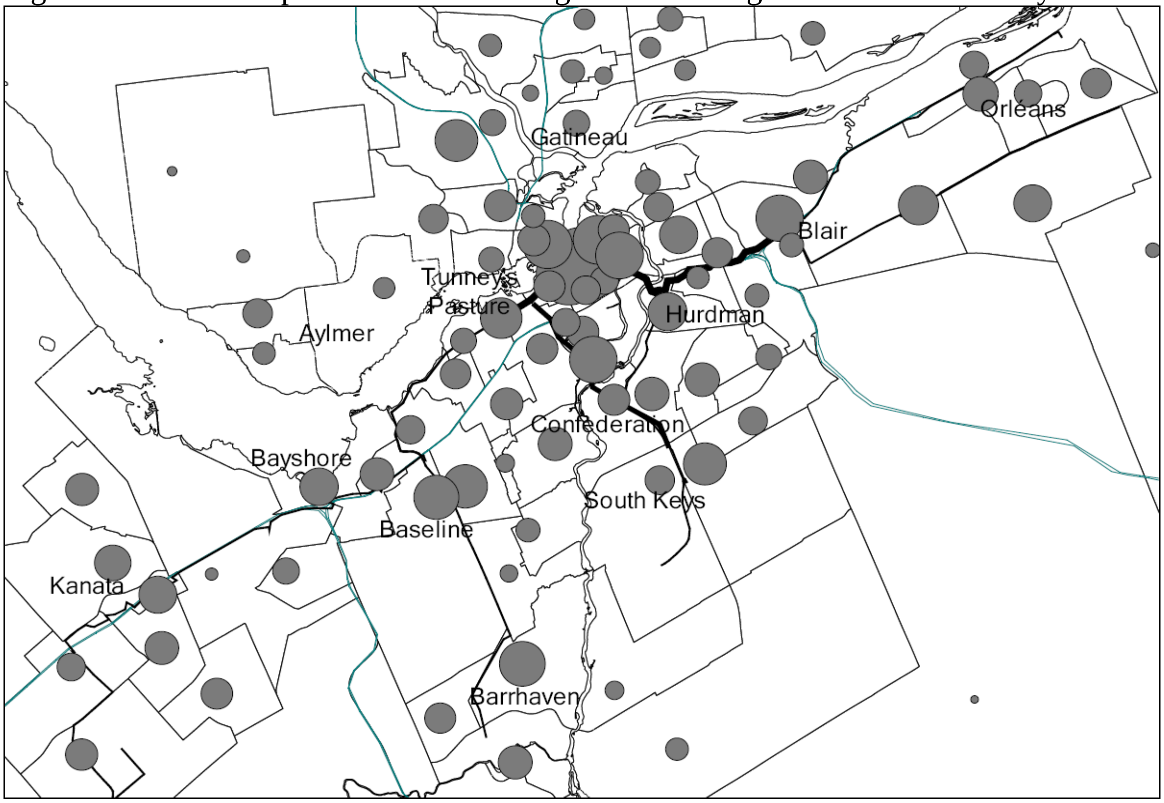


Table 2 – Major Focal Areas for Transit by 2019

Large Zone	Transit Trips Produced There during AM Peak Hour by 2019	Growth from 2008 to 2019
Longfields / Davidson Heights	2,096	112%
South Keys / Bank / Conroy / Blossom	1,954	17%
Centrepointe / Ben Franklin	1,738	15%
Blackburn / Chapel Hill / Orléans Village	1,513	17%
Kanata Town Centre	1,463	68%
Lincoln Heights / Bayshore	1,357	30%
Chapel Hill / Orléans South	1,286	150%
Orléans Town Centre / Convent Glen	1,187	20%
Mont-Bleu / Parc de la Montagne	1,148	16%
Kanata Lakes / Beaverbrook	1,020	121%
Kanata South Business Pk / Bridlewood	1,019	79%
Vanier / McArthur / Overbrook	1,015	41%
Large Zone	**Transit Trips Attracted There during AM Peak Hour by 2019**	**Growth from 2008 to 2019**
Sparks Street / Esplanade	6,659	28%
Sparks Street West / Minto	4,786	26%
Hôtel de Ville / du Musée (Gatineau)	2,683	93%
Lowertown / Byward Market	2,608	27%
U Ottawa / Sandy Hill	1,995	27%

Carleton / St. Paul's	1,955	32%
Blair / Ogilvie / Bathgate	1,651	49%
Parliament / City Hall	1,547	-7%
Algonquin / Crestview	1,428	33%
Tunney's / Westboro / Hintonburg	1,342	73%
Hurdman / Riverside/ Hospital	1,048	52%

Radial Transit Trips vs. Self-Containment

While radial transit trips from the suburbs to downtown Ottawa will remain predominant, the Official Plan aims at increasing the self-containment of urban communities outside the Greenbelt for working, living and playing. This should indeed take place, but to various degrees, as shown in Table 3. For instance, Kanata already has the largest proportion of transit trips produced locally that also have the local area as their destination, and this is expected to increase even more.

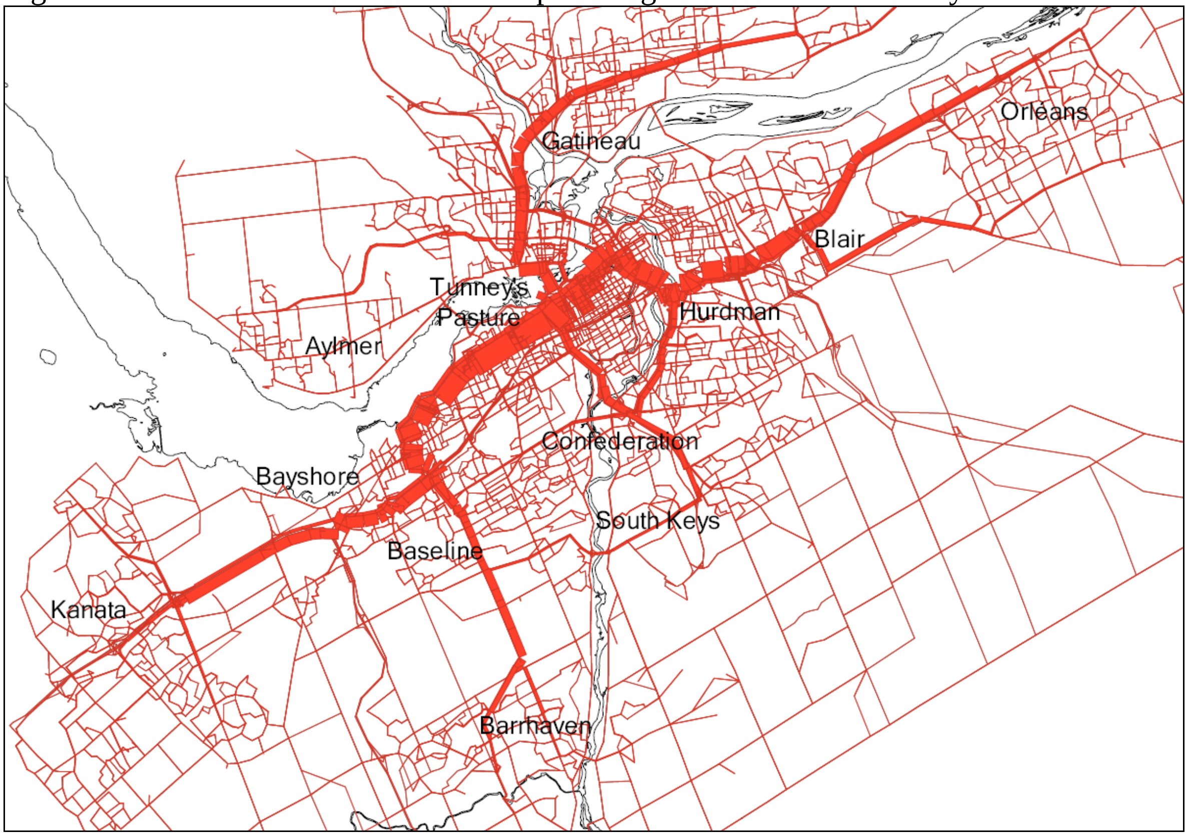
Table 3 – Morning Transit Trips within, from and to Outside-Greenbelt Communities

		% of trips going there that also start there	% of trips coming from there that also go there	Volume of trips coming from there that go elsewhere
Orléans	2008	68%	33%	33,000
	2019	66%	38%	34,000
Barrhaven	2008	59%	28%	18,000
	2019	58%	36%	26,500
Kanata	2008	54%	44%	22,000
	2019	59%	50%	30,000

The Way Transit Trips Would Take if They Could

Figure 10 is the result of an exercise in which the transit trips predicted to be made by 2019 were allowed to take any road or Transitway segment they'd "like", subject to car traffic, in order to minimize transit travel time. The merit of such an exercise is to identify corridors of transit travel with the most potential, unbiased by the types and levels of transit service contemplated. The planned core rail line is noticeable as a "natural" choice, with the predominant use of its corridor by transit trips. The Highway 417 corridor in the west, the A-50 corridor in Gatineau and the Highway 174 corridor in the east also stand out. The O-Train and southeast Transitway corridors are of similar appeal. Also of note is the convenience of some arterials: Innes Road, Baseline-Heron Roads and Hunt Club Road in particular. What the results suggest is that these are the corridors the transit system should focus on and serve with frequent and high-quality service.

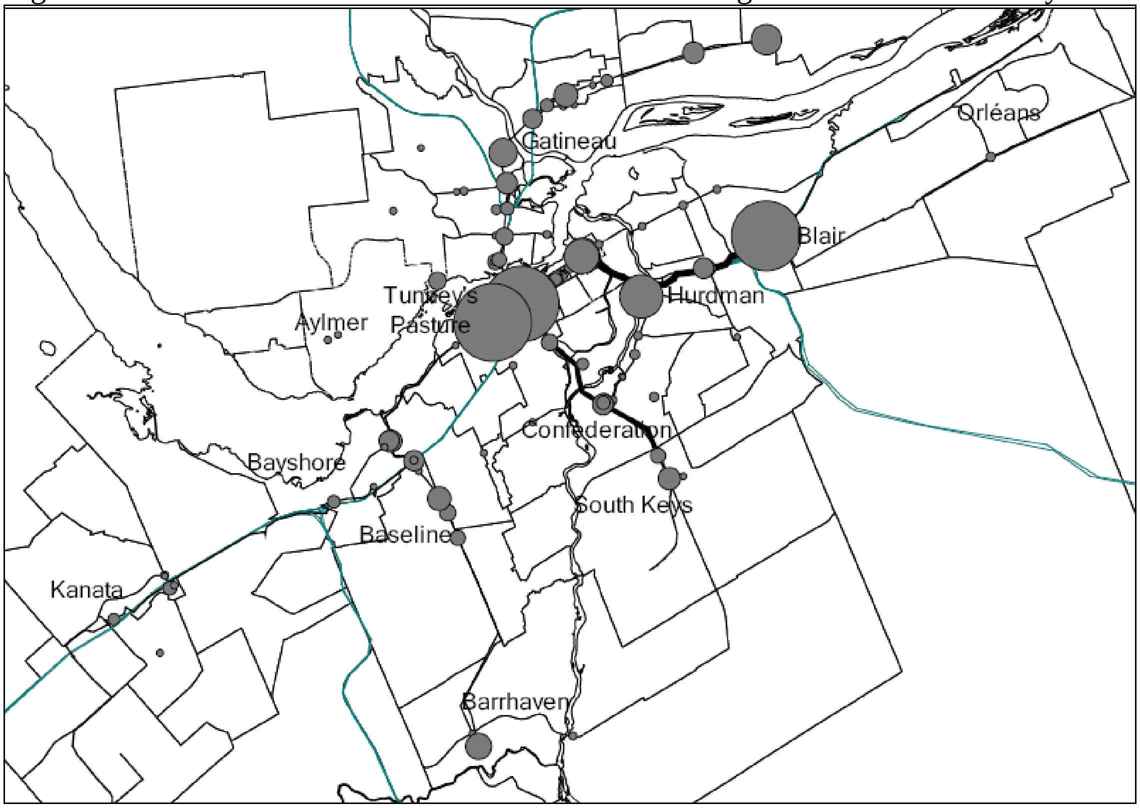
Figure 10 – Preferred Paths of Transit Trips during the AM Peak Period by 2019



Transit Transfer Points

Figure 11 shows where transfers are predicted to take place over the transit system by 2019. Blair and Tunney's Pasture dominate as ends of the core rail line in that year. Bayview (with trips from Gatineau) and Hurdman are also major transfer points, as is Rideau Centre.

Figure 11 – Transfer Points on the Transit Network during the AM Peak Period by 2019



Inter-Provincial Travel

Figures 13 and 14 are the result of that same exercise described above in which transit trips were allowed to take any road they'd "like", subject to car traffic, in order to minimize transit travel time. The two figures single out inter-provincial transit trips predicted to be made by 2019. The figures show that inter-provincial transit trips from both sides of the Ottawa River favour the Chaudières and Portage pair of bridges as a "natural" choice. The Ottawa catchment of morning trips going to Gatineau is quite broad, whereas the Gatineau catchment of morning trips going to Ottawa is much concentrated on the Rapibus corridor. It must be borne in mind that this is independent of any level of transit service contemplated. What these results suggest is that this is the general area of crossing the Ottawa River that the transit system should focus on with high-quality service. Focus on this area can channel the broad northbound traffic of Ottawa residents working in Gatineau and provide capacity to serve Gatineau residents accessing the employment nodes of both the Ottawa CBD and Tunney's Pasture.

Figure 13 – Preferred Paths of Morning Transit Trips from Ottawa to Gatineau by 2019

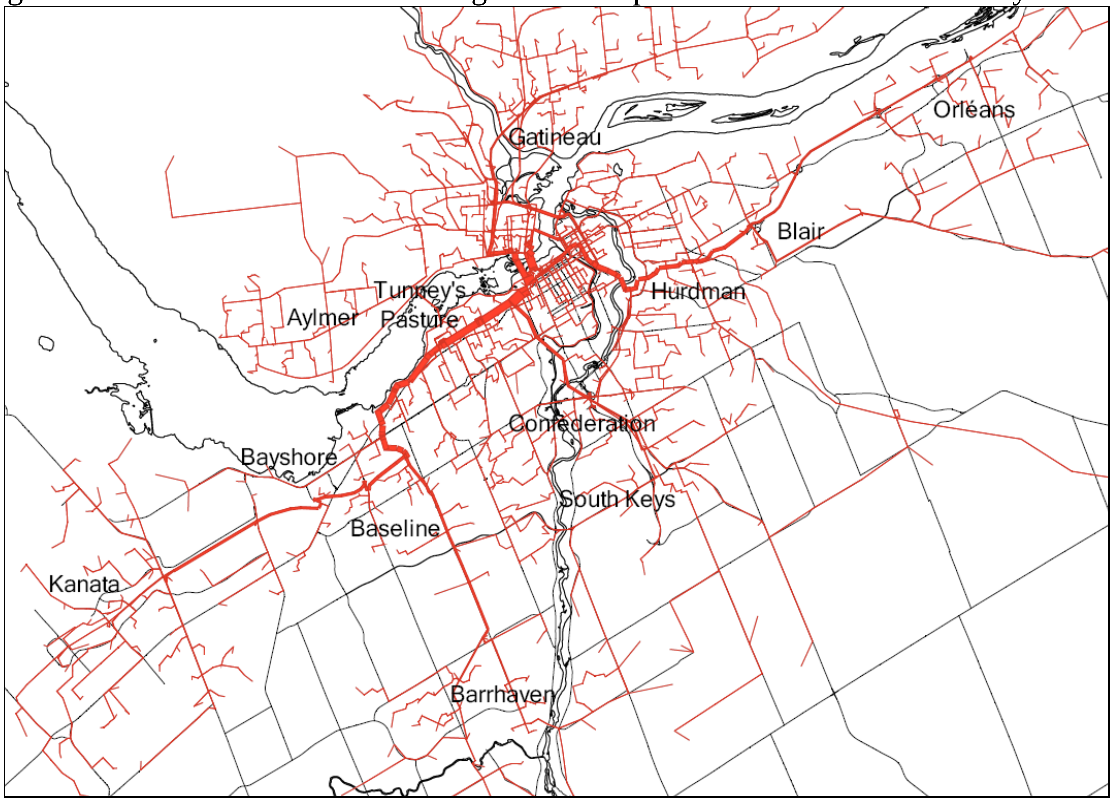
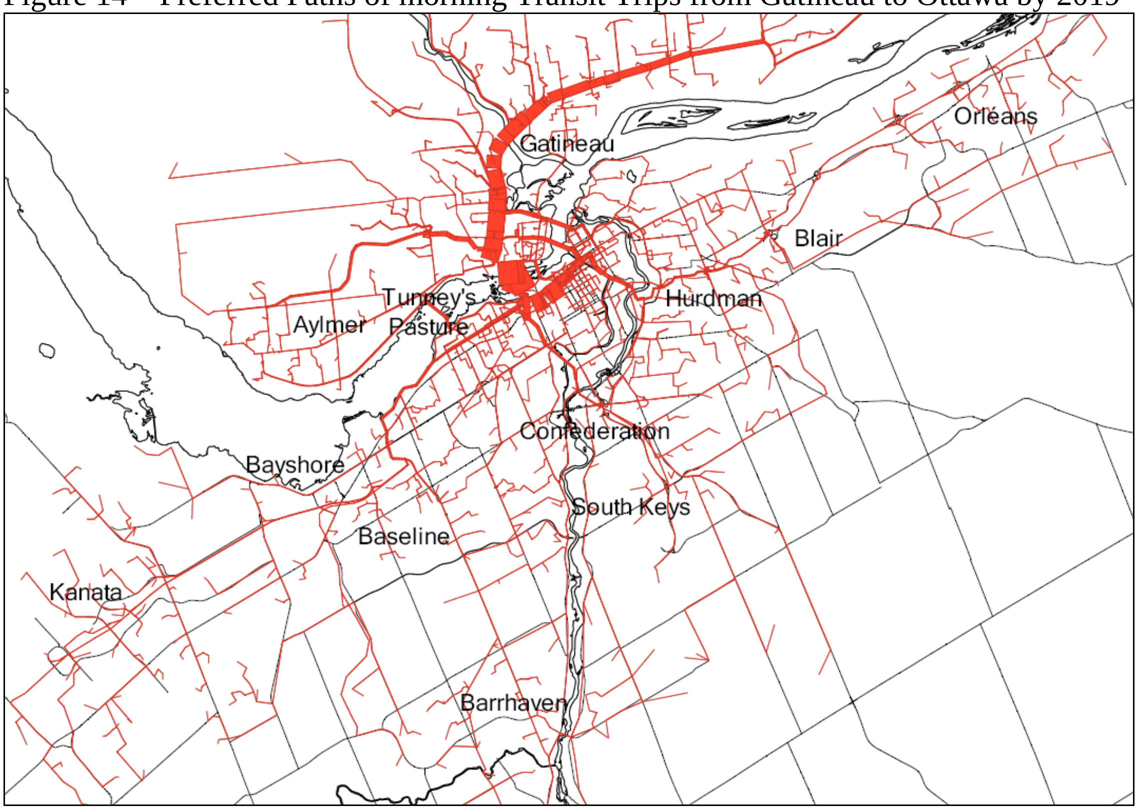


Figure 14 – Preferred Paths of morning Transit Trips from Gatineau to Ottawa by 2019



POLICY STANDARDS: WHAT THEY MEAN

Background

Through the Strategic Branch Review of Transit Services, Council "contracted" with Transit Services for the delivery of services according to 11 standards which form a policy framework within which Transit Services is to manage the services it provides. This is shown, conceptually, in Figure 15. Different values for Area Coverage and Occupancy are compared to their standards below, along with the implications for ridership and cost.

Figure 15 – Policy Standards as Delimiters of Transit Business and Quality Management

Standard for Area Coverage (Reach)

One mandate of the City's transit system is to provide service to all of the Urban Transit Area (UTA). Area coverage is the degree of transit reach to households and job locations. The standard is for 95% of households and 95% of workers at their work locations to be within a 5-minute walk (400 meters) of a transit stop or station during peak periods and for 95% of households to be within a 10-minute walk of transit in the midday and on evenings and weekends.

Table 4 – 2008 Households within the UTA with Different Access Distance to a Bus Stop during Peak Periods

% of Households within	Peak Periods	Off-Peak Periods
200 m	82.0%	77.6%
400 m	98.6%	95.8%
600 m	99.8%	98.3%
800 m	99.9%	99.2%

Variations in Area Coverage

Area coverage must be balanced against the achievement of other transit policy standards, such as occupancy and economic efficiency, but also toward increasing ridership. Table 5 shows that reducing the current extent of area coverage, when done carefully, could generate substantial operating cost savings with very limited impact on ridership.

Table 5 – 2008 Ridership and Service Changes for Changes in Peak Period Area Coverage

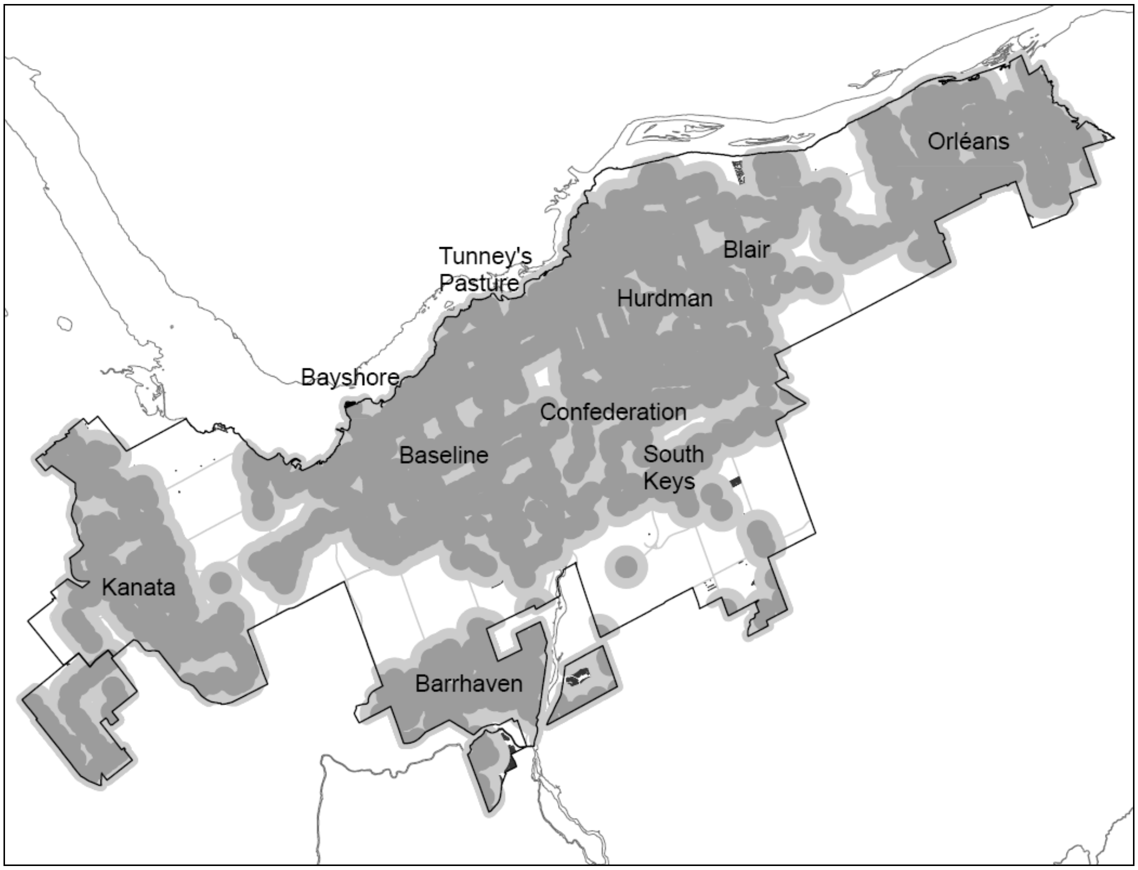
% of Households within 400 m of a Bus Stop	Decrease in Households	Decrease in Ridership	Decrease in Revenue Hrs	Decrease in Revenue Kms	Decrease in Operating Cost
98.6%	-	-	-	-	-
95% *	*-3.6%*	*-1.9%*	*-3.1%*	*-3.3%*	*-2.8%*
93.4%	-5.2%	-2.6%	-4.3%	-4.7%	-4.1%
91.0%	-7.6%	-3.7%	-7.8%	-8.2%	-7.4%

* Existing standard; numbers in italic are estimates

Future Area Coverage with the Alternative Service Delivery Model

The alternative Service Delivery Model lines up with the bottom row of Table 5 above, at 91.1% of UTA households within 400 meters of a bus stop or station during peak periods and 99.4% within 800 meters. Figure 16 shows graphically the coverage attained, the light grey areas being within 800 meters and the darker areas within 400 meters. Small areas in black indicate where most of the 0.6% of households are that would have an access distance to transit exceeding 800 meters.

Figure 16 – 2019 Peak Period Area Coverage within the UTA



<u>Standards for Occupancy</u>

Occupancy is a key measure of transit efficiency. It measures how much of transit supply is "consumed" by customers (passenger-km per capacity-km). Because the nature of travel demand varies across route types and by direction of travel (inbound to downtown vs. outbound), occupancy of a route must be compared with that of routes of the same type; function of route, direction of peak flow. The standard is to exceed 0.58 for the inbound legs of radial routes, 0.28 for circulators and the inbound legs of feeder routes, 0.40 for cross-town routes and 0.60 for express routes.

<u>Future Occupancy with the Alternative Service Delivery Model</u>

Figure 17 positions today's occupancy of existing bus routes with respect to the average occupancy of routes of a given type. In each graph, the crosshair shows the average number of passenger-kilometres and the average number of seats-kilometres offered. Under-performing routes, those with the most seat-kilometres offered for the number of passenger-kilometres actually carried, would be found in the lower right-hand corner of each graph. The figure shows that most routes perform well, except for some circulators that may warrant a review. For underperforming routes, there may be some potential for service investment and promotion, or the latent capacity may benefit other transit users by being redeployed elsewhere in the system, or alternative service delivery mechanisms, such as demand-responsive transit (taxi, “taxibus”, etc.), could be explored. Figure 18 shows the predicted occupancy of future bus routes against the future average occupancy for their type of route. It suggests that the alternative Service Delivery Model succeeds in preserving the good occupancy results observed today for bus routes, in spite of the fact that the largest passenger volumes would be carried by the core rail line by then.

Figure 17 – Transit Occupancy of Existing Routes (2008)

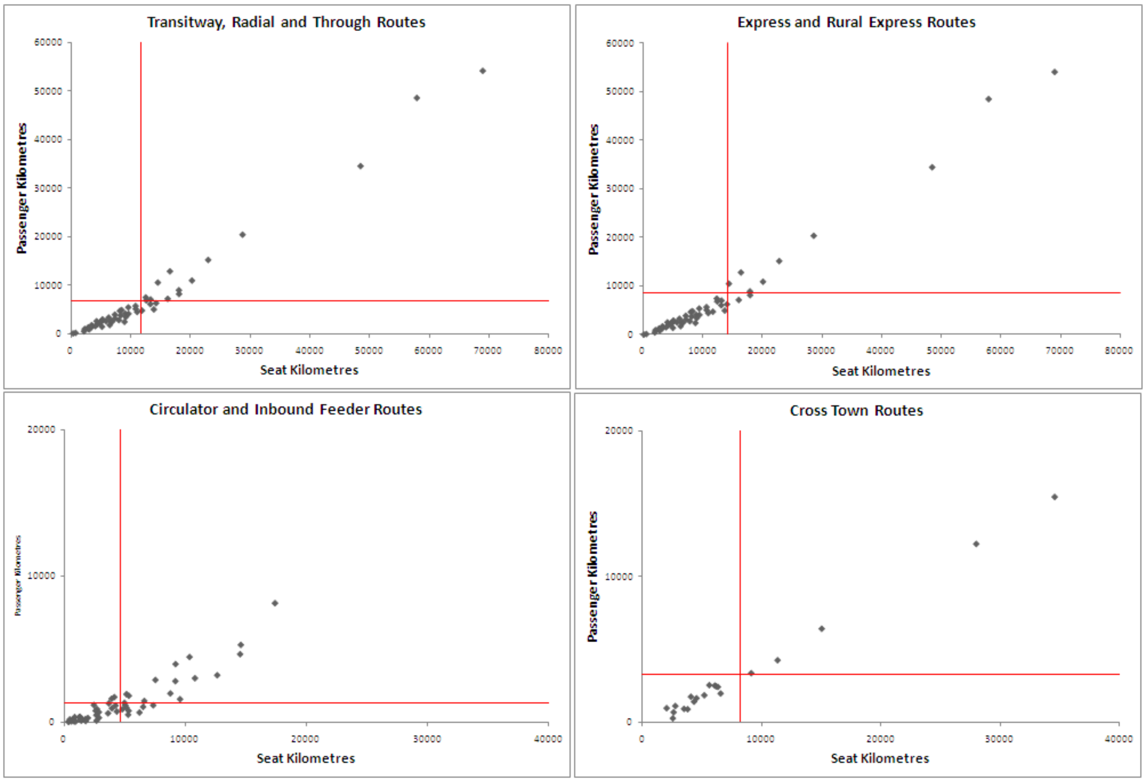
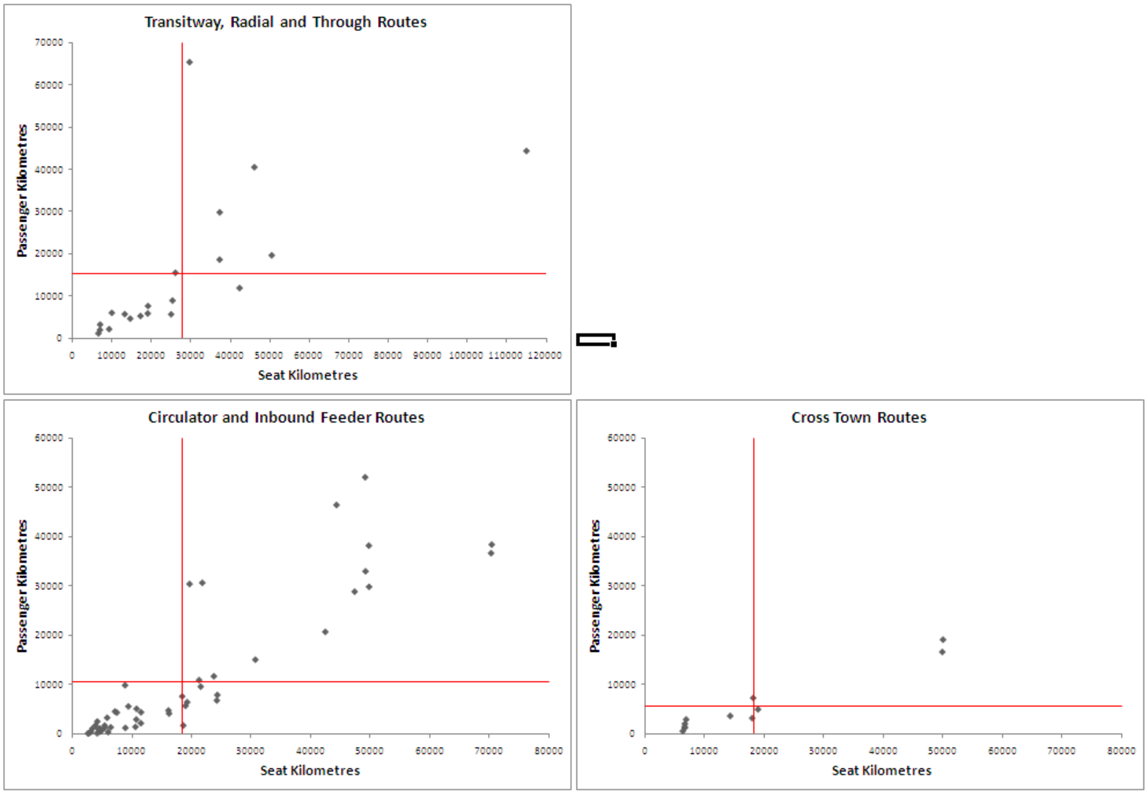


Figure18 – Transit Occupancy of Future Routes (2019)



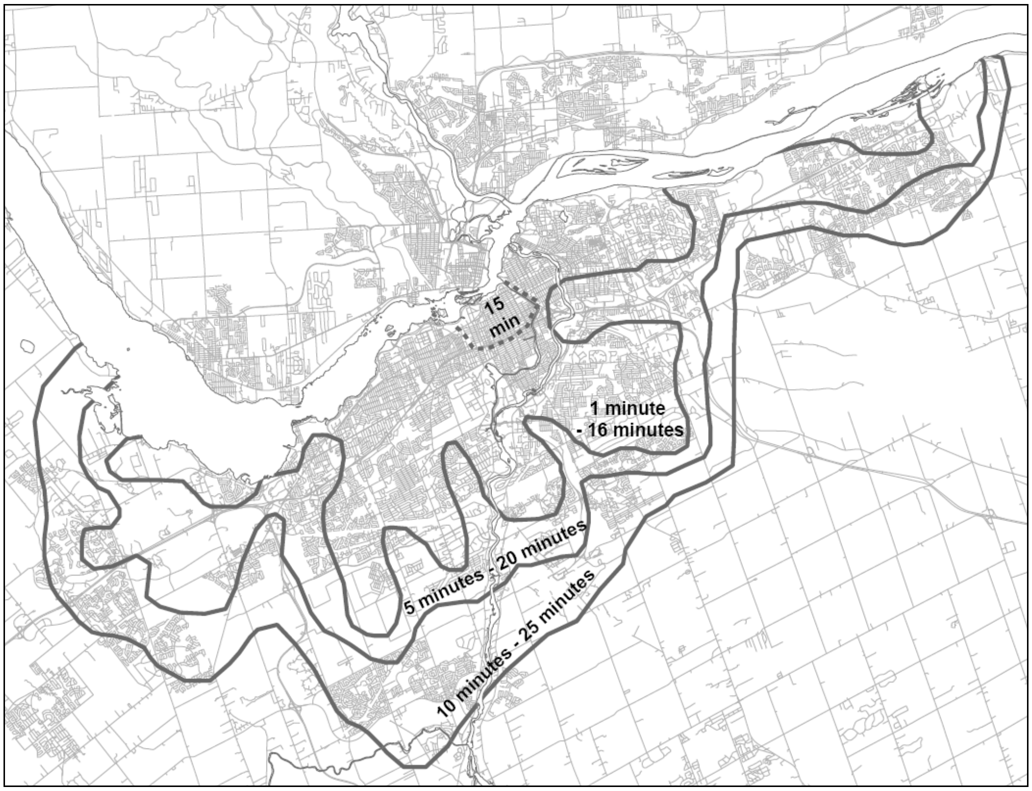
<u>Network Speed</u>

The Transit Services Annual Performance Report has published network speed for the past few years. This is the average speed experienced by passengers on board buses. It stays fairly constant – and constantly high because of the Transitway – from year to year at about 26 to 27 km per hour. An alternative Service Delivery Model would maintain a network speed of 26 km per hour, as the speed gains realized by the core rail line would counteract the system-wide speed reductions of increased local service and increased traffic congestion on the streets as the region grows.

<u>Total Travel Time</u>

Total travel time is made up of walking to a transit stop or station, waiting for service, riding transit, transferring to another service as the case may be, and walking to a destination. Figure 19 suggests that the new rail line would be a major contributor to a reduction in total travel time experienced by transit users. Before 2004, when the number of peak hour buses operated along the downtown section of the Transitway reached a maximum, transit customers would recurrently experience substantial delays of 15 minutes and more, whenever the facility failed and became congested. It has previously been established that, if the downtown section of the Transitway were to stay as it is and cross intersections at grade, it would reach capacity by 2017, due to ridership growth. As an illustration, Figure 19 shows minimum time savings going to Parliament compared to today's normal operation, as well as estimates of time savings compared to operation under congestion (with a delay of 15 minutes). In practice, the enhanced reliability brought about by the alternative service delivery model should reduce occurrences of congestion delays, making the time savings accumulated day after day more substantial yet.

Figure 19 – Minimum Total Travel Time Saved in 2019 Going to Parliament Compared to Today's Normal Operation and Operation under Congestion



ALTERNATIVE SERVICE DELIVERY MODEL

Overview of the Alternative Service Delivery Model

An alternative Service Delivery Model is being explored for the City of Ottawa Transit Services that could be implemented over a period of a few years. Ultimately, it is predicted to generate substantial savings in operating costs, at the price of a marginally negative impact on ridership. This alternative delivery model favours the trunk-and-feeders type of network structure and operation described in the Transit Planning Essentials section above and focuses on enhancing transit services where transit demand is, as per the patterns identified in the Travel Demand section above. In terms of policy standards, the alternative delivery model would improve occupancy and economic efficiency, while contemplating a decrease in the area coverage standard for a limited portion of the transit market in return for significant cost savings.

Network Structure

Inside the Greenbelt and within each of the three urban communities outside the Greenbelt, the alternative Service Delivery Model features the operation of a trunk with feeders. Inside the Greenbelt, this structure is supplemented by a system of cross-town routes roughly approaching a grid structure. Figures 20 and 21 show schematically the transit network structure. In these figures, some small areas are shaded where access distance to transit is greater than 800 metres and where the potential of alternative service delivery mechanisms, such as demand-responsive transit (taxi, “taxibus”, etc.), could be explored.

Table 6 – Overall Description of the Network Structure during the Morning Peak

South	High-frequency Transitway bus route between Barrhaven and Tunney’s Pasture
	Two circulator routes through Barrhaven radiating in to Tunney’s Pasture
	Cross-town service linking Riverside South, Manotick and Barrhaven
	One cross-town route linking Riverside South and Fallowfield via the Woodroffe transit priority corridor
West	High-frequency Transitway bus routes between Kanata and Tunney’s Pasture
	Three circulator routes through Kanata – one south of Highway 417, one north and one linking neighbourhoods on either side – radiating in to Lincoln Fields
	A feeder route serving areas in Stittsville not already served by the Transitway route
East	High-frequency Transitway bus route between Trim Road and Blair
	A feeder route between Millenium and Blair
	Three circulator routes through Orleans, serving the eastern, centre and western neighbourhoods of Orleans, from north of the Queensway to south of Innes
	One cross-town route intersecting the three circulators described above
Gatineau	High-frequency Rapibus route between Gatineau and Bayview Station via Prince of Wales Bridge
	High-frequency Transitway bus route between Southwest, Tunney’s Pasture and downtown Gatineau via Chaudières Bridge

Figure 20 – Alternative Service Delivery Model: Network Structure inside the Greenbelt

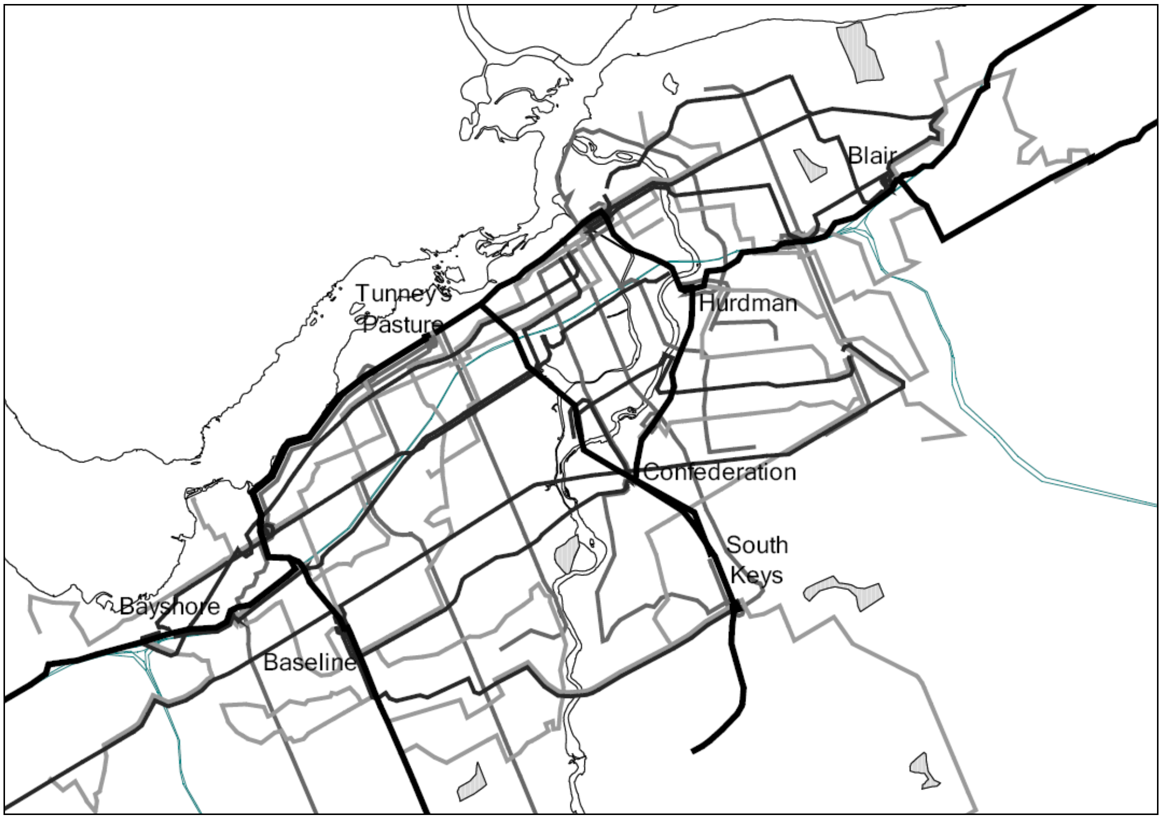
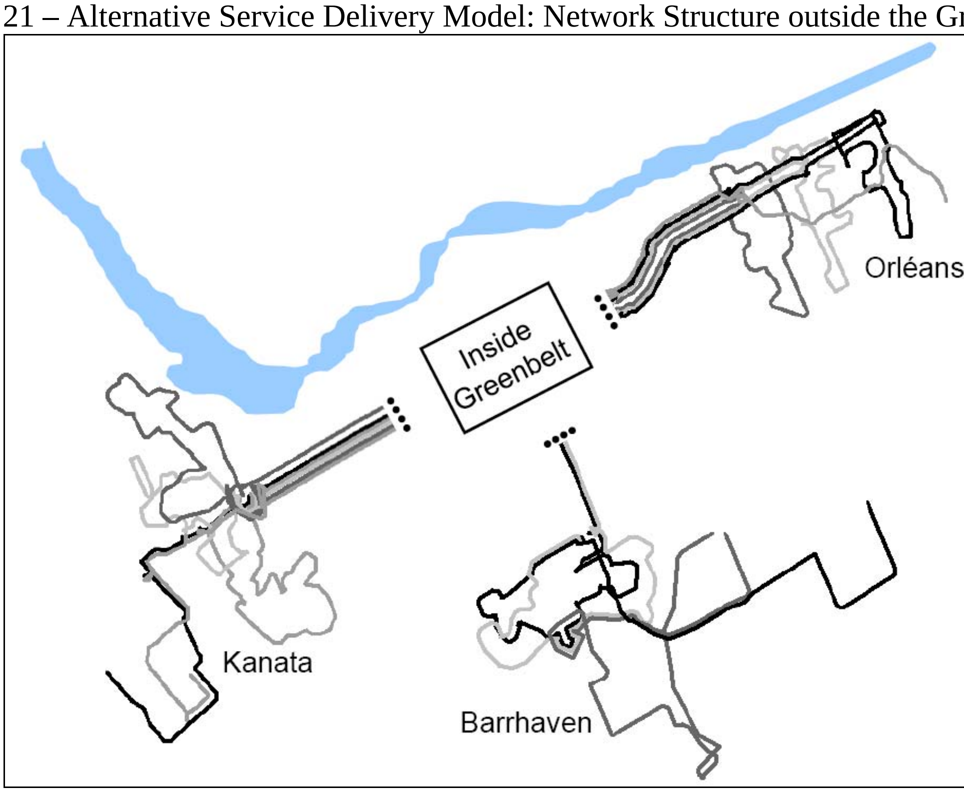


Figure 21 – Alternative Service Delivery Model: Network Structure outside the Greenbelt



Alternative Service Delivery Model: Basic Comparisons

Table 7 compares the Alternative Service Delivery Model with what would be the future of the existing trunk-and-branches operation. Reduced area coverage and the transfers brought about by trunk-and-feeders operation would be key factors in the decrease of 1.4% in overall ridership. However, the operating cost savings generated by the alternative delivery model would be very substantial, up to a 20.3% reduction. Even if allowing for adjustments for a potential increase in the area coverage or further increases in service frequency to compensate for transfers, the cost savings could almost reach $100 million.

Table 7 – Alternative Service Delivery Model: Comparison with Current Trunk-and-Branches Operation Type

	2008 Existing	2019 Network Based on Current Practices (Trunk-and-Branches Operation, Existing Area Coverage)	2019 Alternative Service Delivery Model (Trunk-and-Feeders Operation, Lower Area Coverage)	
Total Ottawa-Based Passengers in AM Peak Hour	31,100	44,720	44,110	(1.4%)
Total Annualized Operating Cost	280,245,000	522,022,000	416,176,000	(20.3%)
BUS				
Annualized Revenue Hours	1,780,000	3,168,000	2,527,000	(20.2%)
Annualized Revenue Kms	47,182,000	81,623,000	66,412,000	(18.6%)
Annualized Operating Cost	275,981,000	498,904,000	393,058,000	(21.2%)
CORE RAIL LINE				
Total Boardings in AM Peak Hour	-	20,670	25,310	22.5%
Maximum Hourly Volume between Stations	-	7,410	11,480	54.9%
Annualized Revenue Hours	-	46,840	46,840	0.0%
Annualized Revenue Kms	-	1,926,800	1,926,800	0.0%
Annualized Operating Cost	-	18,854,000	18,854,000	0.0%
O-TRAIN LINE				
Total Boardings in AM Peak Hour	410	430	850	97.7%
Maximum Hourly	290	280	590	110.7%

Volume between Stations				
Annualized Revenue Hours	8,440	8,440	8,440	0.0%
Annualized Revenue Kms	329,970	329,970	329,970	0.0%
Annualized Operating Cost	4,264,000	4,264,000	4,264,000	0.0%

Alternative Service Delivery for the Urban Communities Outside the Greenbelt

As a variation to the Alternative Service Delivery Model that introduces longer bus feeder services from the suburbs to the trunk services at Blair, Tunney's Pasture and Baseline, shorter feeder services were considered that would connect to Transitway stations along Highway 174 in Orléans, Highway 417 in Kanata and at Fallowfield in Barrhaven. Bus trunk services on the Transitway would link those transfer points to the rail stations at Blair and Tunney's Pasture. Table 8 shows that, while the bus operating costs are further reduced with this concept compared with the Alternative Service Delivery Model, the impact on ridership is significant. For this reason, this alternative was not retained.

Table 8 – Alternative Service Delivery for the Urban Communities Outside the Greenbelt

	2019 Alternative Service Delivery Model	2019 Trunk and Feeders with Shorter Feeders within the Urban Communities	
Total Ottawa-Based Passengers in AM Peak Hour	44,110	42,240	(4.2%)
Total Annualized Operating Cost	416,176,000	344,449,000	(17.2%)

Alternative Service Delivery for Inter-Provincial Transit Trips

Table 9 shows that trunk-and-feeder operation would also benefit the STO system compared to trunk-and-branches operation. The option of all Ottawa-bound STO services terminating at Bayview in the morning would require modification to the Prince of Wales Bridge. It would however reduce STO operating costs the most, for a marginal negative impact on ridership. This option is in line with on-going co-operative work being done with the STO to set a direction for inter-provincial transit. Bayview would become a key intermodal transportation centre for the regional transit system, with a predominance of bus-to-rail transfers that would have to be reflected in the design of the station.

Table 9 – Alternative Service Delivery for Inter-Provincial Transit Trips

	2019 Trunk-and-Branches Operation of the Rapibus	2019 Trunk-and-Feeder Operation of the Rapibus Route to Rideau Centre via Chaudières Bridge, and Aylmer/ Downtown Ottawa and Aylmer/Tunney's Bus Routes		2019 Trunk-and-Feeder Operation of the Rapibus via Prince of Wales Bridge(both directions) to Bayview, with Aylmer Services as Branches	
Total Gatineau-Based Passengers in AM Peak Hour	13,730	12,580	(8.4%)	12,250	(10.8%)
BUS					
Annualized Revenue Hours	524,600	365,900	(30.3%)	331,700	(36.8%)
Annualized Revenue Kms	11,892,000	9,187,000	(22.7%)	8,890,000	(25.2%)

Alternative Service Delivery for Express Service Operation on the Core Rail Line

As an alternative to operating dual tracks on the core rail line between Blair and Tunney's Pasture, the alternative was explored of operating a third track that would accommodate trains made faster by their not serving Cyrville, St.Laurent, Train, Lees, Campus and LeBreton stations. Table 10 shows no clear benefit, due to the modest time gain for passengers. The operating cost (assumed to be driven by revenue kilometres) would be low, but the required capital investment should be very significant, and therefore not justified.

Table 10 – Alternative Service Delivery for Express Service Operation on the Core Rail Line

	2019 Alternative Service Delivery Model	2019 Trunk and Feeders With Express Rail Service	
Total Ottawa-Based Passengers in AM Peak Hour	44,110	43,860	(0.6%)
Total Annualized Operating Cost	416,176,000	416,332,000	0.0%

CONSTRUCTION PHASE SERVICE DELIVERY MODEL

Network Structure of the Construction Phase Service Delivery Model

During construction of the core rail line, major portions of the Transitway would be closed: between Blair and Campus and between LeBreton and Tunney's Pasture. The Alternative Service Delivery Model could already have been implemented for portions of the bus network, but until the core rail line opens, some routes along the Transitway would have to follow temporary alignments. Transitway routes between Blair and Westboro Stations could have to be re-routed onto the Queensway in the east and onto the Ottawa River Parkway and Scott Street in the west during the construction phase. Stations like St. Laurent and Hurdman in the east and Westboro and Bayview in the west could have to be served by selected services only, not to increase travel time to an undue number of services. Some minor stations such as Cyrville and Train may best be served through some special form of service. LeBreton Station could be temporarily relocated onto Wellington Street. Routes from Gatineau would cross either the Chaudières or Portage Bridge and continue to the Rideau Centre during the construction phase.

Construction Phase Network Speed

During the construction phase, the network speed is expected to fall slightly, to 24.6 km/h, or 1.5 km/h slower than that of the post-construction alternative service delivery model. This reduction in speed would be attributed in part to the re-routing of bus routes off a major portion of the Transitway.

Construction Phase Service Delivery Model: Basic Comparisons

To properly gauge the impact of the construction phase, a scenario was developed that features the potential level of transit demand predicted for 2018/2019 and the alternative service delivery model in place, but without the core rail line. This scenario assumes Albert and Slater Streets to have a very high capacity to accommodate buses. With the simulated closure of the Transitway, Table 11 shows that the additional operating costs are very substantial during construction – at 22.4% – to maintain system capacity and minimize ridership loss.

Table 11 – Construction Phase Service Delivery Model: Basic Comparisons

	2019 Alternative Service Delivery Model Without Rail	2018 Construction Phase Service Delivery Model		2019 Alternative Service Delivery Model	
Total Ottawa-Based Passengers in AM Peak Hour	43,610	42,210	(3.2%)	44,110	1.1%
Total Annualized Operating Cost	400,733,000	490,427,000	22.4%	416,176,000	3.9%
BUS					
Annualized Revenue Hours	2,695,000	3,154,000	17.0%	2,527,000	(6.2%)

Annualized Revenue Kms	70,550,000	78,520,000	11.3%	66,412,000	(5.9%)
Annualized Operating Cost	396,469,000	486,163,000	22.6%	393,058,000	(0.9%)
O-TRAIN LINE					
Total Boardings in AM Peak Hour	640	560	(12.5%)	850	33.4%
Maximum Hourly Volume between Stations	440	340	(22.7%)	590	34.5%

<u>Alternative Service Delivery for Opening of Blair-Campus Section of Core Rail Line</u>

To mitigate the impacts of higher operating cost and revenue loss during construction, an alternative would be – if feasible – to open the Blair-Campus portion of the rail line as soon as completed and before the rest of the line. Most of this portion of the rail line would be built at grade. Table 12 suggests that the bus and rail network operated under this approach would generate significant operating costs savings and a nominal increase in ridership. Staff will pursue this option as implementation of the rail project continues.

Table 12 – Early Opening of Blair-Campus Section of Core Rail Line

	2018 Construction Phase Service Delivery Model	2018 Blair-Campus Section of Core Rail Line Open	
Total Ottawa-Based Passengers in AM Peak Hour	42,210	42,640	1.0%
Total Annualized Operating Cost	477,633,000	460,464,000	(3.6%)
BUS			
Annualized Revenue Hours	3,071,000	2,851,000	(7.2%)
Annualized Revenue Kms	77,163,000	70,432,000	(8.7%)
Annualized Operating Cost	473,369,000	445,446,000	(5.9%)
CORE RAIL LINE			
Total Boardings in AM Peak Hour	-	9,280	-
Maximum Hourly Volume between Stations	-	5,880	-
Annualized Revenue Hours	-	25,320	-
Annualized Revenue	-	1,099,000	-

Kms			
Annualized Operating Cost	-	10,754,000	-
O-TRAIN LINE			
Total Boardings in AM Peak Hour	560	630	11.7%
Maximum Hourly Volume between Stations	340	360	4.7%

DETAILED OPERATING COSTS OF THE ALTERNATIVE SERVICE DELIVERY MODEL

Costing Model Assumptions

As part of the tools developed for the Tactical Plan, a costing model was built to fully capture the operating costs of Transit Services and simulate the costs under the Alternative Service Delivery Model. Among the key assumptions made are: $9.3 million in efficiency achieved in 2010; an inflation rate of 2.5% annually (including wages and fuel); fares set to match inflation after 2010 (when the Revenue/Cost ratio of Transit Services is 50%); ridership growth of 3% per year and matched by equivalent service increases. The risk of fuel price increases beyond core inflation is quite high beyond 2011 when current hedging programs have no effect. It is anticipated that fare increases would compensate for this eventuality or additional efficiencies would need to be explored.

The alternative service delivery model explored here would be gradually implemented through the annual Transplan process over a period extending to 2019, when the Core rail line is expected to open.

Findings

The fiscal model, in light of continued ridership growth of 3% to achieve a higher modal split will result in a 1.5% - 2% pressure on the overall taxbase of the City. The implementation of the alternative service delivery model would be a key contributor to bringing the Revenue/Cost (R/C) ratio of Transit Services back to above 50% starting in 2011. Table 13 suggests that the investment in the core rail line could eliminate this tax pressure from transit, as savings from the economy of scale of the new system would be realized. The R/C ratio could be set at 55% when the Blair-Tunney's rail section opens and the alternative service delivery model is in place. It is envisaged that the R/C ratio could be as high as 60% when the Tunney's-Baseline rail section opens at a future stage.

For the City of Ottawa, about 10 million liters of fuel would be saved annually with the opening of the core rail line and the alternative service model, resulting in a 27 million metric ton reduction in GHG emissions based on today's engines.

The construction period would require increases in service to maintain the system capacity. Table 13 shows that this would push the R/C ratio down to slightly below 50% between 2015 and 2018. A total of $149 million has been funded for operating support during construction. With service growth aimed at maintaining capacity, Table 14 shows how ridership per capita would continue to increase every year throughout the construction period.

Table 13 – Alternative Service Delivery Model: Predicted Year-by-Year Operating Costs (in Thousands, All Costs Reflecting Inflation)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bus Costs	345,975	358,026	381,788	407,562	441,856	478,086	524,860	577,476	617,667	506,250
N-S Rail Costs	6,083	6,593	6,908	7,081	7,258	7,439	7,625	7,816	8,011	8,212
Core Rail Costs	0	0	0	0	0	0	0	0	0	39,389
Other Costs	(868)	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500
Total Operations	351,190	373,119	397,196	423,143	457,613	494,025	540,985	593,792	634,178	562,350
City Costs	52,018	53,815	55,382	56,510	56,723	56,948	57,187	57,445	57,722	60,887
Total Costs	403,208	426,934	452,578	479,653	514,336	550,972	598,172	651,237	691,900	623,237
Fare Revenue	(158,632)	(173,836)	(183,533)	(195,753)	(206,217)	(217,241)	(228,855)	(241,089)	(253,977)	(272,017)
Other Revenue	(28,741)	(19,937)	(19,937)	(20,189)	(26,632)	(33,087)	(49,796)	(70,946)	(73,812)	(21,762)
Total Revenue	(187,372)	(193,772)	(203,469)	(215,941)	(232,849)	(250,328)	(278,651)	(312,035)	(327,789)	(293,780)
Net Result	215,835	233,162	249,109	263,712	281,487	300,644	319,521	339,202	364,111	329,458
% Change in Net Result	11.1%	8.0%	6.8%	5.9%	6.7%	6.8%	6.3%	6.2%	7.3%	(9.5%)
R/C Ratio	49.5%	51.0%	50.5%	50.5%	50.0%	49.5%	49.3%	49.2%	48.4%	54.4%
Ridership	101,699	105,716	108,888	113,243	116,387	119,619	122,940	126,353	129,861	135,693
% Change in Ridership	26.8%	4.0%	3.0%	4.0%	2.8%	2.8%	2.8%	2.8%	2.8%	4.5%
% Change in Average Fare	7.5%	5.4%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
% Taxation increase	2.0%	1.6%	1.4%	1.3%	1.6%	1.7%	1.7%	1.8%	2.3%	(3.2%)

Table 14 – Alternative Service Delivery Model: Year-to-Year Bus Service and Financial Indicators

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bus Revenue Hours	1,976	2,010	2,103	2,203	2,365	2,535	2,744	3,025	3,154	2,527
% Change in Revenue Hours	16.0%	1.7%	4.6%	4.8%	7.0%	6.8%	7.9%	9.9%	5.7%	(19.9%)
Cost per Revenue Hour	165	173	176	179	179	179	178	173	175	198
Passengers per Revenue Hour	51,239	52,380	51,572	51,199	49,203	47,353	45,125	42,225	41,069	52,555
Ridership/ Capita	111.4	114.5	116.6	119.9	121.8	123.8	125.9	127.9	130.0	134.4

Table 15 – Alternative Service Delivery Model: Year-to-Year Bus Fleet Requirements

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Fleet required – beginning	1,025	1,068	1,112	1,152	1,190	1,227	1,275	1,320	1,364	1,204
Requirement for construc-tion					14	27	57	113	118	
Fleet required – ending	1,025	1,068	1,112	1,152	1,204	1,254	1,332	1,433	1,482	1,204
Change in fleet size	(21)	43	44	40	52	50	78	101	49	(278)
% Change in Fleet Size	(2.0%)	4.2%	4.1%	3.6%	4.5%	4.2%	6.2%	7.6%	3.4%	(18.8%)

CAPITAL REQUIREMENTS: IMPACTS ON BUS FLEET

The costing model and predictions assume continued improvement in bus availability to 90% from 85% today, and no capital restrictions on bus acquisition or asset maintenance over the next 10 years. During construction of the core rail line, some buses would be kept beyond their lifecycle of 18 years through investments in overhaul. A total life extension cost of $17.7 million has been included in the capital plan as an addition to bus refurbishment. Table 15 shows that when the core rail line opens in 2019, the bus fleet could be reduced by some 278 buses. This implies wide fluctuations in operations and maintenance staffing requirements over a 5-year period. By 2019, total bus operation would be reduced from 2,600 daily in the downtown area to 600 buses per day (1,000 of them being STO buses that would terminate at Bayview). One third of the bus fleet would have 2010 EPA engines (98% reduction in emissions from the worst situation today). The entire bus fleet would be accessible.

APPENDIX

A Further Improved Travel Demand Model

The calibration of the model was fine-tuned over the past few months through the opportunity provided by the extraction of detailed transit volume counts. This has further improved the strength and reliability of the model both in simulating observed Ottawa transit trip volumes and patterns and in predicting future ones. As a result, the modelled transit demand in the morning peak period was scaled back by 3.1% compared to that of the 2007 model. The total number of modelled transit boardings came within 1% of actual counts, along with accurate boardings by individual route type (regular, Transitway and express).

Table 16 – Modelled vs. Observed Transit Volumes

Cordon	Observed Ridership	2007 Calibration	Difference	2009 Refined Calibration	Difference
Inner Area	18,278	21,938	20%	17,934	-2%
Greenbelt	9,451	11,020	17%	9,596	2%
Rideau River	11,607	13,396	15%	10,988	-5%
Dominion Station segment			23%		2%
Cyrville Station segment			25%		6%
Jeanne d'Arc Station segment			21%		- 2%
Lycée Claudel Station segment			25%		7%
Iris Station segment			43%		0%
Fallowfield Station segment			7%		5%
Moodie segment			30%		8%