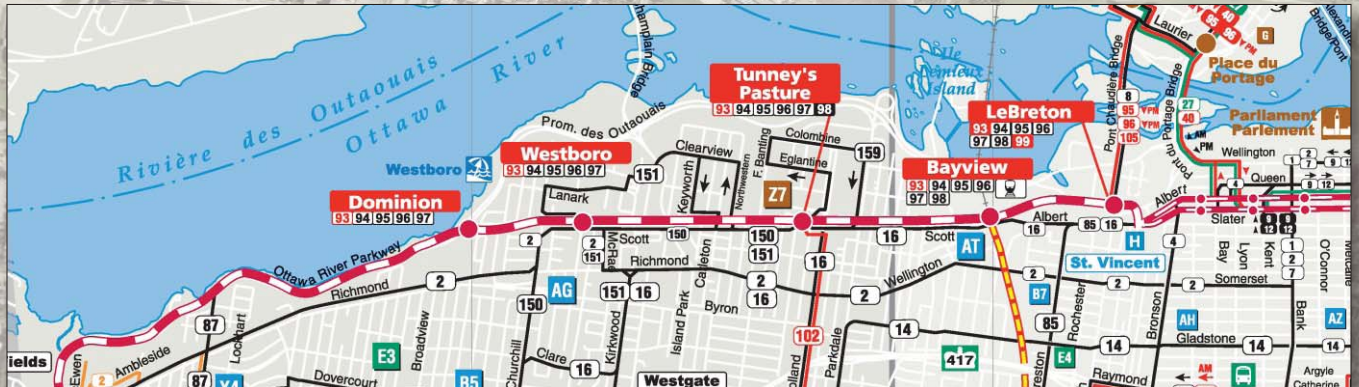




## Ottawa Light Rail Transit: Transit Construction Detours for the West End



Final Report  
October 27, 2011



**MCCORMICK RANKIN**  
CORPORATION

A Member of:



# OLRT TRANSIT CONSTRUCTION DETOURS FOR THE WEST END

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# 1. INTRODUCTION

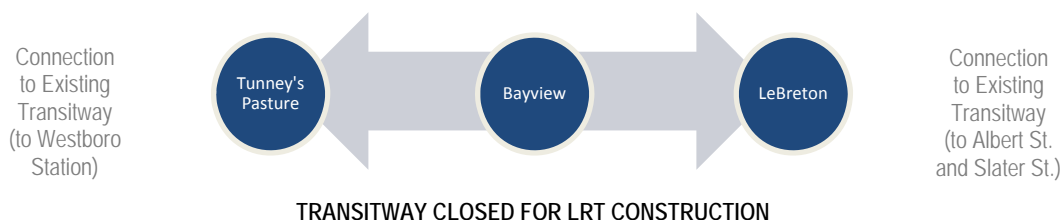
## 1.1 Objective of Study

The City of Ottawa is proposing to build a Light Rail Transit (LRT) system from Tunney's Pasture to Blair Road, a 12.5 km line that includes a 3 km tunnel through downtown Ottawa. It will mainly operate on the current Transitway alignment, and during construction it will be necessary to detour transit around construction in such a way as to minimize inconvenience to transit users while allowing the LRT to be constructed in an efficient fashion.

The objective of this study is to develop the west-end transit service construction detour plan to a level in which transit ridership and operational issues, neighbourhood impacts and resource requirements are identified and quantified, and infrastructure modifications are designed and costed at a conceptual level.

The study covers the detours to be put in place when the Transitway between Tunney's Pasture and Empress Street is closed, including the stations at Tunney's Pasture, Bayview and LeBreton.

Exhibit 1-1: Limits of Study



## 1.2 Light Rail Construction Schedule

The release of an RFP to Design, Build, Finance and Maintain (DBFM) the LRT system is planned for late October 2011, with construction expected to start in late 2012 / early 2013. Early construction will be focused in the central area section of the LRT in order to avoid construction disruption during 2017, Canada's 150<sup>th</sup> anniversary. The line is due to open in 2018 and the construction detours in this portion of the transit system are likely to be in place for two or three years.

## 1.3 Basis of Assessment of Potential Detours

In discussion with various stakeholders, the following attributes have been developed to determine the most desirable options for Transitway construction detours:

- Maintain existing transit routings as closely as possible to current operations;
- Minimize additional transit user travel times;
- Minimize additional transfers;
- Minimize additional resources (number of buses and kilometres travelled);

- Minimize throw-away infrastructure costs;
- Minimize additional bus traffic in residential areas; and
- Minimize disruption to other road users.

These principles guide the evaluation provided in **Section 5** of this report.

## 1.4 Council Direction

Preliminary ways that transit services could be detoured during the construction of the LRT line were included in the Downtown Ottawa Transit Tunnel (DOTT) Environmental Assessment Report. City Council, at a meeting in January 2010, approved motions associated with transit detours:

- Direct staff to use Kent and Lyon Streets as detour streets only as a last resort and that alternative detour corridors be explored for use during and after DOTT construction;
- That bus service to the east of Tunney's Pasture utilize the Ottawa River Parkway as much as possible during the construction of the DOTT;
- That bus service along Albert Street (particularly between Bayview and Booth) be minimized to the greatest degree possible, while still providing off-peak service to nearby residents; and
- That during the development of the detailed plan for transit service for the DOTT construction period, measures are implemented to minimize the impact to the residential neighbourhoods abutting Scott and Albert Streets.

## 1.5 Scope of Study

This study has been completed for, and under the direction of, the City of Ottawa's Rail Implementation Office.

Stakeholder consultation regarding the proposed temporary detours has been included in the scope of this study. OC Transpo and the City of Ottawa Traffic and Parking staff have participated in the work and assessed the impact of the proposals on transit riders, motorists and transit resources. Representatives of the National Capital Commission (NCC) and Public Works and Government Services Canada (PWGSC) have also participated in the study to assess the impacts of the use of the Ottawa River Parkway (ORP) and the implications of the potential detour options through Tunney's Pasture Campus.

This study is meant to inform future decisions of the team that is chosen to complete the Ottawa Light Rail Transit project.

## 1.6 Outline of Report

Following this introduction, **Section 2** describes previous work that was done as part of the Downtown Ottawa Transit Tunnel (DOTT) Planning and Environmental Assessment on the Transitway detour possibilities in the west end. This section also provides the rationale for narrowing down options to exclusively consider the use of Scott Street and the Ottawa River Parkway for transit detours.

**Section 3** of this report covers the existing conditions for transit and traffic in the study area. In particular:

- the services provided by OC Transpo and STO are described as well as transit travel times and passenger activity; and
- travel time and level of service information is provided for Scott Street, Tunney's Pasture Campus and the Ottawa River Parkway.

**Section 4** summarizes the analysis of the retained detour corridors for transit services and other traffic and provides an assessment of the impacts that would result from each option, including infrastructure requirements and high-level costs. This section leads to the identification of three Transit Scenarios (i.e. combinations of corridors and the types of transit services that would be operated on them) to be taken forward for further analysis.

**Section 5** provides detailed analysis and evaluation of the three retained Transit Detour Options.

Lastly, **Section 6** summarizes the recommended transit detour arrangements, impacts on transit users and OC Transpo, the necessary infrastructure and estimated costs, and guidance for construction phasing.





## 2.2 Corridors Carried Forward

The Carling Avenue and Queensway options, as well as the use of the Ottawa River Parkway between Dominion and Tunney's Pasture were dropped as potential detour routes early on in the current study for reasons described below.

The DOTT EA detour work was undertaken to give a broad view of the overall potential for transit detours. The analysis carried out was high-level and the travel time assumptions were not based on an up-to-date assessment of traffic conditions. They also predated Council's direction on detours (**Section 1.4**). It was therefore appropriate to review these options early in this study to identify those that were realistically worth carrying forward for more detailed analysis, to ensure that study resources were focused appropriately.

Transit travel times for the Carling Avenue option are clearly too long, adding more than 10 minutes to bus journey times from Lincoln Fields to downtown Ottawa. In addition, this detour misses important connections at Tunney's Pasture, Bayview (O-Train) and LeBreton (Interprovincial service). This option was therefore eliminated from further study.

The detour proposed in the DOTT study included links to downtown Ottawa via Kent and Lyon Streets, which are at odds with Council direction. The other possibility would be to use Bronson Avenue, adding to the overall travel times. At the time of study, travel time data was not available for the Queensway in the section from Woodroffe to Bronson. Because the study time-frame was summer 2011 and traffic volumes vary seasonally, it was not possible to collect accurate data to fill this gap. However, experience of regular commuters is that travel times vary significantly from day to day: in the AM peak period traffic is often very congested from Bayshore to Carling Avenue, where traffic starts to flow more smoothly. In the afternoon peak period, traffic volumes are high and travel speeds low from Nicholas to Woodroffe Avenue. Further, the Queensway would only be an option for services from Kanata since it is not possible to make a turn from the northbound Transitway to the eastbound Queensway at Queensway Station. This detour route would also bypass Tunney's Pasture, Bayview and LeBreton altogether; would add up to ten minutes to travel time; and would introduce considerable unreliability into the schedules. On the basis of these considerations, the Queensway detour was dropped from consideration early in the study.

Finally, based on discussions with the Rail Implementation Office, it was determined that the temporary station at Tunney's Pasture and a connector ramp from the existing Transitway could be put in place prior to major construction on the West Transitway between Tunney's Pasture and Empress Street (see **Section 4.1**). Since this will enable buses to remain on the Transitway until Tunney's Pasture, the option of running on the Ottawa River Parkway between Dominion and Tunney's Pasture was dropped, as there are significant travel time savings in operating in the transit exclusive trench from Dominion to Tunney's Pasture.

Therefore, the corridors carried forward for further analysis and evaluation are:

### Scott Street

- from Tunney's Pasture to Empress Street; and,

### Ottawa River Parkway

- east of Tunney's Pasture.

### 3. EXISTING CONDITIONS

#### 3.1 Current Transit Services

##### 3.1.1 STO SERVICES IN STUDY AREA

For this study the emphasis has been on OC Transpo services. STO does not operate any of its service on the Transitway and little in the study area and so the impact of LRT construction on their services will not be significant. Two STO routes, 28 and 58, operate across the Champlain Bridge and travel to Tunney's Pasture via the Ottawa River Parkway, entering the Tunney's Pasture campus via the western access and travelling through the campus to the station as shown in Exhibit 3-1. The service operates predominantly in the peak direction (i.e. to Tunney's Pasture in the AM peak and from Tunney's Pasture in the PM peak). In the AM peak, a total of 11 trips travel to Tunney's Pasture and two from Tunney's Pasture; in the PM peak, 10 trips run from Tunney's Pasture and two trips run to Tunney's Pasture.

EXHIBIT 3-1: STO Routing Through Tunney's Pasture Campus



##### 3.1.2 OC TRANSPOT TRANSIT ROUTES AND BUS VOLUMES

###### 3.1.2.1 Ottawa Service

The Transitway is a busy rapid transit facility carrying up to 10,000 passengers per hour per direction in some locations. In the west end the Transitway provides a fast connection into downtown Ottawa for residents of Barrhaven, Kanata and Nepean, as well as for some residents living closer to downtown. The Transitway also provides service to important locations in the City –

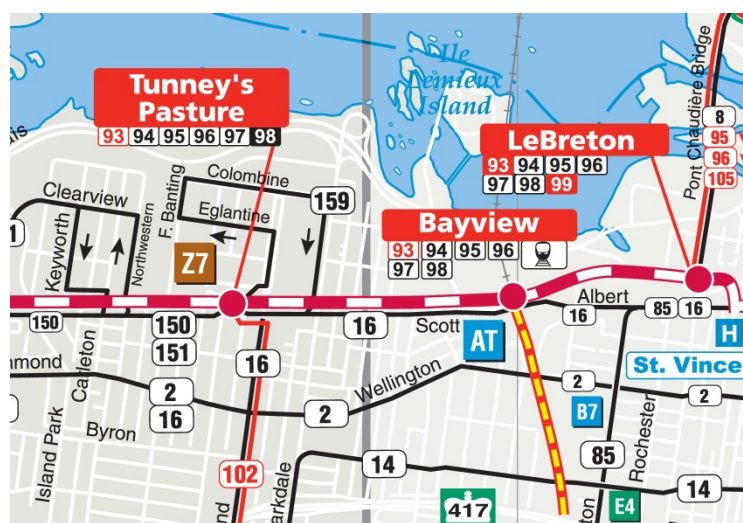
of note in the west end is Tunney's Pasture, a Federal Government employment site where about 12,000 people work.

Exhibit 3-2 & Exhibit 3-3 summarize the transit services currently operating on the West Transitway between Tunney's Pasture and LeBreton. The services have been categorized into:

- Transitway routes (i.e. two-directional routes numbered in the 90 series that stop at all Transitway stops and for which a regular fare is charged);
- West-end express routes<sup>1</sup> (i.e. peak-direction peak-period routes numbered in the 60 series that offer significant travel time savings over local/Transitway service and call for an express fare) mainly serving Kanata and entering the Transitway at Queensway Station;
- South-end express routes (i.e. peak-direction peak-period routes numbered in the 70 series that offer significant travel time savings over local/Transitway service and call for an express fare) mainly serving Barrhaven and entering the Transitway at Baseline Station;
- Local all-day regular routes that operate for some distance on the Transitway in two directions (e.g. Route 86, Route 87); Peak-only routes that operate for some distance on the Transitway (e.g. Route 176); and
- Interprovincial services operating on sections of the Transitway (e.g. Peak-Only Route 105).

There are other OC Transpo routes that operate in the area: Route 150 does not travel on the Transitway but terminates at Tunney's Pasture, and Route 159 that operates as a circulator through Tunney's Pasture starting and finishing at the station. These services will need to be accommodated in the construction detour plans. Also, route 16 serves Tunney's Pasture Station but operates on Scott Street, rather than the Transitway, between Tunney's Pasture and downtown Ottawa.

EXHIBIT 3-2: OC Transpo Operations 2011



<sup>1</sup> Includes rural express services to Stittsville/Richmond (e.g. Rural Routes 261, 262, 263, and 283).

Dead-heading buses (not in-service) must also be addressed in the detour plan. OC Transpo makes extensive use of 'interlining' in the scheduling process to minimize the resources required to provide the required revenue service. This service design, which involves a significant amount of dead-heading, reduces fleet requirements by about 15%. Currently in the AM peak period east-end express routes remain in service at least until LeBreton, and then the buses that would have otherwise travelled out of service to Lincoln Fields or further west remain in service to Lincoln Fields. In the PM peak, all east-end express routes start at LeBreton, which means that buses must dead-head from OC Transpo garages or from the terminus of another route, usually in the west end.

Exhibit 3-3: Table Showing Breakdown of Services Operating Through Bayview – Hourly Volumes by Period  
(Source: Automatic Passenger Count – Point Check Data, Sept 2010 Booking)

Service Type	AM Peak Hour Volume of Buses * (veh/hr)		Mid-Day Average Volume of Buses ** (veh/hr)		PM Peak Hour Volume of Buses * (veh/hr)	
	EB	WB	EB	WB	EB	WB
Transitway Routes	61	49	37	38	56	54
Local Routes	20	12	8	8	9	16
Peak-Only Routes	10	12	0	0	7	8
Kanata Express Routes	41	-	2	-	-	48
Barrhaven Express Routes	31	-	1	-	-	30
Orleans Express Routes	-	38	-	1	-	-
Inter-Provincial (Peak-Only) Routes	4	3	-	-	4	4
TOTAL HOURLY VOLUME- IN-SERVICE	167	114	47	47	76	160
PLUS DEADHEADING (OUT OF SERVICE) ***	12 (7%)	26 (23%)	N/A	N/A	26 (34%)	8 (5%)
TOTAL HOURLY VOLUME OF BUSES ON TRANSITWAY:	179	140	47	47	102	168

\* In the Eastbound direction, the peak hour volumes are best represented by the 7:45 AM - 8:45 AM and 4:30 PM - 5:30 PM time periods. In the westbound direction, the peak hour volumes are best represented by the 7:00 AM - 8:00 AM and 4:15 PM - 5:15 PM time periods.

\*\* The Mid-Day volumes were derived from the average volume of buses over the 6 hr Mid-Day time period.

\*\*\* Estimates of the proportion of dead-heading buses on the Transitway are based on manual counts of "out of service" vehicles at Bayview Station on July 13th, 2011 & July 14th, 2011.

In addition to bus service, the O-Train operates from Greenboro to Bayview Station where it connects with East-West Transitway services. The O-Train is part of Ottawa's rapid transit network and provides fast access to Carleton University and Confederation Heights. The current service runs every 15-minutes in each direction.

### 3.1.2.2 Interprovincial Service

OC Transpo operates service across the Chaudière Bridge to Terraces de la Chaudière and Place du Portage. Most of this service is provided by all-day Route 8 from the east and Route 105 acting as a shuttle from LeBreton Station. However, 15-minute peak-period service is provided between Tunney's Pasture and Gatineau in peak periods by extensions of Route 105. Also, in the PM peak some trips are operated on routes 95 and 96 from Gatineau to the west. Exhibit 3-4 summarizes the activity at Tunney's Pasture and Bayview Transitway stations related to interprovincial trips.

Exhibit 3-4: Table Summarizing OC Transpo Interprovincial Services (Chaudière Bridge)

Service Type	AM PEAK PERIOD		PM PEAK PERIOD	
	# of Boardings	# of Alightings	# of Boardings	# of Alightings
<i>Eastbound * Inbound to Downtown Ottawa</i>				
Tunney's Pasture (Route 105)	35	-	30	-
Bayview (Route 105)	18	-	8	-
<i>Westbound * Outbound from Downtown Ottawa</i>				
Tunney's Pasture (Route 105)	-	55	-	106
Bayview (Route 105)	18	19	3	70

(Source: Automatic Passenger Count – Point Check Data, Sept 2010 Booking)

While the LRT station at Booth Street is under construction there will be a need to provide transit detours that take OC Transpo riders to the Gatineau destinations currently served - Les Terrasses de la Chaudière and Place du Portage - from both the east and the west. Today, LeBreton station is a key transfer station for interprovincial riders, with about 250 passengers boarding interprovincial buses in the AM peak hour, and about 490 passengers alighting interprovincial buses during the PM peak hour. When Booth Street is closed for LRT construction, a temporary connection between Scott Street and the Ottawa River Parkway will be provided for general traffic, likely on either Broad Street or an extension of Preston Street. For this study, it is assumed that OC Transpo's interprovincial transit services would also use this detour route during construction staging of the OLRT.

### 3.1.2.3 Transit Travel Times

The current travel times for buses on the Transitway and on Scott Street are shown in Exhibit 3-5. This information is required to estimate the amount of time that would be added for the various detour options and its impact on transit riders and resource requirements (buses and operators).



Exhibit 3-5: Table Showing Existing Transit Travel Times  
(Source: OC Transpo Website, August 2011)

<i>Section</i>	<i>Average Travel Time* (hr : min)</i>
<b><i>Transitway</i></b>	
Westboro to Tunney's Pasture	0:02
Westboro to Bayview Station	0:04
Westboro to LeBreton	0:05
Tunney's Pasture to LeBreton	0:03
Bayview Station to LeBreton	0:01
Tunney's Pasture to Slater and Kent	0:05
<b><i>Scott Street</i></b>	
Westboro to Tunney's Pasture	0:03
Tunney's Pasture to Bayview	0:03
Tunney's Pasture to LeBreton (Booth St.)	0:06
Tunney's Pasture to Slater and Kent (Bay St.)	0:09

*\*Average Travel Time was derived from the scheduled stops for two indicator routes:  
Route 97 (Transitway) and Route 18 (Scott).*

### 3.1.2.4 Passenger Activity in the Affected Area

Changes in the way transitway services are routed during construction will have impacts on travellers' experiences. In particular, Tunney's Pasture is an important destination in the transit system with approximately 2,350 people alighting at this station during the AM peak period (on local and transitway platforms).

Exhibit 3-6 shows the number of alightings taking place on the transitway platforms at Tunney's Pasture, Bayview, and LeBreton in the AM peak period, broken down by service type.

Exhibit 3-6: AM Peak Period Alightings at Transitway Stations  
(Source: Automatic Passenger Count – Point Check Data, Sept 2010 Booking)

<i>Service Type</i>	<i># of Passengers Alighting</i>		
	<i>Tunney's Pasture</i>	<i>Bayview</i>	<i>LeBreton</i>
<b><i>Eastbound * Inbound to Downtown Ottawa</i></b>	<b>966</b>	<b>641</b>	<b>1413</b>
Transitway Routes	417	264	450
Local Routes	29	30	108
Peak-Only Routes	27	16	123
Kanata Express Routes and Rural-West Routes	293	216	366
Barrhaven Express Routes	200	115	264
Orleans Express Routes and Rural-East Routes			32
Inter-Provincial Regular Routes			10
Inter-Provincial (Peak-Only) Routes			60
<b><i>Westbound * Outbound from Downtown Ottawa</i></b>	<b>955</b>	<b>129</b>	<b>327</b>
<b><i>Total Alightings (AM Peak Period)</i></b>	<b>1921</b>	<b>770</b>	<b>1740</b>

Transfers between transitway services and the O-Train take place at Bayview Station. Currently in the eastbound direction in the AM peak hour, about 425 people per hour alight at the Transitway stop and about 135 people per hour board at this stop, meaning that approximately 425 people are transferring from eastbound transitway buses to rail and about 135 people are transferring from rail to eastbound transitway buses. Exhibit 3-7 shows passenger boardings and alightings at Bayview Transitway Station by service type during the AM and PM peak hours. The vast majority of these passengers are transferring between bus and O-Train services.

Exhibit 3-7: Table Showing Boardings and Alightings at Bayview Station in AM and PM Peak Hours  
(Source: Automatic Passenger Count – Point Check Data, Sept 2010 Booking)

Service Type	AM PEAK HOUR		PM PEAK HOUR	
	# of Passengers Boarding	# of Passengers Alighting	# of Passengers Boarding	# of Passengers Alighting
<b>Eastbound * Inbound to Downtown Ottawa</b>	<b>135</b>	<b>421</b>	<b>88</b>	<b>128</b>
Transitway Routes	65	169	77	109
Local Routes	17	21	5	8
Peak-Only Routes	3	6	1	10
Kanata Express Routes and Rural-West Routes	20	141	-	-
Barrhaven Express Routes	18	84	-	-
Inter-Provincial (Peak-Only) Routes	12	0	5	1
<b>Westbound * Outbound from Downtown Ottawa</b>	<b>92</b>	<b>47</b>	<b>293</b>	<b>158</b>
Transitway Routes	59	27	125	88
Local Routes	11	3	25	16
Peak-Only Routes	17	2	6	1
Kanata Express Routes and Rural-West Routes	-	-	93	13
Barrhaven Express Routes	-	-	42	6
Orleans Express Routes and Rural-East Routes	2	5	-	-
Inter-Provincial (Peak-Only) Routes	3	10	2	34
<b>Total Station Activity</b>	<b>227</b>	<b>468</b>	<b>381</b>	<b>286</b>

Additional station activity details are provided in **Appendix A**.

### 3.1.2.5 OC Transpo's Near-term Service Plans Affecting the Study Area

Transitway service construction detours in this area are likely to be in place between 2015 and 2018. It is therefore important to consider OC Transpo's transit service plans in the evaluation of options.

Overall the service will change very little on the Transitway in the next 5-7 years. More double-decker buses are on order and will be used on express routes. The higher capacity of double decker buses means that fewer buses will be required than would otherwise have been the case, which will off-set some ridership growth.

An important initiative being undertaken is a significant improvement in the O-Train service. The service frequency will be doubled, from 4 to 8 trips per hour, by 2014 and the service will be

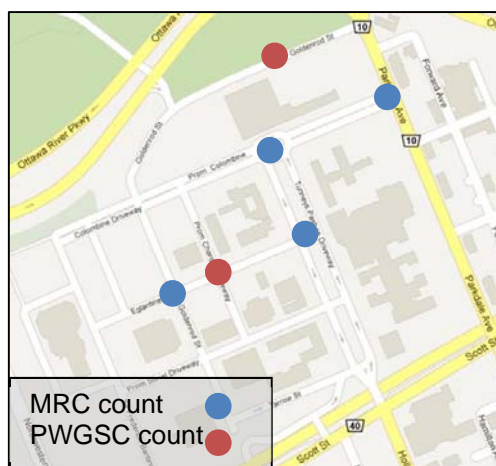
strongly promoted as a faster route from South Ottawa to downtown avoiding the delays that are likely on the Southeast Transitway during LRT construction. This is an important consideration since transfers between the O-Train and Transitway services at Bayview Station will be affected by the choice of corridor(s) selected for construction detours.

## 3.2 General Traffic Conditions

### 3.2.1 DATA COLLECTION PROGRAM

Traffic volumes and signal timing plans at all major intersections along the Ottawa River Parkway/Wellington Street, Scott Street, and Parkdale Avenue were provided by the City of Ottawa. Additional traffic counts for the Tunney's Pasture Campus were provided by Public Works and Government Service Canada (PWGSC) for two locations, and consequently MRC initiated traffic counts at four additional locations. Traffic count locations for the Tunney's Pasture Campus are shown in Exhibit 3-8.

Exhibit 3-8: Map Showing Traffic Count Locations



In addition MRC initiated auto travel time runs between June 14<sup>th</sup> and June 16<sup>th</sup>, 2011 to identify the existing travel times along the Ottawa River Parkway and Scott Street corridors. The surveys were conducted using GPS units which recorded the time, vehicle location and vehicle speed at five second intervals. The number of independent runs varied between 23-36 along each of the identified routes during the peak periods of 7:00 – 9:30 AM and 3:00 – 5:30 PM. The methodology for these data collection efforts and the results obtained are further described in Section 3.2.4.

### 3.2.2 CORRIDOR TRAFFIC DEMANDS (AM & PM)

Both the Ottawa River Parkway and Scott Street corridors function as four lane arterial roads within the study area. The peak hour traffic volumes on the Ottawa River Parkway are as high as 1,900 – 2,100 vph in the peak direction while the peak hour traffic volumes on Scott Street are significantly lower with 800 - 850 vph in the peak direction. Both the AM and PM peak hour traffic volumes are summarised in Exhibit 3-11.

### 3.2.3 INTERSECTION LEVELS OF SERVICE

The performance of area intersections was assessed through the application of widely accepted intersection traffic modeling software known as Synchro. The intersection operations are described by an overall intersection Level of Service (LOS) based on the intersection's reported volume to capacity ratio, as described in the City of Ottawa's Transportation Impact Assessment (TIA) Guidelines.

**Ottawa River Parkway:** Based on the existing traffic volumes and signal timings, the intersections along the Ottawa River Parkway are, for the most part, currently operating at a LOS 'E' during the PM peak hour. In the AM peak the intersections are operating at a LOS 'C' or better with the exception of Booth Street, Portage Bridge and Island Park Drive which are operating at a LOS 'D' or 'E'. With overall intersection operations approaching capacity (LOS 'D' or 'E'), several movements at these intersections have already reached capacity which results in growing queues, as the intersection fails to meet the demand. The movements that are currently operating with a volume to capacity ratio of 0.95 or higher are shown in Exhibit 3-9.

Exhibit 3-9: Existing Critical Movements on the Ottawa River Parkway

Intersection	AM PEAK HOUR	PM PEAK HOUR
Portage Bridge	Eastbound Left Westbound Through Southbound Left	Eastbound Left Westbound Right Southbound Left
Booth Street	Eastbound	Westbound Northbound
Island Park Drive	Eastbound Through Northbound Through Southbound Through	Eastbound Left Northbound Through
Tunney's Pasture	N/A	Westbound

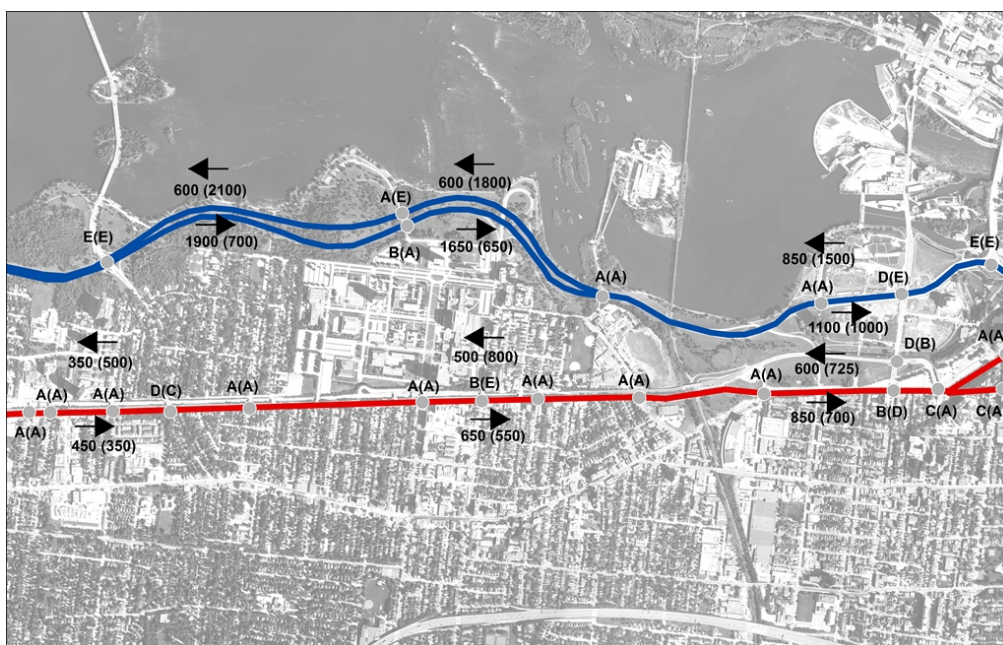
**Scott Street:** The intersections along Scott Street are generally operating at an acceptable LOS during the peak hours (LOS 'C' or better) with three exceptions. These Scott Street intersections are; Island Park Drive which is a LOS 'D' in the morning peak, Parkdale Avenue with a reported LOS 'E' in the PM peak and Booth Street at a LOS 'D' in the PM peak. The movements which are currently operating at or near capacity are summarised in Exhibit 3-10.

Exhibit 3-10: Existing Critical Movements on Scott Street

Intersection	AM PEAK HOUR	PM PEAK HOUR
Booth Street	N/A	Eastbound Left Westbound Through
Parkdale Avenue	N/A	Westbound Northbound
Island Park Drive	Southbound Through	Eastbound Left

The typical peak hour traffic link volumes along the Ottawa River Parkway and Scott Street as well as the reported intersection level of service with in each of the corridors are summarised in Exhibit 3-11.

Exhibit 3-11: Map Showing Existing AM (PM) Peak Hour Traffic Operations



### 3.2.4 TRAVEL TIME ANALYSIS

The travel time data collected along the both Ottawa River Parkway and Scott Street corridors has been tabulated based on the total travel time for the following two roadway segments; Churchill to Bronson and; Holland to Bronson. This provided a comparison of the performance of each corridor under existing conditions and an indication of the degree of traffic congestion during the peak hour when compared with the overall peak period. In addition to the total travel time, the locations where vehicles were moving at travel speeds of 20km/h or less were highlighted for both corridors to identify the locations of significant congestion.

A comparison of the travel time runs for the morning peak indicate that both corridors share similar travel times with the exception of the Ottawa River Parkway, where eastbound traffic during the morning peak between 7:45 and 8:45 AM experienced a much higher travel time, as shown in Exhibit 3-12. The average travel time in the peak direction for the Ottawa River Parkway and Scott



Street were found to be 9 minutes and 7 minutes-45 seconds for the eastbound AM and westbound PM, respectively.

As indicated, the locations where vehicles were moving at 20 km/h or less were identified to specifically locate areas of significant congestion. This is illustrated in Exhibit 3-13 for Scott Street and Exhibit 3-14 along the Ottawa River Parkway. The main congestion on the Ottawa River Parkway travelling eastbound in the morning peak is caused by downstream congestion closer to and in downtown with queues backing up as far as Vimy Place. For Scott Street corridor, the delay for eastbound traffic in the morning peak period is predominately located in the vicinity of the Booth Street and Empress Street intersections.

Exhibit 3-12: Chart Showing AM Peak Period Travel Times - Churchill Avenue to Bronson Avenue

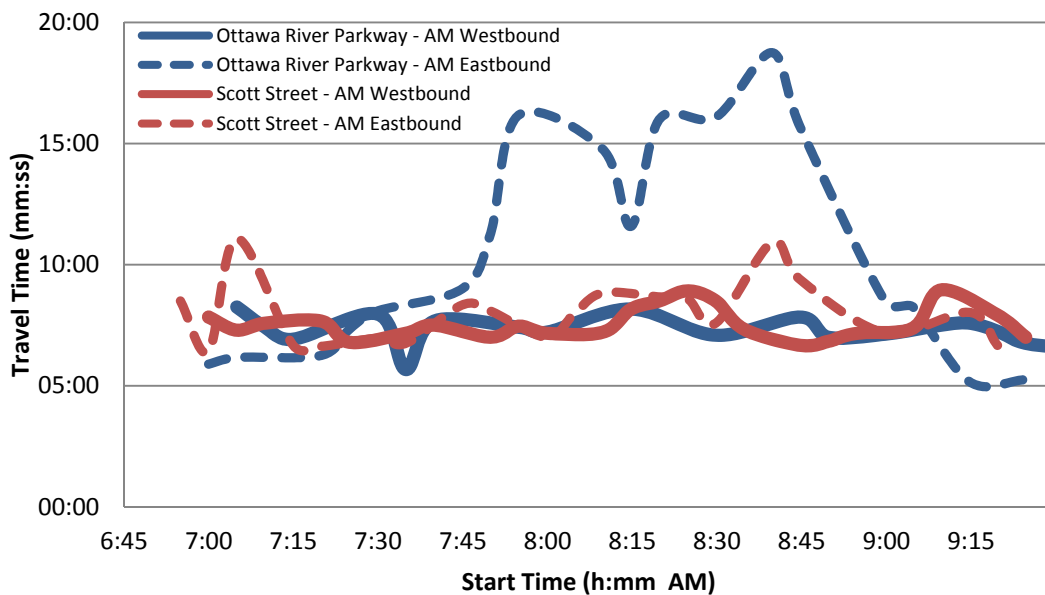


Exhibit 3-13: Map Showing Queues on Scott Street during the AM Peak Period



Exhibit 3-14: Map Showing Queues on the Ottawa River Parkway during the AM Peak Period



During the PM peak hour, the Ottawa River Parkway has the largest travel times however, throughout the afternoon peak period, Scott Street also experiences slow moving traffic, as shown in Exhibit 3-15.

The main congestion along the Ottawa River Parkway in the afternoon peak direction is caused by traffic leaving Tunney's Pasture and the delay experienced at the intersection of Island Park Drive, shown in Exhibit 3-17.

The Scott Street corridor has two primary areas of congestion during the afternoon peak. The first is the Booth Street intersection which creates queues which can spill back as far as Bronson Avenue and the second is the Island Park Drive intersection with queues extending to Northwestern Avenue. The queues for Scott Street are shown in Exhibit 3-16.

Exhibit 3-15: Chart Showing PM Peak Period Travel Times – Churchill Avenue to Bronson Avenue

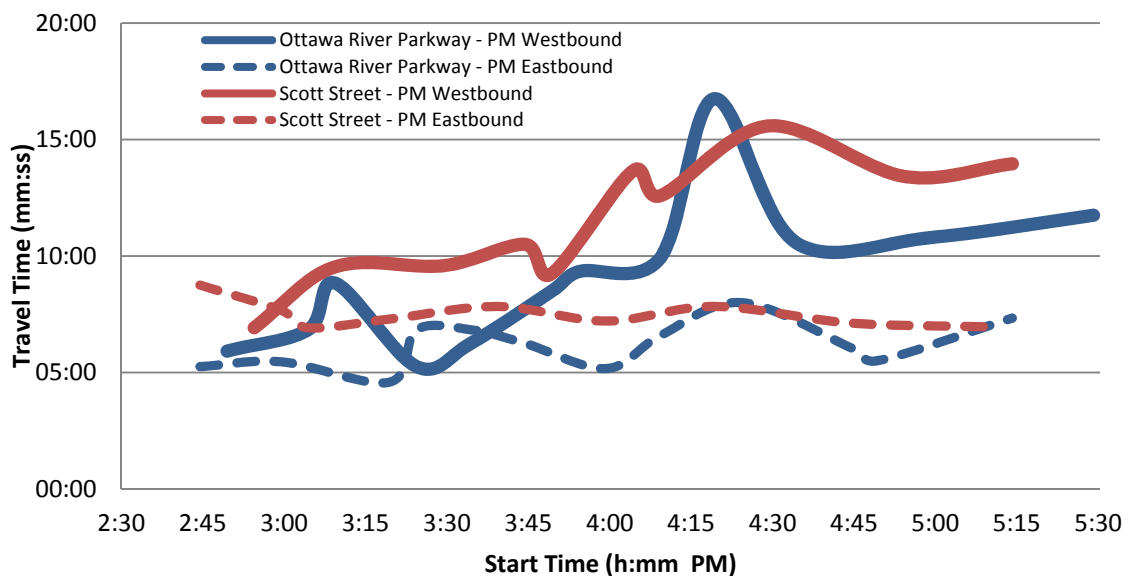


Exhibit 3-16: Map Showing Queues on Scott Street during the PM Peak Period



Exhibit 3-17: Map Showing Queues on the Ottawa River Parkway during the PM Peak Period



## 4. POTENTIAL DETOUR CORRIDORS

### 4.1 Connection to Tunney's Pasture Future Station

The first phase of the LRT line will be built between Tunney's Pasture and Blair Road. People traveling from the suburbs will transfer onto the line and, in the west, the transfer will take place at Tunney's Pasture. To accommodate this transfer movement, a temporary bus terminal will be provided adjacent to the LRT station as shown in Exhibit 4-1. Buses from the west will connect to the bus terminal at Tunney's Pasture via a ramp from the Transitway immediately west of the LRT station. Another feature of the transit hub at Tunney's Pasture will be a bus-only connection from Goldenrod to Scott Street where traffic signals will be provided, as shown in Exhibit 4-1.

Exhibit 4-1: Plan for Tunney's Pasture Station (Source: Rail Implementation Office, 2011)



In the course of this study the idea was explored of introducing the ramp connection to the bus station at Tunney's Pasture as the first stage of the western Transitway conversion to LRT. This would make it possible for Transitway service to remain on the Transitway to Tunney's Pasture and minimize the impact of construction detours. It would be feasible to build the ramp and temporary station over a summer period, during which time Transitway service could be detoured onto Scott Street between Westboro Station and the bus lay-up area immediately east of Bayview Station. The section of Scott Street from Westboro to Tunney's Pasture is partially two-lane (between the station and Island Park Drive) and has residential development on the south side; therefore, transit detours are expected to cause a more significant disturbance in this portion of the corridor, as compared to the four-lane cross-section east of Island Park Drive. However, a relatively short (in the region of four months to construct the Transitway ramp at Tunney's Pasture) period of disruption would enable buses to remain on the Transitway to Tunney's Pasture for the two or three years it will take to build the LRT infrastructure on the West Transitway and commission the system.

Alternatively, the ramp and station could be built while the Transitway remains open, during which time OC Transpo Route 86 would operate on Scott Street east of Holland Avenue. Once the ramp and station were completed, the Transitway would close past Tunney's Pasture. For a very short

period of time after the Transitway closure, while the connection between the temporary station and Scott Street (i.e. the Goldenrod extension) was being constructed, all buses would use the existing bus bridge to connect to Scott Street. While the existing bus bridge is currently operating in only one direction, it is wide enough to accommodate two-way bus traffic. Finally, buses would shift onto the completed Goldenrod extension, as part of the final detour plan that is expected to last 2 to 3 years. A proposed staging plan, provided to us by the City's Rail Implementation Office, is shown in **Appendix B**. The advantage of this two-stage construction process is that it avoids running Transitway services on Scott Street between Westboro and Tunney's Pasture stations. However, it does have a cost premium of approximately \$150,000 <sup>2</sup>.

This study has taken as a basic foundational element that this connection, however it is staged, will be built as a first step to the implementation of longer-term West Transitway service detours.

## 4.2 Transitway Construction Detour Corridors

Three Transitway construction detour corridors were carried forward for evaluation:

- 1) Scott Street from Goldenrod (Tunney's Pasture Station) to Bronson Avenue;
- 2) The Ottawa River Parkway from Tunney's Pasture Station, connecting back to Scott Street using the currently disused Preston Street ramps; and
- 3) The Ottawa River Parkway from Tunney's Pasture directly into downtown Ottawa, connecting back to Albert/Slater via Bay and Lyon.

The corridors are shown in Exhibit 4-2 (Corridor 1) and Exhibit 4-3 (Corridors 2 and 3). An assessment of the three corridors was undertaken to determine their feasibility and the level of transit priority that would be required. They were assessed for the impact of the detours in the peak period on both bus and auto travel times. Peak hour, peak direction Transitway service in this area consists of approximately 100 buses per hour on Transitway and local routes and 70-80 buses per hour on express routes. The assessment was made for two cases: all services detoured onto the corridor; and Transitway routes or express routes only detoured.

Exhibit 4-2: Corridor 1 - Scott Street



<sup>2</sup> Cost estimated provided by City of Ottawa Rail Implementation Office



Exhibit 4-3: Corridor 2 &amp; 3 - Ottawa River Parkway



The assessment indicated that bus lanes would not be feasible on the Ottawa River Parkway because of the high impact they would have on travel times of general traffic. It also showed that the Ottawa River Parkway corridors could not accommodate all the Transitway services without causing very heavy delays to all traffic.

#### 4.2.1 CORRIDOR 1: SCOTT STREET

Scott Street from Goldenrod to Booth Street runs adjacent to the Transitway, its use would therefore enable the existing OC Transpo routes to be maintained with little geographic deviation from current operations.

##### 4.2.1.1 Bus Lanes

Under all transit detour routing scenarios, the projected transit volumes on Scott Street far exceed the 60 buses/hour threshold given in the TAC manual (Transportation Association of Canada guidelines used nationally) to warrant dedicated bus lanes, therefore the introduction of bus-only lanes have been carried forward in this analysis. Issues to consider in the corridor include the residential development on the south side of Scott Street which is built close to the road, particularly in the area between City Centre and Empress Street. Within this section, Scott Street is a four-lane arterial but the lanes are too narrow to provide bus lanes. A widening of approximately 3 m, which could be accommodated on the north side of the road, would be required to provide a dedicated bus lane. Therefore, as a starting point for the corridor comparison, a traffic analysis was carried out assuming that exclusive bus lanes would be provided in both directions on Scott Street west of Goldenrod Street. Initially a concept with curbside bus lanes was considered, with the exception of the section from Goldenrod to Bayview, where an eastbound median bus lane was suggested (**Appendix F**).

##### 4.2.1.2 Other Infrastructure Requirements

###### *Connection to the O-Train Station from the South Side of Scott Street*

Currently transfers from eastbound transit service available on Scott Street to the O-Train are made by crossing Scott Street at the traffic signals and using the north-side ramp down to the O-Train station. With the limited service on Scott Street today, this works well. However, with more transfers being made as would be the case if Transitway services were operating on Scott Street, avoiding the crossing of Scott Street would be a benefit.



It is possible to provide a connection directly to the O-Train station from the proposed platform on the south side of Scott Street. A preliminary design for this is shown in Exhibit 4-4. This connection would be highly beneficial, enhancing convenience and improving safety for transit users. The cost of this connection, excluding any property costs, would be in the order of \$135,000.

Under this preliminary design, the pathway would extend about 150 m and would be 3 m wide. The pathway would be constructed with a maximum grade of 5% to meet all accessibility needs. Pedestrian lighting would be recommended to provide adequate illumination of the pathway. A pedestrian handrail would also be strongly recommended, on the south side of the pathway, to provide extra protection for all users. In addition, about 910 m<sup>2</sup> of property would have to be obtained by the City to construct the path as proposed (see **Appendix G**).

This proposed pathway connection would allow the traffic signals on Scott Street to be removed, which would improve bus stop operation at what will become an increasingly busy stop. A railing would be installed on the median of the roadway in the vicinity of the bus stop to prevent pedestrians crossing Scott Street at this location (see **Appendix G**). Few pedestrian crossings are expected in this area and these can be accommodated by the existing signals at Bayview and the grade-separated crossing through the O-Train station.

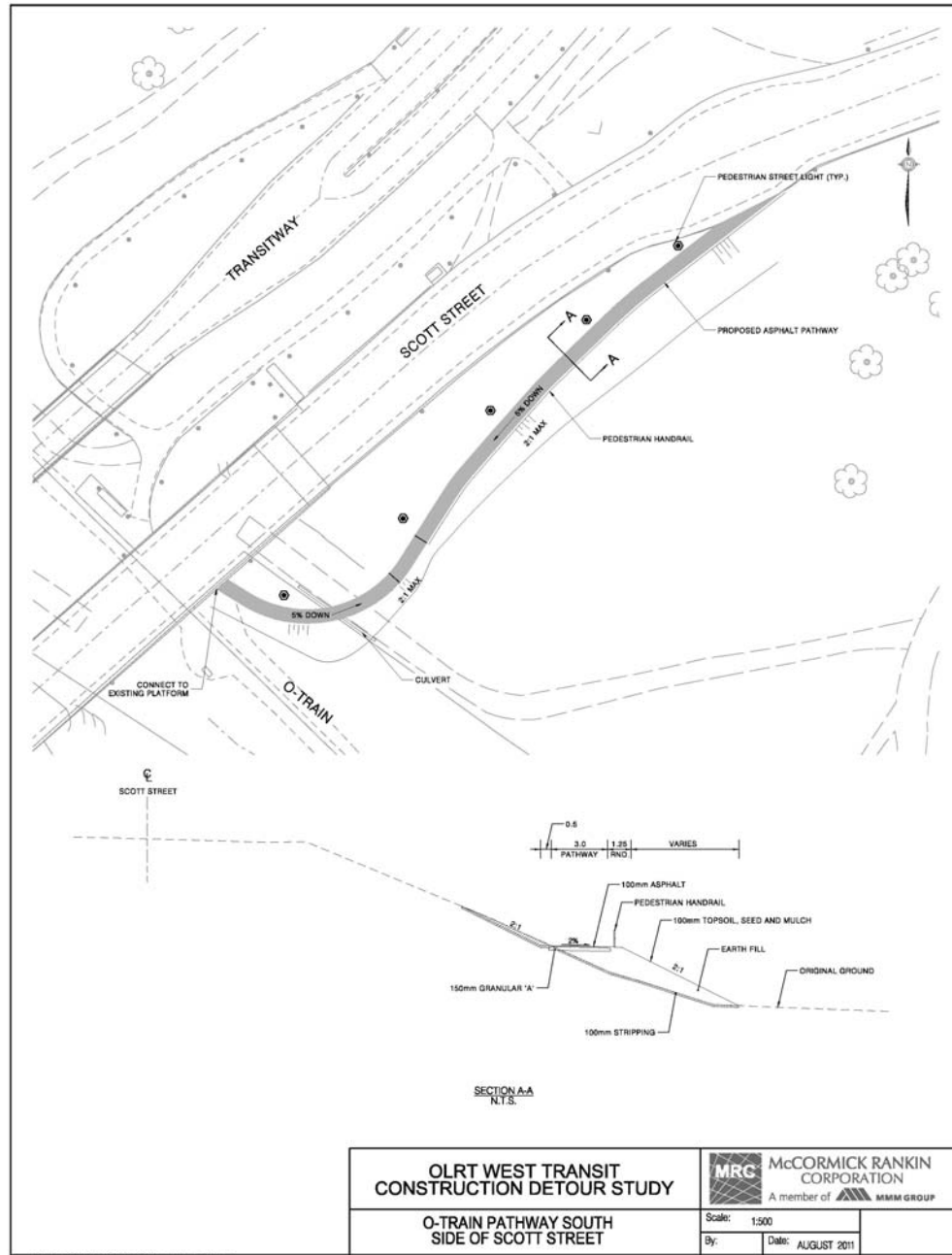
#### *Platforms on Scott Street at Bayview*

With the planned increase in frequency of the O-Train, ridership will increase. Justification of the O-Train improvements was, in part, its enhanced capability to attract south-end transit users away from the Southeast Transitway during LRT construction, avoiding the anticipated delays north of Hurdman Station.

The AM peak hour will be the time at which the maximum number of passengers board buses on Scott Street at Bayview. Currently approximately 200 passengers board eastbound buses at Bayview Transitway station in the AM peak period and approximately the same number board westbound buses. So, in the peak hour, approximately 100 passengers board in each direction. Assuming these numbers double as a result of the O-Train improvements, this will mean that 200 passengers board in each direction in the peak hour. Assuming a maximum gap between buses of 5 minutes in the AM peak hour, this would result in a passenger accumulation of 17 in each direction and space must be available to comfortably accommodate these numbers. Allowing 0.5 square metres per waiting passenger, around 10 square metres would be needed at the eastbound and westbound stops.

Currently there are 30 metre bus bays both eastbound and westbound at Bayview Station offering scope to provide shelters and waiting areas more than sufficient for the expected maximum passenger accumulations. It is estimated that the cost to fill in these bus bays and provide a simple shelter would be in the order of \$30,000 (\$15,000 per direction). (N.B. As a cost-saving measure, it is recommended that the existing bus shelters at Bayview Station be relocated to Scott Street during the duration of the transit detours.)

Exhibit 4-4: Proposed Pathway Connection from South Side of Scott Street



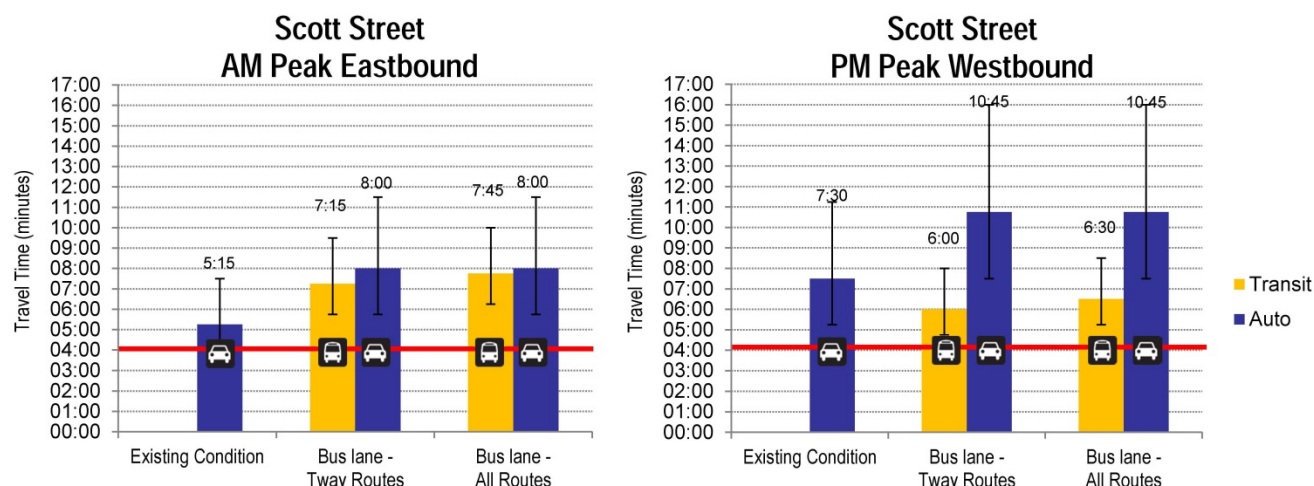
#### 4.2.1.3 Travel Time Analysis

Exhibit 4-5 shows the preliminary expected travel times on the Scott Street corridor in the AM and PM peak periods, peak direction for transit and autos for:

- the case with all Transitway services (including express) diverted onto the corridor in a bus lane; and
- the case when only Transitway and local routes are diverted to the bus lane.

The travel times are compared with the existing condition for general traffic, and the travel time on the existing Transitway is also shown. The degree of variability in travel times is indicated by the black bars. This shows that the impact on general traffic if a bus lane were provided would be a delay of about 3 minutes, and that this would be the same whether all Transitway service or just Transitway and local routes were detoured in this corridor. The additional travel time for transit, compared with the current Transitway routing, would be 2-4 minutes from Tunney's Pasture station to Bronson Avenue. Travel times for transit would be slightly longer if all Transitway services were detoured onto Scott Street than if only Transitway and local routes were detoured. Full details of this analysis are provided in **Appendix C**.

Exhibit 4-5: Projected Peak Direction Travel Times on Scott Street



#### 4.2.2 CORRIDORS 2 AND 3: OTTAWA RIVER PARKWAY

The Ottawa River Parkway is the responsibility of the National Capital Commission. It is a four-lane scenic driveway running alongside the Ottawa River and currently transit buses are prohibited from using it east of Dominion Avenue. Heavy vehicles are prohibited for the full length of the Parkway. However, it is a commuter route from the west-end of Ottawa into the central area and has therefore been considered as a potential temporary construction route for Transitway services.

Corridors 2 and 3 follow a common route from Tunney's Pasture Station until the Preston Street Ramp and connection to Scott Street. Both would see bus service routed from Tunney's Pasture Station to the Ottawa River Parkway. The two corridors diverge at the ramps where Corridor 2 uses the ramp connection to the Transitway and Scott Street at Preston Street and continues on Scott/Albert to downtown Ottawa, while Corridor 3 follows the Ottawa River Parkway and

Wellington Street into downtown Ottawa, reconnecting with the central area Transitway via Lyon/Bay (see Exhibit 4-3 presented previously).

#### 4.2.2.1 Connection between Tunney's Pasture Station and the Ottawa River Parkway

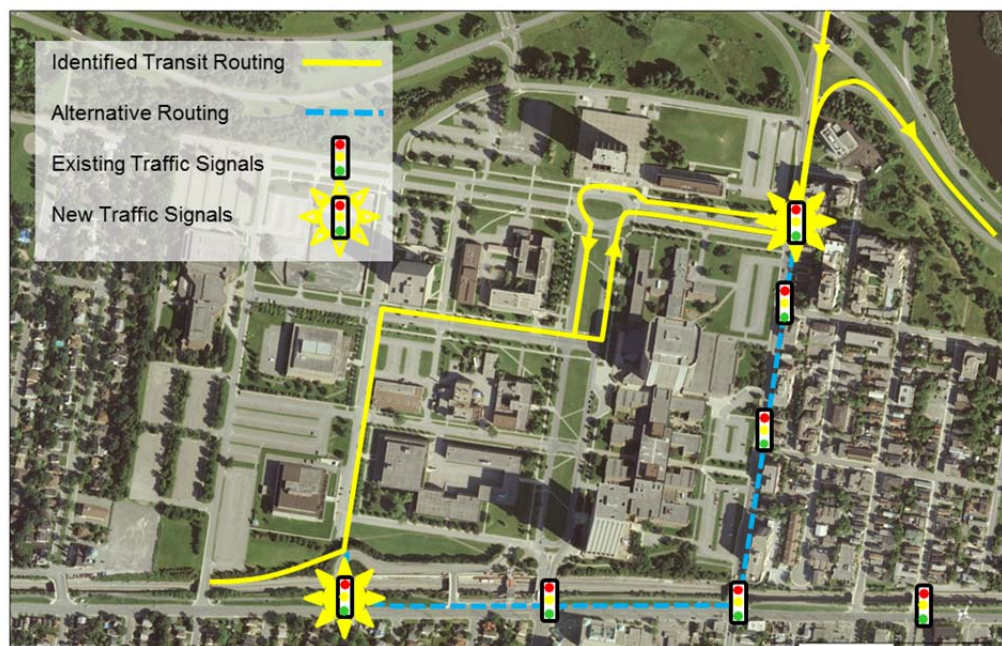
There are two possibilities to make a connection between Tunney's Pasture station and the ORP in the vicinity of the station: routing buses through the campus; and routing buses via Scott Street and Parkdale Avenue. Both of these options were analysed as part of this study. It was concluded that the better way to route buses is via through the campus as shown in the Identified Transit Routing in Exhibit 4-6, and is based on the following analysis.

##### *Routing through Tunney's Pasture Campus*

Tunney's Pasture is a busy campus with about 12,000 people employed within 14 buildings. There are about 3,300 outdoor parking spaces on-site. In peak periods pedestrian activity is significant, and the campus is also used for cut-through traffic from Scott Street to the ORP.

The most promising transit detour path through Tunney's Pasture campus was identified during a study workshop with stakeholders, including Public Works Canada and their consultants who manage the site on their behalf. This is shown (in yellow) in Exhibit 4-6.

Exhibit 4-6: Proposed Routing Through Tunney's Pasture



An alternative routing from Tunney's Pasture Station to the ORP is also highlighted (in blue) in Exhibit 4-6. This makes use of the connection from the station to Scott Street via Goldenrod, Scott Street and Parkdale Avenue. It also uses the proposed bus lane on Scott Street and involves fewer turns than the route through the campus described in the previous section.

However, additional delays anticipated at the six traffic signals on this route make the Tunney's Pasture Campus route preferable. Based on a relative comparison (i.e. not accounting for upstream and downstream traffic) using Synchro traffic modeling software to identify delays, the route through Tunney's Pasture is expected to be faster when considering only express buses going to the ORP (see Section 4.2.2). This is consistent across all peak periods and in both travel directions.

Exhibit 4-7: Comparison of Routes from Tunney's Pasture Station to ORP

Route	EASTBOUND				WESTBOUND			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Through Tunney's	Parkdale	Through Tunney's	Parkdale	Through Tunney's	Parkdale	Through Tunney's	Parkdale
Transit Travel Time (minutes)	2:33	7:20	2:23	3:36	2:12	2:13	1:50	4:12
Travel Time Difference between Routes (minutes)	4:47		1:13		0:01		2:22	

However, it must be noted that for buses to operate through Tunney's Pasture, it would be necessary to upgrade the roadways on which they would operate to support transit services. It is estimated that this would cost in the order of \$2.25 million (\$CDN 2011), based on the need to upgrade<sup>3</sup> approximately 1,675 metres of roadways (8m wide) through the campus.

*Connection to and from the Ottawa River Parkway at the North End of Tunney's Pasture Campus*

There are two connections to the Tunney's Pasture campus from the Ottawa River Parkway: one at the east end connecting to Parkdale Avenue and one further west that connects directly into the north end of the campus (see Exhibit 4-8).

The preferred connection for detoured transit buses would be the one from the Ottawa River Parkway to Parkdale Avenue via the existing ramps. The westbound ramp passes under both lanes of the ORP and there was a concern that the height clearance may not be sufficient to accommodate double decker buses (the three existing double decker bus models operated are approximately 4.255 m in height and the 75 buses OC Transpo has on order will be 4.149 m). However, measurements were taken that confirm the minimum vertical clearance as 4.63 metres, which is more than adequate. In the eastbound direction the connection from Parkdale Avenue to the ORP is a free-flow ramp.

The western entrance, which is currently used by buses on an STO route traveling between Aylmer and Tunney's Pasture across the Champlain Bridge, would require a left-hand turn from the ORP into Tunney's Pasture for westbound buses, which would add delay and would not accommodate either of the routing connections discussed in the previous two sections. This was therefore not pursued further.

<sup>3</sup> Assumed scope of work will include full excavation of the existing roadway for a reconstructed road structure consisting of 500 mm Gran B, 150 mm Gran A, subdrains, concrete curbs, iron work adjustments, 100 mm of superpave 19mm, 40 mm of superpave 12.5 mm, and sod reinstatements.



Exhibit 4-8: Entrances to Tunney's Pasture



#### 4.2.2.2 Connection to Scott Street using Preston Street ramps (Corridor 2)

The Preston Street ramps are disused ramps that could be used to provide a connection from the ORP to the Transitway and from there to Scott Street (Exhibit 4-9 & Exhibit 4-10). The ramps were used by transit buses before the Transitway was constructed, but today the west-bound ramp is used as a maintenance pathway and the eastbound ramp is overgrown with vegetation (predominately grass).

There was some concern that the westbound ramp may not have sufficient vertical clearance to accommodate a double decker bus, but measurements were taken that showed the clearance to be a minimum of 4.62 m, more than sufficient for a double decker bus.

Concerns were also raised about the use of ramps in an area with existing contamination. However, preliminary discussions suggest that these ramps could be re-used without significant issues environmental concerns.

As well as connecting to the Transitway, the connection to Scott Street, which is already there in the form of an old pathway, would need to be reinstated.

If the ramps were to be used for a transit detour they would require to be repaved, as would the existing extension of Preston Street. It is estimated that this would cost in the order of \$675,000 (\$100,000 for the westbound ramp which is still in use as a maintenance ramp; \$500,000 for the eastbound ramp which is currently disused and overgrown; and \$75,000 for the connection to Preston Street).

Exhibit 4-9: Disused Ramp Connection to Transitway

Exhibit 4-10: Alternate View of Disused Ramps  
(Source: Bing Maps, 2010)

#### 4.2.2.3 Connection to Downtown Ottawa Via Wellington Street (Corridor 3)

Once on the Ottawa River Parkway, buses could remain on the Parkway and access the Central Area Transitway via Wellington and Lyon/Bay. However, it should be noted that Wellington Street between Lyon/Bay and the Portage Bridge accommodates about 120 buses per hour in the peak period, consisting of STO services and OC Transpo services that use the Portage Bridge.

#### 4.2.2.4 Potential Transit Priority Measures on the Ottawa River Parkway

The possibility of providing an exclusive bus lane on the Ottawa River Parkway was analysed (see Section 4.2.2.5) but not pursued because of the negative impact the removal of a travel lane would have on general traffic travel times.

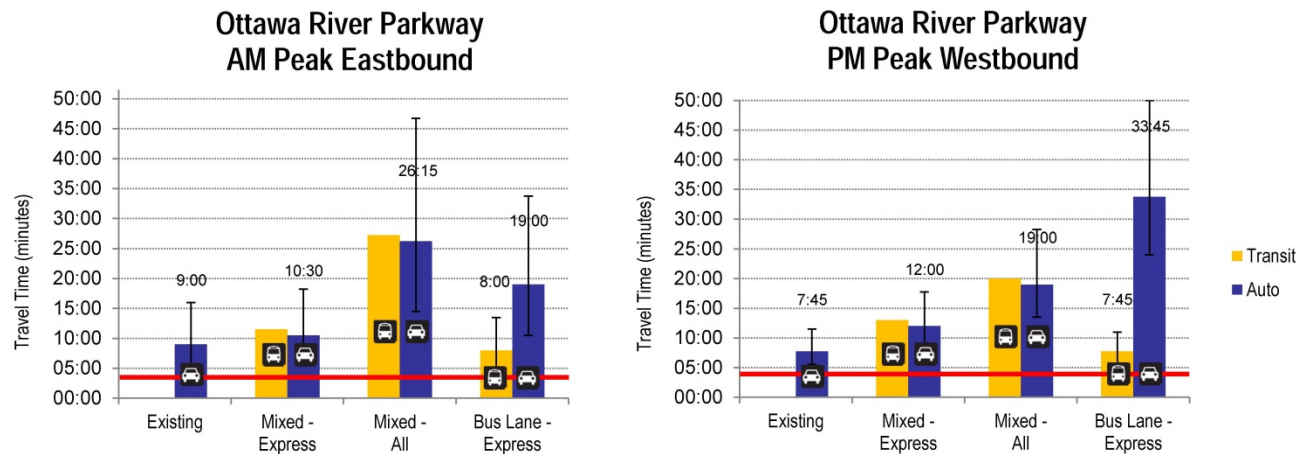
#### 4.2.2.5 Travel Time Analysis

The preliminary travel time analysis for both Ottawa River Parkway Corridors (2 and 3) was initially carried out based on Corridor 3. This was used to determine the feasibility of providing bus lanes on the Parkway and also whether or not the Parkway could accommodate the addition of all Transitway services and what the impact of detouring only express routes would be.

The results are shown in Exhibit 4-11. A review of the assessment results indicated that exclusive bus lanes on the Parkway introduced severe congestion for general traffic. The other conclusion that can be drawn from this analysis is that all Transitway services (i.e. Transitway and express services) could not be accommodated in mixed traffic without causing severe congestion and highly variable travel times. For these reasons, further analysis of transit service detour scenarios using the Ottawa River Parkway was limited to accommodating the express bus services in mixed traffic. Further details are provided in **Appendix C**.



Exhibit 4-11: Peak Direction Travel Time Projections for Ottawa River Parkway



## 4.3 Transit Scenarios

### 4.3.1 THREE TRANSIT SERVICE SCENARIOS

On the basis of the Corridor analysis, three transit scenarios were identified for further analysis and evaluation. These are shown in Exhibit 4-12, Exhibit 4-13 & Exhibit 4-14.

Exhibit 4-12: Transit Scenario 1 – Transitway and Express Buses on Scott Street

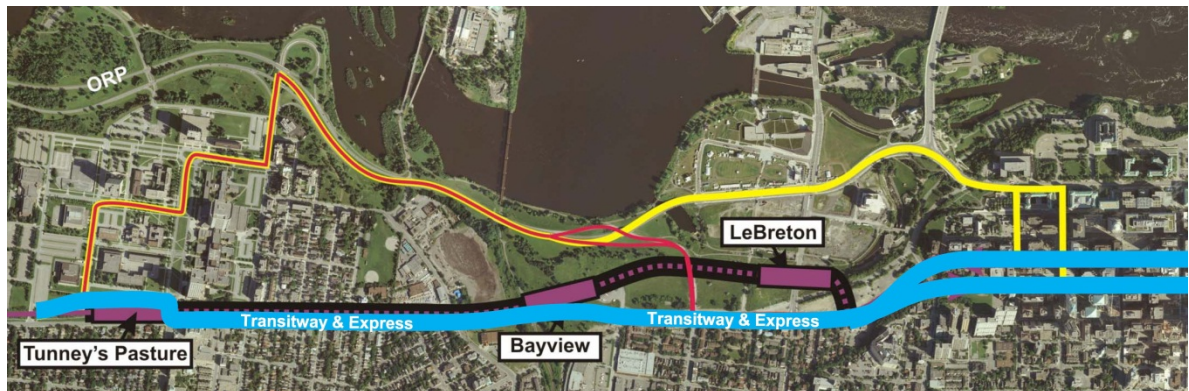


Exhibit 4-13: Transit Scenario 2 – Transitway Buses on Scott Street &amp; Express Buses on ORP to Ramps

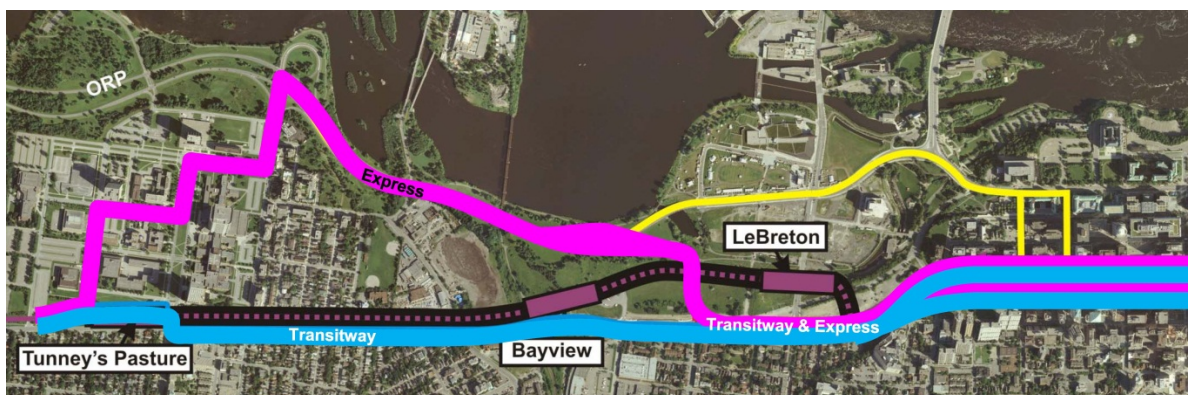
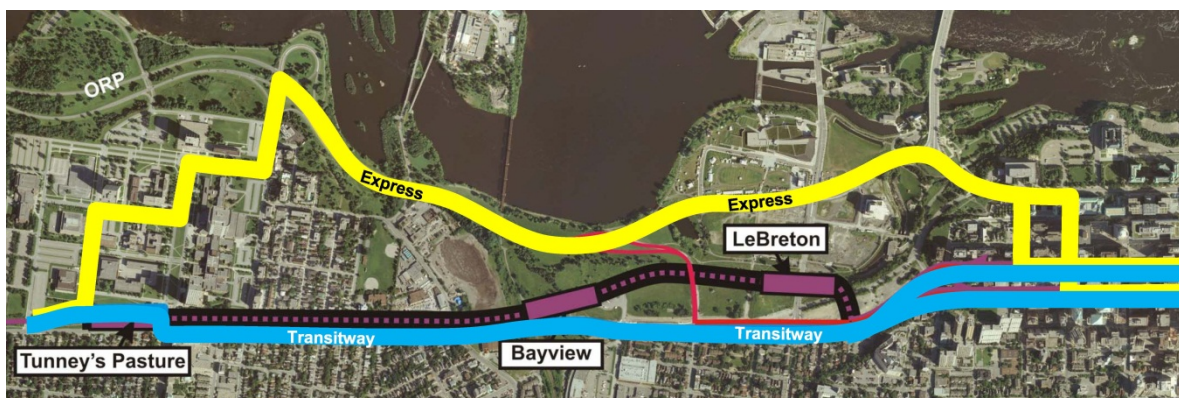


Exhibit 4-14: Transit Scenario 3 – Transitway Buses on Scott Street &amp; Express Buses on ORP to Lyon/Bay



All three scenarios place Transitway and local routes on Scott Street in a bus lane, since the corridor analysis showed that placing all service on the Ottawa River Parkway would not be feasible. Therefore the differences in the three scenarios can be summarised as:

- **Scenario 1** – Express routes on Scott Street in bus lane;
- **Scenario 2** – Express routes in mixed traffic on the Ottawa River Parkway from Tunney's Pasture to the Preston Street ramps and then returning to Scott/Albert Street; and
- **Scenario 3** – Express routes in mixed traffic on the Ottawa River Parkway from Tunney's Pasture to downtown, using Lyon/Bay to return to the Central Area Transitway.

#### 4.3.2 TRAVEL TIME ASSESSMENT

Auto and transit travel times were identified for the three scenarios, with the estimates highlighted in Exhibit 4-15 and Exhibit 4-16. The travel times were identified for the same geographical limits; i.e. between Bronson Avenue/Portage Bridge in the east and Tunney's Pasture Station in the west. However, given the established geographic limits of the travel time analysis, there will be significant additional delay to vehicle and transit operating on Wellington Street in Option 3 to gain access to the Slater/Albert corridor. This additional delay that is not captured within the limits of Bronson Avenue to Tunney's Pasture Station is depicted by a dashed yellow box in the following Exhibits.

From these Exhibits, it is noted that as auto travel times increase, their variability (depicted by the black bars) also increases for all scenarios. During the peak hours, it can be expected that auto travel times would approach the higher end of the projected variability, thereby promoting Scenario 1 as the preferred alternative when the impacts on automobile travel time are also considered.

Increases in transit travel times are also lowest for Scenario 1 and highest for Scenario 3. In fact, the dashed yellow boxes shown for Scenario 3 indicate the expected additional delay east of Bronson that would be expected to occur for this scenario, as the express buses would be added to the already congested Wellington Street corridor. The variation in travel times is also larger for both Scenarios 2 and 3 than for Scenario 1. It is noted that OC Transpo schedules its services with due consideration of travel time variability; with high variability in travel time for a route, more buses and

layovers are needed in order to offer reliable service. Therefore, Scenario 1 becomes the preferred alternative from a transit travel time perspective.

Scenario 1 – with all Transitway and Express buses operating on Scott Street – minimizes the additional transit travel time for passengers when compared to current Transitway operations. This is because the buses operate in a transit exclusive lane, whereas in Scenarios 2 and 3, buses are delayed by mixed traffic operating conditions along the Ottawa River Parkway. However, the transit exclusive lanes on Scott Street are not able to match the transit travel times on today's Transitway, as buses are delayed by signals, right turning vehicles, and transit buses serving local bus stops.

Exhibit 4-15: Peak Direction Auto Travel Time Comparison for Transit Detour Scenarios

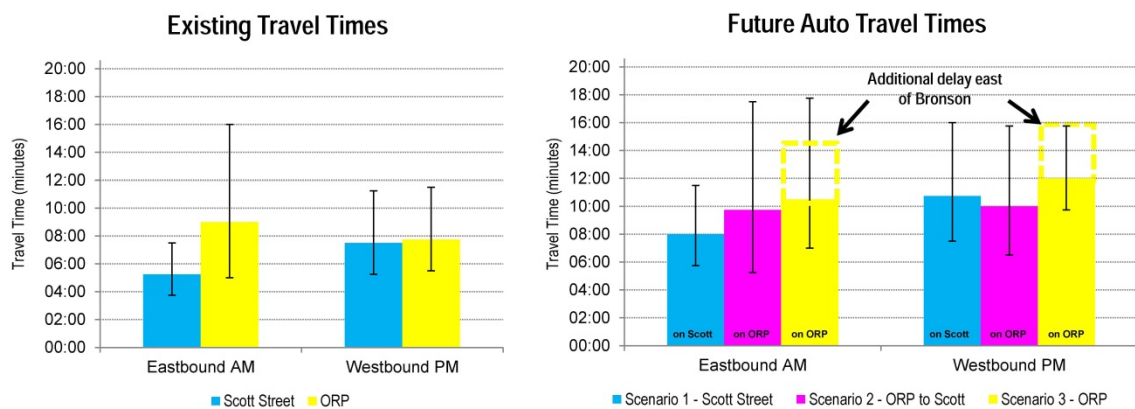
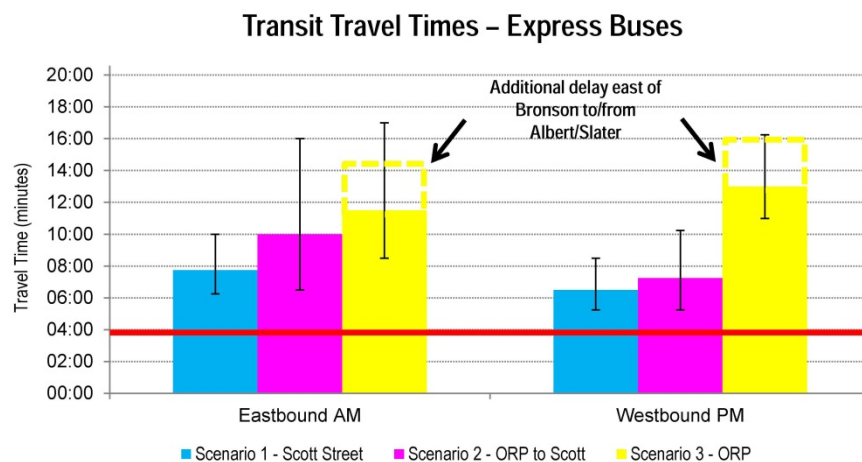


Exhibit 4-16: Peak Direction Transit Travel Time Comparison for Transit Scenarios





## 5. EVALUATION OF OPTIONS

### 5.1 Refinement of Scott Street Bus Lane Proposal

The results of the corridor and transit routing evaluations point to Scenario 1 - operating all Transitway and express routes on Scott Street from Goldenrod to Empress Street in bus lanes - as the likely preferred detour plan. Therefore, further detailed design and traffic analysis was undertaken in order to refine the proposal.

#### 5.1.1 COMPARISON OF POTENTIAL BUS LANE CONFIGURATIONS

Initially the concept with curbside bus lanes was considered for Scott Street, with the exception of the section from Goldenrod to Bayview where an eastbound median bus lane was proposed <sup>4</sup> (**Appendix F**). While the median bus lane would have the advantage of avoiding delays to transit vehicles caused by right-turning vehicles and vehicles stopped in the curb lane to serve passenger needs (e.g. in the vicinity of Holland Cross), an assessment of the merge required at the transition from median to curb lane at Bayview and an overall assessment of the pros and cons indicated that curbside bus lanes are the preferred option for both travel directions over the entire length of the corridor.

While curbside bus lanes may minimize the impact of traffic infiltrating through the neighbourhoods (fewer turn prohibitions required), and ultimately minimize auto traffic delays (reduced delay from local bus stops and right-turning vehicles), they could have less positive impacts on transit performance. This is due to local buses stopping in the curb bus lane, as well as the interaction of right turning vehicles with transit vehicles at cross streets and accesses for adjacent businesses. In developing the preferred concept plan within the Scott Street corridor some potential mitigation measures were reviewed to address these concerns, and some are noted for future mitigation, as further described below.

To address the potential for right turns at cross streets delaying transit vehicles, the delay and queues of right turning vehicles were reviewed to determine if the addition of right turn storage lanes would be warranted. Due to the low right turn volumes at the side streets as well as the low pedestrian volumes, there was no advantage to providing dedicated right turn lanes adjacent to the bus lane, other than where they currently exist in the corridor. Right turn prohibitions could also be considered. Again, due to the low right turn and pedestrian volumes none were included in the analysis but if it was determined to be a problem with the facility in place, turning restrictions during the peak hours at cross streets could be implemented. No traffic volumes were available for the entrances to local businesses and residences, and so no specific driveway analysis was carried out. That being said, to mitigate some of the impacts of vehicles accessing locations on the south side of Scott Street over the bus lane, the potential reconfiguration of the entrances, where possible, could be considered during the retrofit of Scott Street (i.e. combining entrances to better define their location and in some cases where entrance locations are excessively long, reducing the entrance their length with formal curbs).

An estimate of the impact of local bus stops in the corridor on the Transitway and Express buses was carried out. While the volume of local buses is low, Transitway and Express buses behind a local bus could be delayed up to two additional minutes in the corridor. Potential mitigation measures to improve this situation would be relocating local bus stops, providing bus bays if

<sup>4</sup> As identified in the preliminary plan provided by the City of Ottawa Rail Implementation Office

feasible (this would likely require property within the corridor) and/or moving the local bus off Scott Street to an adjacent street.

A comparative assessment of median vs. curb bus lanes is provided in **Appendix E**, while conceptual drawings of the recommended bus lanes are included in **Appendix G**.

### 5.1.2 REFINED TRAVEL TIME ANALYSIS

With the recommendations summarized in the previous section, the future traffic operations were analyzed for the preferred corridor option. The intersection traffic operations and associated LOS are expected to deteriorate with the implementation of transit lanes along Scott Street. The only exception is the intersection of Scott Street and Parkdale Avenue where the overall intersection operation would improve as a result of banning the northbound and southbound left turns in the future as part of the transit detours during the AM and PM peak periods. Without these turn restrictions in place during the peak periods, the traffic analysis indicates the intersection would fail to operate at an acceptable LOS.

Exhibit 5-1: Scott Street Peak Hour Intersection Operations

Intersection	AM PEAK		PM PEAK	
	Existing	Future	Existing	Future
Albert & Bronson	A	A	A	A
Slater & Bronson	C	C	A	A
Albert & Booth	B	C	D	D
Scott & Preston	A	D	A	B
Scott & Bayview	A	A	A	B
Scott & Carruthers	A	A	A	A
Scott & Parkdale	B	C	E	C
Scott & Holland	A	B	A	C

The impact on vehicle and transit travel times for the preferred corridor option with intersection refinements is shown in Exhibit 5-2 and Exhibit 5-3. The transit travel times include an additional 1min 45s of dwell time associated with stops located at Bayview and LeBreton Stations. The transit travel times are expected to increase by two to three minutes above the current four minute travel time on the existing Transitway.

Exhibit 5-2: Scott Street AM Peak Hour Travel Times

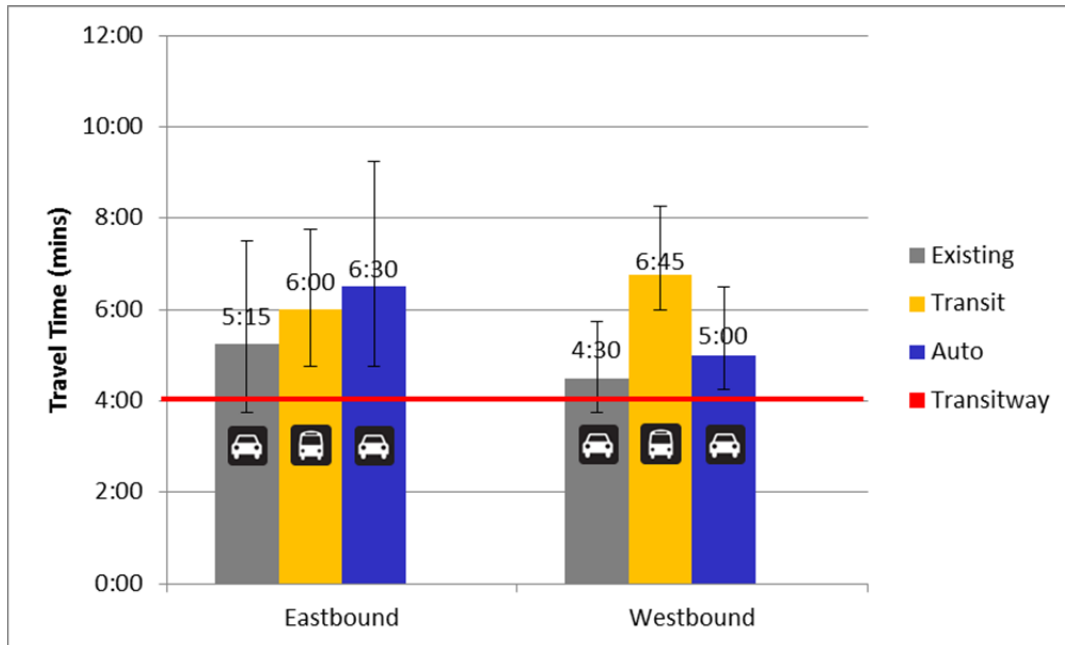
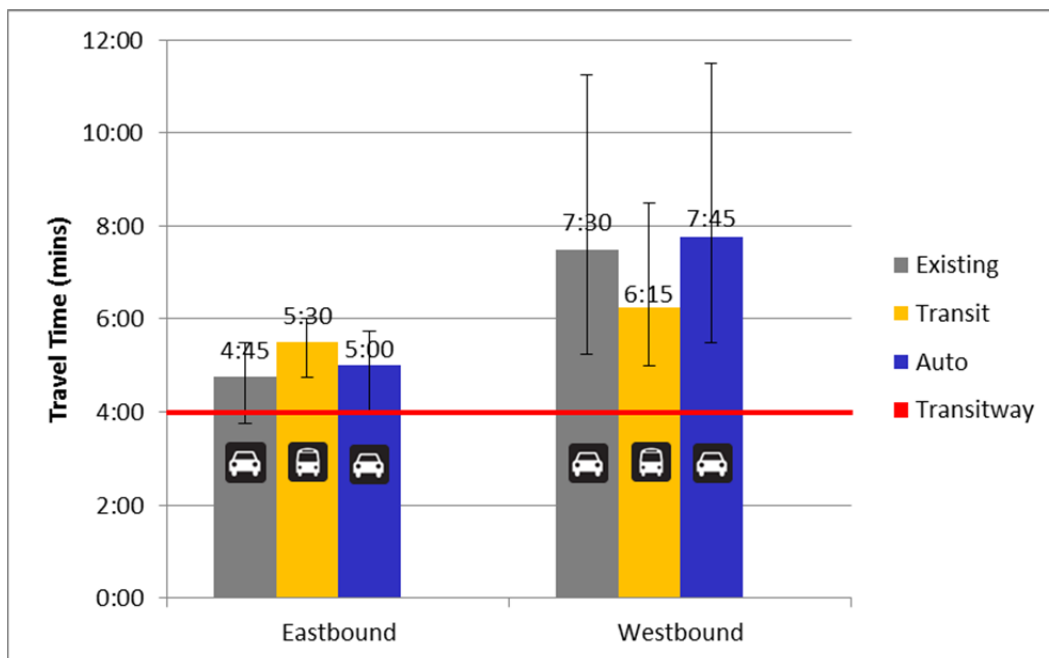


Exhibit 5-3: Scott Street PM Peak Hour Travel Times



### 5.1.3 FUTURE ANALYSIS AND REFINEMENTS

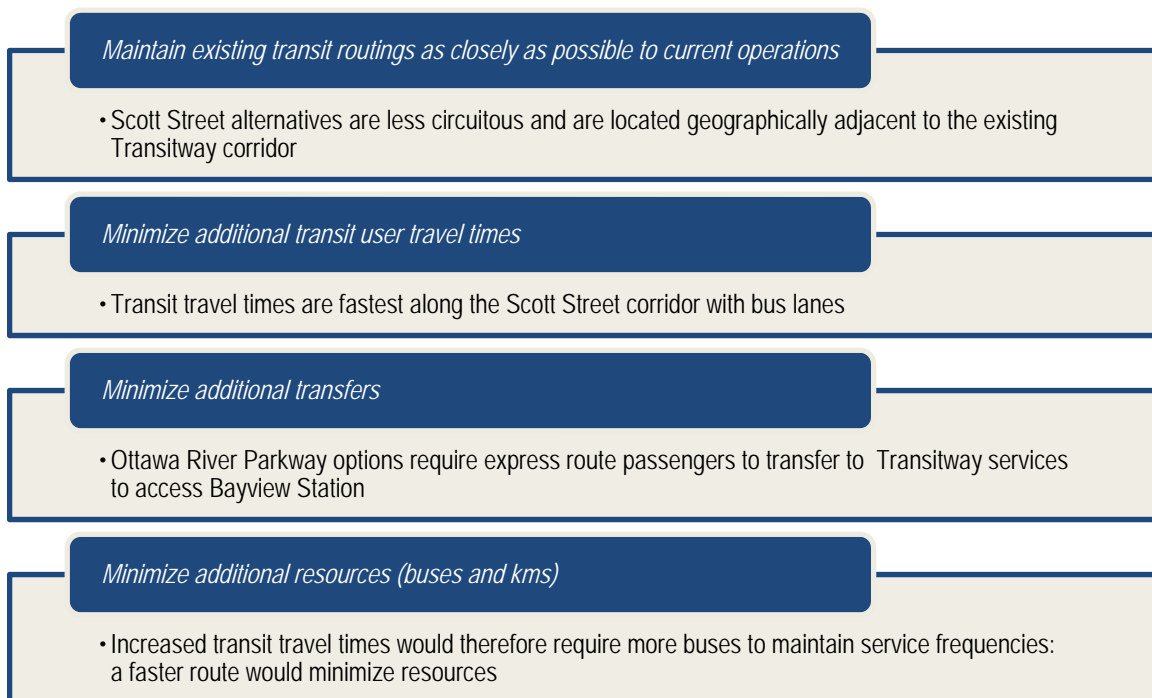
Additional analysis would be required to refine the conceptual plan developed as part of this study. The additional traffic analysis should include a review of the traffic signal coordination with the downtown network and ensure the delays in this area are adequately quantified based on their close proximity to downtown. In addition, further refinement of the Tunney's Pasture Station design including its interim connection to the Transitway ramp and the transit operations at the station will be required to finalize the signal timing plan for the Goldenrod Street intersection on Scott Street. In

the morning peak hour, it will be necessary for at least 4 or 5 buses to pass through the signals on each cycle from Goldenrod to Scott Street. The preliminary design plan provided by the City of Ottawa Rail Implementation Office identifies storage room for only 2 or 3 buses on Goldenrod between the ramp and Scott Street. It is likely that the best way to manage the bus movements in this area will be by having stop controls at the ramp exit and for OC Transpo to develop operational procedures to ensure buses leaving the station are given priority for the signal phase permitting the left turn onto Scott Street.

In addition, the City is reviewing the various options to provide an interim connection between Scott Street and the Ottawa River Parkway in the area of Booth Street due to the requirement to close Booth Street at some point during construction of the LRT. Discussions to date have included using a Broad Street or Preston Street extension as an interim connection. Once this route is selected, further analysis of Scott Street between Preston Street and Empress Avenue will be required to ensure transit and general purpose traffic operates effectively through this area. This study has applied the City's most recent plan for the Booth Street/Albert Street Intersection. It is understood that the design in this area has not been finalized and could be refined during the Albert Street corridor retrofit project. The intersection operations at Booth Street should be reviewed during this additional analysis as more details are determined.

## 5.2 Evaluation of Transit Impacts

Returning to the evaluation criteria identified earlier (Section 1.3), it can be seen that:



On the basis of these evaluation criteria, Scenario 1, with all service on Scott Street, is clearly the best for transit services and riders. However, it means the addition of up to 180 buses in the peak hour, peak direction on Scott Street. Scenario 3 would be highly problematic for transit services, given the additional potential congestion and delays incurred east of Bronson Avenue. Scenario 2 would reduce the numbers of buses on Scott Street west of Preston Street but would add 3 to 6

minutes to express bus users' travel time and would not reduce transit volumes east of Preston Street.

Longer travel times and, equally important, increased variability in travel times will require OC Transpo to provide additional resources. It is estimated that the refined Scenario 1 would require 18 additional in-service buses at an approximate cost of \$5.9 million/year. Scenario 2 would require 24 additional in-service buses and add \$7.6 million to annual operating costs and Scenario 3 would require 28 additional in-service buses and cost \$9.8 million annually (**Appendix D**). It should be noted that Scenarios 2 and 3 may result in west end express routes having to be downgraded to regular routes because of the slower, more circuitous service. This could potentially add an additional cost of \$1.6 million per year in lost revenue.

Travel time and service reliability are important features of transit service from the perspective of transit users and potential users. The addition of travel time and increase in variability of travel time will make the service less attractive and reduce transit ridership. In fact, commuters generally consider travel time and service reliability more important than transit fares. The amount of ridership loss (or reduction in ridership growth) will depend to an extent on the performance of the alternative modes (usually the car). It is not possible to quantify the ridership impact of the construction detour scenarios, but they can certainly be ranked according to the expected delay and variation and the number of additional transfers that will be required.

### 5.3 Evaluation of Traffic Impacts

The traffic analysis of the various transit detour scenarios shows that total traffic impact is minimized with all transit services on Scott Street. Again it is noted that all scenarios analyzed are based on the locating the Transitway services and local bus services along Scott Street in exclusive bus lanes.

#### *Minimize disruption to road users*

- **Scenario 1 – Scott Street:**
  - With a bus lane, all buses could be accommodated in a single corridor
  - Up to 2 minute delay to auto traffic on Scott Street
- **Scenario 2 – Scott / Ottawa River Parkway (using Preston Street Ramps):**
  - Service considers express buses on ORP and Transitway buses on Scott Street
  - Up to 2 minute delay to auto traffic on Scott Street
  - 1 - 2 minute delay to auto traffic on Ottawa River Parkway
- **Scenario 3 – Scott / Ottawa River Parkway (to Lyon / Bay):**
  - Service considers express buses on ORP and Transitway buses on Scott Street
  - Up to 2 minute delay to auto traffic on Scott Street
  - 2 - 3 minute delay to auto traffic on Ottawa River Parkway

Note: Transitway service on Scott Street is common to all scenarios presented above.



## 5.4 Evaluation of Impacts on Residential Areas

The impact on residents of moving Transitway services off the Transitway facility during construction of the OLRT is an issue that must be considered in the evaluation of options. Returning to the evaluation criteria identified earlier (Section 1.3), it can be seen that:

### *Minimize additional bus traffic in residential areas*

- Bus detours on Scott Street impact more residences than detours on the Ottawa River Parkway, which is largely located along federal parkland.

The analysis shows clearly that it is not possible to operate all Transitway service on the Ottawa River Parkway without causing massive congestion. It also shows that, even part of the service (i.e. express routes) cannot be operated into downtown on the Ottawa River Parkway without causing serious delays for all traffic.

Of the two feasible transit routing scenarios (Scenario 1 – with all service on Scott Street and Scenario 2 – with service divided between the Ottawa River Parkway & Scott Street) there is no difference in the impact on the residential area south of Scott Street and east of Preston Street. In these two scenarios, all buses in both directions will travel in bus lanes on Scott Street east of Preston Street.

Scenario 1 and 2 differ in the number of buses travelling on Scott Street between Goldenrod and Preston Street. Scenario 1 results in all buses in both directions travelling in bus lanes on Scott Street, whereas Scenario 2 results in about half of these buses travelling in the bus lanes on Scott Street during the peak hour.

The impact of the detoured Transitway services can be reduced by ensuring that the Scott Street bus lanes are constructed to standards that minimize noise and vibrations. For instance, a main cause of noise and vibrations can be ironworks on the roadway and ensuring that these are, if necessary, relocated when the bus lanes are implemented will be important.

## 5.5 Summary of Scenario Evaluation

A summary of the evaluation of the scenarios is shown in Exhibit 5-4.

It can be seen from this Exhibit that the capital costs associated with the bus lanes on Scott Street, the connection to the O-Train station and improved waiting areas on Scott Street are common to all scenarios. The additional costs for Scenario 2 are to upgrade the pavement to carry buses through Tunney's Pasture campus and to renovate the Preston Street ramp connection to Scott Street. Further information regarding transit resource requirements are provided in **Appendix D**.

Exhibit 5-4: Evaluation of Transit Scenarios

	Transit User Impacts	General Traffic Impacts	Impacts on Residential Areas <sup>5</sup>	OC Transpo Resource Requirements (2016) <sup>6</sup>		Infrastructure Costs
				Number of additional buses <sup>7</sup> (including spares)	Annual additional operating costs (\$ CDN 2011)	
<b>Transitway Service</b>						
ALL SCENARIOS Scott Street in bus lane	Additional travel time per passenger trip <sup>8</sup> : 2 - 3 <sup>9</sup> minutes per trip Additional transfers per day: 0	Up to 2 minutes of additional travel time for cars on Scott	100-110 Eastbound buses/hr and about 140 Westbound buses/hr on Scott Street from Goldenrod to Bronson in bus lane in the AM Peak Hour	17	\$4.3 M	Cost of Bus Lane Project: ? Build pathway connection on south side of Scott St at O-Train: \$135,000 + property requirements Fill in bus-bays and provide shelter on Scott St at Bayview: \$30,000
<b>Express Service</b>						
SCENARIO 1 Scott Street in bus lane	Additional travel time per passenger trip <sup>6</sup> : 2 - 3 <sup>10</sup> minutes per trip Additional transfers per day: 0	No additional delay	Additional 70-80 Eastbound buses/hr on Scott Street from Goldenrod to Bronson in bus lane in the AM Peak Hour	4	\$1.6 M	-
SCENARIO 2 ORP in mixed traffic to ramps, and on Scott to Bronson in bus lane	Additional travel time per passenger trip <sup>6</sup> : 3- 6 <sup>8</sup> minutes per trip Additional transfers per day: 700 <sup>11</sup>	1 - 2 minutes of additional travel time for cars on ORP	Additional 70-80 Eastbound buses/hr on Scott Street east of Preston Street in bus lane in the AM Peak Hour	11	\$3.2 M + \$1.6 M <sup>12</sup>	Signal at Parkdale & Colombine: \$150,000 Refurbish ORP transit ramps: \$675,000 Upgrade road surface through Tunney's Pasture: \$2.25 M
SCENARIO 3 ORP to Bronson in mixed traffic	Additional travel time per passenger trip <sup>6</sup> : 8 - 9 <sup>8</sup> minutes per trip Additional transfers per day: 700 <sup>9</sup>	2 - 3 minutes of additional travel time for cars on ORP	No additional buses on Scott Street	16	\$5.5 M + \$1.6 M <sup>10</sup>	Signal at Parkdale & Colombine: \$150,000 Upgrade road surface through Tunney's Pasture: \$2.25 M

<sup>5</sup> Number of buses affecting residential areas bordering Scott Street<sup>6</sup> A 20% contingency has been added to the expected OC Transpo resource requirements for 2016.<sup>7</sup> Impact analysis based on 2010 OC Transpo information. To adjust to 2015-2018 time period, a growth factor of 3% per year has been added.<sup>8</sup> Additional minutes per passenger trip is shown as a min/max range of additional travel times from both the AM & PM period in both EB & WB directions.<sup>9</sup> Transitway passengers affected: About 7000 – 7500 passenger trips per peak hour.<sup>10</sup> Express passengers affected: About 3250 – 3400 passenger trips per peak hour.<sup>11</sup> Transfers at Bayview (assuming transfer from express to interprovincial services is possible).<sup>12</sup> Potential revenue loss if express routes downgraded to regular service.

Based on this assessment of impacts, Scenario 1 constitutes the preferred detour plan, where all Transitway and express routes will operate on Scott Street from Goldenrod to Empress Street in bus lanes. For further information, please refer to **Appendix C & Appendix D**.

## 6. RECOMMENDATIONS

The foregoing analysis has identified Scott Street as the preferred detour routing for Transitway services when the Transitway from Tunney's Pasture to LeBreton is closed for OLRT construction. The evaluation of options considered impacts on transit users, traffic, residents in the neighbourhood, and capital and operating costs.

It will be important to minimise the time for which the construction detour must be in place so that these impacts may be reduced. For instance, while the analysis has considered the situation when the Transitway is closed between Tunney's Pasture and LeBreton, it may be possible to maintain service on the Transitway between the lay-up area east of Bayview Station and LeBreton station while work is done on Tunney's Pasture and Bayview Stations, to reduce the time for which the detour must use Scott Street east of Preston Street where there are adjacent residential areas.

### 6.1 Corridor Selection

Based on this evaluation, the recommendation is to:

- Build the station at Tunney's Pasture, ramp connection from the Transitway and signaled connection to Scott Street at Goldenrod;
- Operate all Transitway and express routes on Scott Street from Goldenrod to Empress Street in bus lanes as proposed in this report (Section 5.4); and
- Provide a pedestrian connection from the south side of Scott Street to the O-Train Station at Bayview and expand and improve waiting areas on both sides of Scott Street.

### 6.2 Summary of Recommended Service Plan

The implications of the recommended plan are as follows:

Bus Requirements:	
• In-Service Buses:	18
• Active Fleet ( <i>includes 15% spares</i> ):	21
• Additional Annual Operating Cost (\$2011):	~ \$5.9 M
Capital Costs:	
• Bus Lanes on Scott St.	?
• Bayview Station Modifications:	\$155,000 + property requirements
• Additional Delay per Transit Trip:	2 – 3 min.
• About 10,250 – 10,900 passenger trips per peak hour	
Auto Delay:	
• Additional Delay per Auto Trip:	Up to 2 min.

It should be noted that a contingency of 20% has been added to the numbers of additional buses that will be required as well as the annual operating costs.

### 6.3 Phasing of Construction Considerations

Before work commences on the west Transitway conversion, it is suggested that:

- The bus lanes on Scott Street, the pedestrian connection from the south side of Scott Street to the O-Train platform and the expanded waiting areas at the stop on Scott Street at the O-Train station should be in place.

The first work on the west Transitway conversion would be:

- Construction of the ramp from the Transitway at Tunney's Pasture, the bus station at Tunney's Pasture and the connection via Goldenrod to Scott Street, including the traffic signal.
  - During the short period of construction of the ramp and bus station at Tunney's Pasture, Transitway service would operate on Scott Street between Westboro and the lay-up area immediately east of Bayview Station OR the ramp connection and temporary station could be staged as described in Section 4.1 at a cost premium of \$ 150,000.<sup>13</sup>
  - Transfers to and from the O-Train would take place on Scott Street.
- Transitway conversion could then proceed east of Tunney's Pasture once the buses are operating on Scott Street.

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<sup>13</sup> Cost estimate provided City of Ottawa Rail Implementation Office