REGION OF WATERLOO

TRANSPORTATION AND ENVIRONMENTAL SERVICES
Rapid Transit

TO: Members of Council

DATE: June 15, 2011 **FILE CODE:** A02-30/PW

SUBJECT: RECOMMENDED RAPID TRANSIT IMPLEMENTATION OPTION

RECOMMENDATION:

THAT the Regional Municipality of Waterloo take the following action regarding the Region's proposed rapid transit system:

a) Approve light rail transit (LRT) as the preferred technology from Conestoga Mall in the City of Waterloo to the Ainslie Street Terminal in the City of Cambridge;

b) Approve the LRT route and stations generally as shown in Figure A.3 in Appendix A and listed in Appendix B in report E-11-072;

c) Approve the implementation of option L3 as Stage 1 of the LRT system including LRT from Conestoga Mall to Fairview Park Mall and adapted bus rapid transit from Fairview Park Mall to the Ainslie Street Terminal, as shown in Figure A.2 in Appendix A in report E-11-072;

d) Approve funding for the Region's portion of the Stage 1 capital costs and operating and maintenance costs, subject to annual budget deliberations, based on an annual tax rate increase of 1.2 per cent per year (2012 to 2018), area rated to the urban transit service area;

e) Approve funding for improvements to Grand River Transit bus service, subject to annual budget deliberations, based on an annual tax rate increase of 0.3 per cent per year (2012 to 2018), area rated to the urban transit service area;

f) Direct staff to pursue a Regional development charge legislative amendment in order to assist with funding the LRT project;

g) Approve an allocation of $1,000,000 annually, for a 10-year period, to implement transit-supportive strategies in Cambridge, subject to annual budget deliberations during that 10-year period. Details of the program to be developed in conjunction with the City of Cambridge and to be presented to Regional Council for approval in a subsequent report; and

h) Direct staff to pursue the following steps to expedite Stage 2 of the LRT system including LRT from Fairview Park Mall to the Ainslie Street Terminal:

- Begin the Transit Project Assessment for LRT from Fairview Park Mall to the Ainslie Street Terminal in 2014;
- Acquire property for the implementation of Stage 2 of the LRT system as soon as feasible;
- Pursue additional federal and provincial funding for Stage 2 of the LRT system;

- Explore the location of a future multi-modal transit facility in Cambridge to link to future GO rail service; and
- Undertake measures to encourage transit-supportive development, to enhance transit ridership throughout the urban transit service areas, including (but not limited to) developing incentives for transit-oriented developments and supporting and developing transportation demand management strategies for new and existing businesses and residents.

SUMMARY:

The Region continues to plan for tremendous population and employment growth over the next two decades. To provide for the projected growth, the Region will have to either continue its pattern of outward growth or encourage greater intensification in existing developed areas. Recognizing this challenge, staff identified that rapid transit is preferred over business-as-usual, to move people and to shape urban form. The Region began a rapid transit environmental assessment (EA) in 2006 to identify the best possible rapid transit system for Waterloo Region. As part of the EA, the project team evaluated a number of rapid transit technologies. Bus rapid transit (BRT) and light rail transit (LRT) were short listed because they had the greatest potential to:

- Support the Region's redevelopment and intensification objectives;
- Optimize the use of road and railway corridors to serve major destinations; and
- Be compatible with existing and planned built neighborhoods.

In June 2009, Regional Council approved a rapid transit implementation plan subject to satisfactory federal and provincial funding. In 2010, the Provincial and Federal governments announced their funding commitments and staff commenced a review of the financial implications of the rapid transit plan. During the fall of 2010, concerns were raised about the affordability of the rapid transit project, specifically in terms of the Region's contribution. Staff undertook an objective review of project implementation options for Council's consideration, in order to identify a rapid transit project that is affordable to the Region and provides best value to the community.

The Multiple Account Evaluation (MAE) findings demonstrate that LRT has a higher cost to install than BRT, but delivers the greatest benefits to the community, and best accomplishes the goals of the Regional Growth Management Strategy (RGMS). BRT is cheaper per kilometre to install and to operate than LRT, but the number of buses required to meet passenger demand is projected to exceed road capacity within 20 years, requiring replacement with alternate rapid transit technology such as LRT, at considerable expense and disruption. Staff have identified that LRT is the preferred technology because an LRT system provides the best long-term environmentally and financially sustainable solution to help manage our community's future growth and transportation needs.

Staff recommend that the LRT system should be built in affordable stages, and that Stage 1 should include LRT from Conestoga Mall to Fairview Park Mall and adapted bus rapid transit (aBRT) from Fairview Park Mall to the Ainslie Street Terminal. The impacts to property tax for Stage 1 are estimated to be a 1.2 per cent annual tax rate increase for seven years (2012 to 2018), area rated to the urban transit service area. Budget savings from the retirement of other debt on Regional buildings and the uploading of social assistance costs could be allocated to fund a portion of the Stage 1 costs, reducing the impacts to property tax for Stage 1 to a 0.7 per cent annual tax rate increase for seven years (2012 to 2018). The property taxes may also be reduced by other funding sources, such as development charges and additional taxes collected from new property developments.

Staff recommend that Grand River Transit (GRT) bus service should increase by 25 per cent from now until 2018. The impacts to property tax for this expansion of bus service are estimated to be a

1.3 per cent annual tax rate increase for seven years (2012 to 2018), area rated to the urban transit service area.
Stage 2 of the LRT system would add LRT from Fairview Park Mall to the Ainslie Street Terminal. Staff are recommending steps to move forward on implementation of Stage 2, including:

- Allocate $1 million annually, for a 10-year period, to implement transit-supportive strategies in Cambridge;
- Begin the Transit Project Assessment (TPA) for LRT from Fairview Park Mall to the Ainslie Street Terminal in 2014;
- Acquire property;
- Pursue additional federal and provincial funding;
- Explore the location of a future multi-modal transit facility in Cambridge to link to future GO rail service; and
- Undertake measures to encourage transit-supportive development, to enhance transit ridership throughout the urban transit service areas.

Since 2006, the Region has conducted an extensive public involvement process for this project with more than 150 public outreach events for rapid transit, including presentations, speaking engagements, information booths and more than 30 public consultation centres. Between February and May 2011, staff conducted two rounds of public input. The number of people attending each public consultation centre and information booth has added up to well over 2,000 and staff received more than 1,700 written comments. Although a number of issues and questions have been raised, the majority of comments express support for LRT and the staff recommendation.

REPORT:

1. Background

The Region continues to plan for tremendous population and employment growth over the next two decades. To provide for the projected growth, the Region will have to either continue its pattern of outward growth or encourage greater intensification in existing developed areas. High-quality rapid transit has been identified as a crucial component in managing growth, facilitating intensification and minimizing/reducing future “urban sprawl”. A high-quality rapid transit system is vital for the Region to evolve into a more compact urban form, helping to prevent sprawl and protect sensitive environmental landscapes and high quality farmlands from urban encroachment. A high-quality rapid transit system will also reduce the need for the construction of new or expanded roads in existing mature neighbourhoods and reduce road congestion.

The Region of Waterloo faces a major decision with respect to rapid transit. Staff and other outside experts have identified that rapid transit is preferred over business-as-usual, to provide transportation choice, to meet future transportation needs, and for the building of a viable, vibrant and sustainable community (see reports E-09-073, E-11-010, E-11-021 and E-11-044).

The Region is planning for a rapid transit system that will connect the Cities of Waterloo, Kitchener and Cambridge, and many important destinations along the way. The planning for the rapid transit system is being undertaken in conformity with the provisions of the *Regional Official Policies Plan*, the recently approved *Regional Official Plan* (ROP), the *Regional Transportation Master Plan* (RTMP), and the *Places to Grow: Growth Plan for the Greater Golden Horseshoe*.

2. Evaluation of Rapid Transit Technologies

The Region began a Rapid Transit Environmental Assessment in 2006 to identify the best possible rapid transit system for Waterloo Region. In 2007, the rapid transit project team developed a

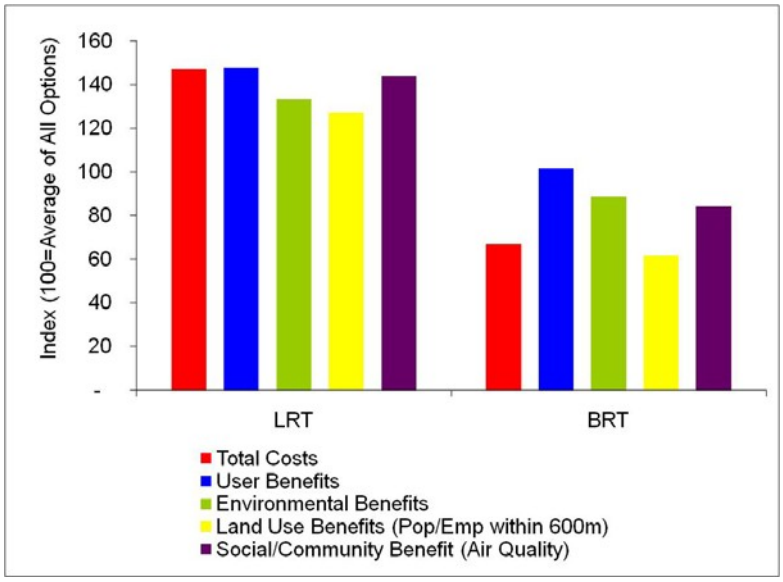
number of criteria to evaluate 10 rapid transit technologies (BRT, LRT, commuter rail, diesel multiple units, aerobus, automated guideway transit, magnetic levitation, monorail, personal rapid transit and subway) and their associated route designs. Based on the results of the evaluation, BRT and LRT operating on a mix of on/off road route designs were short-listed because they had the greatest potential to:

- Support the Region's redevelopment and intensification objectives;
- Optimize the use of road and railway corridors to serve major destinations; and
- Be compatible with existing and planned built neighborhoods.

The evaluation of rapid transit technologies was updated in 2011, confirming the earlier decision to shortlist BRT and LRT. BRT and LRT were evaluated in detail in the MAE analysis. The findings from the MAE were previously presented to Regional Council on June 24, 2009 (report E-09-073). The Project Team used the MAE to compare BRT and LRT because the process provided for flexibility in measuring benefits, allowing decision makers to consider quantitative measures for benefits that were difficult or impossible to translate into dollars and a broader and more targeted representation of project benefits. The MAE examined the economic costs and benefits of the proposed transportation investment within a series of separate accounts including environmental, economic and social drivers. The MAE findings demonstrated that LRT has a higher cost to install than BRT, but delivers the greatest benefits to the community, and best accomplishes the goals of the *Regional Growth Management Strategy* (RGMS).

Figure 1 presents the MAE results incremental to the business-as-usual scenario for full implementation of the two technologies. Business-as-usual means a gradual expansion of roads and bus service. LRT was rated better than BRT for user benefits, environmental benefits, land use benefits and social and community benefits. This information was also previously presented to Council on June 24, 2009 (report E-09-073).

Figure 1: MAE Relative Costs and Benefits



2.1 Costs

BRT is cheaper per kilometre to install and to operate than LRT. As noted in report E-11-021, the full BRT option from the St. Jacobs Farmers' Market to the Ainslie Street Bus Terminal is estimated to cost $702 million. Table 2 provides the costs of the various LRT options. LRT would have higher

fare box revenues than BRT given that LRT (Conestoga Mall to the Ainslie Street Terminal) is expected to have higher ridership than BRT.

2.2 Capacity

For BRT, the fleet would be a mixture of standard and articulated buses, with full standing capacity of approximately 75 and 115 passengers respectively. For LRT, the stations would be designed to accommodate two-car trains, with full standing capacity per train of up to 450 passengers, based on new vehicle designs now available. The train would have approximately four times the capacity of an articulated bus and six times the capacity of a standard bus.

For the Region's rapid transit system, LRT would have more capacity than BRT because the trains would have more room for passengers, and more doors to quickly load and unload passengers with shorter dwell times at stations. Trains running on 5-minute frequencies could reasonably expect signal priority at intersections, so that trains would generally only stop at stations.

With BRT, the number of buses required to meet passenger demand is projected to exceed road capacity north of Fairview Park Mall in the peak period within 20 years. With bus frequencies every 2 to 3 minutes north of Fairview Park Mall, the buses would likely bunch up and signal priority would be impractical. With no spare road capacity, there would be no opportunity to expand passenger capacity by adding more buses. At that point, the Region would be facing replacement of the BRT with alternate rapid transit technology such as LRT, at considerable expense and disruption.

2.3 Urban Form

Both BRT and LRT would generate increased demand for lands near stations, increasing land values and generating new jobs. The estimated increase in land values and jobs is greater for LRT with up to 23,000 new jobs in station areas compared to just over 11,500 for BRT, and up to $370 million in increased land values, compared to up to $75 million for BRT.

2.4 Transportation Benefits

Transportation benefits include savings in travel time, private vehicle operating cost, accident avoidance and parking cost. LRT provides a smoother, quieter, more comfortable ride than BRT with greater passenger capacity. LRT is generally preferred by riders. LRT is estimated to generate $523 million in transportation user benefits, compared to $360 million for BRT.

2.5 Environment and Public Health

LRT is projected to result in a reduction in greenhouse gas emissions of 22,260 tonnes per year by 2031 compared to 12,210 tonnes per year for BRT. LRT is projected to result in better environmental and public health.

2.6 Preferred Rapid Transit Technology

After studying a number of rapid transit technologies, staff have concluded that LRT is the preferred long-term rapid transit technology for the Region. Although LRT has a higher cost to install than BRT, it delivers the greatest benefits to the community, and best achieves the goals of the RGMS, the ROP and the RTMP. LRT has greater capacity to 2031 and beyond, higher ridership potential and better ability to shape growth and redevelopment. BRT is cheaper, but the number of BRT buses needed to meet passenger demand is projected to exceed road capacity within 20 years, and then require replacement with other rapid transit technology such as LRT, at much public expense and travel disruption. Staff and other outside experts have identified that LRT is preferred over BRT

because it provides the best long-term environmentally and financially sustainable solution to help manage our community's future growth and transportation needs.

3. LRT Staging

In considering LRT technology, it is also important to consider a staged transit system as a cost-effective way to allow transit to grow steadily. Rapid transit projects are implemented in stages to:

- Allow for the efficient establishment of the rapid transit system and future extensions to the system as demand for public transport in the Region grows;
- Enable the Region to cost-effectively deliver a staging option that meets the most immediate public transport needs;
- Lessen the initial impact of the construction on the local community and road users by deferring the construction of certain sections; and
- Allow a level of flexibility so that future stages can be refined and tailored to meet the growing needs of the Region as it continues to develop.

It should be noted that there are no LRT systems in North America that were built in their entirety right at the start. Edmonton and Calgary were frontrunners in building LRT in North America, starting with 7 km and 11 km respectively. Generally LRT systems are expanded in steps, as little as one kilometre at a time. It would be unrealistic for the Region to undertake construction of an entire
39-kilometre LRT system all at once, whether that construction starts now or in the future. It is realistic and achievable for the Region to consider building an LRT system in affordable stages. Therefore the LRT implementation options consist of a combination of LRT and aBRT, with the intent of expanding to a full LRT system in steps.

When Calgary first started building LRT in 1978, it had a population of 506,000. The population of Edmonton was just over 445,000 when the City started LRT construction in 1974. Currently, Waterloo Region has a population of 535,000. Calgary and Edmonton both started with LRT lines from their downtown to a point in the suburbs, with the major activity point being downtown. In comparison, Waterloo Region has many activity points concentrated in a linear corridor along its central transit corridor. This gives the Region the advantage of generating trips in both directions along our rapid transit route, rather than a commuter route that runs peak-direction full and off-peak direction empty. It also gives the Region the advantage of serving a much higher proportion of its population and employment than Calgary and Edmonton were able to with their first LRT lines.

The LRT implementation options consider sections of LRT in the northern half of the central transit corridor, with aBRT from the south end of the LRT to the Ainslie Street Terminal, based on existing and projected ridership. Currently, passenger boardings per weekday in the central transit corridor include 29,200 passengers from Fairview Park Mall north and 6,400 passengers south of Fairview Park Mall. More than 80 per cent of the passenger activity is from Fairview Park Mall north and less than 20 per cent is south of Fairview Park Mall. There is four times more passenger activity from Fairview Park Mall to the north compared to the south.

In the first five to ten years, GRT services would be expanded with new and more frequent routes that would provide fast, convenient connections with the rapid transit system. This improved service would translate into a broader transit user base to promote expanded LRT services. Introduction of LRT service in stages would allow the system to grow and bus services to adjust to provide the best connections.

This approach would also provide the necessary time for the Region, area municipalities and

private land owners to collaborate on planning initiatives for increasing densities, improving walkability, controlling parking and enhancing the overall public environment for using public transit in the planned rapid transit station areas. In areas where aBRT is implemented, initiatives to increase ridership would be implemented with a goal of converting to LRT as soon as possible.

4. Rapid Transit Implementation Options

Staff considered nine LRT implementation options, as summarized in Table 1. Each of the rapid transit options would proceed in the context of the *Moving Forward Transit Program*, an integrated rapid transit project that combines rapid transit with the re-oriented and expanded GRT bus system as identified in the RTMP. It includes improvements ranging from integration with GO and VIA to road improvements in support of rapid transit and park 'n ride facilities.

Table 1: LRT Implementation Options

Option		Length (km)		
		BRT or aBRT	LRT	Total Rapid Transit
L1	LRT from Conestoga Mall to Ottawa St & aBRT from Ottawa St to Ainslie St Terminal	22	14	36
L2	LRT from Conestoga Mall to Block Line Rd & aBRT from Block Line Rd to Ainslie St Terminal	19	17	36
L3	LRT from Conestoga Mall to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Terminal	17	19	36
L4	LRT from Conestoga Mall to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Terminal	12	24	36
L5	LRT from Northfield Dr to Ottawa St & aBRT from Ottawa St to Ainslie St Terminal	22	12	34
L6	LRT from Northfield Dr to Block Line Rd & aBRT from Block Line Rd to Ainslie St Terminal	19	15	34
L7	LRT from Northfield Dr to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Terminal	17	17	34
L8	LRT from Northfield Dr to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Terminal	12	22	34
L9	LRT from St Jacobs Farmers' Market to Ainslie St Terminal	0	39	39

5. Costs of LRT Implementation Options

Construction of LRT is expected to begin in 2014. Table 2 summarizes the costs of the LRT implementation options in 2014 dollars, assuming construction inflation of 12.5 per cent from 2011 to 2014. The table includes construction costs, the level of senior government funding and the additional Regional funding required to construct the different rapid transit options, as well as the anticipated net operating and maintenance costs. The net operating and maintenance costs in Table 2 are net of the anticipated farebox revenue, and are expected to decrease over time as rapid transit ridership increases.

Table 2: LRT Implementation Option Costs (2014 $ millions)

Option	Construction Costs	Provincial Funding	Federal Funding	Region's Share	2031 Net Operating & Maintenance Costs per Year	
					2016	2031
L1	$644	$300	$215	$129	$12.4	$8.6
L2	$770	$300	$257	$213	$13.4	$9.1
L3	$818	$300	$265	$253	$13.7	$9.1
L4	$960	$300	$265	$395	$16.1	$11.6
L5	$608	$300	$203	$105	$12.0	$8.2
L6	$733	$300	$244	$189	$13.0	$8.8
L7	$773	$300	$258	$215	$13.3	$8.7
L8	$922	$300	$265	$357	$15.6	$11.2
L9	$1550	$300	$265	$985	$19.8	$15.5

The construction costs noted in Table 2 incorporate the results of value engineering undertaken by Regional staff and the consultant team in late 2010. The value engineering process identified cost-saving opportunities of well over $100 million through a review of design elements. These include savings for civil works, for vehicles, for utility relocation, and for the maintenance and storage yard based on additional evaluation and engineering work, and for electrical works based on detailed estimates provided by potential electricity suppliers.

6. Evaluation of LRT Implementation Options

Staff have evaluated the LRT implementation options based on ridership, level of intensification, transit integration and affordability. Transit integration includes the operation and convenience of passenger transfers between rapid transit and local or express routes and between LRT and aBRT. Table 3 summarizes the evaluation factors.

Table 3: Evaluation Factors for LRT Implementation Options

Option	2031 Annual Ridership (millions)	Increase in Population in Station Areas (thousands)	Increase in Employment in Station Areas (thousands)	Transit Integration	Annual Property Tax Increase for 6 Years	Annual Incremental Household Impact for 6 Years**
L1	12.6	19.8	12.7	Fair	0.97%*	$16.01*
L2	14.3	20.3	12.8	Fair	1.27%*	$20.98*
L3	15.0	20.3	13.1	Good	1.37%*	$22.63*
L4	15.4	20.3	13.7	Good	1.90%*	$31.46*
L5	12.2	19.3	11.6	Poor	0.88%*	$14.63*
L6	13.9	19.7	11.7	Poor	1.13%*	$19.04*
L7	14.7	19.7	12.0	Fair	1.25%*	$20.70*
L8	15.0	19.7	12.6	Fair	1.78%*	$29.53*
L9	18.0	22.6	16.9	Excellent	3.71%*	$62.65*

* Annual property tax increase over six years (2012 to 2017) assuming all costs are funded by property tax levy. Tax levy impacts may be reduced through financing options (e.g. contribution from development charges, reduction of debt charges and upload savings from the Province).
** Based on average property assessment of $254,000 ($ 2010).

The options rank from excellent to poor for transit integration as follows:

- Option L9 ranks as excellent because it connects LRT to the existing transit terminals at Conestoga Mall, Fairview Park Mall and Ainslie Street, and requires no transfer between aBRT and LRT.
- Options L3 and L4 rank as good because the LRT connects to both Conestoga Mall and Fairview Park Mall, two key existing transit terminals. Option L4 has the further advantage of connecting to GO bus service at Sportworld Drive. These options provide a transfer between LRT and aBRT at either Fairview Park Mall or at Sportsworld Drive. The peer review panel noted that ending the LRT short of Fairview Park Mall would result in a missed opportunity to capture the existing higher density apartments in and around the mall and more significantly, limit the potential for intensification in and around the LRT/aBRT transfer point. Achieving LRT to Fairview Park Mall was viewed by the panellists as a prerequisite for the extension of LRT into Cambridge at a future date. To the north, Conestoga Mall represents an important point of access to the transit system for residents north of the city. Ending LRT at Northfield Drive was viewed as a missed opportunity to serve an existing key destination and provide connectivity to the wider transit network.
- Options L1, L2, L7 and L8 rank as fair because the LRT connects to only one of Conestoga Mall or Fairview Park Mall (existing transit terminals and connection points to conventional transit).
- Options L5 and L6 rank as poor because the LRT does not connect to either Conestoga Mall or Fairview Park Mall. If a roundabout is constructed at the intersection of Block Line Road with Courtland Avenue, this could provide a means for buses to turn around at this transfer point. However, an LRT terminus at any of Northfield Drive, Ottawa Street or Block Line Road would provide a challenge in terms of providing a satisfactory transit terminal.

7. LRT Stage 1

Staff have identified that option L3 is preferred for Stage 1 because because it provides good transit integration at the lowest cost, connecting LRT to both Conestoga Mall and Fairview Park Mall. Option L3 includes LRT from Conestoga Mall to Fairview Park Mall, and aBRT south to the Ainslie Street Terminal. The aBRT would allow ridership and development to grow, leading to conversion to LRT.

Figure A.1 in Appendix A shows the existing GRT bus route system, including one express route (the iXpress). Figure A.2 in Appendix A shows the route and station locations for the recommended option L3, set in the context of a conceptual 2018 bus system. The conceptual 2018 bus system includes a 25 per cent increase in bus service from today, including new crosstown express bus routes, both feeding into and complementing the rapid transit route. Further details of the route and stations will be forthcoming at the preliminary and detail design stages, after the completion of the TPA, which is the expedited Provincial environmental assessment process for transit projects.

8. LRT Stage 2

Stage 2 would convert aBRT to LRT from Fairview Park Mall to the Ainslie Street Terminal. With Stage 2, the Region would have an LRT route continuous from Conestoga Mall to the Ainslie Street Terminal, generally as shown in Figure A.3 in Appendix A. Appendix B contains a description of the route and station locations for LRT Stage 2. Staff are recommending steps to move forward on implementation of Stage 2, including:

- Allocate $1 million annually, for a 10-year period, to implement transit-supportive strategies in Cambridge;
- Begin the TPA for LRT from Fairview Park Mall to the Ainslie Street Terminal in 2014;

- Acquire property for the implementation of Stage 2 of the LRT system as soon as feasible;
- Pursue additional federal and provincial funding for Stage 2 of the LRT system;
- Explore the location of a future multi-modal transit facility in Cambridge to link to future GO rail service; and
- Undertake measures to encourage transit-supportive development, to enhance transit ridership throughout the urban transit service areas, including (but not limited to) developing incentives for transit-oriented developments and supporting and developing transportation demand management strategies for new and existing businesses and residents.

9. Public Consultation

Since 2006, staff have participated in more than 150 public outreach events for rapid transit, including presentations, speaking engagements, information booths and more than 30 public consultation centres.

Through February and March 2011, staff undertook public consultation that asked the public for their views on which rapid transit option would provide the best value to our community. Well over 1,000 people attended the public consultation centres (PCCs) and information booths, and over 700 submitted written comments via comment sheets, the website, email, fax and letters. Of these, 78 per cent stated support for rapid transit in general and 66 per cent stated support for LRT in particular. The most preferred LRT implementation options were option L3 (LRT from Conestoga Mall to Fairview Park Mall and aBRT from Fairview Park Mall to the Ainslie Street Terminal) and option L9 (LRT from the St. Jacobs Farmers' Market to the Ainslie Street Terminal).

In April 2011, Regional staff identified a preliminary preferred rapid transit implementation option (report E-11-044). Through April and May 2011, staff undertook public consultation that presented the preliminary preferred rapid transit option, L3, and asked for input on the proposed rapid transit system. Again, well over 1,000 people attended the PCCs and information booths, and over 1,000 submitted written comments via comment sheets, the website, email, fax and letters. Full copies of the written comments are available in the library of the Regional Councillors or upon request from Regional staff. Of these written comments, 64 per cent stated support for LRT. The most common comment by those who support LRT pertains to the future/children/grandchildren. Those who do not support LRT generally prefer bus expansion or business-as-usual, with the most common comment pertaining to the expense of LRT.

The information presented at the PCCs included three ways of integrating rapid transit with improved GRT bus routes:

- Option L3a: build option L3 and expand bus service by 40 per cent by 2018. This would require a 2 per cent annual increase in property taxes each year for the next seven years;

- Option L3b: build option L3 and expand bus service by 25 per cent by 2018. This would require a 1.5 per cent annual increase in property taxes each year for the next seven years, and was identified as the preliminary preferred option by Regional staff; and

- Option L1a: build option L1, a shorter LRT route stopping at Ottawa Street with aBRT continuing the rest of the way south, and expand bus service by 40 per cent by 2018. This would require a 1.5 per cent annual increase in property taxes each year for the next seven years.

The comment sheet provided at PCCs and on-line asked, "Do you support the preferred rapid transit option (L3b)? Yes/no. Why? Or why not? Do you have any other comments or suggestions?" Approximately 59 per cent of those who used the comment sheet to respond said yes to option L3b.

Less than 5 per cent stated support for either L3a or L1a.

At public input meetings on May 31 and June 1, 2011, Regional Council heard directly from 101 delegations regarding rapid transit. Of these delegations, 61 per cent stated support for LRT.

A number of issues and questions were raised in the written submissions and at the public input meetings, including the following:

- Affordability;
- Cost control;
- Funding impacts on other Regional projects;
- Ridership forecasts;
- The cost of a full aBRT system;
- The cost of moving existing infrastructure;
- The rapid transit route through downtown areas, through Waterloo Park, through Caroline Street and through the floodplain;
- Station area planning;
- Park 'n' ride facilities;
- Traffic impacts; and
- Aerobus technology.

Staff responses to these issues and questions are provided in Appendix C.

10. Peer Review Panel

A peer review panel consisting of third-party experts in the fields of rapid transit planning, engineering and city-building investment initiatives reviewed work completed by the rapid transit project team since 2009. The peer review summary report was included in Appendix A in report E-11-044. The peer review panel concluded that:

> "The addition of rapid transit along the central transit corridor is seen as a key strategy towards meeting the region's intensification targets, accommodating employment and residential growth, while minimizing the need for urban expansion and promoting downtown revitalization."
>
> "Waiting to implement rapid transit or deferring in favour of the business-as-usual option is not a viable alternative and will inhibit the Region's ability to meet intensification objectives and jeopardize the countryside line. Without improved connectivity and alternatives to the private car for travel, the Region's economic attractiveness and competitiveness will suffer due to increased congestion."
>
> "Overall, the Peer Review Panel felt that an investment in rapid transit and in particular an investment in LRT represents a critical step towards meeting the Region's growth and revitalization objectives, increasing transit ridership and creating more liveable and economically competitive communities."
>
> "Experience in other jurisdictions suggests that LRT has the potential to attract riders that would otherwise refuse to take bus transit."
>
> "The Region should not be surprised, or disheartened, that it is unable to deliver the full LRT system ultimately envisaged from day one. All transit systems are built in phases from areas of greatest ridership demand to areas of developing demand. The development of an LRT

system in a series of phases, delivered over time and as demand and funding allow, is entirely normal and to be expected."

"While the extension of LRT to Cambridge may not be viable in the short term, the addition of aBRT will provide excellent service in a financially prudent manner that is well matched to the developing nature of Cambridge's transit market."

"Of the 10 choices, option L3 (LRT from Conestoga Mall to Fairview Park Mall) has the greatest integrity as a first stage in the implementation of regional rapid transit. This is based on its ability to support the wider network and catalyze redevelopment in and around the two anchoring station areas. Option L3 has the greatest potential to "build success in the first hase of development" by linking key origins and destinations along the corridor and connecting them to key existing anchor points (Conestoga Mall and Fairview Park Mall) within the Regional Transit System."

11. Project Procurement/Delivery

In 2009, staff with consulting assistance undertook an initial analysis of project procurement and delivery options and financing for the rapid transit project, including initial discussions with Infrastructure Ontario (IO) regarding their potential role in project procurement and delivery. The infrastructure delivery options being considered included the Region's traditional design-bid-build process. Other options considered a stronger role for the private sector, with various combinations of design, build, finance, operate and maintain. Given the uncertainty with project funding at that time, staff put this task on hold pending decisions by senior government to fund the project, and later, pending a decision by Regional Council on the rapid transit technology and scope.

Following Council approval of the preferred rapid transit system, staff will look in more detail at options for procurement and delivery of the rapid transit project. Staff will report back to Council by the end of 2011 regarding a preferred strategy.

12. Next Steps

Regional staff are on track with and continue to follow the project schedule adopted by Council on January 25, 2011. In February/March, staff undertook public consultation regarding rapid transit implementation options. In April/May, staff undertook public consultation regarding the preliminary preferred rapid transit implementation option and draft recommendations. Staff anticipate that next steps will include:

- June 2011: Council approval of the preferred rapid transit system;
- July/August/September 2011: completion of the Environmental Project Report for Stage 1;
- October 2011: commencement of the six-month TPA for Stage 1;
- November 2011: PCCs for the TPA for Stage 1;
- December 2011: report on a preferred procurement strategy;
- April 2012: completion of the TPA for Stage 1;
- 2012: begin implementation of aBRT Stage 1;
- 2014: begin construction of LRT Stage 1 and begin the TPA for LRT Stage 2; and
- 2017: complete construction and begin operation of LRT Stage 1.

CORPORATE STRATEGIC PLAN:

The report supports several objectives of Council's Strategic Focus. These include:

Focus Area 1: Environmental Sustainability: Protect and enhance the environment.
Focus Area 2: Growth Management: Manage and shape growth to ensure a livable, healthy, thriving and sustainable Waterloo Region.
Focus Area 5: Infrastructure: Provide high quality infrastructure and asset management to meet current needs and future growth.

FINANCIAL IMPLICATIONS:

The capital cost of the recommended rapid transit implementation option is estimated to be $818 million, in 2014 dollars. The federal and provincial funding for this option would be $565 million. The Region's share of the capital cost would be $253 million.

The system is expected to begin operation in 2017. The net operating and maintenance cost of the recommended option is estimated to be $13.7 million in 2017, decreasing to $9.1 million in 2031 as ridership and fare revenue increase.

The cost of rapid transit will be area rated to the urban transit service area. As established in report E-11-044, the impacts to property tax for the recommended rapid transit option L3, including capital and net operating and maintenance costs, are estimated to be a 1.2 per cent annual tax rate increase for seven years (2012 to 2018). It should be noted that budget savings resulting from the retirement of debt on Regional buildings at 99 Regina Street and 150 Frederick Street and the uploading of social assistance costs (2012 to 2018) could be allocated to fund a portion of the rapid transit capital, operating and maintenance costs (0.5 per cent per year from 2012 to 2018). This would leave a required annual tax rate increase of 0.7 per cent per year (2012 to 2018) to fund the remaining rapid transit capital, operating and maintenance costs.

For option L3 to be affordable, staff are recommending a phasing in of bus system improvements over a longer period of time than shown in the RTMP. Staff are recommending that bus service increase by 25 per cent between now and 2018. This would lengthen the time to implement the whole RTMP by three years, from 20 to 23 years. The impacts to property tax for the recommended 25 per cent increase in GRT bus service by 2018 are estimated to be a 0.3 per cent annual tax rate increase for seven years (2012 to 2018).

The tax increase for the recommended rapid transit option and bus expansion combined would be a 1.5 per cent annual increase for seven years. For the average household (2010 assessment value of $254,000), a 1.5 per cent tax increase would be approximately $25 per year in additional property taxes so that, after seven years, property taxes would be about $175 higher than today. A household with an assessed value of $200,000 would pay approximately $19 per year in additional property taxes so that, after seven years, property taxes would be about $133 higher than today. A household with an assessed value of $400,000 would pay approximately $38 per year in additional property taxes so that, after seven years, property taxes would be about $266 higher than today.

The property tax impacts may be reduced by other funding sources, such as development charges and additional taxes collected from new property developments.

OTHER DEPARTMENT CONSULTATIONS/CONCURRENCE:

The rapid transit project team includes representatives from Regional Council, the CAO's office, Corporate Resources, Finance, Planning, Housing and Community Services, Public Health, and Transportation and Environmental Services.

ATTACHMENTS:

Appendix A – Transit Maps
Appendix B – Description of Recommended LRT Route and Stations
Appendix C –Issues and Questions and Staff Responses

PREPARED BY: *Nancy Button*, Director, Rapid Transit

APPROVED BY: *Thomas Schmidt*, Commissioner, Transportation and Environmental Services

Transit Maps

Figure A.1: Map of Existing Grand River Transit Bus Service

Figure A.2: Map of Recommended Stage 1 Rapid Transit

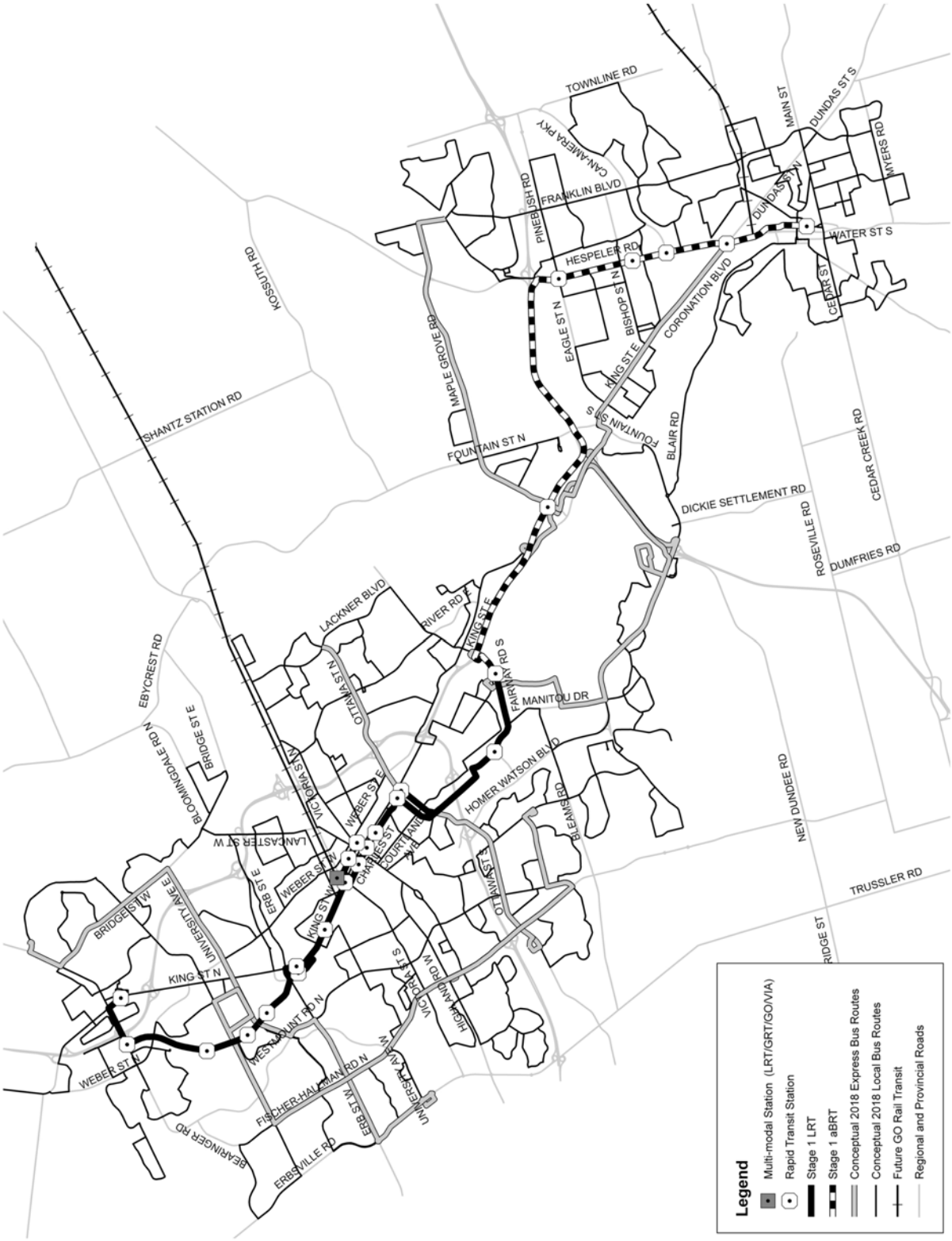
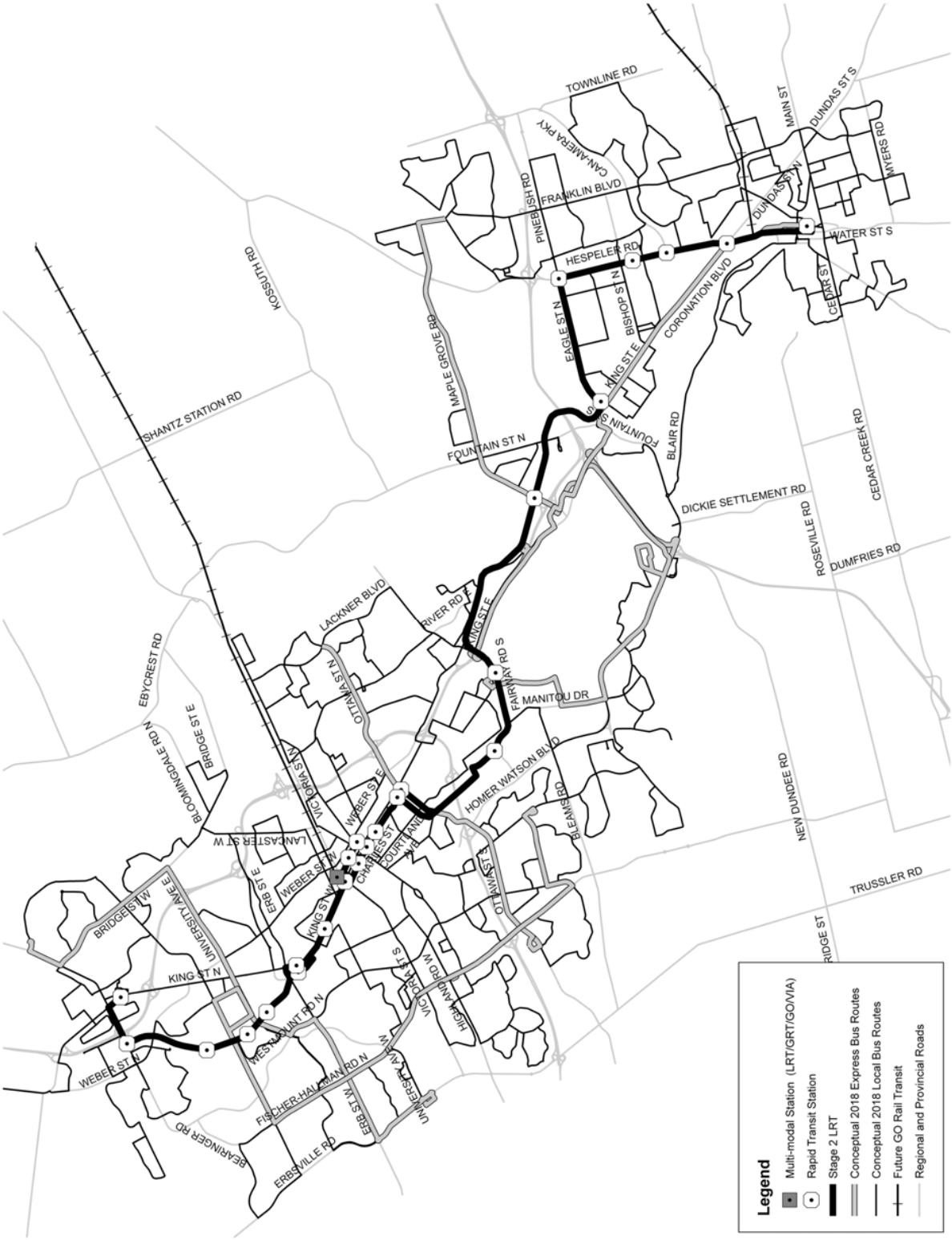


Figure A.3: Map of Recommended Stage 2 Rapid Transit



Description of Recommended LRT Route and Stations

The route will follow:

- Along King Street from Conestogo Road to Northfield Drive;
- Along Northfield Drive from King Street to the Region-owned Waterloo Spur rail line;
- Along the Region-owned Waterloo Spur rail line from Northfield Drive to Erb Street;
- Southbound along Caroline Street from Erb Street to Allen Street and along Allen Street from Caroline Street to King Street;
- Northbound along King Street from Allen Street to Erb Street and along Erb Street from King Street to Caroline Street;
- Along King Street from Allen Street to Victoria Street;
- Southbound along Victoria Street from King Street to Charles Street and along Charles Street from Victoria Street to Benton Street;
- Northbound along Benton/Frederick Street from Charles Street to Duke Street, along Duke Street from Frederick Street to Francis Street, along Francis Street from Duke Street to King Street, and along King Street from Francis Street to Victoria Street;
- Along Charles Street from Benton Street to Borden Avenue;
- Southbound along Borden Avenue from Charles Street to the Huron Park Spur rail line and along the Huron Park Spur rail line from Borden Avenue to Ottawa Street;
- Northbound along Ottawa Street from the Huron Park Spur rail line to Charles Street and along Charles Street from Ottawa Street to Borden Avenue;
- Along the Huron Park Spur rail line from Ottawa Street to Hayward Avenue;
- Along Hayward Avenue from the Huron Park Spur rail line to Courtland Avenue;
- Along Courtland Avenue/Fairway Road from Hayward Avenue to Wabanaki Drive (subject to negotiations with HydroOne to use the hydro corridor instead);
- Along Wabanaki Drive from Fairway Road to the CP Waterloo Subdivision rail line;
- Along the CP Waterloo Subdivision rail line from Wabanaki Drive to Eagle Street;
- Along Eagle Street from the CP Waterloo Subdivision rail line to Hespeler Road;
- Along Hespeler Road from Eagle Street to Water Street;
- Along Water Street from Hespeler Road to Bruce Street;
- Along Bruce Street from Water Street to Ainslie Street; and
- Along Ainslie Street from Bruce Street to the Ainslie Street Terminal.

Stations will be located on:

- King Street at Conestogo Road at Conestoga Mall;
- The Region-owned Waterloo Spur rail line at Northfield Drive, at the Research and Technology Park, at the University of Waterloo, and at Seagram Drive near Wilfrid Laurier University;
- Caroline Street at Willis Way;
- King Street at Willis Way, at the Grand River Hospital, and at the multi-modal transit hub;
- Duke Street at Young Street;
- Frederick Street at Duke Street;
- Charles Street at Gaukel Street, at Benton Street, at Cedar Street, at Borden Street, and at Ottawa Street;
- Courtland Avenue at Block Line Road;
- Fairway Road at the signalized entrance to Fairview Park Mall (note: this station location would change should the hydro corridor route become available);
- The CP Waterloo Subdivision rail line at Sportsworld Drive and at Eagle Street;
- Hespeler Road at Eagle Street/Pinebush Road, at the Cambridge Centre, at CanAmera Parkway, and at Coronation Boulevard/Dundas Street; and
- Ainslie Street at the Ainslie Street Terminal.

Issues and Questions and Staff Responses

During the public consultation process from February to May 2011, staff provided information and received public input through PCCs, information booths, speaking engagements, presentations and the rapid transit webpage. In addition, local municipal staff were provided project updates on several occasions and they have provided valuable insight and technical comments to direct the planning and environmental assessment process. Members of the public provided comments in a variety of ways through comment sheets submitted at the PCCs and mailed to the project team, emails to Regional staff and Councillors, faxes, letters, and presentations to the Council at the public input meetings held on May 31 and June 1, 2011. Below are a number of issues and questions brought forward during the consultation period and staff responses.

C.1 Affordability

The costs of rapid transit will be area rated to the urban transit service area. The impacts to property tax for the recommended rapid transit option L3, including capital and net operating and maintenance costs, are estimated to be a 1.2 per cent annual tax rate increase for seven years (2012 to 2018). It should be noted that budget savings resulting from the retirement of debt on Regional buildings at 99 Regina Street and 150 Frederick Street and the uploading of social assistance costs (2012 to 2018) could be allocated to fund a portion of the rapid transit capital, operating and maintenance costs (0.5 per cent per year from 2012 to 2018). This would leave a required annual tax rate increase of 0.7 per cent per year (2012 to 2018) to fund the remaining rapid transit capital, operating and maintenance costs.

Staff are recommending that bus service increase by 25 per cent between now and 2018. The impacts to property tax for the recommended 25 per cent increase in GRT bus service by 2018 are estimated to be a 0.3 per cent annual tax rate increase for seven years (2012 to 2018).

The tax increase for the recommended rapid transit option and bus expansion combined would be a 1.5 per cent annual increase for seven years. For the average household (2010 assessment value of $254,000), a 1.5 per cent tax increase would be approximately $25 per year in additional property taxes so that, after seven years, property taxes would be about $175 higher than today.

The projected impacts to Regional property taxes are less for the recommended option L3 than for business-as-usual and may be further reduced by other funding sources, such as development charges and additional taxes collected from new property developments. The costs of business-as-usual should not be underestimated. Business-as-usual means following current trends of auto use, with no rapid transit. The property tax impact of business-as-usual is estimated to be a 1.51 per cent annual tax rate increase for six years (2012 to 2017). These tax impacts do not include any transit improvements. Gradually expanding the existing bus system would be an additional cost and would not meet the transit demand to 2031.

C.2 Cost Control

The current project capital cost estimate (in 2014 dollars) is $818 million. This cost estimate includes the results of a "value engineering" exercise conducted by Regional staff and the consultant team in late 2010. The cost estimate includes allowance for inflation from 2011 to 2014 and through the construction period. The assumed inflation rates are consistent with the inflation estimates that Metrolinx is using for their multi-billion dollar rapid transit program in the Greater Toronto Area. Given that the cost estimate is still based on a very preliminary level of design, the estimate also includes significant contingency allowances (30 to 35 per cent depending on the item).

Although the rapid transit project would be the largest capital project undertaken by the Region to-date, the Region does have considerable experience with large capital projects. The Region's capital program averages about $250 million per year. In 2010, the Region issued tenders for over $280 million, and over 80 per cent of these tenders were under-budget.

To assist with cost control and risk management, it is highly likely that the project will be delivered through some form of a Public-Private Partnership (P3) - with private-sector involvement in some combination of project financing, design, construction, operation and/or maintenance. The specific approach to project procurement and delivery will be determined over the next six months. The Region is also in discussions with the provincial agency Infrastructure Ontario (IO) regarding a potential role for IO in project delivery. Funding agreements with the federal and provincial governments will also likely include accountability provisions to ensure cost and schedule control.

C.3 Funding Impacts on Other Regional Projects

Additional road construction and maintenance costs, which would be required with or without the rapid transit project, are already included in the Region's Roads capital budget. There is no proposal to defer or revise the existing roads capital program to fund the rapid transit project. Coordination of the timing of construction of roads and rapid transit will be required.

For option L3 to be affordable, staff are recommending a phasing in of bus system improvements over a longer period of time than shown in the RTMP. Staff are recommending that bus service increase by 25 per cent between now and 2018. This would lengthen the time to implement the whole RTMP by three years, from 20 to 23 years

C.4 Ridership Forecasts

The recommended option L3 is built upon the success of the existing iXpress route. The transit model used to develop ridership forecasts has been developed with extensive local data on traffic volumes, road network, socio-economic, census, and existing and future land use information. The forecasting model used the industry's most elaborate and accepted four-step modelling process. The model has been carefully calibrated to local conditions and the results went through peer reviews (by the University of Toronto and the University of Waterloo), before they were published.

The 2016 and 2031 model projections for rapid transit are not out of line with other systems in North America. The modelled increase in rapid transit ridership reflects a fairly gradual increase in the overall transit modal split of 7.5 per cent by 2016, and further increases to approximately 10 per cent by 2031. When compared to other Canadian cities (over 400,000 population), the transit market shares generally range from 7 per cent to 15 per cent and our model forecasts for 2016 and 2031 fall into that range. In fact, the short-term projections are at the lower end of the observed range, but increase to the middle of the range by 2031. The RTMP sets the bar higher, with a target for 2031 of a modal split of approximately 15 per cent, but this is not the basis for the rapid transit ridership or revenue projections.

C.5 Full aBRT

Full aBRT would include 36 kilometres of aBRT from Conestoga Mall to the Ainslie Street Terminal. This option is not considered viable as a long-term solution because aBRT is only an appropriate technology where ridership is relatively low and as a way to build ridership prior to implementing an LRT or BRT system.

Moreover, the aBRT system would be based on buses operating in mixed traffic and therefore, would not be able to serve as a competitive travel mode with increasing traffic congestion north of Fairview Park Mall. Geometric improvements (e.g. queue jump and exclusive turn lanes) required to move buses effectively can not be implemented along many segments of the route north of Fairview Park Mall because of right-of-way constraints, particularly in downtown areas. Therefore, more buses would be caught in traffic queues without the ability to bypass bottlenecks. In addition, signal priority for buses in queues would become impractical, leading to a decline in reliability and loss of patronage from inconsistent and slow service. Adding more buses to support the demand would impact roadway capacity and result in further deterioration of system performance. More buses would increase the person capacity but, with congestion delays, transit users would not benefit.

Implementation of only aBRT to 2031 would still require the construction of the full road system in the RTMP and from a financial perspective does not vary significantly from business-as-usual. The total cost of the full aBRT system is estimated at $687 million, which includes $187 million for design and construction of the aBRT system and $500 million for the additional roadway improvements to accommodate the transportation capacity deficiencies.

C.6 Cost of Moving Existing Infrastructure

The rapid transit budget includes approximately $130 million for moving existing buried infrastructure. Regional staff are working with City and utility staff to determine the infrastructure that will need to be moved. For City infrastructure such as watermains, sanitary sewers and storm sewers, the general policy used is that the level of government initiating the requirement for a relocation pays for the cost of the relocation. This is the general approach that will be used in the rapid transit project, the exception being infrastructure along the rapid transit corridor that is old. The Cities have already planned and budgeted for the replacement of some of this infrastructure. Regional staff are meeting with City staff to discuss the details of any required relocation, what replacement is already included in the City's plan and budget, and the potential for the City to cover some of the costs of relocating aging infrastructure in the appropriate situation. The Cities may want to take advantage of this opportunity to implement other infrastructure upgrades. It may be possible to accommodate these upgrades in the project with appropriate cost sharing.

For utilities such as gas, telecommunications, electricity, etc., the Region has existing agreements concerning relocation of infrastructure. In general, the Region's maximum cost to relocate these utilities would be 25 to 35 per cent of the relocation cost. The Region's share could be as low as zero.

C.7 Rapid Transit Route

During the route evaluation process, many route alignment options were evaluated. The route was considered in seven sectors, of which each had five route options. This resulted in 35 route segments with multiple combinations. Many of the route options were found to be infeasible due to the ridership, connectivity, right-of-way, utilities, and neighbourhood and traffic impacts. The proposed rapid transit alignment option through the three urban cores is recommended because of its wide-ranging economic, social, and environmental benefits. These include reduced congestion, increased transit ridership, re-urbanization and intensification, improved mobility, environmental benefits, urban revitalization and enhanced public safety and health.

Upon Council's approval of the preferred alignment option and technology, during the preliminary design phase some alignment and design options can be re-evaluated and adjusted if deemed necessary. Any significant changes would have to come back to Regional Council for further approval.

C.7.1 Downtown Areas

Through downtown areas, one-way loops are proposed because of their potential to enhance the urban character with a smaller footprint (using curb lanes), lower traffic impacts, fewer utility relocations and greater level of exposure for future re-development. The one-way loops in Kitchener and Waterloo have been vetted through and were supported by City staff.

C.7.2 Waterloo Park

The proposed rapidway through Waterloo Park will run next to the existing rail road tracks (in use today by CNR) primarily within the existing rail corridor. This routing connects key nodes like the University of Waterloo, Wilfrid Laurier University and the Research and Technology Park with core areas and satellite campuses across the region.

Future design work of the rapidway through the park will be sensitive to the valued heritage, environment and usage of this public space with particular emphasis on providing unimpeded pedestrian flow across the park.

C.7.3 Caroline Street

Rapid transit is expected to remove substantial future traffic volume from a number of roads, including Caroline Street. With the rapidway installed within the existing roadway (the travelled portion of the road allowance) on Caroline Street, general traffic would be moved further from the residences by about 3 metres, thereby reducing road noise levels in those residences. For instance, the closest habitable portion of the residences along Caroline Street between Allen and William Streets is either 11 metres (between Fullerton and Freemont Streets) or 18 metres (from Freemont to Allen Streets) from the roadway and existing traffic. With rapid transit, Caroline Street residences would be approximately 22 metres from general traffic. Quiet, electric rapid transit vehicles would pass by once every 5 to 7 minutes at peak times (as dictated by passenger demand) and off-peak once every 15 minutes.

The recommended route requires minimal utility impacts and no changes to the roadway width along Caroline Street. In addition, waste management staff have confirmed that garbage collection can be accommodated with the closures of Fullerton, Freemont and Norman Streets at their intersection with Caroline Street. Closure options for Fullerton, Norman and Freemont Streets have also been reviewed with City of Waterloo staff and determined to be a non-issue.

It should be noted that as part of the route evaluation process, other options were considered including a route that would follow William Street from Caroline Street to King Street and then meet up with the northbound route to form a two-lane rapidway on King Street from William Street to Allen Street. This route option involves some significant impacts, including:

- The likely removal of the building and business, Bridal Depot Inc, at 20 William Street, at the corner of William Street and Caroline Street;
- A trade-off between impacts to hydro and storm sewer utilities versus removing traffic turning lanes on William Street; and
- Widening of the roadway on that section of King Street, with significant impacts to utilities, accesses, and the intersection of George Street with King Street.

Staff also examined the option of closing William Street from Caroline Street to King Street for all traffic except rapid transit. However, this street closure would result in substantial out-of-direction traffic flow impacting the other neighborhood streets and cause a significant increase of approximately 2,000 more vehicles per day using Caroline Street between William and Allen Streets. Additionally, the closure would cause GRT routing issues which may result in buses using Caroline Street between Allen and Erb Street.

C.7.4 Routing Through Flood Plains

Various routing options were reviewed as part of the broader study for the proposed route. A technical review of the options, including issues associated with flood plains, led to the conclusion that the recommended route is the best option available. The options considered in Cambridge included route alignments running on Dundas and Beverley Streets from Hespeler Road to the Ainslie Street Terminal as well as the CP rail corridor (alongside Dundas Street) and the greenspace beside Beverley Street. These options were not selected because of a combination of issues, including property acquisition requirements, concerns regarding conflicts with the current user of the right-of-way, the need to widen structures, and rapid transit operations.

It should be noted that much existing development in the Region, such as the existing Ainslie Street Terminal, is within or in proximity to the flood plains and therefore, different route alignments would have the same flood plain issues. Moreover, it is unreasonable to assume that development that would otherwise locate in the core area of the Galt community would instead locate at another station area in Cambridge based on the routing or technology selected.

C.8 Station Area Planning

Each of the Cities will develop station area plans through normal planning processes allowing opportunities for public input and comment. It is expected that these station area plans will lead to an appropriate mix of uses with higher densities in the station areas, with the objective to create activity nodes that can become self-sustaining.

C.9 Park ‘n’ Ride Facilities

The rapid transit budget includes funding for new park ‘n’ ride facilities at strategic locations along the rapid transit route, including Northfield Drive, Fairview Park Mall, and Sportsworld Drive. The project budget includes approximately $23 million for these facilities. A minimum of 200 parking spaces were assumed for each of these facilities. The proposed multi-modal hub will also include parking.

As the Cities develop their station area plans, the need for additional parking may be identified. This parking would be funded either by the private sector or the Cities.

C.10 Traffic Impacts

Detailed traffic impact analyses were completed for key areas including the downtown cores, including traffic operation evaluation for existing and future conditions with and without rapid transit. The evaluation shows that with the proposed rapid transit system and proper mitigation strategies, the overall traffic operational conditions throughout the urban core will operate at an acceptable level of service. Further analyses will also be completed as part of the preliminary design and any impacts will be evaluated and mitigated if deemed necessary.

It should be noted that, for the rapid transit route sections with lane reductions (e.g. King Street from Moore Avenue to Allen Street), wider 4.8 metre traffic lanes will be provided in each direction to allow traffic to by-pass stopped vehicles.

C.11 Aerobus Technology

Several transit technologies, including the aerobus, were evaluated through the environmental assessment process in 2006/2007, with an update in 2011, and were determined to be not viable solutions for the Regional rapid transit system. In particular, the aerobus was not identified as a preferred technology because:

- There is no existing mass-transit system in the world based on this technology. Most existing aerobus applications serve point to point destinations (e.g. ski resorts) and are physically separated from the land uses below;
- With aerobus, tight turns are a challenge and require additional structures to support the cable;
- Alignment options over private properties require the purchase of air rights, which would sterilize the property underneath. Moreover, in the event of a fire below the route, the service would need to be stopped because of potential damage the vehicles and the cable infrastructure above.
- Stations would be elevated, requiring structures, elevators, and a significant footprint. The height of supporting towers would not integrate well in our urban setting, especially within the downtown cores. The elevated system would be disconnected from the street-level environment;
- The longer spacing between stations does not support the station spacing proposed in our downtown areas for accessibility and ridership growth;
- The system may be inoperable in high winds; and
- Emergency access to the system would be more difficult because it is suspended