

**REGION OF WATERLOO****TRANSPORTATION AND ENVIRONMENTAL SERVICES
Rapid Transit**

TO: Chair Jim Wideman and Members of Planning and Works Committee

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

SUBJECT: RAPID TRANSIT IMPLEMENTATION OPTIONS

RECOMMENDATIONS:

For information.

SUMMARY:

The Region continues to plan for significant population and employment growth over the next two decades. To provide for this tremendous growth, the Region will have to either continue its pattern of outward growth or encourage greater intensification in existing developed areas. Recognizing this challenge, 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 have been undertaking 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. This report provides background information including new financial analysis that builds on the previous six years of studies and will be the basis of the next round of public consultation, leading to a staff recommendation regarding a preferred rapid transit system.

Staff have reviewed both BRT and LRT options in the implementation of a rapid transit system. With both BRT and LRT options, the Grand River Transit bus system would be re-oriented with rapid transit as the backbone of the system.

The Multiple Account Evaluation findings in 2009 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). 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 15 to 20 years, requiring replacement with alternate rapid transit technology such as LRT, at considerable expense and disruption.

The LRT implementation options consider sections of LRT in the northern half of the central transit

corridor, with adapted BRT (aBRT) from the south end of the LRT to the Ainslie Street Bus Terminal. The aBRT technology proposed is similar to that used in the VIVA rapid transit system in York Region and in the ZÜM rapid transit system in Brampton. It includes buses running in mixed traffic, with curbside rapid transit stations. As with VIVA and ZÜM, the aBRT technology would include a distinctive and frequent, limited-stop service, with signal priority and queue jumping, to allow buses to go ahead of regular traffic at signals and maintain faster, consistent travel times. In addition, the Ministry of Transportation of Ontario has agreed to incorporate bus bypass shoulders on key sections of Highways 8 and 401 between Fairway Road and Hespeler Road.

While there is flexibility to convert adapted BRT (aBRT) to LRT in the future, it should be noted that full BRT would be very difficult to convert to LRT because of the cost associated with replacing BRT infrastructure before its service life is over, because conversion is not likely to happen until BRT is at capacity, and because it would be very difficult to operate BRT while building LRT in the same passageway. As far as staff are aware, there has never been a conversion of BRT to LRT in the same at-grade passageway. Ottawa will be the first. Ottawa is avoiding some of the problems associated with converting BRT to LRT by planning to build their LRT underground in their downtown area, at very high cost. Implementation options for the rapid transit project in Waterloo Region focus on either BRT or LRT. Once either LRT or full BRT is chosen as the preferred technology, no change in technology is expected in the foreseeable future. Staging of LRT will allow the conversion of aBRT to LRT, when funding is available and/or when ridership warrants it.

Staff have considered 11 implementation options, as described in this report. Options L1 to L9 include lengths of LRT ranging from 12 to 39 kilometres, with aBRT making up the total length of rapid transit (34 to 39 kilometres, depending on the option chosen). Option B10 includes 38 kilometres of BRT. Option BU11 is business-as-usual, with no rapid transit. The annual average incremental impact of the implementation options ranges from approximately \$15 to \$63 per household per year over six years. There are also other potential capital funding sources or future budget savings that could be used to mitigate the impact on property taxes of funding rapid transit. These include new development charges, upload savings and savings from maturing debentures.

Plans for the public consultation program to share information and seek public input on the rapid transit technology and implementation options include a series of six Public Consultation Centres over March 3, 9 and 10 as well as booths at malls, updates to the rapid transit website and other points of contact.

REPORT:

1. Background

The Region continues to plan for significant 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. The rapid transit system being considered in the Region has the multiple goals of providing transportation choice, meeting future transportation needs, and building a viable, vibrant and sustainable community.

2. Rapid Transit Technology

The Region began a Rapid Transit Environmental Assessment (EA) 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.

Staff have reviewed both BRT and LRT options in the implementation of a rapid transit system. As shown in the maps in Appendix A, both BRT and LRT options would operate along basically the same route, some sections on road and some sections along existing rail corridors. For the section between Eagle Street and Fairway Road, BRT would run along Highways 401 and 8 with use of bus bypass shoulders, while LRT would run along the existing CP railway corridor. Both technologies would have stations in generally the same locations.

It is important to emphasize that both BRT and LRT would have similar cross-sections. Both would require separate and protected passageways for the rapid transit vehicles, with similar road impacts and property costs. The separate passageway is critical to optimize the speed of the rapid transit system, as opposed to, for example, a slower streetcar system running in mixed traffic. As shown in Figure 1, for two-way on-road sections of rapid transit, the separate passageway would be in the centre of the road. The passageway for BRT would be up to 0.5 m wider than for LRT.

Figure 1: Typical Cross-Section for On-Road Rapid Transit Passageway



With both BRT and LRT options, the Grand River Transit bus system would be re-oriented with rapid transit as the backbone of the system. As shown in the route maps in Appendix B, the new bus system would include expanded local bus routes and a system of express routes, like the iXpress, either feeding into rapid transit or complementing rapid transit by offering a parallel service outside of the central transit corridor. There would be local service along the central transit corridor, serving additional stops in between the rapid transit stations. In addition, there would be inter-regional GO transit service connecting to the central transit corridor.

3. Comparison of BRT and LRT

3.1 Multiple Account Evaluation

The Region faces a fundamental decision in its choice of the preferred long-term technology for the whole Region, BRT or LRT. Once that path is chosen, the Region will need to decide how best to implement the chosen long-term path.

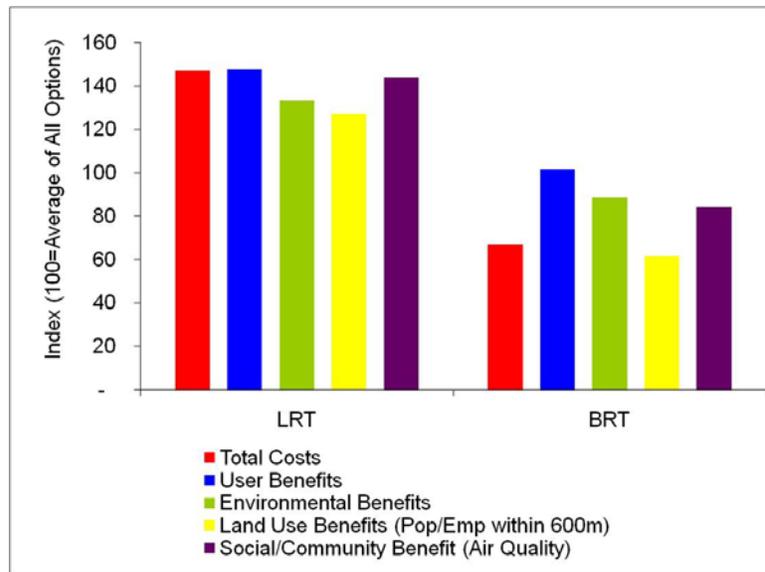
In 2005, the Region completed a transit technology review and considered both BRT and LRT in the analysis. This involved a review of the North American experience over the past 25 years. Some of the key findings from this study included:

- LRT is much more likely to achieve the objectives of the RGMS than BRT;
- LRT has higher capital and net operating costs than BRT, but provides significantly greater benefits;
- LRT has much greater potential to attract transit ridership and to shape urban form than BRT; and
- LRT has a demonstrable influence on land values and is recognized as a planning tool that can support and encourage the development of more sustainable land use patterns.

These initial findings from the 2005 study are reinforced by the Multiple Account Evaluation (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 RGMS.

Figure 2 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 2: MAE Relative Costs and Benefits



3.2 Costs

BRT is cheaper per kilometre to install and to operate than LRT. LRT costs approximately twice as much per kilometre as BRT to install. More details about capital and net operating costs are provided in Section 7.4. Operating costs are shown net of fare box revenue. LRT would have higher fare box revenues than BRT given that LRT (Conestoga Mall to Ainslie Terminal) is expected to have higher ridership than BRT.

3.3 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.

3.4 Urban Form

Both BRT and LRT would generate increased demand for lands near stations, increasing land values and generating new jobs. The 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.

3.5 Transportation Benefits

Transportation benefits include savings in travel time, 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 expected to generate \$523 million in transportation user benefits, compared to \$360 million for BRT.

3.6 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.

4. LRT Staging

In considering the more-expensive LRT technology, it is also important to consider a phased transit system as a cost-effective way to allow transit to grow steadily. Rapid transit projects are usually 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. As shown in Table 1, Edmonton and Calgary were frontrunners in building LRT in North America, starting with 7 km and 11 km respectively.

Table 1: LRT Staging in Other Municipalities (kilometres constructed per year)

City	Year Opened	Starting Length	Additions
Edmonton	1978	7 km	2 km 1981 1 km 1983 1 km 1989 2 km 1992 1 km 2006 2 km 2009 5 km 2010
Calgary	1981	11 km	10 km 1985 6 km 1987 1 km 1990 3 km 2003 4 km 2009 5 km 2010
Vancouver	1985	29 km	20 km 2002 19 km 2009
Portland	1986	24 km	28 km 1998 9 km 2001 9 km 2004 14 km 2009

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.

Generally LRT systems are expanded in steps, as little as one kilometre at a time. It would be unrealistic for the Region to plan 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.

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 Bus 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.

5. Adapted BRT

The LRT implementation options all include combinations of LRT and aBRT, with aBRT running from the south end of the LRT to the Ainslie Street bus terminal providing a complete rapid transit system connecting Cambridge, Kitchener and Waterloo. The aBRT technology proposed is also used in the current VIVA rapid transit system in York Region and in the ZÜM rapid transit system in Brampton. It includes buses running in mixed traffic, with curbside rapid transit stations.

As with VIVA and ZÜM, our aBRT technology would include a distinctive and frequent, limited-stop service, with signal priority and queue jumping, to allow buses to go ahead of regular traffic at signals and maintain faster, consistent travel times. The aBRT would include more stations than on the current iXpress line, with streetscaping, and bicycle and pedestrian amenities at stations. Fares would be paid before boarding, with ticket machines at each station. Real-time passenger information would be available at each station. The aBRT would be supported by expanded local bus routes, a system of express routes, and connections to inter-regional transit service.

In addition to the VIVA and ZÜM technologies, the Ministry of Transportation of Ontario has agreed to incorporate bus bypass shoulders on key sections of Highways 8 and 401 between Fairway Road and Hespeler Road. For this section of the rapid transit route, the technology is the same for both BRT and aBRT.

6. Converting to LRT

There is flexibility to convert aBRT to LRT in the future. During the conversion, one general traffic lane at a time would be shut down for construction. The aBRT service would continue to operate in mixed traffic, using its curbside stations. Its queue jump lanes and signal priority would allow the aBRT service to go ahead of the congested traffic. The aBRT would be converted to LRT when funding is available and/or when ridership warrants it, before the aBRT service lanes become overly congested. The aBRT service would allow transition from aBRT to LRT sooner by helping to build up ridership.

However, it should be noted that BRT would be very difficult to convert to LRT in the future. Having committed a high level of investment to BRT, it would not likely be converted to LRT until the BRT service has reached its capacity. It would be challenging to convert the system to LRT, using inflated future dollars, while maintaining a mature BRT level of transit service. BRT during conversion would not be able to access its existing stations and would not have the benefit of the aBRT priority measures to help maintain the level of transit service that passengers would have

come to expect. The concept of convertibility is often advertised as the solution, but it fails to acknowledge the disruption riders would experience during the changeover and the cost associated with replacing BRT infrastructure before its service life is over.

The City of Ottawa will be facing this challenge over the next decade, as it tackles the problem of building LRT while moving its significant BRT transit ridership in buses running in mixed traffic on already-congested roads. With Ottawa's BRT system, the streets in downtown Ottawa are dominated by buses. During the peak hours, most downtown buses are carrying full standing loads. One of the reasons that Ottawa is building their LRT underground in their downtown area, at very high cost, is to avoid some of the problems associated with converting BRT to LRT along the same passageway. As far as staff are aware, there has never been a conversion of BRT to LRT in the same at-grade passageway. Ottawa will be the first, but only outside of the downtown area.

Once either LRT or full BRT is chosen as the preferred technology, no change in technology is expected in the foreseeable future. Staging of LRT will allow the conversion of aBRT to LRT, when funding is available and/or when ridership warrants it.

7. Implementation Options

7.1 Refining the Options

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 have been undertaking an objective review of project implementation options for Council's consideration, to identify a rapid transit project that is affordable to the Region, and provides best value to the community. For both BRT and LRT options, staff have completed site specific surveys to refine the design and minimize property impact. In addition, new functional designs have been developed that affect both BRT and LRT options. These include:

- the grade separation of King Street at the CN Guelph Subdivision in Kitchener (adjacent to the proposed multimodal hub);
- the BRT route on Highway 401 and Hespeler Road;
- the route alignment along the Hydro Corridor in south Kitchener and the alternative on Fairway Road;
- the intersection design for the future Block Line Road Extension and Courtland Avenue integrated with rapid transit;
- route options along Ottawa Street in view of the recently completed Regional Transportation Master Plan (RTMP) and its recommendations; and
- a new station location at the intersection of Frederick/Benton Street and Charles Street in downtown Kitchener.

Moreover, staff have identified cost-saving opportunities that apply to either or both BRT and LRT through a review of several design elements. These refinements include:

- \$35 to \$100 million savings for BRT and LRT utility relocation (from delaying the replacement of certain infrastructure and refining the design), for civil works and for vehicles;
- \$10 million savings for LRT from additional evaluation and engineering work for a maintenance and storage yard; and
- \$40 million savings for LRT based on detailed estimates provided by potential electricity suppliers.

7.2 Description of Options

Based on the above design work as well as further structural and utilities review, the list of implementation options for the rapid transit project includes refined BRT and LRT options further to the original BRT and LRT options considered in 2009.

The implementation options were generated based on a number of considerations, including:

- affordability – consideration given to available funding, capital and operational costs, and cost recovery from fare box revenue;
- likely public transport demand – identifying various sections that incorporate as many of the primary destinations and transfer points as possible in order to attract the highest patronage;
- ability to meet the overall public transport service need – consideration given to the ability of feeder bus services meeting the residual transport need in the interim period until that particular section of the rapid transit was delivered;
- economies of scale to capitalize the system – identifying an initial stage that is big enough to allow efficient operation and performance; and
- maintenance yard and storage facility location – consideration given to the ability of the initial stage to access this site.

The BRT option includes BRT from the St. Jacobs Farmers' Market to the Ainslie Street Bus Terminal. No shorter options were considered for BRT because aBRT will not provide sufficient capacity north of Fairview Park Mall and because one of the reasons for considering BRT is to provide the same technology throughout the central transit corridor.

The LRT options include LRT from either Conestoga Mall or Northfield Drive to either Ottawa Street, Block Line Road, Fairview Park Mall or Sportsworld Drive, with aBRT from the south end of the LRT to the Ainslie Street Bus Terminal. Staff have also included an option that includes LRT from the St. Jacobs Farmers' Market to the Ainslie Street Bus Terminal, and a business-as-usual option, that includes no rapid transit but gradually increasing roads and transit service.

The business-as-usual (road expansion) option is included not because it is considered a feasible option but for purposes of illustration. If the Region continues with current trends of auto use, the road network will need to expand by at least 500 additional lane-kilometres of traffic by 2031. As development spreads outward and congestion grows on the major arterial roads, further road construction will become necessary, including road widenings through mature neighbourhoods. Without rapid transit, the road expansion costs including property would be in the range of \$1.4 to \$1.5 billion. On top of the high cost, this road expansion would seriously threaten the quality of life in much of the community and cause significant disruption in many areas. Achieving higher transit ridership targets will not eliminate the need for road improvements, but it can reduce the amount of road construction required and reduce road expansion costs by \$400 to \$500 million. The approved RTMP concluded that the business-as-usual option is not feasible.

Should a decision be made that the preferred rapid transit system is an LRT-based system, it will become necessary to select a preferred staging option. The staging options will be evaluated based on affordability, ridership, integration with conventional transit and aBRT, and level of intensification. Affordability will be a significant factor as the options generally provide similar ridership and intensification potential. Options that go to Fairview Park Mall provide better connectivity to aBRT.

Table 2 lists the implementation options and their length. Options L1 to L9 include lengths of LRT from 12 to 39 kilometres, with aBRT making up the total length of rapid transit (34 to 39 kilometres, depending on the option chosen). Option B10 includes 38 kilometres of BRT. The BRT option is a kilometre shorter than the longest LRT option because it follows a slightly different route. Option

BU11 is business-as-usual, with no rapid transit.

Table 2: Length of Implementation Options

Option		Length (km)			
		BRT	LRT	aBRT	Total Rapid Transit
L1	LRT from Conestoga Mall to Ottawa St & aBRT from Ottawa St to Ainslie St Bus Terminal	0	14	22	36
L2	LRT from Conestoga Mall to Block Line Rd & aBRT from Block Line Rd to Ainslie St Bus Terminal	0	17	19	36
L3	LRT from Conestoga Mall to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Bus Terminal	0	19	17	36
L4	LRT from Conestoga Mall to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Bus Terminal	0	24	12	36
L5	LRT from Northfield Dr to Ottawa St & aBRT from Ottawa St to Ainslie St Bus Terminal	0	12	22	34
L6	LRT from Northfield Dr to Block Line Rd & aBRT from Block Line Rd to Ainslie St Bus Terminal	0	15	19	34
L7	LRT from Northfield Dr to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Bus Terminal	0	17	17	34
L8	LRT from Northfield Dr to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Bus Terminal	0	22	12	34
L9	LRT from St Jacobs Farmers' Market to Ainslie St Bus Terminal	0	39	0	39
B10	BRT from St Jacobs Farmers' Market to Ainslie St Bus Terminal	38	0	0	38
BU11	Business-as-Usual (road expansion)	0	0	0	0

All of the LRT staging options provide rapid transit service to core areas along the central transit corridor, linking existing activity nodes to neighborhoods/station areas with future potential. As a result, all LRT staging options capture a considerable portion of the future growth, generating comparable land use and social benefits. Moreover, the sizeable catchment area served by these staging options results in sound annual ridership numbers ranging from 12 to 15 million by year 2031. Projected annual ridership is shown in Table 5. These ridership numbers can be compared to other LRT systems currently in service across North America (e.g. Edmonton, San Jose, Houston, and Buffalo).

The proposed LRT options, however, do differ from each other in terms of their influence on overall shift towards transit use. Although all LRT staging options generate positive benefits, the options

with longer segments of LRT are more attractive to choice riders and out-of-town commuters because they reduce the number the transfers required, increase the number of destinations served, and provide convenient locations for patrons seeking a park 'n' ride facility (e.g. terminus at Sportsworld Drive and Conestoga Mall).

7.3 Moving Forward Transit Program

Rapid transit must proceed in the context of a Region-wide transit system. Staff are developing the *Moving Forward Transit Program*, an integrated rapid transit project that combines rapid transit with specific improvements identified in the approved RTMP and required to create a fully functional rapid transit system. The components of the program include:

- Rapid transit along the central transit corridor;
- Re-orientation of Grand River Transit bus system;
- New and more frequent bus service in targeted areas, requiring fleet and garage expansions;
- Integration with inter-regional transit service (VIA, GO Transit, Greyhound, etc.);
- Improved transit stations/stops and amenities;
- Intelligent Transportation Systems improvements (including real-time scheduling of transit vehicles, transit traveler information and optimization of transit priority);
- Development and implementation of smart-card fare-collection technology;
- Road improvements in support of rapid transit; and
- Park 'n' ride facilities.

7.4 Costs

All project costs have been revised to reflect 2014 dollars because it is anticipated that construction of rapid transit will begin in the year 2014. Table 3 below shows the impact of the project refinements and the inflationary impacts, using projected inflation from 2009 to 2014, on the project costs. The inflationary impacts are based on values being used by Metrolinx for predicting inflation on similar projects in Toronto. The inflation values used are 2009/2010 - 3.0 per cent, 2010/2011 - 3.0 per cent, 2011/2012 - 4.0 per cent, 2012/2013 - 4.0 per cent and 2013/2014 - 4.5 per cent.

Table 3: Project Refinements and Inflationary Impacts (\$ millions)

	Option		2009	2014
L3	LRT from Conestoga Mall to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Bus Terminal	Original	\$790	\$1010
		Refined	\$641	\$818
B10	BRT from St Jacobs Farmers' Market to Ainslie St Bus Terminal	Original	\$584	\$747
		Refined	\$549	\$702

The Provincial government has agreed to provide \$300 million towards the capital cost of the rapid transit system and the Federal government has agreed to fund one third of eligible project costs to a maximum of \$265 million. Region staff have been in discussions with Federal staff to determine if related projects which complement the implementation of rapid transit (such as bus purchases, bus storage and maintenance facilities, road improvements, signal changes, etc.) could be included as eligible costs. Federal staff have verbally confirmed that these types of projects could be eligible for federal funding provided they are required for the successful implementation of a rapid transit system and form an integrated rapid transit project. The types of projects being considered for inclusion in the rapid transit funding proposal are either already included in the Transportation Capital program or are part of the RTMP. There are approximately \$150 million in projects in the current Transportation Capital program that would be related to the implementation of the rapid transit system and approximately \$50 million in RTMP implementation costs from 2011 to 2018.

This is a total of \$200 million in rapid-transit-related costs that can be counted as included in the overall scope of eligible project cost to maximize Federal government funding. These costs would be common to all of the options because they are required regardless of the rapid transit option selected.

Table 4 below shows the construction costs of all of the implementation options in 2014 dollars, the level of senior government funding and the additional Regional funding required to construct the different rapid transit options.

Table 4: Implementation Options and Capital Costs (\$ millions)

Option	Construction Cost (1) (\$ 2014)	Provincial Funding (\$ 2014)	Federal Funding (\$ 2014)	Region's Share (1) (\$ 2014)	
L1	LRT from Conestoga Mall to Ottawa St & aBRT from Ottawa St to Ainslie St Bus Terminal	\$644	\$300	\$215 (3)	\$129
L2	LRT from Conestoga Mall to Block Line Rd & aBRT from Block Line Rd to Ainslie St Bus Terminal	\$770	\$300	\$257 (3)	\$213
L3	LRT from Conestoga Mall to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Bus Terminal	\$818	\$300	\$265	\$253
L4	LRT from Conestoga Mall to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Bus Terminal	\$960	\$300	\$265	\$395
L5	LRT from Northfield Dr to Ottawa St & aBRT from Ottawa St to Ainslie St Bus Terminal	\$608	\$300	\$203 (3)	\$105
L6	LRT from Northfield Dr to Block Line Rd & aBRT from Block Line Rd to Ainslie St Bus Terminal	\$733	\$300	\$244 (3)	\$189
L7	LRT from Northfield Dr to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Bus Terminal	\$773	\$300	\$258 (3)	\$215
L8	LRT from Northfield Dr to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Bus Terminal	\$922	\$300	\$265	\$357
L9	LRT from St Jacobs Farmers' Market to Ainslie St Bus Terminal	\$1550	\$300	\$265	\$985
B10	BRT from St Jacobs Farmers' Market to Ainslie St Bus Terminal	\$702	\$300	\$234 (3)	\$168
BU11	Business-as-Usual (road expansion)	\$500 (2)	0	0	\$500

(1) Construction costs are shown in 2014 dollars. Construction inflation of 12.5 per cent from 2011 to 2014 is assumed.

(2) Incremental road construction costs without rapid transit.

- (3) Other related projects would be included in the *Moving Forward Transit Program* to optimize the available Federal funding.

Table 5 below shows the projected ridership and the anticipated net operating and maintenance costs for all of the implementation options. The net operating and maintenance costs are net of anticipated farebox revenue, and are expected to decrease over time as rapid transit ridership increases.

Table 5: Implementation Options, Ridership and Net Operating and Maintenance Costs

Option		Annual Rapid Transit Ridership (millions)		Net Operating & Maintenance Costs (\$ millions per year) (\$ 2014)	
		2016	2031	2016	2031
L1	LRT from Conestoga Mall to Ottawa St & aBRT from Ottawa St to Ainslie St Bus Terminal	6.4	12.6	\$12.4	\$8.6
L2	LRT from Conestoga Mall to Block Line Rd & aBRT from Block Line Rd to Ainslie St Bus Terminal	7.3	14.3	\$13.4	\$9.1
L3	LRT from Conestoga Mall to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Bus Terminal	7.5	15.0	\$13.7	\$9.1
L4	LRT from Conestoga Mall to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Bus Terminal	7.6	15.4	\$16.1	\$11.6
L5	LRT from Northfield Dr to Ottawa St & aBRT from Ottawa St to Ainslie St Bus Terminal	6.1	12.2	\$12.0	\$8.2
L6	LRT from Northfield Dr to Block Line Rd & aBRT from Block Line Rd to Ainslie St Bus Terminal	7.0	13.9	\$13.0	\$8.8
L7	LRT from Northfield Dr to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Bus Terminal	7.3	14.7	\$13.3	\$8.7
L8	LRT from Northfield Dr to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Bus Terminal	7.4	15.0	\$15.6	\$11.2
L9	LRT from St Jacobs Farmers' Market to Ainslie St Bus Terminal	9.3	18.0	\$19.8	\$15.5
B10	BRT from St Jacobs Farmers' Market to Ainslie St Bus Terminal	7.5	14.9	\$11.7	\$9.0
BU11	Business-as-Usual (road expansion)	0	0	\$1.2	\$1.2

There are a number of ways to phase in and finance the costs of the various implementation options, and many variables that affect the property tax levy impacts of these options. Staff have done some initial estimates of potential property tax implications of the various scenarios based on several assumptions including:

- All costs are funded from the property tax levy;
- Estimated 2014 average annual property tax of \$1,656.32;
- Each \$50 million in capital financing translates into .87 per cent property tax increase in 2014 for the 2014 urban service area based on a 30-year term at 4.75 per cent;
- Each \$3.6 million increase in operating cost requires a 1.0 per cent property tax increase;
- For the business-as-usual option, there would be an expenditure of \$25 million per year for 20 years and a one-time tax increase with no debentures; and
- Business-as-usual operating costs only include annual maintenance costs. Future rehabilitation and replacement costs would be in addition to these costs.

A potential financing strategy for implementing the property tax increases is to implement the increases over a six-year period from 2012 to 2017. The six-year period was selected to smooth out the tax rate increases over the construction period and have the funding in place when construction is complete and operations are starting. Table 6 summarizes the potential incremental property tax impacts of this funding strategy. Other financing strategies are possible and staff can develop alternative options for Council's consideration. The household impacts are the annual amount that the average property tax bill would increase incrementally over six years. The percentage impacts are calculated only on the Regional portion of property taxes.

It should be noted that the property tax impacts shown on Table 6 are relatively conservative estimates of the potential tax rate impacts. The tax rate impacts could be mitigated in several ways, involving reductions in capital and operating costs through further value engineering or inflation impacts being less than projected, or funding a portion of the capital costs through other mechanisms, such as development charges. Some of the potential ways to mitigate the tax rate impacts are discussed in the Financial Implications section.

Table 6: Implementation Options and Project Financing Strategy Property Tax Impacts Per Household in Urban Service Area

Option		Annual Property Tax Over 6 Years (1) (2012 – 2017)	Annual Incremental Household Impact for 6 Years (2) (2012 – 2017)
L1	LRT from Conestoga Mall to Ottawa St & aBRT from Ottawa St to Ainslie St Bus Terminal	0.97%	\$16.01
L2	LRT from Conestoga Mall to Block Line Rd & aBRT from Block Line Rd to Ainslie St Bus Terminal	1.27%	\$20.98
L3	LRT from Conestoga Mall to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Bus Terminal	1.37%	\$22.63
L4	LRT from Conestoga Mall to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Bus Terminal	1.90%	\$31.46
L5	LRT from Northfield Dr to Ottawa St & aBRT from Ottawa St to Ainslie St Bus Terminal	0.88%	\$14.63
L6	LRT from Northfield Dr to Block Line Rd & aBRT from Block Line Rd to Ainslie St Bus Terminal	1.13%	\$19.04
L7	LRT from Northfield Dr to Fairview Park Mall & aBRT from Fairview Park Mall to Ainslie St Bus Terminal	1.25%	\$20.70
L8	LRT from Northfield Dr to Sportsworld Dr & aBRT from Sportsworld Dr to Ainslie St Bus Terminal	1.78%	\$29.53
L9	LRT from St Jacobs Farmers' Market to Ainslie St Bus Terminal	3.71%	\$62.65
B10	BRT from St Jacobs Farmers' Market to Ainslie St Bus Terminal	0.95%	\$15.73
BU11	Business-as-Usual (road expansion) (3)	1.51%	\$24.98

(1) Annual incremental property tax impact over six years (2012 -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).

(2) Based on average property assessment of \$225,000 (\$ 2010).

(3) The majority of road expansion costs are usually collected from development charges. The future replacement costs (which are fully borne by tax payers) are not included in this cost. The business-as-usual case does serve as a good comparison to rapid transit costs and also confirms that there are significant costs associated with expansion of the road network.

8. Next Steps

Subject to Regional Council consideration, staff anticipate that steps leading up to the Transit Project Assessment for the rapid transit project will include:

- February/March: undertaking public consultation. The purpose of this next series of public consultation, through February and March, is to share information (including refined options and cost implications since fall 2010), respond to questions, and seek public input on the rapid transit technology (BRT or LRT), the functional design of the route, the implementation options, and the evaluation of the implementation options;
- April 12: providing feedback to Planning and Works Committee regarding public consultation and identifying a preliminary preferred option;
- April/May: undertaking public consultation regarding the preliminary preferred option;
- Late May: Public Input Meeting(s) regarding the preliminary preferred option;
- June: Council approval of the preferred rapid transit system;
- July/August/September: completing Environmental Project Report; and
- October: commencing six-month Transit Project Assessment (the expedited Provincial EA process for transit projects).

The public will be given an opportunity to provide comment on the benefits and impacts of both the LRT and BRT systems in terms of service delivery, cost and effectiveness.

9. Public Consultation Program

Plans for the public consultation program include:

- Public Consultation Centres in March 2011
 - Thursday, March 3 at the Albert McCormick Community Centre on 500 Parkside Drive in Waterloo;
 - Thursday, March 3 at the Regional headquarters on 150 Frederick Street in Kitchener;
 - Wednesday, March 9 at 150 Main Street in Cambridge;
 - Wednesday, March 9 at the First United Church on 16 William Street West in Waterloo;
 - Thursday, March 10 at the United Kingdom Club on 35 International Village Drive in Cambridge; and
 - Thursday, March 10 at the Faith Lutheran Church on 247 Westmount Road East in Kitchener.
- Public information booths in March 2011
 - Saturday, March 5 at Fairview Park Mall on 2960 Kingsway Drive in Kitchener;
 - Saturday, March 5 at the Kitchener Farmer's Market on 300 King Street East in Kitchener;
 - Saturday, March 12 at Conestoga Mall on 550 King Street North in Waterloo; and
 - Saturday, March 19 at Cambridge Centre on 355 Hespeler Road in Cambridge.
- Public Consultation Centres in May 2011 (suburban locations have yet to be confirmed)
 - Wednesday, May 4 at the Regional headquarters on 150 Frederick Street in Kitchener;
 - Thursday, May 5 at the First United Church on 16 William Street West in Waterloo; and
 - Tuesday, May 10 at the United Kingdom Club on 35 International Village Drive in Cambridge.
- Public information booths in April-May 2011
 - Saturday, April 30 at Cambridge Centre on 355 Hespeler Road in Cambridge;
 - Saturday, April 30 at the Kitchener Farmer's Market on 300 King Street East;
 - Saturday, May 14 at Conestoga Mall on 550 King Street North in Waterloo; and
 - Saturday, May 14 at Fairview Park Mall on 2960 Kingsway Drive in Kitchener.

- Updates to the rapid transit website;
- All-Council meeting on March 10;
- Speaking engagements;
- Displays;
- Newsletters mailed to all households in the Region and all businesses within the three Cities;
- Television and newspaper advertisements; and
- Emailed and mailed notices.

Staff will present comprehensive information on the rapid transit project at each public meeting, booth and event. The public will be able to submit their comments in person, by mail, by email, or through the website.

The public will have multiple opportunities to obtain information or to provide input to the rapid transit project. Staff will notify the public of these opportunities through television advertisements running for two weeks, through email or regular mail notices to the rapid transit contact list of nearly 3,000 addresses, through roadside signs and website updates, and through newspaper advertisements placed in seven different newspapers.

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:

A potential financing strategy for implementing the property tax increases is to implement the increases over a six-year period. Table 6 in Section 7.4 summarizes the potential property tax impacts of this strategy. Other financing strategies are possible and staff can develop alternative options for Council's consideration. Funding for the Rapid Transit system is proposed to be area rated to the cities of Cambridge, Kitchener and Waterloo in the same manner as current GRT costs.

There are also other potential capital funding sources or future budget savings that could be used to mitigate the impact on property taxes of funding rapid transit. Staff continue to pursue the possibility of legislative changes that would allow the Region to collect development charges for rapid transit. Over the 2012 to 2017 time period, the province will upload a total of \$8.4 million of annual costs from the Region. These savings could be directed to rapid transit to mitigate tax impacts. Some of the Region's debentures for Regional facilities will be maturing between 2012 and 2017. This would also create the option to direct these savings to rapid transit without increasing property tax rates.

OTHER DEPARTMENT CONSULTATIONS/CONCURRENCE:

The rapid transit Project Team includes representatives from Regional Council, the CAO's office, Communications, Community Planning, Finance, Legal, Public Health, Social Services, Transit Development, Transportation and Environmental Services, Transportation Planning and Transit Services.

ATTACHMENTS:

Appendix A – Maps of BRT and LRT Routes

Appendix B – Transit Network Supporting Rapid Transit

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

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

Appendix A Maps of BRT and LRT Routes

Map of BRT Route



Map of LRT Route



Appendix B Transit Network Supporting Rapid Transit

Existing



Expanded

