



## REGION OF WATERLOO

### TRANSPORTATION AND ENVIRONMENTAL SERVICES Rapid Transit

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

**DATE:** December 6, 2011 **FILE CODE:** A02-30/PW

**SUBJECT: PRELIMINARY PREFERRED RAPID TRANSIT PROCUREMENT AND DELIVERY OPTION**

#### RECOMMENDATION:

THAT the Regional Municipality of Waterloo direct staff to work with Infrastructure Ontario (IO) to develop a draft Memorandum of Understanding to engage IO as an independent contractor to provide rapid transit procurement coordination and transaction management services, for Council's consideration, as described in Report No. E-11-097, dated December 6, 2011.

#### SUMMARY:

Region staff have been reviewing a number of procurement and delivery options for the light rail transit (LRT) project. The procurement and delivery options being considered are: Design-Bid-Build (DBB), Design-Build (DB), Design-Build-Finance (DBf), Design-Build-Operate-Maintain (DBOM), Design-Build-Finance-Maintain (DBFM) and Design-Build-Finance-Operate-Maintain (DBFOM). Staff considered and evaluated the risks and benefits associated with the various options. Based on this review staff have identified public-private Design-Build-Finance-Operate-Maintain (DBFOM) with a 30-year term as the preliminary preferred procurement and delivery option. The DBFOM option offers the following:

- cost: LRT design and construction can proceed at the same time, with significant time savings. In spite of higher costs of the private financing component, competitive pressure and up-front due diligence by lenders would compel the private sector to optimize management and produce design innovations, resulting in better value and a lower total project cost (construction, operation and maintenance).
- funding contributions: Use of the DBFOM option will be subject to confirmation by the provincial and federal governments that they will maintain their rapid transit funding commitments with the DBFOM option.
- experience and qualifications: The private sector has more experience and qualifications than the Region in designing and constructing an LRT system, in operating and maintaining an LRT system at start-up, and in providing trained and certified staff to operate the light rail vehicles.
- incentives: Coordination efficiencies provide strong incentives for the private sector to design an LRT system that can be constructed efficiently. Payments and penalties based on LRT system performance and availability would provide a strong incentive for the private sector to complete construction on schedule and to meet availability and operational service standards after construction, with greater long-term asset quality. By taking on financial risks, the lender would have interests aligned with the Region's in monitoring contractor performance and protecting their investment.
- risks: The DBFOM option with a 30-year term results in the lowest net present value of Regional capital, operating and maintenance costs when the value of the Region's retained risks are included. The financing component would give strength to the

contractual obligations with less risk of contractor default because the private sector would only receive each instalment payment if it has complied with performance and availability requirements. The option would provide better accountability where performance and availability issues may be related to either maintenance or operation (no integration issues between operations and maintenance). It would transfer lifecycle risks to the private sector. The Region would retain those risks that it is best positioned to manage and mitigate, such as fare setting and ridership risk.

- flexibility: The DBFOM option may constrain the choices for LRT integration with Grand River Transit and for who would maintain and/or operate Stage 2 LRT.

Pending Planning and Works Committee discussions and staff responses to any questions raised, it is proposed that a report including a recommended procurement and delivery option be presented to Planning and Works Committee on January 10, 2012.

Implementation of the DBFOM option will require the Region to engage assistance to provide procurement coordination and transaction management services. Staff discussions with Infrastructure Ontario (IO) have confirmed that IO is interested in having a role with respect to the procurement of the Region's rapid transit project and has procured numerous DBFOM-type projects for the Province of Ontario. Staff are seeking direction to work with IO to develop a draft Memorandum of Understanding (MOU) to engage IO as an independent contractor to provide rapid transit procurement coordination and transaction management services, for Council's consideration. Pending successful negotiations with IO, staff plan to bring a report to Planning and Works Committee in January 2012 for Council approval of the MOU and to engage IO.

## **REPORT:**

### **1. Introduction**

Rapid transit is needed in Waterloo Region because it will move people and shape urban form as the Region continues with tremendous population and employment growth. In June 2011, among other motions related to rapid transit, Council approved the technology, route, stations, staging and funding of Stage 1 of the Region's rapid transit project. Stage 1 includes 19 km of light rail transit (LRT) from Conestoga Mall to Fairview Park Mall and 17 km of adapted bus rapid transit (aBRT) from Fairview Park Mall to the Ainslie Street Terminal.

In June 2011, Council also directed staff to complete an evaluation of project procurement and delivery options, including the role of Infrastructure Ontario, with the goals of maximizing project innovation and quality, leveraging private sector expertise, and managing risks to the Region of Waterloo and our taxpayers. Staff have considered the rapid transit project procurement and delivery options available, and the risks and benefits associated with the various options, within an evaluation framework.

### **2. Procurement and Delivery Options**

The following is not an exhaustive list of available project procurement and delivery options, but rather a list of the most likely options for delivering the rapid transit project:

**Design-Bid-Build (DBB):** The Region completes the preliminary and detail design and then tenders the project to the private sector for construction through separate and distinct procurements. The selection of the construction contractor is generally focused on the lowest construction cost. Payment is typically on a monthly progress basis. Only one complete design is generated for the project.

Design-Build (DB): The private sector completes the preliminary and detail design and the construction in an integrated process. Payment is typically on a monthly progress basis. The Region would hold contractors to performance by conducting engineering reviews of contractor-supplied documents, field inspection and compliance reviews during construction.

Design-Build-Finance (DBf): A portion of construction payments are withheld until completion of construction, adding short-term financing requirements for the private sector to the DB process, with payments to the private sector based on major milestone payments or substantial completion.

Design-Build-Operate-Maintain (DBOM): This adds an operating and maintenance term to the design-build process, which can be DB or DBf. The contractor operates and maintains all or part of the system during revenue operations. Payment for operation and maintenance is typically on a monthly basis based on performance and availability, with security in the form of performance bonding or a letter of credit, equal to about the annual maintenance fee. The term is typically a relatively short 10 to 15 years. This provides incentive to the private sector to maintain the system in good repair so that they are in a better position to be awarded the next operating and maintenance term. At the same time, this approach reduces the lifecycle cost to the private sector and the Region.

Design-Build-Finance-Maintain (DBFM): A portion of construction payments are withheld and paid during a maintenance term to secure performance. This withheld portion could be in the order of 25 per cent of construction costs. This adds long-term maintenance and long-term financing to the DBf process for the portion of the construction costs that have been withheld. The Region pays the private sector for this withheld payment in installments over the length of the project term, subject to compliance with performance and availability specifications. The term is typically 25 to 30 years to ensure that the lifecycle is covered. The 25-year lifecycle includes major capital refurbishment, including the full rehabilitation of civil infrastructure, vehicles and systems. During the procurement process, the shortlisted bidding construction contractors would each generate complete designs, each meeting the requirements of the Region, but each likely reflecting a different approach or innovation on the project.

Design-Build-Finance-Operate-Maintain (DBFOM): This adds a long-term operation term to the DBFM process. Bundling operations with maintenance reduces the coordination risk between the two, lowering costs.

### **3. Private Sector Roles**

Table 1 summarizes the roles allocated to the private sector by procurement and delivery option. Generally, fare setting and ridership risk are retained by the Region. A small portion of ridership risk may be allocated to the private sector as a performance incentive under DBFOM.

**Table 1: Roles allocated to Private Sector by Procurement and Delivery Option**

	DBB	DB	DBOM	DBf	DBFM	DBFOM
Preliminary design		X	X	X	X	X
Detail design		X	X	X	X	X
Design and construction co-ordination		X	X	X	X	X
Construction	X	X	X	X	X	X
Maintenance			X		X	X
Lifecycle (major capital refurbishment)					X	X
Operations			X			X
Operation and maintenance integration			X			X
Short-term financing during construction				X	X	X
Long-term financing					X	X

#### 4. Evaluation Criteria for Procurement and Delivery Options

The evaluation criteria for procurement and delivery options provide conflicting measures that must be balanced to find the best option for the Region. The evaluation criteria include:

- project cost;
- level of funding contributions from senior government;
- the Region's experience and qualifications to fill the roles that could possibly be allocated to the private sector (does the Region have the ability to perform the roles required for the different options);
- incentives for private sector innovation and performance, including quality of product and service over the lifecycle;
- transfer of appropriate risks from the Region to the private sector that the private sector can best price and mitigate or manage e.g. construction cost overruns. The transfer of risk is also tied to incentives for performance in terms of on-time construction and long-term operational performance, including a consideration of the related performance security upon which the Region can rely; and
- operational and expansion flexibility in the long term.

Appendix A includes a comparison of the pros and cons associated with the procurement and delivery options.

#### 5. Value for Money Assessment

With the assistance of Deloitte, staff undertook an assessment of the procurement and delivery options listed in Section 2, to provide a relative comparison of the value for money (VFM) for each option and of project terms of 15, 25 and 30 years. The VFM is the amount of capital, operating and maintenance costs saved by each option, in net present value, compared to the base option of DBB. The analysis places a value on the risks retained by the Region under each option. The risks were identified using output from a comprehensive rapid transit risk workshop undertaken by the Region in 2008, plus comparable data from a recent VFM exercise undertaken by the City of Ottawa for its LRT project (lifecycle cost curve, financing assumptions, and some risk analysis).

Table 2 lists the risks retained by the Region for each option, assuming a 30-year term. The VFM savings range from 0 per cent for the base DBB option to 18 per cent for the DBFOM option. The DBFOM option results in the lowest value of risks retained by the Region and the highest VFM savings.

**Table 2: Risks Retained by the Region by Procurement and Delivery Option (30-year term)**

Option	Retained Risks (\$Millions)	VFM Savings
DBB	825	0%
DB	728	5%
DBf	597	9%
DBOM	622	10%
DBFM	318	16%
DBFOM	274	18%

Table 3 lists the risks retained by the Region for the DBFOM option by project term. For each project term, the analysis covered 30 years with the assumption that, following the expiry of the project term, the Region would take over all operations and maintenance. The VFM savings ranges from 13 per cent for a 15-year term to 18 per cent for a 30-year term. The 30-year term results in the lowest value of risks retained by the Region and the highest VFM savings.

**Table 3: Risks Retained by the Region by Project Term (DBFOM Option)**

Project Term (years)	Retained Risks (\$Millions)	VFM Savings
15	413	13%
25	328	16%
30	274	18%

Staff also reviewed and evaluated why the VFM assessment for DBFOM resulted in savings over the traditional approach and the most savings of all the options considered. With this option, the cost of financing is higher but the construction, operating and maintenance costs are significantly lower. The cost of financing is higher because the cost of private sector financing is higher than public financing. The costs of construction, operating and maintenance are lower because of competitive pressures, because of efficiencies from integrating the design, construction, operating and maintenance processes, and because of the incentives introduced by the private sector having money at risk based on their performance. Overall, based on recent industry observation, the significant reductions in construction, operating and maintenance costs are expected to more than balance the higher costs of financing resulting in overall savings. The DBFOM option is expected to be affordable, within the funding approved by Regional Council, subject to annual budget deliberations, for the Region's portion of the Stage 1 capital, operating and maintenance costs.

## **6. Preliminary Preferred Procurement and Delivery Option**

### **6.1 aBRT Procurement and Delivery Option**

Along Hespeler Road, the aBRT construction will generally include station improvements and intersection improvements to provide queue-jump lanes. The Region has the experience and qualifications to manage the design and construction process for the aBRT improvements along Hespeler Road through its traditional DBB procurement and delivery option. The Region will complete the preliminary and detail design and then tender the work to the private sector for construction, beginning in 2012.

Along Highways 8 and 401, the aBRT construction will include bus bypass shoulders. The construction of the Highway 8 bus bypass shoulders by the Ministry of Transportation of Ontario

(MTO) is nearing completion. The Highway 401 bus bypass shoulders will be designed and built by the Region of Waterloo subject to MTO approval of the design and the construction methods.

## 6.2 LRT Procurement and Delivery Option

For Stage 1 LRT, staff have identified DBFOM with a 30-year term as the preliminary preferred procurement and delivery option. During the DBFOM procurement process, the shortlisted contractors would each generate designs to meet the requirements of the Region, and each provide a DBFOM proposal with a fixed price to design and construct and then operate and maintain the Stage 1 LRT for 30 years. The successful contractor would complete the preliminary and detail design and the construction followed by operation and maintenance, in an integrated process. The Region would withhold a portion of construction payments and pay the private sector for this withheld payment in installments over the 30 years, subject to compliance with performance and availability specifications. A private sector lender would be required to provide short-term financing during construction and long-term financing for withheld payments over the 30-year term. The contractor would be responsible for lifecycle costs (major capital refurbishment) during the 30-year term.

The DBFOM option offers the following:

- cost: LRT design and construction can proceed at the same time, with significant time savings. In spite of higher costs of the private financing component, competitive pressure and up-front due diligence by lenders would compel the private sector to optimize management and produce design innovations, resulting in better value and a lower total project cost (construction, operation and maintenance).
- funding contributions: Use of the DBFOM option will be subject to confirmation by the provincial and federal governments that they will maintain their rapid transit funding commitments with the DBFOM option.
- experience and qualifications: The private sector has more experience and qualifications than the Region in designing and constructing an LRT system, in operating and maintaining an LRT system at start-up, and in providing trained and certified staff to operate the light rail vehicles.
- incentives: Coordination efficiencies provide strong incentives for the private sector to design an LRT system that can be constructed efficiently. Payments and penalties based on LRT system performance and availability would provide a strong incentive for the private sector to complete construction on schedule and to meet availability and operational service standards after construction, with greater long-term asset quality. By taking on financial risks, the lender would have interests aligned with the Region's in monitoring contractor performance and protecting their investment.
- risks: The DBFOM option with a 30-year term results in the lowest net present value of Regional capital, operating and maintenance costs when the value of the Region's retained risks are included. The financing component would give strength to the contractual obligations with less risk of contractor default because the private sector would only receive each instalment payment if it has complied with performance and availability requirements. The option would provide better accountability where performance and availability issues may be related to either maintenance or operation (no integration issues between operations and maintenance). It would transfer lifecycle risks to the private sector. The Region would retain those risks that it is best positioned to manage and mitigate, such as fare setting and ridership risk.
- flexibility: The DBFOM option may constrain the choices for LRT integration with Grand River Transit and for who would maintain and/or operate Stage 2 LRT.

Pending Planning and Works Committee discussions and staff responses to any questions raised, it is proposed that a report including a recommended procurement and delivery option be presented to Planning and Works Committee on January 10, 2012.

## **7. Potential Role of Infrastructure Ontario**

Implementation of the DBFOM option will require the Region to engage assistance to provide procurement coordination and transaction management services. Staff discussions with Infrastructure Ontario (IO) have confirmed that IO is interested in having a role with respect to the procurement of the Region's rapid transit project. IO is a crown corporation that has procured many of Ontario's public-private partnership (P3) projects for the provincial government. IO considers their role to be the delivery of infrastructure and partnership solutions through lending, project procurement and delivery, asset management and advisory services.

IO has considerable experience procuring DBFOM-type projects for the Province of Ontario. IO has not done many transportation projects, but is coordinating procurement of the Windsor-Essex Parkway and the Air Rail Link Spur in Toronto, and is taking a similar role with the City of Ottawa's light rail transit project as is being considered for the Region of Waterloo. IO's participation in past projects within Ontario has contributed to:

- completion of construction on time and on budget;
- reduced overall project costs by transferring appropriate risks to the private sector;
- enhanced private sector familiarity with the procurement process and private sector confidence that the project will proceed to completion, improving the number and quality of responses to the request for proposals; and
- improved capacity of the proponent to implement the project.

Staff propose to work with IO to develop a draft Memorandum of Understanding (MOU) for Council's consideration. The draft MOU will pave the way for the Region to consider engaging IO as an independent contractor to provide rapid transit procurement coordination and transaction management services, with the Region retaining final approval authority on all decision making. The MOU will clarify the potential roles and responsibilities of IO and the Region with respect to the rapid transit project. Pending successful negotiations with IO, staff plan to bring a report to Planning and Works Committee in January 2012 for Council approval of the MOU and to engage IO.

## **8. Next Steps in the Rapid Transit Project**

Implementation of the rapid transit project is being done on an aggressive schedule. There are a number of key decision points and major milestones that will have to be met to maintain the schedule. Adherence to the aggressive project schedule is critical because of the risks associated with any delays to the project including inflation and scope creep. Staff anticipate that the next steps in the rapid transit project will include:

- January 2012: report on recommended rapid transit procurement and delivery option;
- January 2012: hold public consultation centres for the Transit Project Assessment (TPA) for Stage 1;
- January 2012: report on an MOU with IO;
- February 2012: report on a preferred general engineering consultant;
- May 2012: complete the TPA for Stage 1;
- June 2012: finalize funding agreements;
- September 2012: issue request for qualifications from potential construction contractors;

- January 2013: shortlist qualified construction contractors;
- January 2013: complete performance specifications and a draft project agreement between the Region and a construction contractor;
- February 2013: issue request for proposals from shortlisted construction contractors;
- December 2013: evaluate and select preferred construction contractor;
- May 2014: approve final agreement with the preferred construction contractor;
- 2014: full implementation of aBRT
- 2014: begin construction of LRT Stage 1;
- 2014: begin the TPA for LRT Stage 2; and
- 2017: complete construction and begin operation of LRT Stage 1.

**CORPORATE STRATEGIC PLAN:**

The report supports Focus Area 3.1 of Council's Strategic Focus: Develop an implementation plan for light rail transit including corridor and station area planning.

**FINANCIAL IMPLICATIONS:**

The capital cost of Stage 1 of the rapid transit project is estimated to be \$818 million, in 2014 dollars. The Region's portion of the capital cost is \$253 million. On June 15, 2011, Council approved the funding for the Region's portion of the Stage 1 capital costs, subject to annual budget deliberations.

**OTHER DEPARTMENT CONSULTATIONS/CONCURRENCE:**

This report was prepared with input from Finance, from Planning, Housing and Community Services, from Transportation and Environmental Services, from Corporate Resources and from Human Resources.

**ATTACHMENTS:**

Appendix A – Comparison of Procurement and Delivery Options

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

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

## Appendix A

### Comparison of Procurement and Delivery Options

The most likely options for the procurement and delivery of the rapid transit project include:

- Design Bid Build (DBB);
- Design Build (DB);
- Design Build Finance (DBf);
- Design Build Operate Maintain (DBOM);
- Design Build Finance Maintain (DBFM); and
- Design Build Finance Operate Maintain (DBFOM).

The procurement and delivery options are compared in a stepwise fashion starting with DBB and ending with DBFOM because each option contains all of the pros and cons of the previous option plus a step of added features.

#### DB compared to DBB:

##### Cons:

- The Region has less control over the design process.

##### Pros:

- The private sector has more experience and qualifications than the Region in designing and constructing a light rail transit (LRT) system.
- Combines design with construction. Design and construction can proceed at the same time, with significant time savings.
- Coordination efficiencies provide strong incentives for the private sector to design an LRT system that can be constructed efficiently.
- Less risk of implementing a less-than-optimal project.
- Less risk of change orders during construction because of design coordination issues.
- Lower net present value of Regional capital, operating and maintenance costs when the Region's retained risks are included.

#### DBOM compared to DB:

##### Cons:

- Choices for who would maintain and/or operate any LRT expansion and choices for LRT integration with Grand River Transit would be impacted by private sector operation and maintenance of the first stage of the LRT system.

##### Pros:

- Provides for consideration of operations and maintenance costs during design and construction, which can introduce greater opportunities for cost savings through innovation, because the contractor will be responsible for operations and maintenance.
- Under a contract with defined performance standards, helps to ensure better initial construction quality and superior vehicle and system reliability.
- Transfers operations and maintenance risk to a corporate counterpart secured by a letter of credit and/or bonding, each of which is priced based on the annual fee.
- The private sector has more experience and qualifications than the Region in maintaining and operating an LRT system at start-up.
- Greater experience to provide trained and certified staff to operate vehicles. Particularly for a small LRT system, it can be difficult to draw transit operators because it will be a

smaller pool of operators and harder to schedule time off.

**DBf compared to DB:** All of the pros and cons of DB plus:

**Cons:**

- Higher capital cost to the Region because of risk transfer security in the form of the cost of private short-term financing during the construction period because the private sector's borrowing costs are higher than the Region's. The costs of short-term private financing may be mitigated by providing milestone payments during construction.

**Pros:**

- Less risk to the Region in design, procurement and construction because of higher discipline and up-front due diligence because of private sector financial risks. Less risk of ambiguities in the project legal documents that could lead to disagreements at a later stage.
- Full co-ordination and control by the private sector results in less risk of change orders because change orders are difficult to get in public-private partnerships (e.g. requires approval of lender and Region).
- Less risk of construction contractor defaults because, in public-private partnerships, the private sector (project equity sponsor and/or the lender) is responsible to replace the construction contractor.
- Strong incentive for the private sector partner to complete construction on schedule because of deferment of payment until completion of construction or major milestones.
- Lower net present value of Regional capital, operating and maintenance costs when the Region's retained risks are included.

**DBFM compared to DBf:** All of the pros and cons of DBf plus:

**Cons:**

- Highest capital cost to the Region because of the cost of private long-term financing during the term of the project.
- Choices for who would maintain any LRT expansion would be impacted by private sector maintenance of the first stage of the LRT system.
- May cause integration issues between maintenance and operational components..

**Pros:**

- The financing component gives strength to the contractual obligations; the contractor is less likely to default on their contractual obligations if the project goes poorly.
- Strong incentives for on-time and on-budget delivery, because late delivery results in higher financing costs and erodes private sector returns;
- Liquid performance security in the form of deferred payment;
- Long-term capital providers will monitor private sector performance. The lender is introduced between the equity sponsor (e.g. builder) and the Region and many of the lender's interests are aligned with those of the Region.
- Fixed maintenance costs for the term of the project, which are locked in during the bid process and require the consideration of lifecycle cost efficiencies as part of the design-build process.
- The private sector has more experience and qualifications than the Region in maintaining an LRT system at start-up.
- The longer project term (25 to 30 years) introduces a strong incentive for the private sector to meet maintenance standards through payments and penalties based on system performance and availability and introducing opportunities for innovation, and result in an LRT system in good working condition at the end of the project term.

- Lower net present value of Regional capital, operating and maintenance costs when the Region's retained risks are included.
- During the procurement process, the shortlisted bidding construction contractors would each generate complete designs, each meeting the requirements of the Region, but each likely reflecting a different approach or innovation on the project. This would provide the Region with some flexibility in evaluating the bids, other than lowest cost of construction, because these innovations would be reflected in the project cost (construction and maintenance costs).

**DBFOM compared to DBFM:** All of the pros and cons of DBFM plus:

**Cons:**

- Choices for LRT integration with Grand River Transit and for who would operate any LRT expansion would be impacted by private sector operation of the first stage of the LRT system.

**Pros:**

- The private sector has more experience and qualifications than the Region in operating an LRT system at start-up.
- Greater experience to provide trained and certified staff to operate vehicles. Particularly for a small LRT system, it can be difficult to draw transit operators because it will be a smaller pool of operators and harder to schedule time off.
- Strong incentive for the private sector to meet operational service standards through payments and penalties based on system performance and availability.
- Better accountability where performance and availability issues may be related to either maintenance or operation (no integration issues between operations and maintenance).
- Greater long-term asset quality.
- Lowest net present value of Regional capital, operating and maintenance costs when the Region's retained risks are included.
- Design innovations would be reflected in the total project cost (construction, operation and maintenance).

**Project term:**

The options that include long-term financing (DBFM and DBFOM) have a project term that defines the length of period over which the project is financed by the private sector. The project term could range from 15 to 25 or 30 years. The impacts of the project term include:

- The capital cost to the Region increases with the length of the project term because of the cost of private long-term financing over that term.
- Maintenance risk is reduced with a longer project term. A longer project term of 30 years more than covers one full lifecycle so that significant rehabilitation and replacement occurs within the project term. The 25-year lifecycle includes major capital refurbishment, including the full rehabilitation of civil infrastructure, vehicles and systems.
- A longer finance period results in a lower net present value of Regional capital, operating and maintenance costs when the Region's retained risks are included, principally because of the transfer of lifecycle risks.