6.0 TRANSIT TECHNOLOGY

This section outlines the process which led to the selection of a recommended transit technology for the DOTT project.

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6.1 Background
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6.1 Background

The selection of the appropriate rail transit technology for the City of Ottawa is a major component of the 2008 Transportation Master Plan (TMP) process and the choice of rail technology has been determined by a number of guiding principles:

A selected rail transit technology must:

- *Accommodate the predicted passenger volumes:* Ensuring that operational efficiency and running costs are optimized.
- *Fit into Ottawa's urban environment:* Ensuring that the vehicle and system support the achievement of the City's urban and environmental vision.
- *Minimize capital costs:* To ensure that stakeholders and citizens have a good return on investment.
- *Minimize the lifetime operating and maintenance costs:* Ensuring low fares and taxes and encouraging ridership.
- *Be able to respond to future land use changes within the City and the demand for travel:* Providing flexibility of operations to accommodate future city planning and operational changes.
- *Take advantage of the most current proven technologies:* Providing operational efficiencies and high reliability and subsequent lower operating costs.
- *Be suitable for the climate in Ottawa:* Ensuring that the vehicle can withstand the extremes of temperature.
- *Provide conditions to easily implement the first increment and all subsequent phases of the system.*

A study was undertaken to advance this component of the TMP process and finalize the technology selection which began with the Technology Workshop held in June 2009. The primary purpose of this work was to develop a clearer set of technology parameters and provide information on how the proposed rapid transit network, projected ridership levels and the technology characteristics of different rail modes interacted with one another. The entire contents of this study titled *Transit Technology Choice Report* are located in Appendix G.

6.2 Key Discriminators

The key discriminators for the rail transit technology choice included:

- Transit System and Network Integration, including the impacts of multiple transportation modes on
  - The number of transfers for passengers
  - Fleet management, including deadheading, with multiple unconnected operations, maintenance and storage facilities
- The impacts of segregation
  - Cost of segregation
  - Impact of an alignment through the Greenbelt

6.3 Passenger Volumes and Predicted Ridership

The TMP planning process was supported by a regional transportation model that projected future (2031) transit ridership through the downtown of Ottawa would reach 14,400 persons per hour per direction (pphpd) between Bayview Station and the future Downtown West Station (to be constructed as a part of the Downtown Ottawa Transit Tunnel project).

Additional volumes of passengers emanating from the future extension of LRT to South Keys, and Société de transport de l'Outaouais (STO) routes from Gatineau could increase potential volumes to 20,000 pphpd should any future interprovincial rapid transit link feed into the planned TMP network west of the downtown. Based on this, and to provide an adequate spare capacity to accommodate future growth beyond 2031, for the purposes of the technology selection the ultimate capacity is considered to be 24,000 pphpd. It should be noted that for reasons of geographical and development constraints in this area, the core may not increase beyond this ridership capacity.

Based on the above, a number of different technologies were evaluated for suitability. Some technology choices such as monorail and heavy rail were discounted early due to poorer match of transit requirements in terms of ridership capacities and cost.

To meet the predicted ridership capacity, two generic system technology choices were considered more suitable to the City of Ottawa and carried forward for further evaluation:

- ***Light Metro*** (as in the Skytrain system used in Vancouver or the Mini-subway used in Kobe Japan), which is more operationally suited to development in the downtown core, and

- ***Light Rail*** (as used in Calgary or Minneapolis) and is a better selection for urban planning and implementation outside of the main core, while also still being able to operate in the main core.

To meet eventual ridership predictions of 20,000 pphpd, the system will require a communications-based train control system (CBTC) which permits automatic train control and operation in the segregated core.

Table 6-1 provides a comparison of key transit technology criteria.

Table 6-1: Comparison of Key Transit Technology Criteria

#	Criteria	Description	Light Metro	LRT	Driver operation (ATC manual)	Automated (Non-manual ATC)
1	Maximum passenger capacity in the core	>20,000pphpd	Good	Fair	Poor	Best
2	Low passenger capacity in the extensions	> 5,000 pphpd	Good	Best	Good	Poor
3	No more than one transfer and no in-line passenger transfers		Poor	Best	Required	Not applicable
4	Ability to build a non-segregated system in low density areas		Poor	Best	Lowest Benefit	Highest Benefit
5	Comparative total system capital cost	all Phase 1 network, infrastructure and vehicle fleet	Good	Best	Best	Highest
6	Comparative life time operating and maintenance costs	all Phase 1 network, infrastructure and vehicle fleet	Best	Good	Lowest	High
7	Proven in service	At least five years in revenue service	Good	Good (Note 1)	Good	Good (Note 1)
8	Suitable for the climate in Ottawa	Operated in a climate similar to that of Ottawa	Good	Good	Good	Good

Note 1: In order to meet the 2031 core capacity requirement, the vehicles associated with the LRT system will require operation with less distance between them. This requires a more modern Automatic Train Control (ATC) system such as the Communications Based Train Control (CBTC) system.

6.4 *The Preferred Technology*

The choice of technology determines the future flexibility of a transportation network within Ottawa. Light Metro was recognized as meeting the core capacity prediction targets and having sufficient margin for growth beyond the prediction but found that the potential capacity within the core may not warrant such a system. The development of a high capacity light metro style system could potentially divide Ottawa's transportation network into a set of fragmented, unconnected and disparate transportation modes, which may affect operational costs. A further result of fragmentation will be the increase of onward transit mode changes which can have a detrimental effect on ridership and would effectively increase transportation costs due to higher costs of segregation for the outlying suburbs, and may result in lower operational efficiencies with potentially higher fares.

In contrast, the use of Light Rail Transit (LRT) in the proposed corridor will provide a more efficient capacity match for the ridership prediction throughout the main core and outlying regions up to and beyond 2031, but will require automatic operation to achieve the envisaged ridership, which will also achieve a reduction in long term operating costs.

A hybrid version of driver operated/automated LRT will provide a longer term flexibility to transit network planning and the possibility of on-street running, a lower cost segregated corridor and the reduced complexity of driver operation in the suburbs.

A generic set of Light Rail Transit technology vehicle specifications have been used as part of the study. A typical Light Rail Vehicle (LRV) will have a length of approximately 30 m and a width of 2.65 m. The passenger capacity is expected to be up to 200 per car, although for service planning purposes a capacity of 150 per LRV has been generally assumed. The line has been planned and designed to accommodate 6-car (180 m) trains, although it is likely that operation will commence using 3 or 4-car trains (90 and 120 m respectively). The trains are powered by electricity, which will be supplied via overhead line equipment. Most modern LRT systems operate with an electrical supply of 600-750 VDC although some, as was the N-S LRT project, use 1500 VDC. Train operations will be fully automated, with or without an on-board staff member on the train to open/close vehicle doors at station stops and otherwise assist with passenger safety and security. A communication based train control (CBTC) signalling system will regulate the movement of trains along the line, allowing for reduced headways between trains.

The Transit Technology Choice Report was approved by Ottawa City Council on 25 November 2009, recommending a Light Rail Transit system as the preferred technology choice for deployment in Ottawa as it:

- Provided the necessary capacity for the ridership predictions in the main core,
- Could accommodate low passenger capacity in the extensions outside of the main core,
- Resulted in less fragmentation of the network, reducing the need for onward transfers,
- Had less impact on the urban fabric and allows the ability to build a non-segregated system in the Greenbelt,
- Had comparative total system capital costs with Light Metro,
- Had comparative lifetime operating and maintenance costs with Light Metro,
- Allowed better integration of technology for the Carling-Lincoln Field's corridor,
- Provided greater network flexibility and promotes development of the transportation network in the core,
- Was a proven design, and
- Is more suitable for the climate in Ottawa.

6.5 *Consultation on Transit Technology*

Underpinning the transit technology selection process, the City hosted a LRT Technology Forum On 19-20 June 2009 to discuss light rail transit technology options in the development of the new transit vision.

The Forum brought together representatives of manufacturers and transit agencies from across North America to discuss various types of transit systems, best practices and lessons learned. The event was attended by a number of City Councillors, senior City staff, and a number of key stakeholders from various federal, provincial and municipal agencies (NCC, Transport Canada, Infrastructure Ontario, Société de transport de l'Outaouais.).

The Technology Forum provided an opportunity to bring together transit experts, technology providers, key stakeholders and the public to identify the best transit technology options for the City's new LRT System. Presentations by staff and technology providers were followed by small group discussions. The results of the Technology Review were provided to each of the groups outlining the various technologies and operating requirements that will guide decision making. The review was not intended to recommend a specific system, manufacturer or vehicle-type, but to assist with developing a framework for future planning and procurement. To assist the forum, a number of background papers were created and placed on the City's website to inform the general public of the key decision and issues which required evaluation. Background papers included:

- Climate considerations
- Regulatory framework
- Degree of Corridor Segregation
- Power Collection Systems
- Signalling Systems
- Automatic versus Driver-operated Vehicles
- Single Versus Multiple Vehicle-Type Fleets
- High Floor versus Low Floor Vehicles

Following on from the successful LRT Technology Forum, the draft Transit Technology Choice Report was presented to the public as part of the third Public Open House and Presentation (26 October 2009) and at a meeting of the City of Ottawa's Transit Committee (18 November 18 2009). As outlined above, the final recommendation for LRT technology was approved by Ottawa City Council on 25 November 2009.