Review of August 2007, Urbandale LRT Network Plan

by McCormick Rankin Corporation

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Introduction

Mr. S. Lyon Sachs, President of Urbandale Corporation submitted a proposed network plan entitled "An Affordable Solution for Rapid Transit in Ottawa" to the City's Joint Transportation and Transit Committee on 15 August 2007. This proposal was based on the original North-South LRT project but proposes some suggested cost savings in the original plan as well as added scope. The additional scope included a tunnel in the downtown and an extension of the LRT line east and south to the VIA Rail station. Urbandale's estimated Phase 1 project cost is $1,111 M. Additional Phase 2 extensions were suggested to the west and east and to complete the North-South line to Barrhaven in the southwest.

McCormick Rankin Corporation was requested to review the revised alignment along Armstrong Road, the proposed Phase 1B project from Bayview easterly to the VIA Rail station and the proposed Phase 2 westerly extension from Bayview to Bayshore. Another consulting firm is reviewing the remaining aspects of the Urbandale proposal.

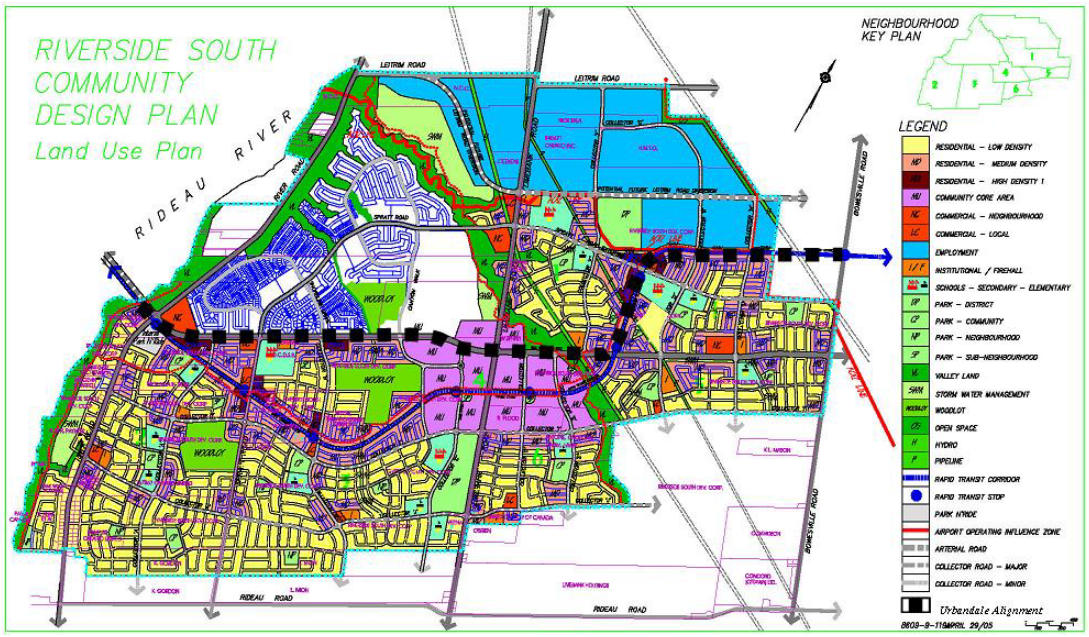
This analysis is based on the Urbandale report plus clarification discussions that City staff held with Urbandale's consultant, Mr. Morrison Renfrew. The following is a high level review of the relevant aspects of the Urbandale proposal.

1.0 Proposed Realignment along Armstrong Road

The preferred alignment for the North-South LRT Project serving Riverside South was determined as a component of the Riverside South Community Design Plan (CDP) study, approved by City Council in June 2005. In support of the CDP, a separate functional planning study was undertaken (Riverside South Rapid Transit Functional Planning Study, December 2003) with a goal of identifying a transit corridor that would best serve the Riverside Community in order that land-use planning and development in the area could proceed with long term planning objectives in mind. The CDP, functional planning study, and the environmental assessment study for the North-South LRT were subject to extensive public consultation in accordance with the requirements of the Planning Act and Environmental Assessment Act.

The CDP incorporates an east-west transit corridor within the Community Core. The corridor is envisioned to be pedestrian-oriented, adjacent to retail/commercial and residential areas and have a community wide appeal. The CDP provides guidelines for development sites adjacent to the rapid transit corridor to be designed to mitigate noise and potential pedestrian/vehicular conflicts. The Riverside South

CDP (including the transit corridor) is shown below with Urbandale's proposed Armstrong Road alignment superimposed on it.



The significant differences between the two corridor options are highlighted below:

Earl Armstrong Road alignment (Urbandale proposal):

- Located on a major arterial with high volumes of traffic and limited right-of-way;
- Potential conflicts between LRT operations and traffic turning movements;
- Potential interference to LRT operations from emergency operations at the newly-built fire hall on Armstrong Road;
- Least opportunities for future transit-oriented development (low-density residential development already exists on the north-side of the road);
- Not readily accessible for a majority of transit users in the community (need to bus or walk to stations on Armstrong Road);
- Would require a redesign of the Riverside South CDP to relocate some of the higher density development to within walking distance of Armstrong Road transit stations.

CDP/North-South LRT EA Alignment:

- Located in the centre of the community, with highest density development adjacent to the transit corridor;
- Stronger positive influence on future transit oriented development on both sides of the transit corridor;
- Attracts higher ridership because of proximity to a higher proportion of walk-in traffic from future development.

The corridor selected as part of the community design process and reconfirmed as part of the North South LRT EA is considered to be more transit supportive than the Armstrong Road corridor in that it has the potential to attract more ridership and that it can provide better service to the planned high and medium density residential development south of Armstrong Road.

2.0 Phase 1B: Bayview to VIA Station

2.1. LeBreton Station

The Urbandale proposal does not include a transit station in LeBreton Flats. The redevelopment plans for the Flats has a strong transit component including a station at Booth (LeBreton Station). It is highly unlikely that this station can be deleted without considering the effects on the community as a whole. Furthermore, LeBreton Station is intended to be integrated with the local service on Booth Street – which includes interprovincial transit services.

2.2. Proposed Downtown Tunnel

The Urbandale proposal recommends an LRT tunnel in the downtown from the escarpment adjacent to LeBreton Flats, east under Sparks Street and the Rideau Canal and then south parallel to the east side of the Canal to come to the surface between Campus Station and Lees Station just north of Highway 417. The LRT would then continue east on the existing Transitway to the VIA Rail station.

2.2.1. Tunnel Alignment

The Urbandale proposal suggests a tunnel under Sparks Street to take advantage of a potential station near the Congress Centre and Federal Government Conference Centre (old train station).

The Urbandale alignment (compared to Albert/Slater) would result in an increase length to the overall project because of diverting north at the west end to get to Sparks Street and than back south again at the east end. This extra length would add costs to the tunnel. Alternatives under Albert/Slater or other east-west streets will have to be assessed through the upcoming tunnel environmental assessment study.

Typically, tunnel alignment will be influenced by: the availability of sites for surface interface requirements (station stairs, escalators, and elevators and tunnel ventilation shafts), underground geology, utility conflicts, the size of the tunnel and underground stations, and property and transit service considerations.

2.2.2. Portal Locations

The west portal east of LeBreton Flats takes advantage of the escarpment and is similar to the 1988 “Central Area Transitway Grade Separation Feasibility Study”. However, the Urbandale proposal alters the alignment through the east end of

LeBreton Flats and introduces a sharp "S" curve at the proposed west portal in order to reach the Sparks Street alignment which would introduce a speed limitation.

The east portal location proposed by Urbandale has the tunnel extended parallel to the east side of the Canal approximately 450 m further south than the 1988 study portal location which would increase the tunnel cost. The tunnel was extended to south of the University of Ottawa so that the Transitway could still operate with buses into the downtown. This extension would allow buses to continue surface operation into the downtown during tunnel construction.

2.2.3. Tunnel Size

The Urbandale plan proposes a 4.7 m tunnel diameter. Assuming that this is an inside diameter, there would not be sufficient room for an overhead catenary electric power pickup for the LRT. This would require side pick-up in the tunnel with overhead pickup for surface running.

Typically, the outside diameter of LRT (and subway) tunnels range from 5.8 m to 6.1 m. For example: the Toronto Sheppard Subway had an outside diameter of 5.9 m with a finished inside diameter of 5.2 m; the Calgary LRT has 6 m diameter tunnels; the Vancouver RAV Line has an outside diameter of 6.1 m. Therefore, an LRT tunnel under downtown Ottawa should have an outside diameter closer to 6 m, and may be even wider if it is also to accommodate buses.

While the 4.7m tunnel diameter may be feasible, it will limit future system flexibility and would not allow any option for buses running in the tunnel. The actual size of a future transit tunnel(s) will depend on whether the tunnel is to include LRT only, LRT plus buses, or buses only. The upcoming tunnel EA will identify the preferred diameter.

2.2.4. Underground Station Locations

The Urbandale proposal includes 3 underground stations at Kent, Metcalfe and Union Station to serve the CBD, Rideau Centre and the University of Ottawa. The North-South LRT EA included 4 surface LRT stops at Lyon/Bay, Bank, Metcalfe/O'Connor and Mackenzie King to serve the CBD and Rideau Centre. In addition, Council approved an easterly extension of the North-South LRT to service Ottawa University to address concerns regarding removal of vehicular traffic on Mackenzie King Bridge.

The Urbandale proposal suggests that the LRT station at/near the Congress Centre and Federal Government Conference Centre (old train station) will provide service to Ottawa University. This would be the only LRT station to serve the University as there are no additional proposed stations prior to Hurdman Station. An additional LRT station would be required to properly serve the University and to provide a direct LRT connection between the City's two universities (Ottawa and Carleton).

2.3. From East Portal to VIA Station (Joint Twy/LRT Operation):

Once out of the tunnel, Urbandale proposes a joint use of the Transitway by both buses and LRT to Hurdman and VIA Rail stations, which implies that buses are still continuing into the downtown and that not everyone is transferring to the LRT at Hurdman. This may not meet the objective of significantly reducing the number of buses entering the downtown on the surface once the transit tunnel is in operation.

The joint use concept will need to be further analyzed to assess the impact on Transitway operation. Also, LRT connections to the VIA Rail station will need to be further analyzed as there will be major issues with access to platforms and the need for the LRT to cross over both the VIA tracks and Vanier Parkway/Riverside Drive (Urbandale's proposal is for the LRT station to be south of the VIA rail terminal, adjacent to Terminal Avenue – the existing Transitway is north of the VIA rail terminal). This work will have to be developed further through the TMP update.

3.0 Phase 2: Westerly Extension Between Bayview and Bayshore

The Urbandale proposal shows a westerly extension from Bayview to be a shared-use BRT/LRT corridor. The joint corridor would subsequently diverge to a road alignment and proceed to a park-and-ride at the 417/416 interchange. Urbandale confirmed that this westerly extension has not been developed in any detail. However, the LRT appears to follow the West Transitway corridor and part of the Carling Avenue LRT corridor as identified in the TMP.

Further analysis will need to be carried out to assess whether or not there is sufficient right-of-way for both technologies and if there is a requirement for both. Therefore, it is proposed that these issues be examined in more detail through the TMP update to ensure that corridors and other transit components are part of an affordable and effective network that supports the transit goals of the City.

4.0 Cost Estimates (West Portal to VIA Station)

A preliminary review of the Urbandale cost estimates was conducted for Phase 1B (from the proposed west portal to the VIA Rail station). Urbandale had not provided costing information for other extensions westerly and easterly.

4.1. Tunnel Cost

The Urbandale proposal has an estimated cost of $401 M for the section from Bayview Station to a proposed east tunnel portal. The cost estimate includes a 15% contingency.

A downtown tunnel at this stage of planning is very conceptual with very little details regarding depth, location, station configuration, impact on utilities and property, etc. Therefore, any tunnel estimate at this stage should be treated as very preliminary. Standard engineering practice for budget estimating at this level of plan development would include a relatively high contingency to cover costs that will occur but are unknown at this time. Standard practice assumes a 30% (or higher) contingency applied to broad items such as the tunnelling and stations.

Most recent transit tunnelling projects in Canada reveal the following costs: the Sheppard Subway tunnel without stations is $100 M/km; the tunnel portion of the Spadina Subway is approximately $115 M/km. For the purposes of this review, $100 M/km has been used for an LRT twin tunnel excluding stations. Therefore, a 3 km twin tunnel including tracks, signal and electrical will cost approximately $300 M. Three centre platform stations are estimated at approximately $120 M ($40 M for each). With a 30% contingency added to include all other items and unknowns, an order of magnitude of costs for the entire tunnel section would be approximately $550 M.

To make it comparable to the Urbandale estimate, the section from Bayview through LeBreton to the west portal would have to be added at a cost of approximately $65 M. Therefore, the total cost from Bayview to the east portal of the tunnel is estimated at $615 M compared to Urbandale's estimate of $401 M.

The stations and ventilation system in the tunnel will also vary depending on whether the tunnel is for LRT only, bus only or LRT and bus. All of these variables will be investigated in detail as part of the upcoming tunnel EA.

4.2. East Portal to VIA Station

From the east portal, the Urbandale plan shows the LRT running in joint operation with the Transitway and then diverting to the south side of the VIA Rail station, assuming use of the VIA tracks. The VIA Rail Station would require significant modifications to connect the new LRT alignment (on the south side of the VIA Rail station) to the existing Transitway (on the north side of the VIA Rail station).

There are a number of unknowns in this proposal and a variety of location options for accessing the VIA Rail station. One possible option would be to stay on the north side of the VIA Rail station but this would have to be investigated in much more detail if this proposal were to be pursued.

Urbandale has estimated a cost of $51 M for 2.5 km of twin track from the east portal to the Via Rail station including modifications to Hurdman and the VIA Rail stations. As part of this estimate the Hurdman transfer station is estimated to be $25 M because of major station modifications required including an extensive retaining wall system, stairs and elevators to access the elevated LRT platforms and shelters. Hurdman Station is also located on a former landfill site and therefore additional attention to environmental issues will be necessary.

The total Urbandale cost estimate for this section (without knowing the specific design details) would appear to be reasonable with the proviso that the interface with VIA in particular needs more study.

5.0 BRT/LRT Joint Operation

The Urbandale proposal suggests BRT and LRT operate jointly on sections of the Transitway west of Bayview Station and east of Campus Station.

Joint operation of BRT and LRT, in the same right-of-way, exists in other jurisdictions under certain operating conditions and speeds. Under joint operation, there is some concern that both LRT and BRT vehicles may have to run at a slower speed (less than the present 90 kph Transitway speed) because of differing braking and acceleration performance of each type of technology. Further investigation is required to determine the appropriate safe operating parameters for any possible joint BRT/LRT operation in Ottawa, and to assess the impact on transit service performance.

Conclusion

There are a variety of issues and concerns that have been identified in this report that would require attention prior to any final project approval. The Urbandale cost estimates are on the low side and should not be used for any budgetary purposes at this time.

The overall transit network configuration and the downtown tunnel and extension east and west will have to be established jointly as part of the current Transportation Master Plan update and the upcoming downtown transit tunnel EA.