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VIVA PHASE 1 CAPITAL ENHANCEMENTS

The Rapid Transit Public/Private Partnership Steering Committee recommends the following:

- 1. The presentation by Mary-Frances Turner, Vice President, York Region Rapid Transit Corporation, be received; and**
- 2. The recommendations contained in the following report April 4, 2007, from the Vice President, York Region Rapid Transit Corporation and the Commissioner of Transportation and Works, be adopted:**

1. RECOMMENDATIONS

It is recommended that:

1. Council adopt the evaluation criteria, detailed in this report, for determination of new Viva Phase 1 stop locations.
2. Council approve a new Vivastation stop (both directions) on Yonge Street in the vicinity of Stouffville Road, the final location of which shall be determined through a plan for conventional service connections.
3. Council approve new queue-jump lanes at three locations;
 - i. Highway 7 at Leslie Street through Commerce Valley Drive West.
 - ii. Kennedy Road at Unionville Station Road.
 - iii. Yonge Street at 19th Avenue / Gamble Road.
4. Council approve an optimization study of existing traffic signal priority (TSP) parameter settings.
5. Council approve \$1,675,000 from the Phase 1 capital improvement budget to implement three new queue-jump lanes, a new Vivastation stop (both directions) on Yonge Street, and modelling work to determine optimal Traffic Signal Priority (TSP) settings through use of the York Consortia and the establishment of a Guaranteed Maximum Price (GMP) for the work with KED, the design-builder.

2. PURPOSE

This report assesses and recommends several key capital enhancements to Viva Phase 1:

- Intersection improvements to enhance operational efficiency, specifically provision of additional queue-jump lanes at three intersections and evaluation of potential adjustments to the Transit Signal Priority (TSP) system.
- Provides a framework for evaluating additional Phase 1 Vivastation stops. Using the framework, the current system has been reviewed and potential new Vivastation stops have been evaluated. One new Vivastation stop location is recommended.

3. BACKGROUND

A review of the potential options to improve the overall performance of Viva Phase 1 was warranted based on the operating experience of the Viva Phase 1 system to date and to changing conditions throughout the system due to additional land development and growth, and to the overall delay to the original schedule for implementing Viva Phase 2. In addition, staff have been tracking requests from potential customers and an informed response to these inquiries based on a sound justification to support or deny these requests is due (*see Council Attachment 1*).

The greatest potential to attract new riders comes from measures to decrease travel times, and potential addition of new station stops, and fleet expansion to maintain and enhance service levels and accommodate growing ridership demand.

Intersection Enhancements: Travel speed improvements on the Phase 1 Viva network have been achieved through the use of queue-jump lanes, which enable Viva vehicles to pass more smoothly through areas of chronic peak-period congestion, and traffic signal priority measures, which facilitate real-time adjustments to traffic signal timing in the event that vehicle-specific operating delays fall below a pre-determined threshold.

Most intersections where queue-jump lanes were identified as being most beneficial were implemented under the original Phase 1 program. However, factors, such as cost, property or utility issues and limited rider demand, led to postponement of others. Day to day operation of the Viva system has provided the operator with keen insight into locations where chronic congestion occurs and those locations where queue-jump lanes could enhance operating performance.

The traffic signal priority system for Phase 1 is complete in terms of hardware and operating systems. However, it is still running with parameters identified prior to the commencement of service in September 2005. There are likely many locations where an adjustment in controller parameters or control centre settings could achieve travel time savings without adversely impacting other roadway users. A traffic engineering analysis, involving additional modelling and field trials, to update these settings could result in meaningful running time savings.

New stations: The original network configuration for Viva Phase 1 included a set of Vivastations spaced, on average, about 1.4 kilometres apart along its four core routes. The attainment of rapid transit status is predicated on relatively high average speeds on-route, high frequency, and the ability to reach many trip ends on foot. With the present number of stations, Viva will attain this status once the Phase 2 improvements are made. The addition of new stations should be made judiciously and according to set criteria, to assure that there is a net increase in transit ridership with each new station, and that the ability to achieve true rapid transit in Phase 2 is not compromised.

Outstanding Phase 1 Project Work - Two pieces of work remain: Viva Phase 1 includes establishment of service to and a terminal in the Cornell area of Markham, as well as completion of a pedestrian bridge connecting the Richmond Hill Centre Viva Terminal with the Langstaff GO Transit Station. Although part of the original Phase 1, program these initiatives are not dealt with in this report.

Additional vehicles will be required to extend service to Cornell Centre and accommodate system-wide ridership growth

Fleet requirements to extend Viva service easterly to Cornell Centre, and accommodate system-wide ridership growth, will be the subject of a future report to Committee and Council. The fleet requirements will be reflective of the improvements as recommended in this report

4. ANALYSIS AND OPTIONS

York Region has made a significant investment in Viva Phase 1. Keeping the system healthy and current, while working towards the ultimate funding and construction of Phase 2, is vitally important to preserve ridership growth and the established system brand. This section of the report evaluates and recommends several key capital enhancements necessary to the continued health of Viva Phase 1.

The two strongest determinants of system performance are average speed and average distance between stops

It is critical to Viva's success that it continues to deliver an average speed that is noticeably better than local transit services, and in Phase 2 it must achieve a reasonable definition of 'rapid transit'. The strongest determinants of system performance are average speed, the average distance between stops and the general operating environment; ie. mixed traffic, and exclusive rapidway with and without traffic signals.

Improvements at selected intersections may significantly enhance Viva operating performance

Additional queue-jump lanes would significantly improve system-wide performance

New or extended queue jump lanes can offer considerable advantages to performance without negative impacts on the existing operation, and therefore have the potential to be highly effective investments for incremental improvements to Phase 1 operation.

Advantages:

- Incremental solutions for total travel time savings on-route.
- Relatively low incremental cost.
- Additional priority criteria from operating experience has been gained since the commencement of service.
- Beneficial to other road users by reducing congestion for right turning movements.
- Will continue to provide benefits to other road users when dedicated lanes in Phase 2 are constructed.

Disadvantages:

- Site-specific utility conflicts or property requirements may be onerous.
- Ultimate redundancy for Viva operations once dedicated Phase 2 lanes are constructed.

Intersections that present the opportunity for upgrading of queue-jump lanes can be characterized in one or more of the following three categories:

1. Intersections with existing Phase 1 Vivastations that did not receive queue-jump lanes in the original station construction program.
2. Other intersections not slated for stations but characterized by notable congestion that traps Viva vehicles in travel lanes at peak travel times.
3. Individual intersections with unique constraints that may require land acquisition or other actions to correct or improve.

Three new queue-jump lanes are recommended

Evaluation of queue-jump lane opportunities, based on moderate cost and strength of travel time improvement, has yielded the following set of recommended improvement areas. The costs indicated are approximate, subject to further design and field investigations:

1. 150 metre extension of eastbound lane on **Highway 7 at Leslie Street through Commerce Valley Drive West**. This project is modest in cost and would improve the speed of Viva Purple and Pink services on a highly congested section of Highway.
2. Lengthening of the southbound lane on **Kennedy Road at Unionville Station Road** by 120 metres. This project may require some acquisition of private property but would be modest in cost and improve reliability of Viva purple service.

3. Improvement to bus bay and queue-jump lane configuration, including 60 metre extension of the northbound queue-jump lane at **Yonge Street at 19th Avenue / Gamble Road**. This is the least costly of the alternatives, but may also yield only modest travel time improvement. Although the 19th/Gamble queue jump was evaluated in original the *Quick Start* program, it was deferred in anticipation of the planned installation of new sewer/stormwater pipes. These new pipes are currently being installed.

It is anticipated that provision of the three abovementioned queue-jump lanes will collectively reduce system-wide travel time by roughly 3,500 person hours annually. A performance improvement of this magnitude is expected to attract up to 200 new daily riders to the system. The collective cost of constructing the three recommended queue-jump lanes is estimated to be \$500,000. This estimate does not include the cost of any utility relocation or property acquisition. The cost will be estimated prior to finalizing the estimate.

It is important to note that none of the proposed queue-jump lanes are in the segment of Yonge Street currently under preliminary engineering for Phase 2.

Updating Transit Signal Priority (TSP) parameters has the potential to significantly improve Viva operating performance

A TSP update would include an analysis of Viva automated vehicle location (AVL) data to identify intersections with a high level of traffic signal delay. Subsequent traffic simulation of the operation of high-delay locations would then identify those TSP parameter changes that would reduce bus delays significantly while having little or no effect on general traffic. The work would include review and coordination with regional, local and provincial operators of each signal controller where such improvements could be attained, to seek support for installing the new parameters.

A TSP update could yield an estimated overall travel time reduction of 1-2% system-wide, generating annual passenger time savings of 25,000-50,000 passenger-hours, measured at 2006 ridership levels. The cost of the analysis, review and implementation of new parameters is estimated to be about \$75,000.

Potential new stations need to be considered with regard to their impact on operating performance and potential contribution to attract new riders

Adding a Vivastation has three effects on system ridership:

- It shifts existing riders among Vivastations and local services; some of the ridership at the new station will come from other stations or local YRT stops.
- It attracts new riders from the vicinity of the new station for a site-specific net gain, which will be related to the extent of development in the immediate vicinity
- It diverts existing 'through' riders away from Viva due to increased overall trip time.

The evaluation of a new station location can be considered as a trade-off between the convenience of additional access to the Viva system from a new Vivastation and the system-wide effects of the additional stop to the system. For example, a new station will cause in-vehicle time to increase for all riders, including dwell time (the interval that the vehicle is actually stopped at the station) as well as the roughly 8-10 seconds of acceleration and deceleration time on either side of the stop. It is generally recognized that the introduction of a new stop in Viva-like systems will introduce a travel time penalty that is anticipated to erode 'through' rider volume by roughly 2-3%. The spacing of stations is therefore a considerable influence on the overall performance of the system. These impacts are offset by the benefits to riders at the new stop, who have additional choices and a shorter access path, whether they arrive at the new Vivastation on-foot or by driving.

Two principles can be advanced for the addition of stations to the Phase 1 arrangement:

1. The addition of a new station stop should not result in a net ridership loss.
2. The new station should generate increased revenue to offset total annualized station capital and operating costs; otherwise, system-wide cost-effectiveness suffers.

Proposed measurements for this analysis are also addressed in the 2006 YRT/Viva Five Year Plan and Transit Service Guidelines, dated May 2006 and endorsed by Council on June 22, 2006. These are:

- A new Vivastation should be at least 750 metres from the nearest adjacent Vivastation on any Viva route serving it.
- A new Vivastation should not reduce the average route-wide distance between Vivastations on any route it serves to less than 1,000 metres.
- A new Vivastation should yield net new daily boardings of at least 300 riders.

A secondary analysis conducted by ENTRA for York Region Transit (YRT) (*see Council Attachment 2*), as illustrated in Figure 1, suggests that it may be appropriate to reduce the minimum new boarding standard on Yonge Street north of Bernard and Highway 7 from 300 to 100, and on the green Markham route from 300 to 75.

Figure 1
New Vivastation Modified Standards

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Viva Route	Minimum New Boardings ¹		Minimum New Boardings ²	Minimum Station Spacing
blue (Finch-Bernard)	300	OR	100	AND No less than 750 metres, with an average spacing along the line above 1,000 metres
blue (Bernard-Newmarket)				
purple				
orange				
green				

¹ As per YRT Five-Year Service Plan 2006-2010

² Secondary Analysis Based on Current Conditions, D. Allen, IBI Group July 2006

These criteria indirectly assure a level of cost-effectiveness compatible with overall system success. The present number of Phase 1 stations is near optimal. Additional stations have been established in the Highway 7 Environmental Assessment (EA) and the upcoming North Yonge EA as part of Phase 2; however, with the introduction of new land development staff will be prepared to revisit stations on either side of any new proposed station with a view to consolidating one or more stops to re-optimize the vicinity.

Proposals for New Vivastations in Phase 1 have been evaluated against proposed measurements

The decision to add new Vivastations requires an understanding of when the advantages of new access to the Viva system exceeds the inherent disadvantages of reducing travel speed for the entire route, which is a consequence of stopping all vehicles at a new location. The net benefits of establishing a new stop must also be weighed against the cost of constructing and maintaining the new station. The introduction of new stations at locations that do not provide a net benefit to the system will ultimately result in degradation of the performance of the system, lower system-wide ridership, and reduce the recovery of operating costs.

A new Vivastation stop at Highway 7 and Chalmers Road is not supported

Several requests have been received from the local municipality and business interests in the area of Highway 7 and Chalmers Road. In particular, a further review of the request by Resolution of Council from the Town of Richmond Hill, dated April 2005, was undertaken. The Region responded to this request, stating that this station location is identified as part of Phase 2 where travel times can warrant the additional station. Furthermore, the application of the Viva guidelines, carried out with help from ENTR

Consultants in August 2006 (*see Council Attachment 2*), showed that distance criteria were not met for Phase 1, as illustrated in Table 1. The new station would be located between the Bayview and Valley Mede Vivastations, which are 1200 metres apart. Chalmers would reduce station spacing to Bayview to roughly 650 metres and to Valley Mede to 550 metres, which is less than the 750 metre standard. Furthermore, the route-wide average distance on Highway 7 east of Yonge Street is already 870 metres, which is less than the 1,000 metre standard established by YRT

In conclusion, a new station at Highway 7 and Chalmers Road for Phase 1 is not recommended. However, this station site will be considered for implementation as part of Viva Phase 2.

Table 1
New Vivastation Standards and Evaluation of Candidates

	Standard	Hwy7/Chalmers	Yonge/Stouffville
Minimum distance to nearest adjacent stop	750 m.	650 m. to Bayview 550 m to Valley Mede	Approx. 2,000 m.
Route-wide average station spacing distance	1,000 m.	870 m. currently without new stop	1560 m.
New daily boardings: Yonge north of Bernard and Hwy 7	100	100 in 2006 150 is most optimistic	105 in 2006 150 in 2011
Net system ridership gain/loss	0		105 in 2006 150 in 2011
Revenue/cost effectiveness	+\$		+\$

A new Vivastation stop (two directions) is recommended in the vicinity of the Stouffville Sideroad

On the Viva Blue route on Yonge Street between the 19th Avenue / Gamble Road Vivastation and the King Vivastation, a distance of 4 kilometres, there is currently no Viva station. At the time of the planning of Viva Phase 1 implementation there was little demand for a stop at this location and little development was in place. This situation has now changed with new development having occurred and significant further development planned.

The new density between the 19th Avenue / Gamble Road Vivastation and the King Vivastation, presents a promising location for adding a Vivastation. An ENTR Consultants study prepared on behalf of YRT (*see Council Attachment 2*) indicates that a Vivastation, near Stouffville Road, would meet the criteria for consideration in Phase 1 as illustrated in Table 2. Preliminary estimates indicate that there is potential for in excess of 31,500 additional riders annually, with only a modest reduction in travel speed on the Blue route.

A further factor in determining the exact location of the Vivastation is the extent of planned YRT local service in new areas. Consultation with YRT will be undertaken to establish a joint decision on the best location for additional Viva access. The cost to establish both a northbound and southbound stop in this area is approximately \$900,000, which includes road improvements, platforms, enclosures and fare equipment. Utility relocation and provisions for power, communications, and for any necessary land acquisition would be in addition to this estimate.

5. FINANCIAL IMPLICATIONS

Order of magnitude costs for new Vivastations of Phase 1 design at the Yonge Street location in the vicinity of Stouffville Road is estimated to be \$900,000 for both directions, including road improvements, communications, platforms, enclosures and fare equipment. Property and utility relocations will be an additional cost, to be determined in detail design. Such costs are estimated to be in the order of \$200,000. Order of magnitude costs for the construction of three new queue-jump lanes is estimated at \$500,000. The cost of TSP analysis, review and implementation of new parameters is estimated at \$75,000.

Table 2
Summary of Viva Phase 1 Enhancements

Improvement	Cost
New station on north Yonge Street	\$900,000
Queue Jump Lanes (3) – total 330m	\$500,000
Utilities and Property Cost (est.)	\$200,000
TSP enhancements	\$75,000
Total	\$1,675,000

The overall cost for the additional station and queue-jump lanes has been requested within the Draft 2007 Rapid Transit Capital Budget.

6. LOCAL MUNICIPAL IMPACT

Local impacts during the construction period are expected to be minimal. The proposed new Vivastation stop in the vicinity of Stouffville Road on Yonge Street will provide rapid transit service, which does not currently exist, to a growing community. Queue-jump lanes will reduce travel times along the north Yonge corridor, as well as along Highway 7 east and into Unionville Station.

7. CONCLUSION

This report provides Council with a framework for evaluating additional Phase 1 Vivastation stops. Potential new station locations were evaluated against the framework and inclusion of a new Vivastation on North Yonge Street in the vicinity of Stouffville Sideroad is recommended at a cost of approximately \$900,000. It is necessary to evaluate and select the most appropriate location for a new Vivastation between the 19th Avenue / Gamble and King Vivastations as soon as possible to take advantage of the 2007 construction season.

Three queue-jump lanes at three heavily congested intersections are recommended to provide in-service improvements to the Viva Phase 1 service at a cost of approximately \$500,000. Also, it is recommended that TSP measures currently in place be evaluated to determine if adjustments are warranted to improve system performance at a cost of approximately \$75,000. Preliminary and detail design, in-field investigation and utility coordination will be required immediately to have a reasonable opportunity to construct the proposed additional queue-jump lanes in 2007.

This report has demonstrated that significant benefits will be realized through the implementation of these incremental improvements to Viva Phase 1 prior to implementation of Phase 2. No improvements are being considered in the segment of Yonge Street currently under preliminary engineering for Phase 2.

For more information on this report contact Peter Chackeris, Engineering Manager, York Region Rapid Transit Corporation (Ext. 2288).

The Senior Management Group has reviewed this report.

(The attachments referred to in this clause are attached to this report.)