E. EXECUTIVE SUMMARY

E.1 BACKGROUND

York Region's Official Plan places a strong emphasis on significantly increasing public transit use to accommodate future transportation needs and support the Plan's vision of sustaining the natural environment, optimizing economic vitality and ensuring healthy communities.

The Region's approved *2002 Transportation Master Plan* (TMP), undertaken in accordance with the municipal Class Environment Assessment (EA) Master Plan process, has reaffirmed the need to achieve a balanced transportation system by implementing rapid transit in four corridors. The TMP incorporates the Government of Ontario's Smart Growth vision for fostering and managing growth.

In the planned rapid transit network, shown in **Figure E-1**, three of the corridors comprise north-south rapid transit facilities. These are the Yonge Street corridor connecting Newmarket Regional Centre to the Yonge Subway, a link from the Vaughan Corporate Centre to the Spadina Subway and a link from the proposed Markham Centre to the Sheppard Subway.

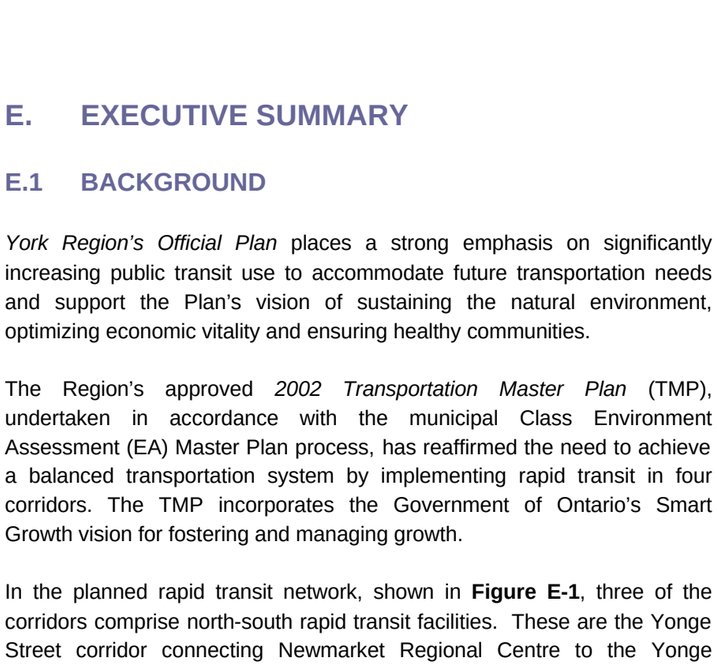


Figure E-1
Rapid Transit Network

The fourth corridor is an east-west rapid transit facility in the Highway 7 corridor connecting to all three of the north-south rapid transit lines, to the Region of Peel in the west and to the Region of Durham in the east.

In June 2002, Regional Council endorsed the proposal of York Consortium 2002 to establish a public private partnership for implementation of the York Rapid Transit Plan (YRTP), a program of rapid transit projects designed to form a transit network in York Region. Transportation and environmental planning studies for the Yonge Street Corridor, commenced in August 2002 and continued through 2003, were updated following *Terms of Reference* approval and assembled to form the content of this report.

On June 30, 2004, the MOE approved the *Terms of Reference* for the Environmental Assessment of Public Transit Improvements in the Yonge Street Corridor. These *Terms of Reference* set out the requirements for the Environmental Assessment in accordance with Section 6.1(2) of the *Ontario Environmental Assessment Act*.

The study area used to evaluate the route alternatives for improved public transit service extends from Steeles Avenue in Thornhill to 19th Avenue in Richmond Hill, as illustrated in **Figure E-2**.

E.2 PURPOSE OF THE UNDERTAKING

The purpose of the "Undertaking", Public Transit Improvements in the Yonge Street Corridor, encompasses two fundamental objectives:

- Firstly, to improve accessibility to current and planned development by providing a high quality public transit alternative to reduce automobile dependence; and

- Secondly, to contribute to the achievement of the *Regional Official Plan* objectives of sustainable natural environment, economic vitality and healthy communities. The undertaking must help make the Region's urban centres more liveable, pedestrian-oriented and economically viable by providing a valuable tool for structuring and achieving land use and social objectives.

In the Yonge Street Corridor, the purpose can be summarized as:

- Providing improved public transit infrastructure and service in the network's primary north-south corridor capable of producing significant increases in transit ridership both within the corridor and across the network and regional boundary. This objective will be supported by

Figure E-2
Study Area for Public Transit Improvements in the Yonge Street Corridor

interconnection with other corridors and GTA transit systems such as Highway 7/407, GO Transit and the TTC.

- Integrating improved public transit facilities in a manner that improves and enhances streetscapes with new amenities by using a holistic urban design approach to support the Region's goals for higher density mixed-use transit-oriented development along the corridor in accordance with the approved official plans.

The undertaking, for which Ministry approval is sought, will comprise all infrastructure, systems, vehicle types and subsequent operational requirements necessary to achieve a significant improvement in public transit service and its attractiveness in the southern portion of the Yonge Corridor during the planning period.

E.3 RATIONALE FOR THE UNDERTAKING

E.3.1 Need and Justification

A study of the need and justification, *Yonge Street Transitway Need and Justification*, for improved public transit in the Yonge Street Corridor was initiated by York Region and completed in July 2002. This study examined the growing transportation demands associated with the projected growth in the Region's population (from 800,000 to 1.2 million) and employment (400,000 to 655,000) during the planning period to 2021 and, subsequently, identified Yonge Street Corridor as the north-south corridor in the rapid transit network.

In the context of *York Region's Official Plan* objective of achieving a significant increase in transit's share of peak period travel, this initial study and subsequent further analysis using updated modelling in 2004, investigated a range of transportation solutions for the Corridor. In accordance with the requirements of the EA Act, these solutions were defined and evaluated as alternatives to the proposed Undertaking.

E.3.2 Alternatives to the Undertaking

Five alternatives were defined and compared in terms of their ability to address the shortfall in transportation system capacity and their effect on the environment. These included:

- "Do Nothing";
- "Current Commitments Including Priority Transit and Transportation Demand Management" Strategy: or base case solution comprising committed improvements to highway and arterial road networks along with on-going increases in local and inter-regional bus services, and Transportation Demand Management strategies;
- "Road Expansion" Strategy: an auto-focussed alternative adding enough road system capacity beyond that currently committed to eliminate the capacity shortfall;
- "Enhanced Richmond Hill Commuter Rail and Inter-Regional Bus Service" Strategy: the "Current Commitments" solution combined with enhanced inter-regional bus and rail transit service and capacity on the existing GO commuter rail lines and the 400-series highways; and
- "York Region Rapid Transit Corridor Initiatives" Strategy: the proposed Undertaking, namely "Current Commitments" plus public transit improvements such as the Region's planned rapid transit network comprising bus and light rail service in dedicated transitways on the surface assuming the extensions of Toronto's existing subway system into the Region.

Evaluation of these alternative solutions led to the conclusion that:

- Both the "Do Nothing" and the "Current Commitments" solution would not address the estimated road capacity deficiency and further expansion of the road system beyond the current commitments was not possible without unacceptable disruption of the social environment, degradation of the natural environment and cost,
- Enhancing inter-regional bus and rail services in the corridor will not reduce the road capacity shortfall significantly because more frequent rail service attracts primarily downtown-Toronto destined trips and inter-regional bus service on Highway 404 bypasses the core development nodes along the corridor. In addition, the location of the inter-regional transit routes does not support the urban form envisioned in the *Region's Official Plan* and thus will not encourage transit-oriented development within the region.
- If the *Region's Official Plan* urban form and development vision is to be achieved in a sustainable manner, public transit improvements in the form of a higher order rapid transit facility, fully integrated with the GTA rapid transit network will be required.
- The "York Region Rapid Transit Corridor Initiatives" Strategy is best able to meet long-term growth needs and planning objectives while offering the opportunity to mitigate high costs and local environmental impacts by maximizing the use of existing transportation corridors.

As a result, the **"York Region Rapid Transit Corridor Initiatives"** Strategy was selected as the preferred transportation strategy for the Undertaking.

E.3.3 Alternative Methods of Carrying Out the Undertaking – Rapid Transit Routing

The entire study area in **Figure E-2** was considered in assessing the alternatives to the Undertaking outlined above. For the analysis of routes for rapid transit service, the findings of the *Yonge Street Transitway Need and Justification* were used as the basis on the primary study area shown in the figure. In the southern portion, the area south of Highways 7 and 407 is fully developed leaving the present Yonge Street right-of-way as the only cost-effective and environmentally acceptable route for extension of rapid transit from the Finch Subway Station. North of the highways up to 19th Avenue, the options for locating a rapid transit route extend from Yonge Street itself, to CN Rail's Bala subdivision to the east.

Consequently, this EA has considered effects of the Undertaking on the areas adjacent to and influenced by the routes identified above and shown in **Figure E-3**.

E.3.4 Alternative Methods of Carrying Out the Undertaking – Rapid Transit Technologies

As part of the assessment of alternative methods of carrying out the undertaking, an analysis and evaluation of potential rapid transit technologies in **Chapter 5** identified two candidates for application in the Yonge Street Transitway. These consisted of the bus rapid transit (BRT) and light rail transit (LRT) technology families, illustrated below.

In addition, the Region's Need and Justification Study and subsequent EA demand forecasting identified the likelihood that, ultimately, the southernmost segment (Highway 7 to Finch Avenue) would experience passenger demands that would support the total segregation of rapid transit from other modes. An underground alternative, i.e., subway extension, is the only practical method to achieve this, given the right-of-way constraints and land use sensitivities in this segment.

Bus Rapid Transit (BRT)

The role of the Yonge Street Transitway in the planned York Rapid Transit Network, discussed above, is a key factor in selection of the appropriate technology for the corridor. Studies of potential network configurations (route and technology options) have indicated that the Yonge Street Corridor is one in which the rapid transit technology would evolve over time. As growth and development patterns change, increases in demand may justify or even mandate transitions from an initial technology application, that is, partially segregated BRT (segregated operation with at-grade intersections), to light rail transit. In the southernmost segment, an eventual extension of Toronto's subway technology into the Region is highly desirable, however; this is not part of this Undertaking and is not a priority project for TTC at this time.

Light Rail Transit (LRT)

In the assessment of the effects of implementation and operation of rapid transit on the environment, the basic characteristics of each technology family have been taken into account. These are described in detail in **Chapter 5** of the EA Report and encompass elements such as:

- The practical system passenger-carrying capacity range in the specific corridor application,
- The physical requirements to establish a segregated transitway and the flexibility to stage its implementation,
- The range of vehicles that can use the rapid transit infrastructure,
- Vehicle performance characteristics and propulsion methods,
- Station physical requirements, amenities and facilities to encourage system use,
- Life-cycle costs and system cost-effectiveness.

Key characteristics reflecting the above elements are tabulated below.

System Element	Technology Characteristics	
	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
Practical system capacity (passengers per hour per direction)	2,000 to 12,000 (depending on degree of separation from street traffic, separate right-of-way needed for higher volumes at high frequency)	5,000 to 15,000 (depending on degree of separation from street traffic, separate right-of-way needed for higher volumes at high frequency)
Right-of-way required and staging flexibility	Service in mixed traffic can be converted to 8.5 – 10 m wide transitway in 2 - 4 km increments. Storage and maintenance garage required or space in existing bus garage	Minimum initial operable segment length is 8-12 km with 8-10 m wide running way and LRV storage and maintenance facility
Vehicle type and characteristics	Conventional buses or special purpose hybrid diesel-electric, rubber-tired rapid transit vehicles 12-25m long	Generally articulated, 23-30m long, coupled cars with overhead electric power supply for propulsion
Station characteristics	Platform length can vary from 18 – 90m with simple shelter or elaborate passenger facilities	Platform length can vary from 30 – 90m with simple shelter or canopy or elaborate passenger facilities
Service planning options	A blend of line-haul and branched services is possible as rubber-tired vehicles can leave the transitway to reduce transfers	All service is line-haul with feeder bus access and transfers at stations. Requires more emphasis on park and ride.
Range of capital costs including vehicles	Varies from $10 to $40 million per km depending on degree of transitway separation	Varies from $25 to $55 million per km depending on degree of track separation

E.3.5 Alternative Methods of Carrying Out the Undertaking – Rapid Transit Infrastructures

E.3.5.1 Planning and Design Objectives

In designing the rapid transit infrastructure and service, the primary objectives are to achieve the following:

- A flexible, permanently integrated high-performance system with a strong customer-oriented identity;
- An integrated assembly of elements appropriate for the current and future market(s) to be served and the urban environment;
- High service speeds offering superior travel times competitive with those of the private automobile;
- Demonstrated service reliability providing high frequency (often under 5 minutes but not more than 8 to 10 minutes) and a high degree of on-time performance;
- Comfort and convenience by providing a smooth ride, level boarding in a user-friendly, quality station environment, easy transfers between systems and innovative fare pre-payment and passenger information services;
- Environmental compatibility manifested by reductions in energy use, pollution, noise and visual intrusion as well as environmentally sensitive urban design.

E.3.5.2 Rapid Transit Alignment Alternatives

The Alternatives Analysis phase of the Yonge Corridor EA developed alignment alternatives along the three primary route options identified in the Terms of Reference and shown in **Figure E-3**. These route options are:

- Alternative 1: Yonge Street only Route
- Alternative 2: Yonge Street and alongside the CN Bala GO Rail Line Route
- Alternative 3: Yonge Street, Weldrick Road and alongside the GO Rail Line Route

These alignments were first presented to the Public at the second series of Public Consultation Centres held at two locations in January 2003. The results of the evaluation of the route alternatives were presented for public review at the subsequent series of centres held in early June 2003 and finally in September 2004 at the conclusion of the formal public consultation program.

It should be noted that the alignment analysis was neutral regarding the type of technology and the findings would apply to both BRT and LRT technologies given that the alignments were developed to accommodate design standards of both technologies and possible transition from one to the other.

The detailed evaluation, presented in **Chapter 8** of this report, considered the ability of each of the routes to respond to the five main objectives of YRTP.

These included:

- Improving mobility and attractiveness of public transit.

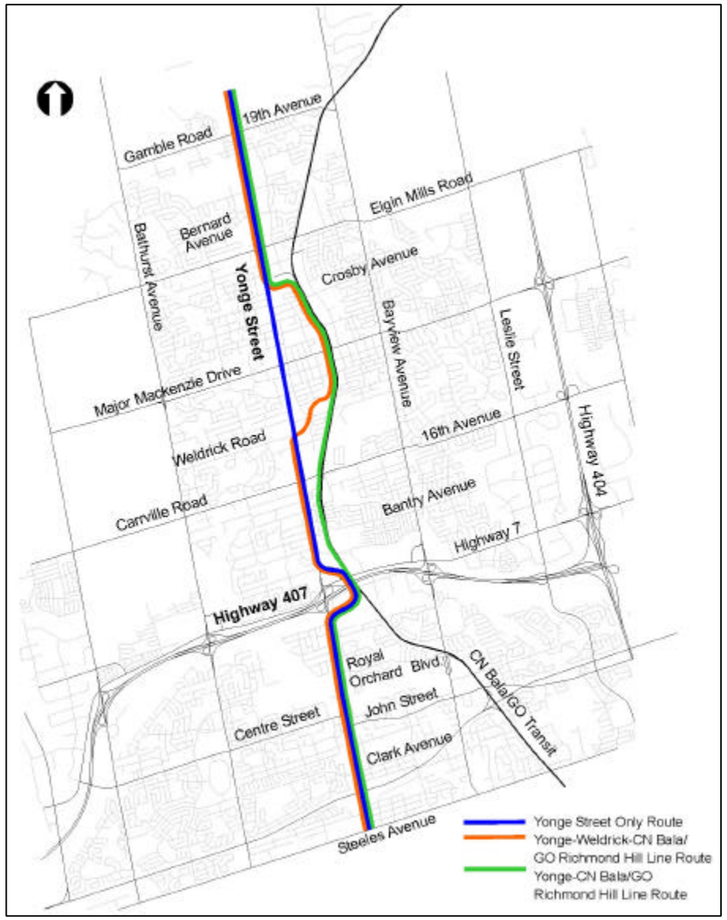


Figure E-3
Primary Route Options

- Protecting and enhancing the social, cultural and heritage environment.
- Protecting the natural environment.
- Promoting smart growth and economic development.
- Maximizing cost-effectiveness of the rapid transit system.

For each of the above objectives, a range of goals and indicators was established to provide a measure of the effectiveness of each alternative in meeting the objectives.

E.3.5.3 The Preferred Rapid Transit Alignment

An evaluation of each alternative in meeting the goals and objectives leads to the conclusion that a transitway alignment located entirely on Yonge Street; i.e., **Yonge Street Only Route**, should be identified as the Preferred Alignment for the following reasons:

- The Yonge Street Only alternative has the potential to attract 7 to 10% more AM peak period transit boardings in the corridor, both home and work-based, and provides the most convenient pedestrian access to major community activity centres along the corridor such as shopping malls, community centres, old Richmond Hill;

- Rapid transit will reinforce the "main street" role of Yonge Street by encouraging mixed use redevelopment and intensification of existing adjacent land use, particularly around station nodes outside of and within the old Richmond Hill district;

- The reduction in service speed likely in the short section of mixed traffic operation through old Richmond Hill will not increase overall travel time compared to the GO Rail alignment because the overall length of the Yonge route is two kilometres shorter. Also, traffic signal optimization incorporating transit priority can reduce the speed penalty;

- Although the transitway insertion will require a change in traffic patterns on Yonge Street to access minor streets and adjacent properties, it will cause no other significant adverse effects on adjacent communities, such as displacement of homes or businesses, disruption of community interaction, visual intrusion or noise impacts;

- A transitway on Yonge Street offers good access to stations and local transit, and can support a major improvement in the urban design of the corridor. These benefits are much less achievable with a transitway along the GO Rail corridor because of its industrial character and frequent freight service;

- Although marginally more costly to construct, transitway construction mostly within the existing street right-of-way, avoids significant property acquisition and displacement of residential units that would be required for the alternative GO Rail alignments;

- Given that the urban structure of the north-south corridor through Richmond Hill is to be concentrated around Yonge Street, rapid transit service entirely on the street will best support this planning objective.

The preferred alignment with station locations is illustrated in **Figure E-4**.

A transitway along the GO Rail corridor avoids some of the traffic integration issues on Yonge Street. However, its ability to attract transit ridership along the north-south spine of the YRTP network depends on the degree to which surrounding land use can be changed to broaden the Yonge Street urban corridor, particularly around stations. This is not always achievable, particularly with respect to residential uses because of the continuing presence of CN freight and VIA/Ontario Northland long distance passenger operations and their effect on the station environment.

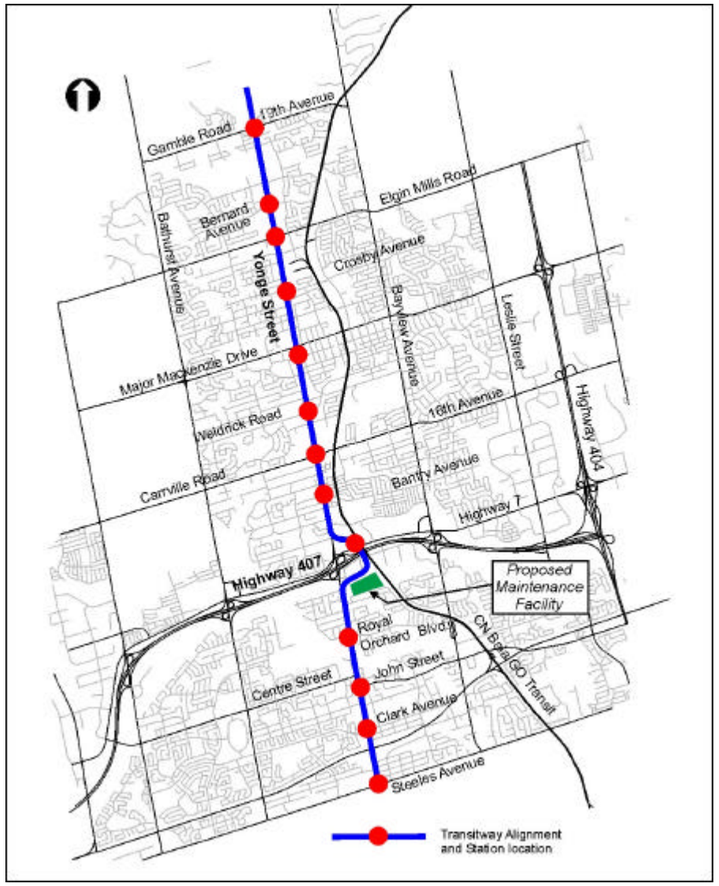


Figure E-4
Preferred Alignment and Station Locations

E.3.5.4 Maintenance and Storage Facility Options

An evaluation of options for maintaining and storing the rapid transit vehicle fleet considered contracting out the services, purchase of an existing facility or construction of a new facility. The third alternative, selected as the preferred approach, encompasses a variety of options. These range from provision of facilities for bus rapid transit only, to development of a site with capacity to become the central maintenance complex for both conventional bus and bus rapid transit fleets as well as the light rail transit fleet, if and when it is put into service.

A new facility can be designed in a manner responsive to the local constraints of any potential sites identified along the rapid transit routes. Also, this option allows flexibility in selecting the site, defining the scope of maintenance activities performed at the facility and establishing the size of fleet to be serviced at any time during its life and in its ultimate development. In addition, this alternative offers the maximum opportunity to meet the Region's commitment to facility ownership and centralization of operation and maintenance activities.

An investigation of potential sites, conducted in consultation with municipal property services staff, revealed four options. These locations were determined to be the only alternative sites to which reasonable service connections could be developed from the primary network alignments, Yonge Street and Highway 7. This feature was particularly important for any ultimate facility required to support LRT technology on the network.

E.4 THE UNDERTAKING

E.4.1 System Capacity

By the year 2021, ridership forecasts indicate that the Yonge Street transitway service will require a capacity of:

- 3,000-4,400 passengers per hour per direction (pphpd) through and north of the Richmond Hill Business District between Major Mackenzie Drive and Crosby Avenue,

- 4,800-5,100 pphpd approaching the Richmond Hill Centre intermodal terminal (Highway 7) and

- 6,800-7,100 pphpd across the Steeles Avenue boundary.

North of the Langstaff node, the proposed two lane exclusive transitway, with at-grade intersections and BRT transitioning to LRT technology, is able to accommodate the above volumes as well as some additional growth beyond 2021.

In the segment between Highway 7 and Steeles Avenue, the projected 2021 volume could be effectively carried on York Region's transitway. However, when added to the bus volumes likely to be needed in the future by the TTC in 2021 (70 per hour at present), on the short 2 km section between Steeles Avenue and Finch Subway Station, a surface rapid transit facility in this section in Toronto could become unreliable due to vehicle volumes through intersections.

Consequently, at some point before 2021, the Yonge Transitway (the "Undertaking" in this EA), would have to be grade separated to access the subway in Toronto, if the projected growth of transit demand materializes. As an interim solution, the effective service life of the surface transitway on Yonge St. in Toronto could be extended if GO Rail service enhancements on the three lines serving the Region continue to be implemented.

Grade separation options, (e.g. an extension of the Yonge Subway or a 2km underground segment for BRT or LRT), would require a subsequent EA, with Toronto as a co-proponent, commenced a suitable period in advance of implementation.

E.4.2 System Technology

In order to carry the projected ridership volumes in 2021, the following service levels would be required on the Yonge transitway for each technology that will be operated during the planning period:

Segment	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
North of Major Mackenzie Drive to 19th Avenue	50 articulated buses (18m length) per hour Buses at approx. 0.5km spacing or one per traffic signal cycle.	16 two-car LRT trains per hour (58m length)
Major Mackenzie Drive to Langstaff	60 articulated buses (18m length) per hour or two buses per traffic signal cycle.	16 two-car LRT trains per hour (58m length)
Langstaff to Steeles Avenue	85 articulated buses (18m length) per hour. Buses would operate in two-vehicle platoons with one or two platoon per traffic signal cycle.	20 two-car LRT trains per hour (58m length)

As noted above, major terminal access improvements at Finch Subway Station or a subway extension would be required to accommodate the vehicle frequencies listed above for the portion of the corridor south of Steeles Avenue. Lower frequencies, matching demand prior to 2021, could be accommodated in the short Toronto segment without major modifications at the existing subway terminals.

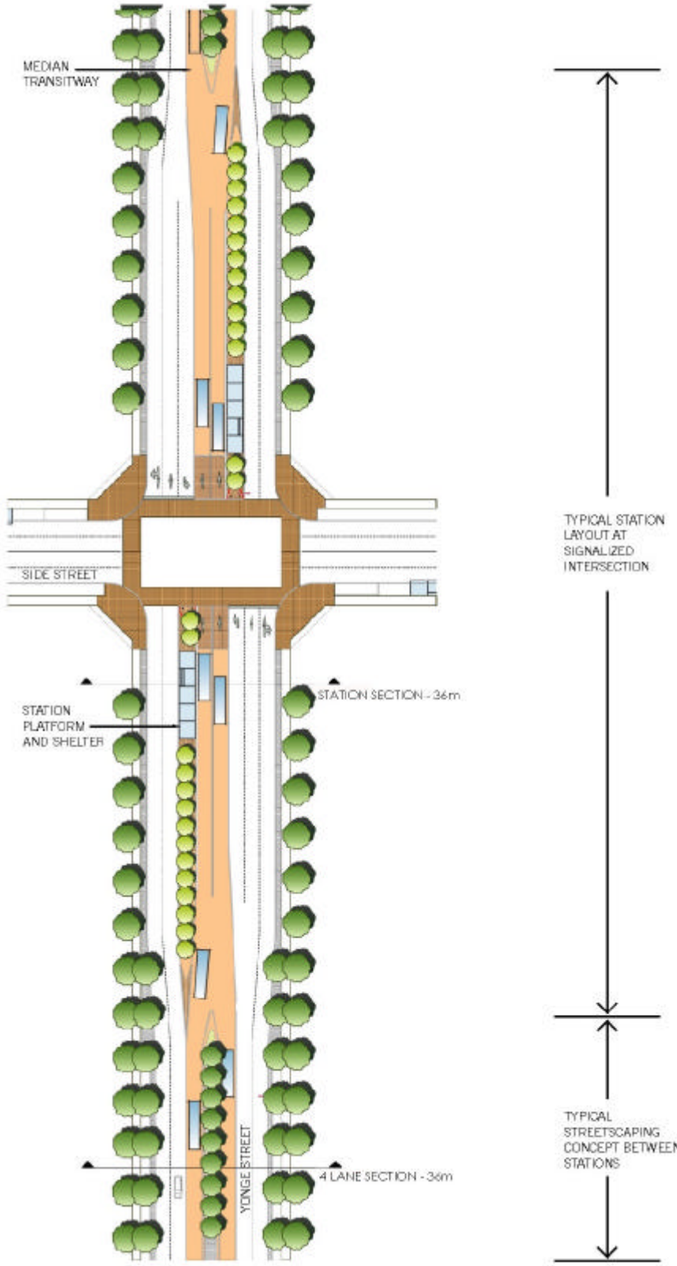


Figure E-5
Typical Two-Lane Exclusive Transitway

E.4.3 System Infrastructure

The preferred transitway alternative for Rapid Transit comprises:

- A 12.5 km two-lane, median transitway in the Yonge Street Corridor between Steeles Avenue and 19th Avenue approved for both BRT and LRT vehicle technologies (illustrated in **Figure E-5**)
- A one kilometre section of transit operation in mixed traffic in the Richmond Hill Central Business District;
- Yonge Street crosses CN Rail's York Subdivision between Clark Avenue and Dorchester Roads in southern Thornhill. The existing 7-lane highway overpass can accommodate the transitway by replacing the existing HOV lanes with dedicated median transit lanes, thus avoiding widening over the CN right-of-way.
- Stations at approximately one kilometre spacing, located generally at major intersections with side platforms placed on the far-side of the intersection opposite left-turn lanes to minimize overall roadway widening This layout is shown in **Figure E-5** and illustrated in photo-simulations in **Figures E-6** and **E-7**;

Figure E-6
Typical Station Platform Concept

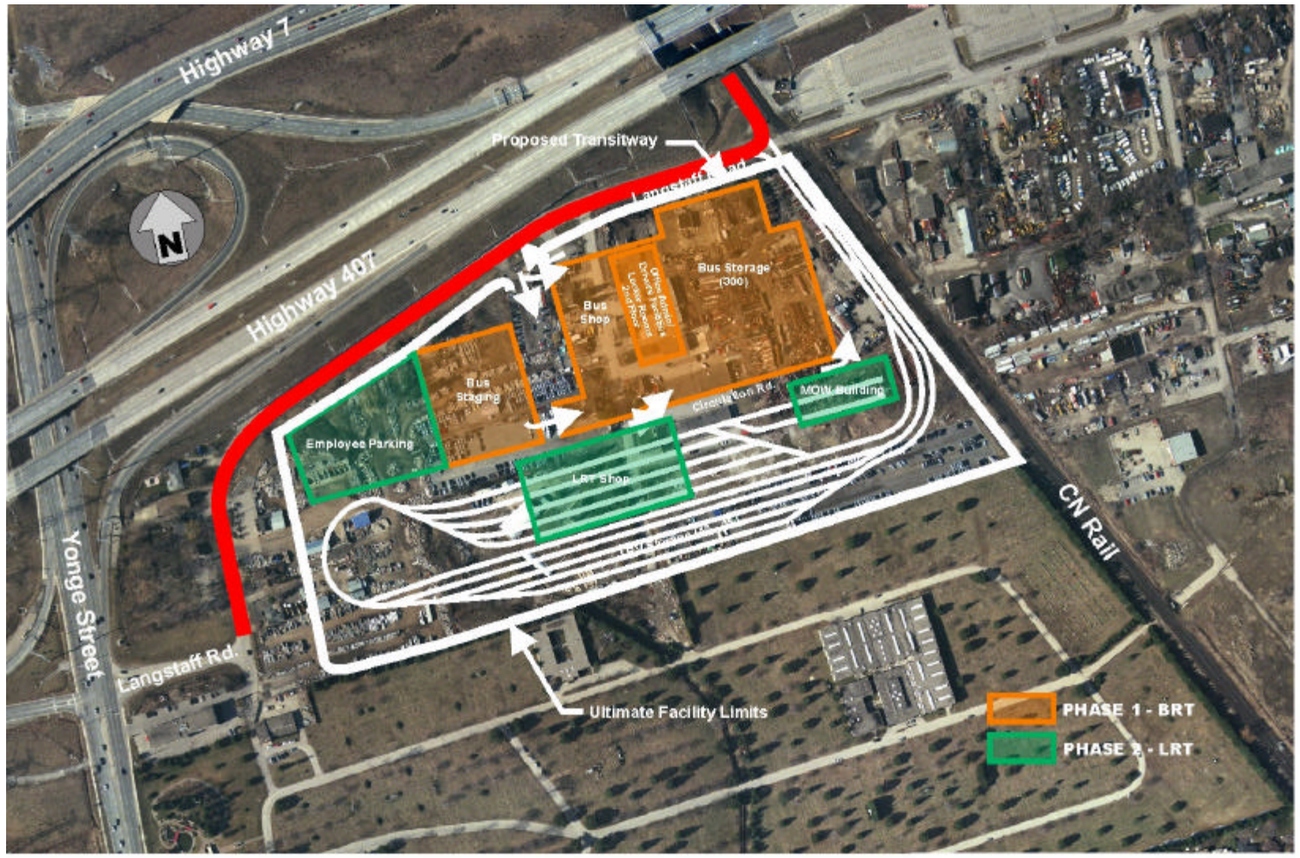
- BRT and LRT alignments from Yonge Street to access the Richmond Hill Centre Intermodal Terminal currently under construction on York Region's land north of Highway 7 at Langstaff opposite the existing GO Langstaff Station

- A combined BRT and LRT maintenance and storage facility for transit vehicles will be located south of Highway 407 on the east side of Yonge Street. A conceptual layout of the ultimate maintenance facility complex, sized to accommodate up to 300 buses and 50 light rail vehicles, is shown in **Figure E-8**.

- Crossings in the median with approximately 100 m spacing will be provided along Yonge Street to reinstate current operations of most Emergency Response Services vehicles.

Typical Yonge Street cross-sections in **Figures E-9** to **E-12** illustrate the integration of the transitway in the streetscape.

Figure E-7
Typical Streetscaped Transitway and Station Area



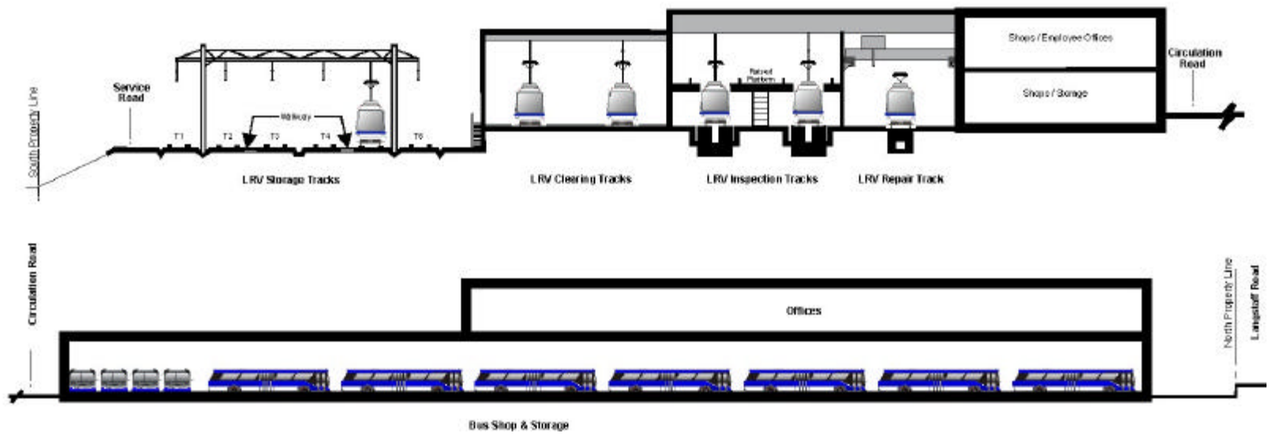


Figure E-8
Conceptual Maintenance and Storage Facility

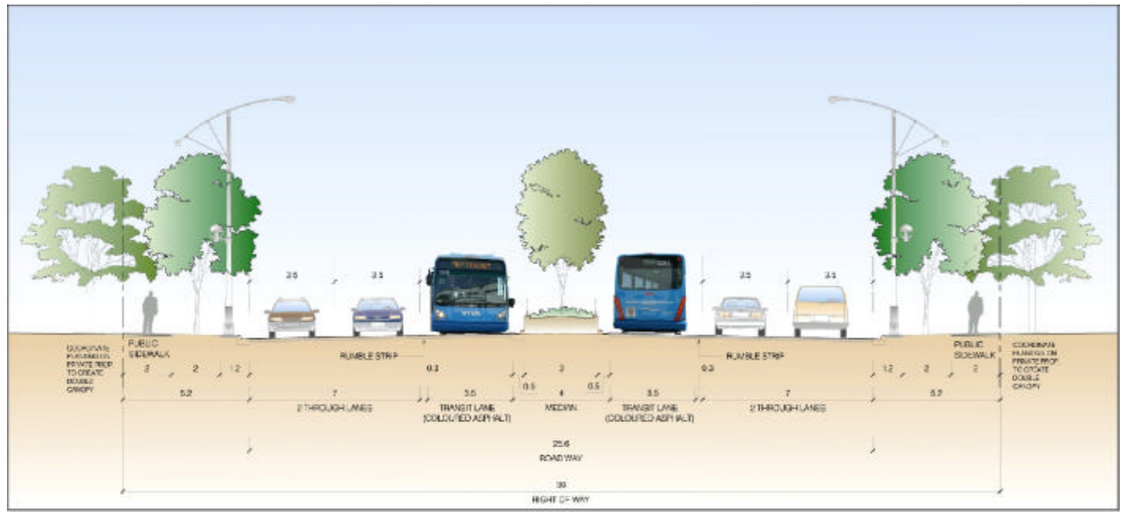


Figure E-9
Typical Transitway Cross Section for BRT between Stations

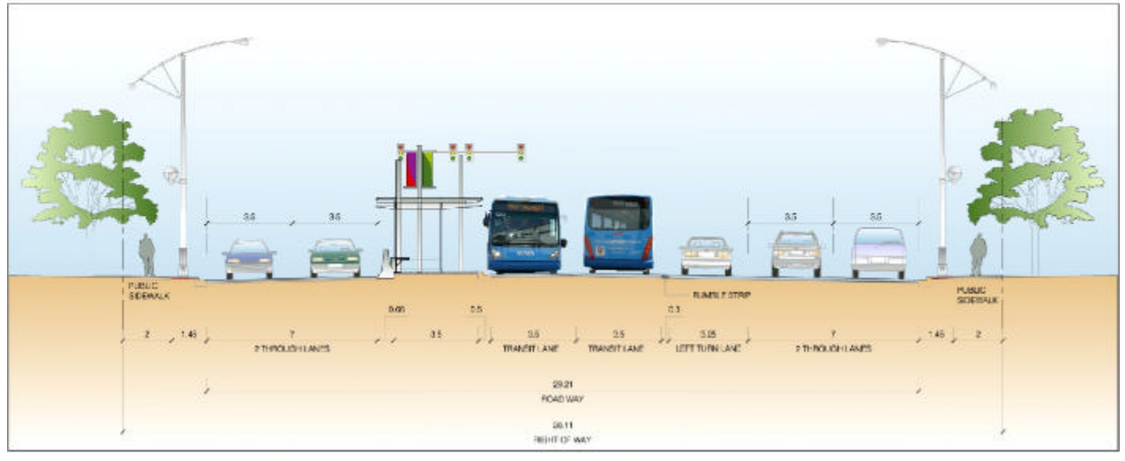


Figure E-10
Typical Transitway Cross Section for BRT at Station

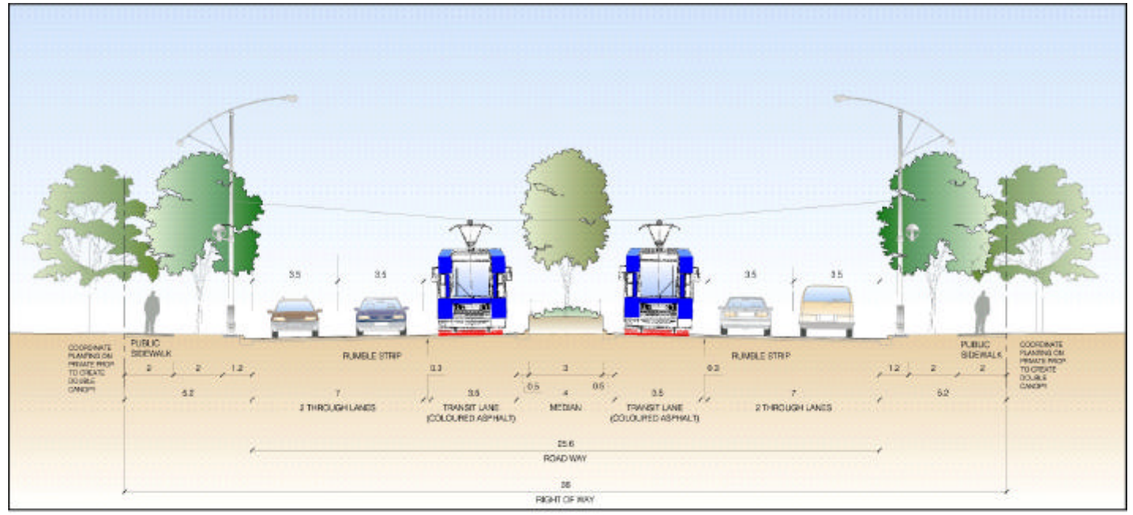


Figure E-11
Typical Transitway Cross-Section for LRT between Stations

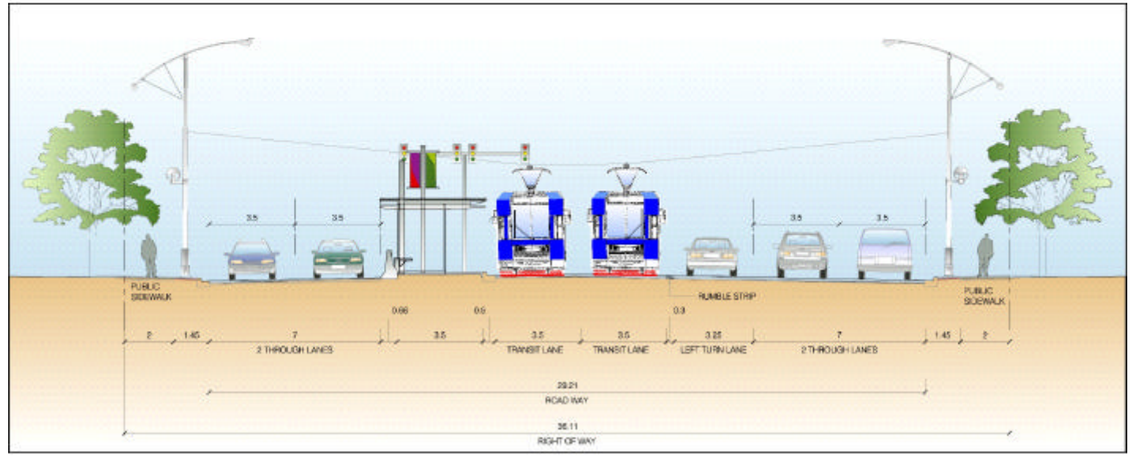


Figure E-12
Typical Transitway Cross Section for LRT at Station

E.5 PROJECT RELATED EFFECTS AND MITIGATION

The assessment of project-related effects was performed using the primary Rapid Transit Plan objectives and related goals developed for the evaluation of alternatives in selecting the preferred alignment. These objectives are:

- To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service;
- To protect and enhance the social environment in the corridor;
- To protect and enhance the natural environment in the corridor;
- To promote smart growth and economic development in the corridor.

The effect of the proposed Undertaking in terms of each environmental value was rated using a qualitative scale ranging from a positive or beneficial effect through negligible to a potentially significant negative effect as described in the methodology outlined in **Chapter 11** of the report.

Generally, the Undertaking has the ability to improve mobility within the region and provide good connectivity with inter-regional transit services. From this point of view, the proposed transitway will have an overall positive effect on transit ridership in the region. The planned alignment characteristics and geometry will provide a fast, convenient and reliable service in most respects. Although operations at the maintenance and storage facility proposed for the Undertaking will add to the immediate traffic environment, the facility's location and mitigation measures available will minimize any potential adverse effects.

Overall, the various goals set to protect and enhance the social environment are largely achieved. The assessment in terms of the related environmental values indicates that most adverse effects are generally mitigated by the built-in attributes of the design and the benefits for the communities within the corridor can be maximized.

The introduction of a transitway, even in a highly developed urban context can act as the catalyst for urban revitalization, as has been the case in many other locations, such as the main street of Richmond, British Columbia.

The protection and enhancement of the natural environment within the corridor has been entirely achieved. By definition, the Undertaking along the Yonge Street right-of-way is set in a highly developed urban environment, where natural features have mostly been disturbed by previous development. In terms of all valued environmental components to be considered, effects on aquatic and terrestrial ecosystems are either negligible or insignificant where built-in mitigation measures are implemented or sensitive construction and operation methods are respected. The potential need to re-align a short portion of the waterbody crossing the west end of the proposed Maintenance and Storage Facility site is an example of a mitigation measure that could result in an increase in aquatic habitat. The Undertaking is considered to have insignificant environment effects on the Oak Ridges Moraine because the impacts have been avoided, minimized or mitigated.

One of the main purposes of the Rapid Transit System is to support the smart growth policies in the Region and simultaneously encourage economic development. From this perspective, the Undertaking strongly supports Regional and Municipal planning policies, such as the Centres and Corridors urban form. In many respects, the Undertaking will contribute to the intensification of underutilized sites and encourage transit-oriented development at infill locations and vacant land along the corridor. Sections of the Yonge Street corridor are seen as appropriate for possible intensification area as described in the Provincial Government's draft *Growth Plan* which has a target density of 200 residents and jobs per hectare for the intensification areas.

E.6 IMPLEMENTATION CONSIDERATIONS

The Undertaking, described in **Chapter 8**, is the primary north-south corridor in York Region's proposed four-corridor Rapid Transit Plan. In addition, travel demand modelling has indicated that rapid transit service on Yonge Street will attract the highest transit ridership on the network. Consequently, the Region's plans for the evolution of the network place a high priority on early implementation of facilities and service in this corridor.

Following approval of the Environmental Assessment by both provincial and federal agencies, further preliminary design and subsequently, detailed design will constitute the first stage of the region's implementation plan.

Selection of bus rapid transit (BRT) as the preferred initial technology allows the facilities to be constructed and the service to be operated in stages along the length of the corridor. The timing and extent of each stage implemented and operated will depend on the availability of funding and the period required for construction of each stage.

It is likely that the design phase for transitway infrastructure will be completed sequentially in three segments along the route, each timed to allow sufficient time for post-EA approvals prior to the scheduled start of construction in each segment.

E.6.1 The Construction Phase

The early introduction of BRT services in mixed traffic in the corridors, including Yonge Street, will require operational bus maintenance and storage facilities at the earliest practical time after approval of the EA and acquisition of the property. Hence, the initial phase of the proposed facility will be the first element of this Undertaking to be constructed. It is expected that construction of the initial phase will commence as soon as land acquisition is complete, expected to be in early 2006. Completion of the initial phase of the facility is scheduled for early 2007.

Assuming continuity in the availability of funding for construction, it is anticipated that construction of the transitway and associated station facilities will commence early in year 2007 in the southernmost segment between Steeles Avenue and Langstaff Road. Work in this 6 km segment will continue through the 2007 and 2008 construction seasons. It is assumed that, if approved, construction of transit infrastructure improvements in the short Toronto section of Yonge Street between Steeles Avenue and Finch Subway Station will be carried out simultaneously. If a median transitway is not implemented south of Steeles Avenue, the necessary works to permit a transition from median lanes to existing curbside HOV lanes will be implemented north of Steeles Avenue.

In late 2007, preparatory works, such as utility relocations, will commence in the 4-km central section between Highway 7 and Major Mackenzie Drive as well as the 2.7-km northern section between Crosby and 19th Avenues. Transitway and station construction, consisting of the activities described above, will be carried out during the 2008 and 2009 construction seasons.

E.7 PUBLIC OUTREACH

The Yonge Street Public Transit Improvements Environmental Assessment has conducted a public consultation program comprising four series of information centres. These have afforded the general public and other stakeholders the opportunity to view design alternatives and their evaluation, express concerns related to environmental effects and provide input to the development of mitigation measures.

1. INTRODUCTION

1.1 PURPOSE OF THE YONGE STREET CORRIDOR PUBLIC TRANSIT IMPROVEMENTS REPORT

In June 2004, the Regional Municipality of York (Region), the proponent of the York Rapid Transit Plan, obtained formal approval of the Terms of Reference (ToR) for an Environmental Assessment (EA) of the proposed Public Transit Improvements in the Yonge Street Corridor, the primary north-south corridor of the Plan. In accordance with clause 6.2 of the *Ontario Environmental Assessment Act*, the Region initiated the Environmental Assessment to fulfil its obligations under clause 3 of the Act. The EA studies, meeting the requirements of the approved Terms of Reference, carried out between late 2002, and the end of 2003, were updated following *Terms of Reference* approval and assembled to form the content of this report.

The purpose of this report is to document the scope and findings of the EA study assessing the effects of both the construction of the Yonge Street Public Transit Improvements and the operation of rapid transit service along it. The report and its appendices, including the approved Terms of Reference, constitutes York Region's application to the Ontario Ministry of the Environment, submitted under subsection 6.2 (1) of the EA Act, for approval to proceed with the undertaking. In addition, approval under the *Canadian Environmental Assessment Act* is being sought through an integrated parallel process.

1.2 PURPOSE OF THE PROJECT

A review of recent planning initiatives and studies carried out in the Region is beneficial in describing the context for and purpose of, the proposed undertaking, Yonge Street Corridor Public Transit Improvements.

1.2.1 Context

York Region's Official Plan (Office Consolidation, as of July 1, 1998) outlines a regional structure based on the establishment of a system of centres and corridors to act as a focus for residential and commercial development. The Official Plan (OP) identifies four regional centres and two main regional corridors. The four existing and/or developing centres, intended to be focal points for business, government and culture with complementary medium and high density mixed-use development, are:

- The Langstaff Community Area in southern Richmond Hill surrounding the Yonge Street/Highway 7 intersection;
- Newmarket, at the top of the primary north-south corridor on Yonge Street and home to the Regional Council offices;
- Markham Centre to the east in the vicinity of Highway 7 and Warden Avenue; and
- Vaughan Corporate Centre to the west in the vicinity of Highway 7 and Highway 400.

Much of the Region's transportation system centres on the two primary corridors identified in the OP. These are the north-south leg on Yonge Street and Highway 7, the major east-west leg. As a major step towards achieving the Official Plan's three goals of sustainable natural environment, economic vitality and healthy communities, the Region developed its *Transportation Master Plan* (June 2002). This Transportation Master Plan (TMP) articulated the goals in a set of twelve, desirable 'end states' for the transportation system:

- Reduced vehicular trips and shorter work trips;
- Employer based Travel Demand Management initiatives;
- Reduced dependence on automobiles;
- Universal access to public transit;
- Integrated transit services and fares among GTA transit operators serving York Region;
- Transit accessible human services;
- Efficient and safe movement of goods;
- Efficient use of infrastructure;
- Infrastructure in a 'state of good repair';
- Strong protection for the environment;
- Adequate and dedicated long-term funding sources; and
- Effective public consultation.

The *Transportation Master Plan* (refer to **Appendix L**) established a comprehensive blueprint for road and transit developments in the Region through 2031 and outlined the proposed four corridors, rapid transit network, shown in **Figure 1-1**. The principal objective of this network, known as the York Region Rapid Transit Plan (YRTP) is to provide a high quality rapid transit alternative for travel between the four regional centres as well as rapid transit links from the Region's network to the City of Toronto's subway network.

1.2.2 Objectives

The purpose of the undertaking encompasses two fundamental objectives:

- Firstly, to improve accessibility to current and planned development by providing a high quality public transit alternative to reduce automobile dependence; and
- Secondly, to contribute to the achievement of the Regional Official Plan objectives of sustainable natural environment, economic vitality and healthy communities. The undertaking must help make the Region's urban centres more liveable, pedestrian-oriented and economically viable by providing a valuable tool for structuring and achieving land use and social objectives.

Following adoption of the *Transportation Master Plan* by Regional Council, the Region initiated the planning and project development phase of the rapid transit plan by entering into a public-private partnership with York Consortium 2002. The scope of this first phase included network-wide transportation planning in parallel with, and in support of, Environmental Assessments of public transit improvements in each of the four corridors.

Figure 1-1
Planned Rapid Transit Network

A key activity has been travel demand analyses, using the recently published results of the *2001 GTA-wide Transportation Tomorrow Survey* (TTS) and the current demographic projections of York Region and Toronto. This demand forecasting across the network has confirmed the findings of the York Region's *Yonge Street Transitway Need and Justification* (July 2002), specifically, by showing that the shortfall in the Yonge Street Corridor road capacity at the 2021 planning horizon can be reduced by attracting a significant share of corridor trips to public transit. These travel

demand forecasting results, combined with the smart growth and sustainable environment objectives of the *Region's Transportation Master Plan* reflect the purpose of the "Undertaking", the Yonge Street Public Transit Improvements.

The purpose can be summarized as:

- Providing improved public transit infrastructure and service in the Region's primary north-south corridor capable of producing significant increases in transit ridership both within the corridor and across the network and regional boundary. This objective will be supported by interconnection with other corridors and GTA transit systems such as GO Transit and the Toronto Transit Commission (TTC); and
- Integrating new public transit facilities in a manner that improves and enriches streetscapes with new amenities by using a holistic urban design approach to support the Region's goals for higher density mixed-use transit-oriented development along the corridor in accordance with approved official plans.

The undertaking, for which Ministry approval is sought, will comprise all infrastructure, systems, vehicle types and subsequent operational requirements necessary to achieve a significant improvement in public transit service and its attractiveness in the southern portion of the Yonge Street Corridor from Steeles Avenue to 19th Avenue during the planning period.

1.3 RELATIONSHIP WITH OTHER CORRIDORS

In York Region's proposed rapid transit network, the Yonge Street Corridor intersects the network's Highway 7 Corridor approximately 4 km north of the Region's southern boundary at Steeles Avenue. Also, the corridor parallels the GO Transit Richmond Hill Line corridor for most of its length and approaches close enough in the Langstaff area to allow development of an inter-modal terminal. In addition, this terminal location is very close to the proposed Highway 407 inter-regional bus rapid transit corridor, currently protected by the Ontario Ministry of Transportation and studied recently by GO Transit.

As a primary corridor on York Region's proposed rapid transit network and the major inter-regional connector with the City of Toronto, the Yonge Street Corridor fulfils several roles relating to the other corridors in the Region's network as well as those of other transit operators interfacing with it. These roles can be summarized as follows:

a) Providing the high quality transit link between the Newmarket Regional Centre and the three southern Regional Centres located along the Highway 7 Corridor.
b) Providing the central north-south public transit feed to the planned Richmond Hill Centre intermodal terminal station at the junction of the Yonge Street and Highway 7 Corridors in the Bayview Glen area of Richmond Hill.
c) Distributing trips from the Highway 7 Corridor to the north-south service at the Richmond Hill Centre terminal,
d) Providing improved transit capacity in the heavily congested southern leg of the corridor between Richmond Hill Centre terminal and the northern limit of Toronto's Yonge Street Corridor at the Steeles Avenue regional boundary.
e) Providing rapid transit access to the GO Transit Richmond Hill commuter rail corridor at the Langstaff and Richmond Hill GO Stations.
f) Providing rapid transit access to the proposed Highway 407 inter-regional bus rapid transit corridor at the Richmond Hill Centre terminal.

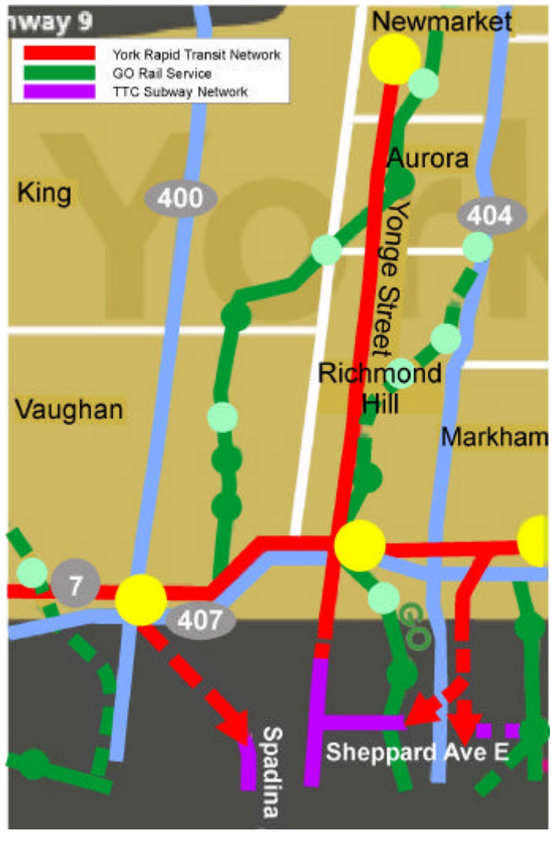


Figure 1-2
Relationship of Yonge Street Corridor to other Interconnected Corridors

g) Permitting convenient connections between rapid transit and local transit services.

The relationship of the Yonge Street Corridor to the other inter-connected corridors mentioned above is illustrated in **Figure 1-2**.

1.4 RELATIONSHIP WITH THE CITY OF TORONTO, YONGE STREET SURFACE TRANSIT IMPROVEMENTS, FINCH AVENUE TO STEELES AVENUE CLASS EA STUDY

The City of Toronto and the Toronto Transit Commission are jointly carrying out a study to investigate options for improving surface transit operations along Yonge Street from Finch Avenue to Steeles Avenue. The study is being undertaken according to Schedule C of the Municipal Class Environmental Assessment. The Municipal Class EA is an approved process under the Ontario (EA) Act, which defines the steps the City must follow when planning to implement physical changes to a roadway. The study is expected to be completed in 2005.

Given that the Yonge Street Corridor Public Transit Improvements in the Region must be connected to Finch Station to provide access to Toronto's subway, any improvements between Finch Avenue and Steeles Avenue and amenities at Finch Station recommended in the above Municipal Class EA will affect the overall corridor service. Potential effects of improved regional public transit on the Finch Station are addressed in **Chapter 10** of the report. Depending on the recommendations of the Toronto study, a transition arrangement may be required at the limit of both studies if similar facilities are not adopted as the preferred option to improve surface transit. This transition will be addressed in both the York and Toronto studies.

Any questions regarding the Yonge Street Surface Transit Improvements, Finch Avenue to Steeles Avenue Municipal Class EA Study, or requests to be added to the study mailing list, can be addressed to the study's Project Manager, Penelope Palmer at 416-392-9599.

1.5 STUDY PROCESS

The Yonge Street Corridor Public Transit Improvements study followed an Individual Environmental Assessment process in accordance with the requirements of the *Ontario Environmental Assessment Act* (Part II). This Individual Environmental Assessment was carried out in a *Harmonized* manner so as to comply with the *Canadian Environmental Assessment Act* (CEAA). Federal funding will almost certainly be required because of the

size and importance of this project. Funding by a federal agency is considered a *trigger* under the *Canadian Environmental Assessment Act*. The harmonization would ensure that the process followed would fulfill the requirements of both acts.

Funding could flow from Industry Canada through the Strategic Infrastructure Fund and as such Transport Canada is likely to be designated the *Responsible Authority*. Other approvals or triggers under CEAA for this project include approval for a TransCanada Pipeline crossing under the jurisdiction of the National Energy Board and DFO (Department of Fisheries and Oceans).

The four phases followed as part of this process are illustrated in **Figure 1-3**. The first two phases have utilized findings of transportation studies completed prior to the commencement of this EA. These have been supplemented by further updating and analysing, focussing on defining the problem, identifying the need, and analysing alternative transportation solutions to the problem and their ability to meet the need of the Region's land use and transportation objectives.

The third and fourth phases were carried out during this assessment. Within these phases the following key tasks were completed:

- Detailed and focused investigation of existing conditions;
- Development of alternative functional designs;
- Assessment of environmental effects of the alternative functional designs;
- A comparative evaluation of the functional design alternatives;
- Selection of Preferred Functional Design;
- Detailed description of the project including phasing and built-in mitigation;
- Detailed assessment of the environmental effects of the preferred design;
- Identification of land needed for the implementation of the Preferred Functional Design;
- Recommendations for actions to prevent, change, mitigate, or remedy effects, including monitoring provisions;
- Conclusions of the effects of the project on the human and natural environment; and
- Documentation of the Study in an EA Report.

The outcome of these tasks included:

- Opportunities to minimize identified potential adverse effects through the implementation of effective mitigation measures;
- Opportunities to restore, enhance, or improve overall environment quality of the Study Area including the preparation of a streetscape plan;
- Definition of the Preferred Functional Design for the improvements including intermodal, passenger pick-up/drop-off facilities and a maintenance and storage facility;
- Right-of-way (ROW) protection requirements for the preferred design, to allow for orderly development or redevelopment of lands in proximity of the transit facilities; and
- An implementation process for the construction of the Yonge Street transit improvements based on development pressures and ridership requirements.

1.6 REPORT ORGANIZATION

This report is divided in thirteen Chapters. The purpose of the study and the vision of transit within York Region are provided in **Chapter 1** including the planning and approval process. **Chapter 2** provides the background to the study and describes the study area identified in the Terms of Reference. **Chapter 3** identifies the Alternative Transportation Strategies to the need addressed by the undertaking and describes the findings of a comparative evaluation of these solutions. **Chapter 4** sets out the findings of the travel demand analysis carried out. In **Chapter 5**, the alternative methods of carrying out the preferred Transportation Strategies are presented and evaluated.

A description of existing conditions within the Study Area that could be affected by the undertaking is presented in **Chapter 6**. **Chapter 7** describes fundamental planning and design parameters that were used in developing alignments and alternatives. A description of the route alternatives and the factors influencing their development is provided in **Chapter 8** which also includes the evaluation methodology, criteria used for the evaluation and the preliminary screening of route alternatives.

Chapter 9 evaluates different design alternatives through each section of the preferred route and identifies the preferred features of an improved transit system. A more detailed description of the preferred design solution including project development activities that might affect the environment is presented in **Chapter 10**.

Results of the assessment of the environmental effects, recommended mitigation measures and proposed monitoring are summarized in **Chapter 11**. **Chapter 12** outlines the Implementation Plan. Public and agency consultation formed an integral part of all phases of this study and is summarized in **Chapter 13**.

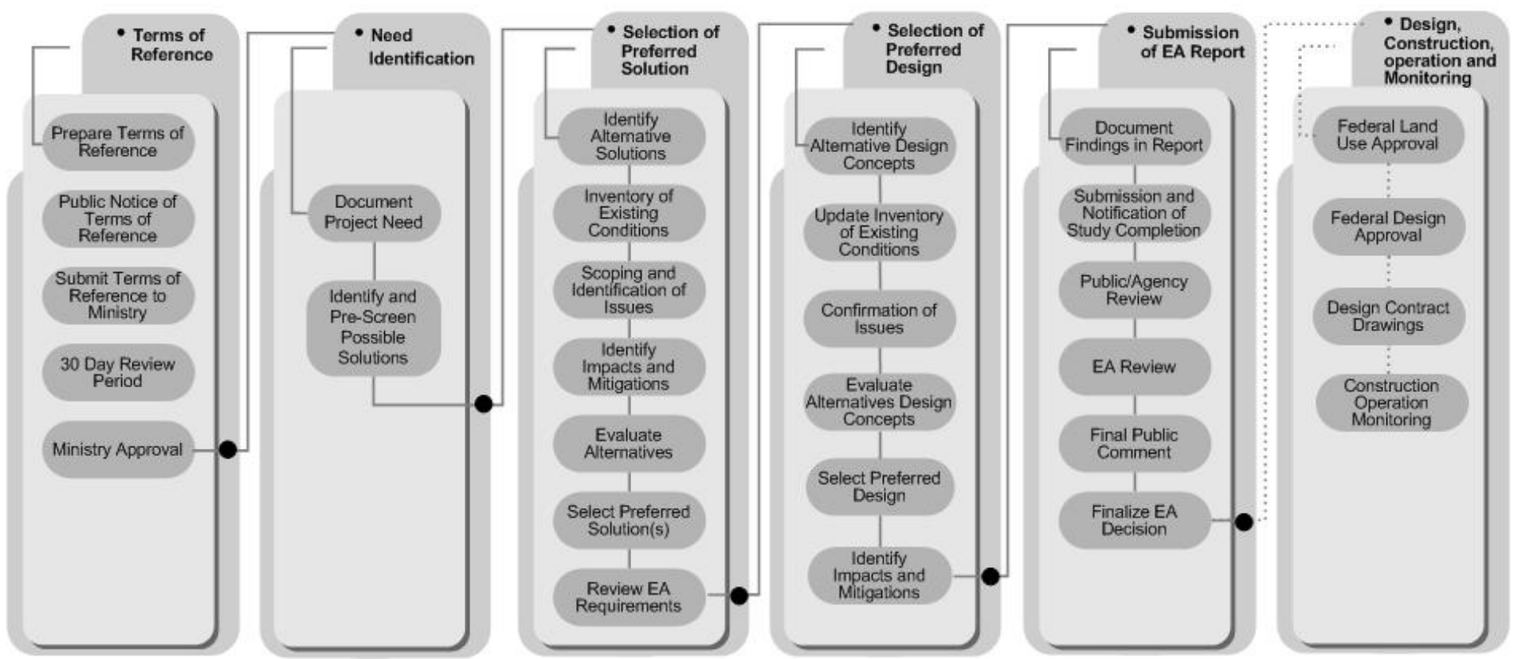


Figure 1-3
Harmonized Environmental Assessment Process

2. STUDY AREA BACKGROUND

2.1 DEFINITION OF STUDY AREA

The proposed geographic limits of the EA Study Area for the Yonge Street Corridor Public Transit Improvements are shown in **Figure 2-1**. It is generally centred along the Yonge Street Corridor and bounded by Dufferin Street to the west, and Highway 404 to the east. The southern limit of the Study Area is the Regional boundary at Steeles Avenue while the northern limit is the 19th Avenue/Gamble Road concession road across Richmond Hill.

The geographic limits of the EA Study Area for the development of the undertaking were selected using the following guidelines:

- The constraints and opportunities within the selected corridor as identified through the inventory of the existing and planned environment completed as part of a Need and Justification analysis carried out in advance of ToR preparation;
- The configuration of the rapid transit network proposed in York Region's Transportation Master Plan considering integration with the existing TTC network; and
- The forecast level of transit ridership along the length of the corridor within the planning period to 2021.

A number of background reports were also used in the preparation of this study. These supporting reports, listed chronologically, include:

- Langstaff Gateway Requirements Review Study, April 1997, Ministry of Transportation;
- Langstaff Gateway, November 1998, Town of Richmond Hill;
- 2031 Road & Transit Network, Staging & Costs, February 2002, York Region;
- Richmond Hill Corridor Planning Study, March 2002, GO Transit;
- Transportation Master Plan, Final Report, June 2002, York Region;
- Inter-Regional Bus Rapid Transit, Volumes 1-3, December 2002, GO Transit; and
- Master Plan, Rear Lanes, Rear Lane Parking and Pedestrian Links for the Central District, April 2003, Town of Richmond Hill.

The EA Study Area is comprised of two components within the Yonge Street Corridor:

- Steeles Avenue to Highway 7; and
- Highway 7 to 19th Avenue.

Figure 2-1
Study Area for the Yonge Street Corridor Public Transit Improvements

2.2 OVERVIEW OF EXISTING CONDITIONS IN STUDY AREA

In order to provide the setting for evaluation of alternatives to the undertaking, an overview of the study area is presented below with existing conditions described in more detail in **Chapter 6**.

2.2.1 The Built Environment

The Yonge Street Corridor has historically provided a focus for mixed-use development comprised of a combination of higher density residential, institutional, retail and highway commercial land uses. There is a mix of recently planned mixed-use areas and historic cores (Thornhill and Richmond Hill) that incorporate a variety of uses and development densities. Recently designated or emerging mixed-use areas identified in the EA Study Area include the Bayview Glen Area in Richmond Hill at Yonge Street and Highway 7, which is the most significan emerging mixed-use area and is a designated regional centre in the *Region of York Official Plan*.

In general, the Yonge Street Corridor development is bounded by stable low-density residential development. The CN Bala subdivision to the east, which is an integral part of CN's mainline network, is a significant feature within the EA Study Area. It supports the present GO Rail commuter service with two stations located at Langstaff Road and Major Mackenzie Drive.

Historic core areas along Yonge Street include the former village centres of Thornhill and Richmond Hill. These areas have historic streetscapes and the local plans promote their retention and enhancement. These areas are important to the local community. The existing and planned development is described in more detail later in the report in **Chapter 6**.

2.2.2 The Natural Environment

2.2.2.1 Watershed Areas

The Study Area includes two main watersheds. Crossing Yonge Street in the south, the Don River Watershed (including the Little Don River and German Mills Creek) has been identified as a significant watercourse system through the initiatives of the Toronto and Region Conservation Authority (TRCA) Don Watershed Task Force. This body incorporates representation of Watershed residents; Friends of the Don (York Region); The Task Force to Bring Back the Don; The Waterfront Regeneration Trust; and the Metro Toronto Remedial Action Plan. Part of the upper watershed in Richmond Hill is within the Oak Ridges Moraine and the vulnerable Redside Dace occurs in many of the tributaries draining to Lake Ontario.

The Rouge River Watershed crosses the central portion of the Town of Richmond Hill with an upper watershed area located on the Oak Ridges Moraine. This is a significant drainage system with coldwater flows and discharge contributing to the Rouge River which is the focal area for the extensive Rouge Valley Park that has been established downstream of the study corridor. Development in this watershed should consider the goals of the TRCA for Rouge River watershed protection. The vulnerable Redside Dace has been identified as an appropriate management target for some of the watershed tributaries.

2.2.2.2 Designated Natural Areas

Designated natural areas include areas identified for protection by the Ontario Ministry of Natural Resources (MNR), TRCA and upper tier and lower tier municipalities. The location of designated areas within the broader study area is outlined below.

The northern portion of the study area, between Elgin Mills Road and 19th Avenue, is located on the Oak Ridges Moraine and is designated a Settlement Area according to the Oak Ridges Moraine Conservation Plan (ORMCP). There are no Environmentally Significant/Sensitive Areas (ESAs) within the study area. Richvale Forest ESA 71 is located to the west of the study area south of Carrville Road in the City of Vaughan.

There are no Provincially Significant Wetlands (PSWs) within the Study Area but, Richvale Forest Life Science Area of Natural and Scientific Interest (ANSI) is situated on the east branch of the Don River south of Carrville Road and east of Bathurst Street, west of the Study Area, in the Town of Richmond Hill. Baker's Woods Provincial Life Science ANSI is a mature, managed sugar maple bush located at the northwest corner of Langstaff Road and Bathurst Street, on the western edge of the study area, in the City of Vaughan.

Very few woodlots exist within/adjacent to the Study Area. One very small, fragmented woodlot is located in the southeast corner of Yonge Street and High Tech Road. Other wooded areas within/adjacent to the Study Area include: a forested tract on the east side of Yonge Street south of Royal Orchard Boulevard along the main branch of the East Don River; a forested tract on the west side of Yonge Street north of Elgin Mills Road along German Mills Creek; and a forested tract on the west side of Yonge Street south of Brookside Road on a tributary of the Rouge River.

Wooded areas along watercourses in the Study Area act as corridors for wildlife tolerant of an urban environment. These areas allow for wildlife movement along the watercourses to and from more protected areas surrounding the Study Area such as PSWs, ESAs and ANSIs. The Study Area is highly urbanized and very few natural areas in locations other than along watercourses are linked together.

2.2.3 The Transportation Environment

Yonge Street is an arterial roadway extending from Lake Ontario in downtown Toronto to north of York Region and beyond. Within the Study Area, Yonge Street, from Steeles Avenue to 19th Avenue is under the jurisdiction of York Region, except for the section between Major Mackenzie Drive to Elgin Mills Road that is controlled by The Town of Richmond Hill.

North of Steeles Avenue, Yonge Street consists of four general use lanes with an additional HOV lane in the north and south directions that extend from Steeles Avenue to a point just north of Clark Avenue. North of Clark Avenue, Yonge Street narrows to four through lanes until Langstaff Road. Through the Yonge Street and Highway 407 interchange, Yonge Street operates as a six-lane facility to High Tech Road where it narrows to four general use lanes through to 19th Avenue.

The average annual daily traffic (AADT) along Yonge Street varies from 49,510 to 31,810 vehicles as illustrated by the 2002 AADT's for representative locations below.

Location	AADT (Vehicles per day)
North of Steeles Avenue	49,510
North of Highway 7	38,330
North of Major Mackenzie	31,810
North of Elgin Mills Road	33,120

Source: Automatic traffic recorder (ATR) counts provided by the York Region

Truck movements make up approximately 5% of the vehicle composition during the peak hours.

Intersection capacity analysis, undertaken using the Highway Capacity Manual (HCM) methodology and 2002 counts, current signal timings, and existing lane configurations has revealed the following:

- The majority of the capacity constraints are located in the Thornhill core area between Steeles Avenue and Centre Street/Thornhill Summit Drive and also from north of Bantry Avenue to Weldrick Road;
- The Yonge Street/Centre Street/Thornhill Summit Drive intersection represents a key constraint in the road network in the AM and PM peak hours and 16th Avenue/ Yonge Street intersections represent key constraints; and
- A number of the northbound and southbound left turn movements at the intersections are operating under permissive left turn control and thus are operating at capacity when opposing the peak through movement.

Field investigations and discussions with area municipality staff indicated that a number of collector roadways and neighbourhoods have local traffic concerns. Examples of these are the Grandview Avenue and South Richvale neighbourhoods.

All existing bus routes operate in mixed traffic on most of Yonge Street with the exception of the use of peak period HOV lanes, located in the street from the south study limit at Steeles Avenue to just north of Clark Avenue. For the remainder of Yonge Street, the bus system operates without designated lanes or signal priority. The routes operating along Yonge Street consist of GO Transit's Newmarket 'B' and Newmarket 'B' Express routes. There are currently no Toronto Transit Commission routes operating on Yonge Street north of Steeles Avenue.

3. ANALYSIS AND EVALUATION OF ALTERNATIVES TO THE UNDERTAKING

In accordance with the information requirements set out in Section 6.1 (2) of the Environmental Assessment Act, the approved Terms of Reference for this study required the Proponent to identify, analyze and evaluate all reasonable alternatives to the proposed undertaking, public transit improvements in the Yonge Street Corridor. For this undertaking, the alternatives comprise functionally different transportation strategies to the problem summarized in the study context in **Chapter 1** and addressed in York Region's Transportation Master Plan (TMP). This chapter presents the findings of this step in the EA process.

3.1 DESCRIPTION OF ALTERNATIVES TO THE UNDERTAKING

The alternatives to the Undertaking or the alternative transportation strategies that could be considered to respond to the Region's mobility needs and Official Plan objectives are outlined below. Components assumed in each alternative are shown in **Table 3-1**. In addition to the existing (2001) conditions, five alternative strategies have been examined. These have been built incrementally around different components of the York Region Transportation Master Plan and represent a broad range of approaches with different transportation modes.

3.1.1 Do Nothing

The purpose of this alternative is to confirm the need and justification for an undertaking by assessing the effect of utilizing only the road and public transit infrastructure and services in place in 2001, without improvements throughout the planning period to 2031. For public transit, this assumption applies to all bus and rail transit service providers including GO Transit, the YRT and the TTC.

3.1.2 A Current Commitments Strategy Including Priority Transit and Transportation Demand Management

This base case strategy comprises all road infrastructure improvements currently committed in York Region's 10-year capital plan, the committed service and infrastructure improvements of the local and inter-regional transit authorities, YRT, TTC and GO Transit and all TMP excluding regional rapid transit network. Also included are Transportation Demand Management (TDM) strategies which the region and local municipalities are currently pursuing. Examples include transit priority for new services, *Smart Commute North Toronto, Vaughan* and *Smart Commute Markham, Richmond Hill.* In this strategy, the above commitments are assumed to be the full extent of transportation improvements through the planning period.

3.1.3 A Road Expansion Strategy

The focus of this strategy is an increase in road capacity only beyond the "Current Commitments" Strategy's road and public transit improvements. Road capacity is assumed to be increased to whatever level is required to meet the demand at the 2031 planning horizon.

Table 3-1
Summary of Alternative Transportation Strategies

Alternative Transportation Strategy	Components In Each Strategy			
	Road Network	Inter-regional Transit Network (GO Transit)	Local Transit System Network	Public Transit Improvements (e.g. Rapid Transit Network)
Do Nothing	• Existing (2001) road network	• Existing GO Rail network	• Existing Transit Network	• No improvements in York Region
Current Commitments Strategy Including Priority Transit and TDM	• Planned improvements based on York Region 10 year capital plan • Expanded provincial highway system	• Capacity and Service improvements consistent with GO Transit 10 year Capital Plan	• Committed YRT local transit service improvements	• No improvements in York Region
Road Expansion	• Expansion of road network and widenings to meet travel demand	• Existing GO Rail network	• Committed YRT Improvements	• No improvements in York Region
Enhanced Richmond Hill Commuter Rail and Inter-regional Bus Service	• Planned improvements based on York Region 10 year capital plan • Expanded provincial highway system	• All day and reverse peak service on all existing GO Rail lines • Freeway HOV on Highways 407, 400 and 404	• Committed YRT Improvements • Connections to new GO services	• No improvements in York Region
York Region Rapid Transit Corridor Initiatives (in the Yonge Corridor as represented by the *Region's Transportation Master Plan*)	• Planned improvements based on York Region 10 year capital plan • Expanded provincial highway system	• Capacity and Service improvements consistent with GO Transit 10 year Capital Plan	• Committed YRT Improvements • Connections to new Rapid Transit	• Rapid transit in all proposed corridors identified in TMP • Implementation of transit priority network in TMP • Extension of Yonge Subway to Highway 7 • Extension of Spadina Subway to York Univ. • Extension of Sheppard Subway to Scarborough

3.1.4 An Enhanced Richmond Hill Commuter Rail and Inter-regional Bus Service Strategy

In this strategy, the transportation system would comprise all current road and local transit service commitments plus an enhanced inter-regional transit system consisting of both commuter rail and 400 series highway bus services such as those operated by GO Transit.

3.1.5 York Region Rapid Transit Corridor Initiatives Strategy

This strategy focuses on a significant improvement in public transit services in York Region in addition to all components of the "current commitments" strategy. This strategy comprises the implementation of York Region's Rapid Transit Plan (YRTP) recommended in the *2002 Transportation Master Plan* with associated local service connections.

3.2 ANALYSIS OF ALTERNATIVE TRANSPORTATION STRATEGIES

Evaluation of the above alternative strategies must consider the advantages and disadvantages of each in terms of a broad range of criteria reflecting both the problem faced by the Region and the opportunities presented. These criteria, based on the primary objectives introduced in **Chapter 1**, the Purpose of the Undertaking will be identified later in this section. Initially, it is necessary to analyze and quantify the performance of the existing transportation system and improvements currently committed in meeting the forecast travel demand during the planning period.

3.2.1 Forecast of Future Travel Demand

York Region has had the greatest proportional increase in population and employment amongst the four suburban regions of the Greater Toronto Area over the past 10 years. Within the 2021 planning horizon, the population of the Region is forecast to increase from the current 0.8 million residents to 1.2 million residents, while employment is estimated to increase from the existing 385,000 jobs to 655,000 by the year 2021.

Much of this growth is targeted to live and/or work within the southern Yonge Street Corridor between Steeles and 19th Avenues. This growth will generate a proportionate increase in travel demand. While it is expected there will be a greater segment of the population living and working within the Region itself, north-south travel demand between the Region and the City of Toronto will remain the dominant feature amounting to 35% of total travel demand.

3.2.1.1 The Demand Forecasting Model

A comprehensive, state-of-the-art transportation demand forecasting model has been developed to provide an effective planning tool for York Region's Public Transit Improvements program. The model, developed from an extensive survey of travel behaviour, the *2001 Transportation Tomorrow Survey* (TTS), has been successfully validated as a forecasting tool. With sensitivity to transportation and transit system connectivity, levels of service and prices, demographic characteristics and land use, the models can be used to analyze alternative policies (e.g., fares, service levels), investments (rapid transit, intermodal connections) and design details. The model estimates a.m. peak period travel for five modes:

- Auto driver and passenger;
- Public transit (YRTP, YRT, TTC, GO Bus) with walk access;
- Public transit with park/kiss-and-ride access;
- GO Rail with public transit or walk access;
- GO Rail with park/kiss-and-ride access.

Travel is estimated for work, post-secondary school, secondary school and other trip purposes. The Program's model encompasses the Greater Toronto Area (GTA and Hamilton) and is based on the 2001 GTA zone system comprising 1,717 traffic zones. Additional traffic zone detail was included in the YRTP corridors to reflect walk access and station location assumptions. Level-of-service sensitive and behaviour based trip distribution (gravity model) and modal split (logit model) techniques are employed within the four-stage modelling process, described as follows:

- **Trip Generation:** estimates the number of trips that will be made within the study time period. A conventional approach using trip rates and regression equations is used for work, school and other trips. For work and school purpose trips, sub-categories are defined with trip rates developed that reflect the different travel behaviour of social groups by occupation type (professional, manufacturing, general office/sales) and schooling level (secondary and post secondary), respectively;

- **Trip Distribution:** links the trip productions and attractions by trip purpose and type to determine travel flows. A gravity model is calibrated to estimate work trip flows, again accounting for socio-economic differences within the population by calibrating separate models for each occupation type. The process is sensitive to level-of-service, with the resulting travel orientations reflecting the assumed improvements in public transit facilities and other major transportation system changes. A standard Fratar proportional balancing process is used for school and other trip purposes;

- **Mode Split:** determines the trip travel mode. A multinomial logit model is used to determine the breakdown by mode (auto, transit, commuter rail) for work (by occupation group) and post-secondary school trips. It also distinguishes the transit access mode (park-and-ride or all-way). Existing modal split rates are assumed for non-work trips, based on defined origin-destination superzones; and

- **Trip Assignment:** determines the trip route through the given transportation system. The standard assignment algorithms within EMME/2 are used, involving a multiple path transit assignment and user equilibrium auto assignment.

In recognition of the interaction between the four components of travel behaviour, equilibration is achieved by iterating through the three stages of trip distribution, modal split and trip assignment until a reasonable level is achieved. In addition, a link between the trip distribution and modal split components is maintained to incorporate the interdependence between them.

For preliminary planning purposes, the model forecasts can be translated from the a.m. peak 3-hour period to an a.m. peak hour or daily forecasts using relevant conversion factors. A factor of 0.6 was developed for the a.m. peak hour based upon comparisons of actual auto and transit traffic data, with 0.55 used for the higher volume Yonge Street Corridor. The daily trips were converted using a factor of 3.5, calculated from 2001 TTS data relationships between the time periods.

The model outlined above was used to forecast the travel patterns and mode choice within the region and across regional boundaries in both the 2021 and 2031 horizon years for each of the alternative transportation strategies, including the "Do Nothing" option. Population and employment data, based on the Regional and City of Toronto Official Plans and described in **Chapter 4**, was utilized as the primary input for the modelling. **Chapter 4** also provides details of the basic transportation network modelled using the assumptions outlined below for each transport mode.

3.2.1.2 Key Assumptions for Demand Modelling

Road Network

The base case road network includes all arterial improvements identified in the 10-year York Region capital programme. It also includes planned collector roads such as the Rodick Road extension, Birchmount Extension and Enterprise Drive as outlined in area municipality transportation plans. Expansion of the provincial highway system within York Region included the proposed extensions of Highway 427 and Highway 404 and the widening of Highway 400. In the alternative scenario involving road expansion, an iterative approach was used to expand roads to meet projected auto demand.

GO Transit Network

Improvements considered under the enhanced Richmond Hill commuter rail and inter-regional bus service alternative are generally consistent with the GO Transit 10-year Capital Plan and 2021 Plan and included full all-day and reverse peak service on the Richmond Hill, Bradford and Stouffville GO Rail Services.

Peak headways of 15 minutes were assumed for the Richmond Hill and Bradford services while headways of 10 minutes were assumed for the Markham to Union portion of the Stouffville Service. This latter assumption was made to explore the upper end potential of commuter rail service in the Markham North-South Corridor of the Region's proposed rapid transit plan.

In addition to the changes to the GO Rail services, this alternative includes an extensive network of Freeway Express Bus or BRT inter-regional transit services including:

- A Highway 400 service from Newmarket (with connections to Barrie) to the Spadina Subway (Downsview);
- A Highway 407 service across York Region;
- A Highway 404 service from Newmarket to the Bloor Subway (Castle Frank Station).

In all cases, these services included connections to major transit routes in South York and Toronto.

Local Transit Network

For all future strategies except the Do Nothing Alternative, most of the recommendations from the York Region Transit 5-Year Service Plan have been included. This includes route extensions, route restructuring and expansion of service to new communities.

For the York Region Rapid Transit Corridor Initiatives Alternative, YRT services overlapping with rapid transit services (e.g. Express services from Markham and Unionville) have been removed to avoid duplication.

In the existing transit network within the demand model, transit speeds were estimated from timetables and vary by route segment. Assumed speeds for regular bus services generally range from 20–25 km/hr. With future traffic growth, transit speeds on major routes such as Highway 7 and Yonge Street, where minimal road expansion is planned, will likely degrade due to congestion. In order to reflect this condition in the model, speeds for all

regular bus routes were reduced by 20% on average. For example, a route that was coded with a 20km/hr speed in the existing network was reduced to 16km/hr in the future network. This reduction was not applied for the Road Expansion Alternative or the York Region Rapid Transit Corridor Initiatives Alternative, as these options include significant improvements to reduce congestion (e.g. road expansion) or improve bus times in key corridors (e.g. bus-rapid transit and transit priority).

Improved Public Transit

For the York Region Rapid Transit Corridor Initiatives Alternative, several major transit improvements were incorporated. These included:

- Bus Rapid Transit operating in all YRTP corridors at average speeds of up to 30 km/hr;
- Implementation of transit priority on most major arterials in South York Region, consistent with Figure 20 of the *York Region Transportation Master Plan*. The effect of transit priority was assumed to provide an improvement of 5 km/hr over the base case bus speeds on the transit priority routes;
- Extension of subways including Yonge Subway to Highway 7, Spadina Subway to York Region (Steeles Avenue) and Sheppard Subway to the Scarborough Town Centre.

The above assumptions formed the basis for forecasting both the 2021 and 2031 travel demand and mode choice and the ability of the five alternative transportation strategies to carry the forecast travel demand.

3.2.2 Modelling of Alternative Transportation Strategies

An established technique for assessing the performance of any transportation system is to compare the relationship between overall travel demand and roadway capacity at selected locations or screenlines in the system. In any scenario being assessed, this method also recognizes the capacity of other non-auto modes contributing to the total capacity across any one screenline.

Screenlines across the transportation network are selected to provide an improved basis for analysis for the following reasons:

i) because of parallel facilities, there are a number of alternative routes available and the choice between routes can vary from the most direct route in order to reduce travel time and avoid local congestion.
ii) comparison of historical and future trends must be based on roadway groupings as present roadways are expanded or new parallel roadways are added.
iii) the traffic characteristics, i.e. local vs. through traffic and modal split vary due to the type and location of the roadway facility and transit service.

For analysis purposes, three east-west screenlines across the Yonge Street Corridor were selected as illustrated in **Figure 3-1**, the first extending along the boundary between York Region and Toronto, Steeles Avenue, the second along the Carville Road/16th Avenue arterial approximately 2 km north of Highway 7 and the third at the north boundary of the study area generally parallel to the King Road/Stouffville Road arterial.

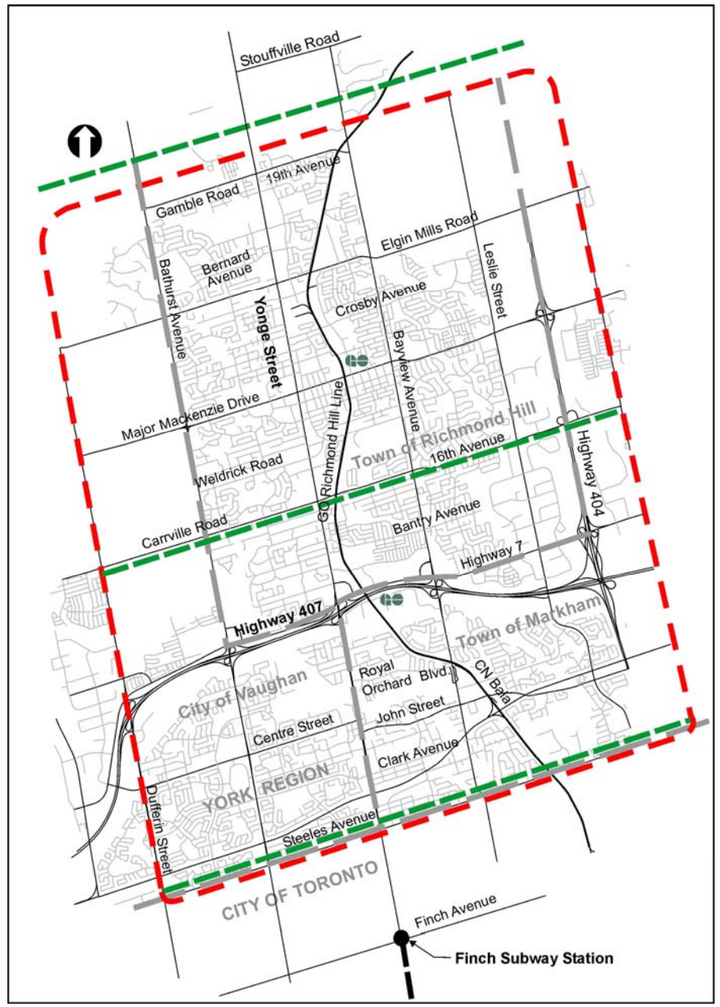


Figure 3-1
Screenlines for Demand vs Capacity Analysis

3.2.3 Alternative Strategies: Demand vs. Capacity Analysis

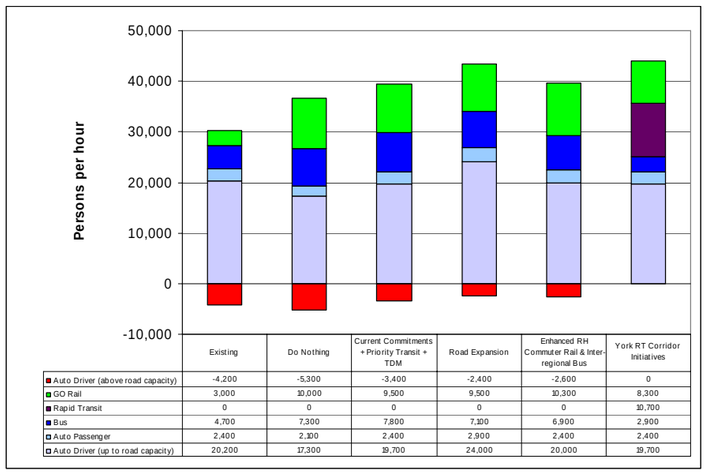
The effectiveness of each transportation strategy in meeting both the near/medium and long term travel demand within the region and across regional boundaries was analyzed by modelling 2021 and 2031 AM peak period travel. Analysis was done using a network-wide approach adopting similar system components for all corridors of the *Region's Transportation Master Plan* network. In order to reflect the effectiveness of each transportation alternative in its mature form, the 2031 planning horizon adopted in the TMP was used for this analysis. **Figures 3-2 to 3-7** illustrate the projected near/medium and long term relationship between demand and capacity at the three screenlines for southbound peak direction travel in each of the alternative strategies in 2021 and 2031.

In the Yonge Street Corridor, there is a clear need to address transportation capacity deficiencies through a broad range of improvements. Under the Do Nothing Alternative, road capacity shortfalls would be significant and without other travel options, travel demand would be severely constrained. In both the Do Nothing and Current Commitments Alternatives, the demand on the existing bus system would be significant; the projected demand would require buses operating at 2 minute headways on all five major arterials along the screenline (assuming 50 passengers per bus).

For both the North of Steeles Screenline and the South of Carrville Road/16th Avenue Screenline the only alternative that would address corridor travel demand in 2031 is an alternative involving significant improvements to the public transit system – a combination of BRT and Subway in the Yonge Street Corridor.

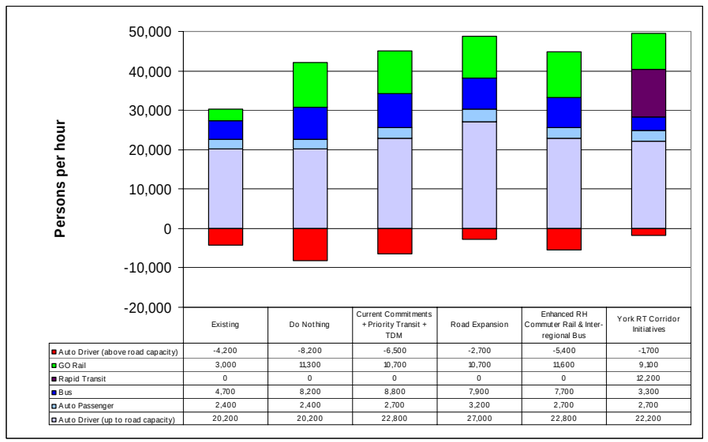
3.2.4 Criteria for Evaluation of Alternative Strategies

The framework adopted for evaluation of the alternative strategies was that of the Regional Official Plan objectives or themes stated in **Chapter 1** in describing the Purpose of the Undertaking. These principle themes incorporate the criteria proposed in the approved *Terms of Reference* (Section 5.7.2) within the following categories of criteria for the evaluation:



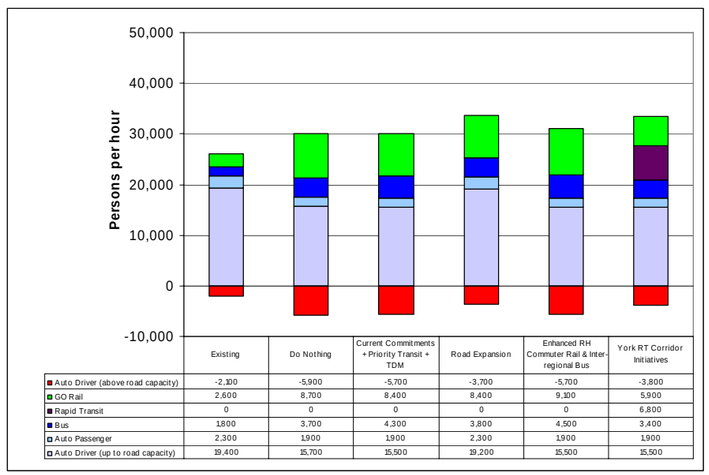
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	-4,200	-5,300	-3,400	-2,400	-2,600	0
GO Rail	3,000	10,000	9,500	9,500	10,300	8,300
Rapid Transit	0	0	0	0	0	10,700
Bus	4,700	7,300	7,800	7,100	6,900	2,900
Auto Passenger	2,400	2,100	2,400	2,900	2,400	2,400
Auto Driver (up to road capacity)	20,200	17,300	19,700	24,000	20,000	19,700

Figure 3-2
Yonge Street – North of Steeles (SB) - 2021



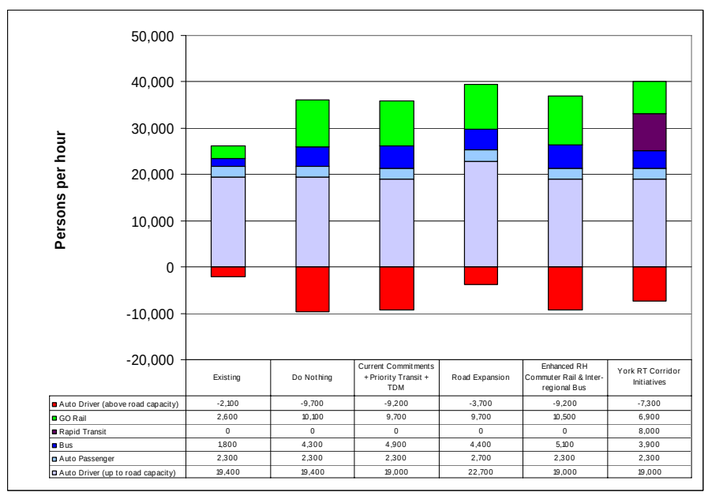
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	-4,200	-8,200	-6,500	-2,700	-5,400	-1,700
GO Rail	3,000	11,300	10,700	10,700	11,600	9,100
Rapid Transit	0	0	0	0	0	12,200
Bus	4,700	8,200	8,800	7,900	7,700	3,300
Auto Passenger	2,400	2,400	2,700	3,200	2,700	2,700
Auto Driver (up to road capacity)	20,200	20,200	22,800	27,000	22,800	22,200

Figure 3-3
Yonge Street – North of Steeles (SB) - 2031



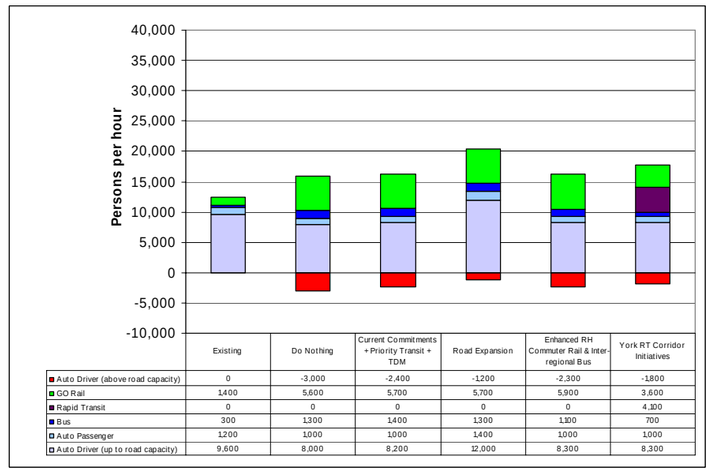
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	-2,100	-5,900	-5,700	-3,700	-5,700	-3,800
GO Rail	2,600	8,700	8,400	8,400	9,100	5,900
Rapid Transit	0	0	0	0	0	6,800
Bus	1,800	3,700	4,300	3,800	4,500	3,400
Auto Passenger	2,300	1,900	1,900	2,300	1,900	1,900
Auto Driver (up to road capacity)	19,400	15,700	15,500	19,200	15,500	15,500

Figure 3-4
Yonge Street – South of Carrville/16th (SB) - 2021



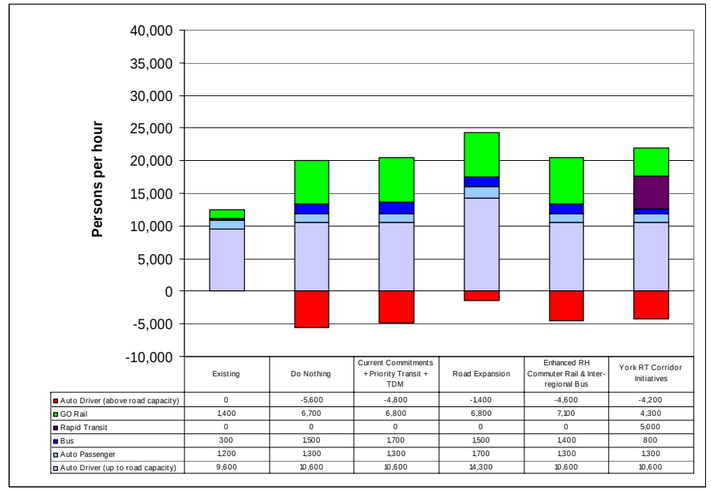
	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	-2,100	-9,700	-9,200	-3,700	-9,200	-7,300
GO Rail	2,600	10,100	9,700	9,700	10,500	6,900
Rapid Transit	0	0	0	0	0	8,000
Bus	1,800	4,300	4,900	4,400	5,100	3,900
Auto Passenger	2,300	2,300	2,300	2,700	2,300	2,300
Auto Driver (up to road capacity)	19,400	19,400	19,000	22,700	19,000	19,000

Figure 3-5
Yonge Street – South of Carrville/16th (SB) - 2031



	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-3,000	-2,400	-1,200	-2,300	-1,800
GO Rail	1,400	5,600	5,700	5,700	5,900	3,600
Rapid Transit	0	0	0	0	0	4,100
Bus	300	1,300	1,400	1,300	1,100	700
Auto Passenger	1,200	1,000	1,000	1,400	1,000	1,000
Auto Driver (up to road capacity)	9,600	8,000	8,200	12,000	8,300	8,300

Figure 3-6
Yonge Street – South of Stouffville (SB) - 2021



	Existing	Do Nothing	Current Commitments + Priority Transit + TDM	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus	York RT Corridor Initiatives
Auto Driver (above road capacity)	0	-5,600	-4,800	-1,400	-4,600	-4,200
GO Rail	1,400	6,700	6,800	6,800	7,100	4,300
Rapid Transit	0	0	0	0	0	5,000
Bus	300	1,500	1,700	1,500	1,400	800
Auto Passenger	1,200	1,300	1,300	1,700	1,300	1,300
Auto Driver (up to road capacity)	9,600	10,600	10,600	14,300	10,600	10,600

Figure 3-7
Yonge Street – South of Stouffville (SB) - 2031

3.2.4.1 Effects on the Social Environment (reflecting the "Healthy Communities" theme)

Criteria in this category address the impact on the socio-economic environment and include the need for acquisition of residential or commercial property for new or widened road rights-of-way, level of traffic congestion, the potential for traffic infiltration through neighbourhoods, the effect of increased noise and vibration during construction and operation and the likelihood of adverse effects on archaeological resources and heritage or cultural features.

3.2.4.2 Effects on the Natural Environment (reflecting the "Sustainable Natural Environment" theme)

The focus of this category of criteria is to assess the potential effect of a transportation strategy on elements of the natural environment such as fisheries and aquatic habitat, wildlife habitat, natural vegetation and wetlands, ground and surface water resources, regional and local air quality and ecosystems.

3.2.4.3 Effects on the Economic Environment (reflecting the "Economic Vitality" theme)

This category addresses the economic aspects of the socio-economic environment and the impact on urban form by encompassing criteria that assess either opportunities to promote existing and increased economic activity or the potential adverse effects on current business activity in the corridor. The criteria measuring benefits include support of the Region's overall vision, approved urban structure and development distribution, improved access to business and community centres, increased pedestrian activity around facilities, the quality of commuting options for employees and the effect on congestion levels in the corridor.

Potential adverse effects of the strategies are assessed by criteria such as disruption or modification of access to businesses, displacement of businesses due to right-of-way widening and convenience of goods movement.

Direct costs in the form of public sector capital funding needed and the travel time delay costs are also addressed in this category.

3.2.4.4 Effectiveness of the Transportation Strategy in Meeting Travel Demand

The purpose of this category is to compare the effectiveness of the alternatives in terms of their capacity to contribute to the forecast travel demand at the 2031 horizon year. A qualitative assessment of the long-term growth capacity is also considered in this category.

3.2.5 Evaluation of Alternative Transportation Strategies

The selection of the preferred transportation strategy stems from the multi-criteria comparative evaluation presented in tabular form in **Table 3-2**. Each transportation alternative was assessed in terms of the criteria described previously and its ability to meet the overall planning objective for each category.

A "quality of response" rating for each criterion was assigned to each alternative to provide a graphical indication of their relative merits on the basis of this qualitative and quantitative evaluation. The findings lead to the following conclusions:

a) Clearly, "Doing Nothing" cannot be considered a valid alternative. Although it would be the least capital cost alternative, it is not responsive to any of the key objectives in addressing the transportation problem.

b) Although the "Current Commitments" strategy includes several road improvements in various parts of the region, it is unable to reduce the capacity shortfall in the Yonge Street Corridor. Without corresponding improvement in public transit, continued operation of existing conventional transit service will not provide an effective alternative to the severe traffic congestion predicted for the arterial roads in the corridor.

c) A strategy focussed on road expansion until the shortfall is eliminated is not practical in that five extra traffic lanes in each direction over and above the *Transportation Master Plan* commitments still leaves a shortfall in capacity of three to four lanes at the Steeles Avenue screenline. Clearly, widening of arterial roads to this extent will result in major social impacts in the form of property acquisition, a decrease in air quality resulting from more vehicle trips, a higher accident potential and community barrier effects. In addition to the lane increases above, this strategy also requires the conventional bus service to carry over 5,000 passengers/hour/direction across the screenline. This capacity translates into a service comprising standard buses at three-minute headways on all arterial roads in the corridor.

d) Enhancing Richmond Hill commuter rail and inter-regional bus services in the corridor will not reduce the road capacity shortfall significantly because more frequent rail service attracts primarily downtown-Toronto destined trips and inter-regional bus service on Highway 404 bypasses the core development nodes along the corridor. In addition, the location of the inter-regional transit routes does not support the urban form envisioned in the Region's *Official Plan* and thus will not encourage transit-oriented development within the Region.

e) As noted previously, the York Region Rapid Transit Corridor Initiatives strategy is the only alternative that eliminates most of the shortfall in road capacity in the corridor. By providing an effective alternative to auto use, this strategy supports both York Region and local municipal Official Plan objectives. At the same time, the improvements can incorporate significant flexibility to expand the system capacity over time for the long-term travel needs in the Region.

   As well as responding best to the transportation demands, this alternative can be implemented with minimal adverse effects on the natural environment and will make a positive contribution to the reduction of harmful vehicle emissions. In addition, adverse effects on the social environment can be mitigated and the strategy offers the opportunity to support the desired urban form, enhance streetscapes and encourage development of more liveable communities.

As a result, the **"York Region Rapid Transit Corridor Initiatives"** Strategy was selected as the preferred transportation strategy for the undertaking.

3.2.5.1 Effect of Alternative Strategies on Transit Mode Share

Improving public transit is fundamental to the York Region Growth Strategy from a social, environmental and economic perspective. In order to evaluate the ability of each alternative to improve the attractiveness and use of public transit in York Region, this section presents a summary and discussion of the impacts of each alternative on transit mode shares.

As shown in **Table 3-3**, transit mode shares are expected to remain relatively constant under the Do Nothing and Current Commitments alternatives. The exception is in corridors where severe congestion contributes to significant shifts from auto to transit (a result that is mostly related to the underlying model assignment procedures that do not reflect capacity constraints on the transit system).

An alternative involving enhanced Richmond Hill commuter rail and inter-regional bus service will have modest impacts on mode shares, although it is important to note that some components of this enhanced transit system

Table 3-2
Evaluation of Alternatives to the Undertaking

Evaluation Objectives and Criteria	ALTERNATIVE TRANSPORTATION STRATEGIES				
	Do Nothing	Current Commitments including Priority Transit and Transportation Demand Management	Road Expansion	Enhanced Richmond Hill Commuter Rail and Inter-regional Bus Services	York Region Rapid Transit Corridor Initiatives
Protect and Enhance Social Environment ▪ acquisition of residential or commercial property for new or widened road rights-of-way; ▪ the level of traffic congestion; ▪ the potential for traffic infiltration through neighbourhoods; ▪ the effect of increased noise and vibration; and ▪ effects on archaeological resources and heritage or cultural features.	Congestion due to a significant road capacity shortfall in corridor will cause: ▪ neighbourhood traffic infiltration, ▪ a loss of community mobility, ▪ an increased accident potential, and ▪ a degraded transit service making it less attractive as a travel option.	Residual road capacity shortfall in corridor will, to a lesser degree, still cause: ▪ neighbourhood traffic infiltration, ▪ some loss of community mobility and pressure on existing road rights-of-way, ▪ an increased traffic accident potential, and ▪ the present low transit mode split to continue in the absence of an enhanced transit service.	Road widening beyond current commitments minimizes capacity shortfall but will: ▪ require commercial/ residential property to achieve wider rights-of-way on major arterials, ▪ initially reduce neighbourhood traffic infiltration but create more of a barrier between communities, ▪ perpetuate reliance on auto use in an already congested corridor, ▪ not reduce traffic accident potential.	Residual road capacity shortfall in corridor will, to a lesser degree, still cause: ▪ neighbourhood traffic infiltration, ▪ some loss of community mobility and pressure on existing road rights-of-way, and ▪ an increased traffic accident potential. Higher service frequency on rail rights-of-way increases noise intrusion potential. Little opportunity for streetscape enhancement. A focus on inter-regional transit enhancement will not improve mode split for internal travel.	Replacing most of road capacity shortfall by greater transit use will: ▪ reduce neighbourhood traffic infiltration, ▪ reduce traffic accident potential, ▪ offer improved access to community amenities by providing a convenient alternative to auto use. Insertion of new transit infrastructure can act as a catalyst for streetscape improvement and urban renewal. However dedicated transitways in existing road rights-of-way often require modified access patterns to adjacent properties.
	◔	◑	◔	◑	◕
Protect and Enhance Natural Environment The potential effect on: ▪ fisheries ▪ aquatic habitat ▪ wildlife habitat ▪ natural vegetation and wetlands ▪ ground and surface water resources ▪ regional and local air quality ▪ ecosystems	Continued reliance on auto use for growing travel demand will increase overall vehicle trips and congestion resulting in increased vehicle emission and energy consumption.	Continued reliance on auto use for growing travel demand will increase overall vehicle trips and congestion resulting in increased vehicle emission and energy consumption.	Continued reliance on auto use for growing travel demand will increase overall vehicle trips and congestion resulting in increased vehicle emission and energy consumption. Marginally better than "Do Nothing" since added road capacity will reduce overall traffic congestion. Road widening will require more new or widened bridges at creeks and rivers.	▪ A higher mode split for inter-regional travel will reduce total number of vehicle trips thereby reducing emissions and GHG effects. ▪ Expansion of transit infrastructure in existing rail and freeway rights-of-way minimizes adverse effects on natural features.	▪ A higher transit mode split for all travel destinations will contribute to the greatest reduction in vehicle trips and have the greatest overall benefit to reducing emission and GHG effect as compared to the other alternatives. ▪ Expansion of transit infrastructure in existing road or rail rights-of-way minimizes adverse effects on natural features. Road widening for transit facilities will require some new or widened bridges at creeks and rivers.
	◔	◔	◑	◕	●
Promote Smart Growth and Economic Development ▪ opportunities to promote existing and increased economic activity; ▪ potential adverse effects on current business activity in the corridor; ▪ support for the Region's vision and approved urban structure ▪ access to community centres, increased pedestrian activity around facilities; ▪ the quality of commuting options and the effect on congestion levels ▪ access to and displacement of, businesses and convenience of goods movement. ▪ Direct costs ▪ Travel time delay costs	Resulting significant loss of mobility will: ▪ discourage business investment, ▪ prevent achievement of O.P. land use and development objectives, ▪ degrade employees' work commute in and to, the Region, ▪ significantly increase time-related cost of travel in the Regional economy. Doing nothing minimizes public sector capital costs and business displacement but will increase indirect business costs due to inefficiency of goods and people movement. Indirect cost due to urban sprawl requiring additional facilities	Continuing corridor congestion without an effective non-auto alternative will: ▪ slow business investment, ▪ not promote regional/municipal O.P. urban form and development objectives, ▪ degrade employees' work commute in and to, the Region, Region's TMP current commitments will require fairly significant on-going public sector capital spending. Worsening congestion over time will gradually increase time-related cost of travel and goods movement in the Region,	A focus on meeting travel demand by increasing road capacity alone: ▪ does not promote regional/municipal O.P. urban form objectives and constrains development levels, ▪ downgrades viability of the transit option forcing people and goods to share the enhanced road system, ▪ requires significant investment in capital works and high property acquisition costs due to lack of road right-of-way for extensive widening. ▪ implies a higher unit travel cost by general public who will have no alternative to auto use on the enhanced road system. Increase in time-related costs is considered less significant assuming road capacity increases can be achieved.	▪ Use of existing rail or provincial highway rights-of-way offers limited opportunities to support regional/municipal O.P. urban form and development pattern objectives. ▪ Improves goods movement by providing some reduction in auto volumes on arterial roads. ▪ Requires significant investment in capital works and inter-regional transit operation and maintenance. ▪ Longer term congestion related costs for goods and people movement will still increase for intra-regional travel.	▪ Improvement such as a rapid transit network supports Region's O.P. centres and corridors urban form and municipal development objectives. ▪ Improves goods movement by providing some reduction in auto volumes on arterial roads. ▪ Requires substantial investment in capital works and regional transit operation and maintenance. ▪ Reduces land acquisition costs for transportation facilities by promoting greater use of high capacity vehicles. ▪ Offers a lower unit travel cost option to the general public.
	◔	◑	◔	◑	◕
An Effective Transportation Strategy to Meet Travel Demand ▪ their capacity to contribute to the forecast travel demand at the 2031 horizon year; and ▪ the long-term growth capacity is also considered in this category.	Forecast major shortfall in corridor road capacity (8-14 traffic lanes each direction) indicates that ▪ relying on existing systems is not an effective strategy to future intra- and inter-regional travel needs, ▪ system operational performance will be severely degraded.	Forecast continuing shortfall in corridor road capacity (7-13 traffic lanes each direction) indicates that: ▪ focus on auto-based system without TMP rapid transit initiative is not an effective strategy to future intra- and inter-regional travel needs, ▪ local transit system operational performance will be severely degraded. ▪ Increase in transit person trips is only between 0 and 300.	▪ Requires 7-11 arterial lanes in addition to current commitments to provide 2031 capacity. ▪ Largely eliminates road capacity shortfall but provides limited reserve capacity for long-tern growth. ▪ Relies primarily on auto use for connectivity to inter-regional transit services. ▪ Strategy discourages the use of committed transit services.	▪ Forecast continuing shortfall in corridor road capacity (7-13 traffic lanes each direction) indicates this strategy cannot increase transit mode split for shorter intra-regional trips. ▪ Requires enhanced local transit service and large park-and-ride lots to attract ridership and reach employment centres. ▪ Enhanced bi-directional inter-regional rail and 400 series service offers long-term reserve capacity for some origin-destination pairs. ▪ Strategy increases transit person trips only between 300 and 1,200 (depending on screenlines). ▪ Auto use reduces between 960 and 1,000 person trips.	▪ Rapid transit in dedicated lanes largely eliminates road capacity shortfall and provides reserve transit capacity for long-tern growth. ▪ Provides improved access and connectivity to inter-regional services operating in Region. ▪ Offers long-term growth capacity for several origin-destination pairs. ▪ Strategy increases transit person trips between 4,400 and 5,600 (depending on screenlines). ▪ Auto use reduces between 1,400 and 4,200 person trips.
	◔	◑	◕	◑	●

LEGEND: Least Responsive ○ ◔ ◑ ◕ ● Most Responsive

are not included in some of the screenline totals (e.g. freeway express bus services on Highway 400 and the Bradford GO Rail Service).

Not surprisingly, the only option that could contribute to significant improvements in transit mode shares is an option involving public transit improvements, and in particular rapid transit. With the combination of transit improvements considered, mode shares could be expected to more than double across several of the screenlines.

Table 3-3
Effect of Alternative Strategies on Transit Mode Share

Corridor	Screenline	Direction	AM Peak Period Transit Modal Shares Including GO Rail						
			Existing	Do Nothing	Current Commitments + Priority Transit + TDM (Base Case)	Road Expansion	Enhanced RH Commuter Rail & Inter-regional Bus Service	York Rapid Transit Corridor Initiatives	Rapid Transit Corridor Initiatives vs. Base Case (% change)
Yonge Street*	N of Steeles	NB	11%	10%	9%	9%	9%	13%	*43%*
	N of Steeles	SB	24%	40%	39%	39%	40%	50%	*27%*
	S of Carrville/ 16th	NB	7%	5%	5%	5%	5%	6%	*32%*
	S of Carrville/ 16th	SB	17%	32%	33%	33%	33%	41%	*23%*
	S of Stouffville	NB	5%	4%	4%	4%	4%	5%	*24%*
	S of Stouffville	SB	14%	33%	34%	34%	35%	40%	*15%*
Highway 7	E of Highway 50	EB	1%	1%	1%	1%	2%	3%	*86%*
	E of Highway 50	WB	0%	1%	1%	1%	1%	2%	*179%*
	E of Highway 400	EB	4%	4%	4%	4%	4%	14%	*256%*
	E of Highway 400	WB	4%	4%	4%	4%	4%	12%	*191%*
	W of Yonge	EB	12%	13%	13%	13%	14%	20%	*55%*
	W of Yonge	WB	7%	9%	9%	9%	13%	18%	*114%*
	E of Yonge	EB	9%	10%	9%	9%	10%	16%	*84%*
	E of Yonge	WB	15%	20%	23%	23%	24%	28%	*22%*
	W of Highway 404	EB	6%	6%	6%	6%	6%	11%	*95%*
	W of Highway 404	WB	11%	14%	14%	14%	14%	20%	*47%*
	W of McCowan	EB	6%	5%	5%	5%	6%	12%	*167%*
	W of McCowan	WB	13%	23%	22%	22%	25%	27%	*19%*
Vaughan Link	S. of Highway 7	NB	20%	13%	13%	13%	15%	30%	*138%*
	S. of Highway 7	SB	9%	10%	9%	9%	8%	40%	*369%*
Markham Link	S of Finch	NB	16%	15%	13%	13%	14%	18%	*38%*
	S of Finch	SB	20%	26%	24%	24%	26%	27%	*11%*
	N of Steeles	NB	7%	7%	6%	6%	7%	12%	*85%*
	N of Steeles	SB	10%	19%	16%	16%	20%	23%	*39%*
	S of 14th Avenue	NB	6%	6%	5%	5%	6%	10%	*88%*
	S of 14th Avenue	SB	8%	17%	15%	15%	18%	21%	*40%*
	S of Highway 7	NB	5%	5%	5%	5%	7%	11%	*105%*
	S of Highway 7	SB	10%	19%	16%	16%	19%	19%	*20%*
* Note: Yonge Street Screenlines include ridership from both the Richmond Hill and Bradford GO Lines									

4. FORECAST OF TRAVEL DEMAND WITH PUBLIC TRANSIT IMPROVEMENTS

4.1 SETTING FOR THE PROPOSED YONGE STREET PUBLIC TRANSIT IMPROVEMENTS

4.1.1 Existing Transit Travel Patterns

Existing transit ridership to, from and within York Region is approximately 48,000 trips per weekday on services provided by all operators (York Region Transit (YRT), Toronto Transit Commission (TTC) and GO Transit) and modes (local bus, express bus and commuter rail). In the past, most of this ridership has had an ultimate origin or destination in Toronto, either via the TTC subway (the Yonge or Spadina Lines) or GO Transit commuter rail or bus services to Union Station in downtown Toronto. However, data from the recently completed *2001 Transportation Tomorrow Survey* indicates that the proportion of trips destined to Toronto by all modes is decreasing. This trend towards greater intra-regional trip-making stems from the growth in employment opportunities within the region. This pattern is now bringing into focus the lack of a frequent, region-wide transit service as a travel alternative for internal trips resulting in the very low transit mode-share.

Currently transit services in the Yonge Street Corridor include buses operated by YRT, TTC, and GO Transit on Bathurst Street, Yonge Street, and Bayview Avenue and the Richmond Hill GO Rail line. Together they carry approximately 18,000 transit passengers per day crossing the screenline at Steeles Avenue. Out of this, GO Transit buses carry the largest share at 45%, with the rest of the ridership equally split between YRT bus routes (28%) and the Richmond Hill GO Line (27%).

Richmond Hill GO line caters almost entirely to transit passengers travelling to Toronto. It carries approximately 2,400 passengers per day downtown in the morning peak and in the reverse direction in the evening peak period. Some 70% of these GO Rail users board the trains at Richmond Hill, with the rest boarding at GO Langstaff Station.

Of the bus services serving the Yonge Street Corridor, the GO Transit's Newmarket "B" and YRT's Route #99 Yonge C are the major service routes in terms passengers carried. Transit passenger counts carried out in February 2003 at the Finch YRT/GO terminal show that these two routes served about 1,600 passengers arriving and 400 departing during the morning 3-hour peak period (6:00 a.m. to 9:00 a.m.). Similar numbers of passengers use these services in the evening peak periods. Along with the YRT's Bayview service, these routes provide for the major transit travel market within the corridor between 19th Avenue and Finch Subway Station.

YRT bus services in the Yonge Street Corridor include some of the heavily used services of the YRT, such as Route #1 Highway 7, Route #77 Highway 7, Route #5 Clark, Route #2 Milliken, Route #88 Bathurst, and Route #99 Yonge C. Except for the #88 Bathurst and to some extent the #1 Highway 7, most of the YRT routes do not run as north-south trunk routes. Instead, they primarily serve passengers travelling from the east and west and accessing the Finch Subway station to other parts of the City of Toronto.

4.2 TRANSIT RIDERSHIP PROJECTIONS

On the basis of the recommendations of the Region's TMP, it was concluded that public transit improvements in the Yonge Street Corridor should take the form of the primary north-south spine of the proposed York Rapid Transit Network. This section summarizes the projected ridership on an improved public transit service in the Yonge Street Corridor during the planning period. The TMP developed forecasts for three planning horizons, namely 2011, 2021 and the long term 2031. For analysis of the alternative methods of implementing the rapid transit network, the 2021 horizon year was selected as representing 20 years from the 2001 base year to which the model was calibrated. This period is typically used as the timeframe over which demographic trends and travel patterns can be predicted with reasonable reliability. Passenger volumes on the southern portions of the corridor are made up of transit riders entering the transitway from zones north of the 19th Avenue limit of the undertaking (e.g. Oak Ridges, Aurora and Newmarket), riders transferring from east-west services crossing the transitway and those boarding along the transitway itself.

4.2.1 The Demand Forecasting Model

The transportation demand forecasting model described in Chapter 3 and used for analysis of the response of alternative transportation solutions to long term travel demand was again used to develop forecasts of the ridership to be carried by the improved public transit alternative.

Consequently, demand forecasts presented in this chapter reflect the potential ridership attracted to rapid transit service operating on the planned network in the 2021 demographic scenarios outlined below. The performance characteristics (speeds, headways) assumed for the service are also identified in the following discussion.

4.2.2 Modeling Scenarios and Assumptions

The following sections present the assumptions used to derive the 2021 York Region Rapid Transit Plan ridership forecasts for a network of rapid transit service in the YRTP corridors.

4.2.2.1 Population and Employment

Population and employment projections at the traffic zone level from the OP forecasts provided by York Region and the City of Toronto have been used. No modifications were made to concentrate future development in nodes and corridors served by YRTP, which typically occurs with the introduction of new rapid transit facilities. This reflects a conservative assumption for the development of YRTP ridership forecasts.

Table 4-1 shows the population and employment projections to 2021 in tabular form, along with the trend in the past 15 years (1986 to 2001) for York Region municipalities and other Regions in the GTA. This growth is also shown graphically in **Figures 4-1 to 4-4**.

Population and employment growth and its spatial distribution will have an impact on the travel pattern and trip demand in the Yonge Street Corridor. Of the 423,000 growth in York Region population in the 2001-2021 period, about 30%, or 122,000 will be concentrated in the three municipalities (Aurora, Newmarket, and Richmond Hill) served by the corridor. Similarly, approximately 30% of the employment growth of 269,000 in York Region will be within these three municipalities. A portion of the growth in Markham and Vaughan south of Highway 7 will also contribute to potential corridor ridership.

Strong employment growth in the central area Planning District 1 (PD1), in Toronto will also result in high growth in travel demand between York Region and PD1. The Yonge Street Corridor being the major spine through York Region connecting it with Toronto, also serves the travel market from parts of Vaughan and Markham to PD1 and the rest of Toronto. Vaughan and Markham together account for 52% of the growth in York Region population to 2021.

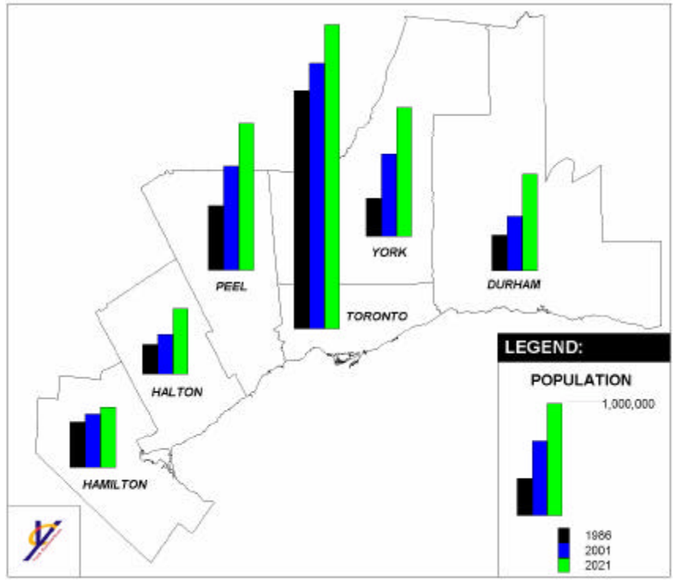


Figure 4 1
GTA/Hamilton Population Growth: 1986 – 2021

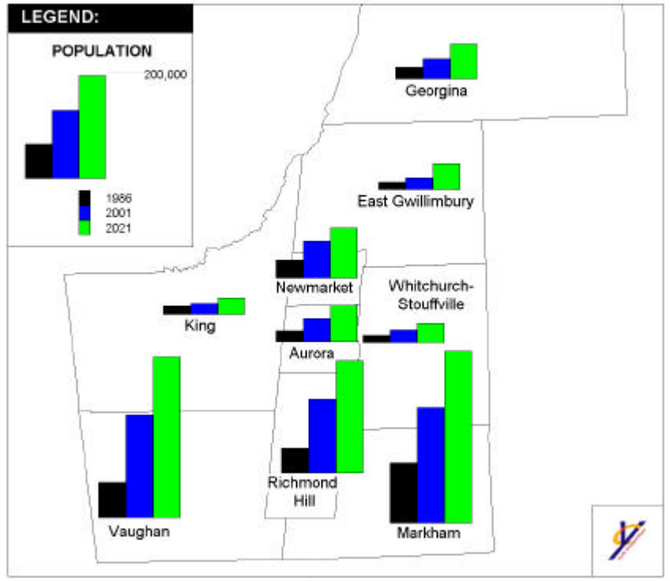


Figure 4-3
York Region Population Growth: 1986 – 2021

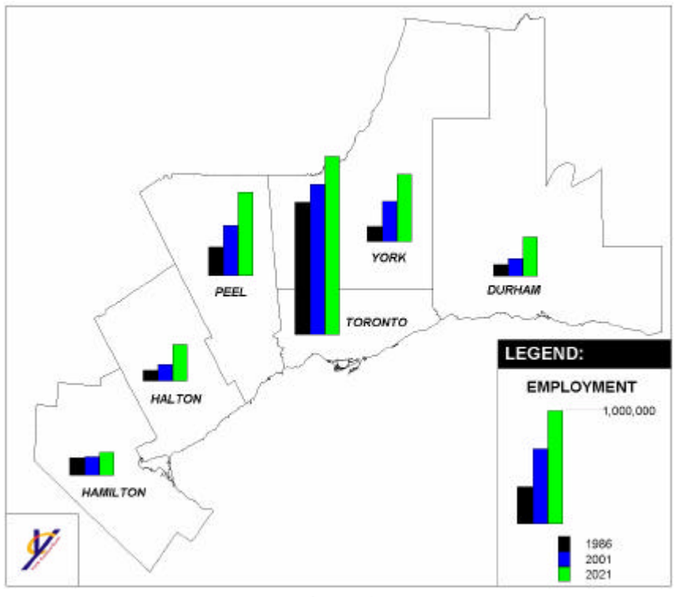


Figure 4-2
GTA/Hamilton Employment Growth: 1986 – 2021

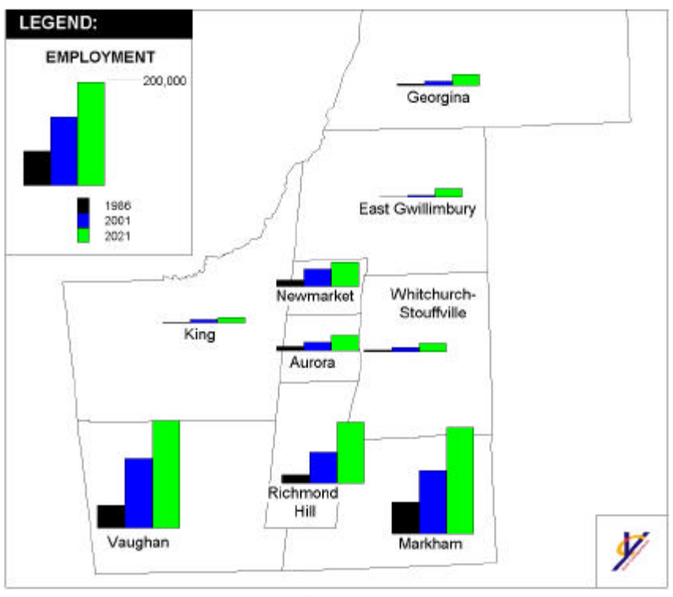


Figure 4-4
York Region Employment Growth: 1986 – 2021

Table 4-1
Population and Employment -York Region and GTA/Hamilton, 1986 – 2021

REGION/ MUNICIPALITY	POPULATION				1986-2001 Growth		2001-2021 Growth	
	1986	2001	2011	2021	Absolute	%	Absolute	%
YORK REGION	**353,300**	**772,000**	**1,008,000**	**1,195,000**	**418,700**	**119%**	**423,000**	**55%**
Aurora	20,900	43,000	56,000	69,000	22,100	106%	26,000	61%
East Gwillimbury	14,600	23,000	32,000	51,000	8,400	58%	28,000	122%
Georgina	22,600	39,000	51,000	67,000	16,400	73%	28,001	72%
King	16,000	20,000	25,000	32,000	4,000	25%	12,000	60%
Markham	115,100	218,000	281,000	326,000	102,900	89%	108,000	50%
Newmarket	35,300	71,000	87,000	95,000	35,700	101%	24,001	34%
Richmond Hill	47,200	140,000	191,000	212,000	92,800	197%	72,001	51%
Vaughan	66,500	194,000	254,000	305,000	127,500	192%	111,000	57%
Whitchurch-Stouffville	15,100	24,000	31,000	38,000	8,900	59%	14,000	58%
OTHER	**3,826,600**	**4,792,100**	**5,681,700**	**6,226,000**	**965,500**	**25%**	**1,433,900**	**30%**
PD1	132,000	152,200	217,700	241,400	20,200	15%	89,200	59%
Rest of Toronto	2,066,200	2,298,500	2,502,400	2,558,700	232,300	11%	260,200	11%
Durham	330,000	502,800	710,000	900,000	172,800	52%	397,200	79%
Peel	599,400	967,000	1,214,500	1,351,800	367,600	61%	384,800	40%
Halton	274,400	371,800	505,900	607,400	97,400	35%	235,600	63%
Hamilton	424,600	499,800	531,200	566,800	75,200	18%	67,000	13%
REGION/ MUNICIPALITY	**EMPLOYMENT**				**1986-2001 Growth**		**2001-2021 Growth**	
	1986	2001	2011	2021	Absolute	%	Absolute	%
YORK REGION	**152,300**	**386,000**	**540,000**	**655,000**	**233,700**	**153%**	**269,000**	**70%**
Aurora	7,300	16,000	22,000	30,000	8,700	119%	13,999	88%
East Gwillimbury	1,000	5,000	9,000	16,000	4,000	400%	11,000	220%
Georgina	4,100	8,000	13,000	20,000	3,900	95%	12,000	150%
King	2,100	6,000	8,000	11,000	3,900	186%	5,000	83%
Markham	60,600	119,000	169,000	200,000	58,400	96%	81,000	68%
Newmarket	12,600	33,000	41,000	45,000	20,400	162%	12,000	36%
Richmond Hill	16,600	59,000	94,000	115,000	42,400	255%	56,000	95%
Vaughan	44,000	132,000	172,000	202,000	88,000	200%	70,000	53%
Whitchurch-Stouffville	4,000	8,000	12,000	16,000	4,000	100%	8,000	100%
OTHER	**1,961,300**	**2,462,900**	**3,092,400**	**3,473,600**	**501,600**	**26%**	**1,010,700**	**41%**
PD1	410,100	423,000	480,800	523,900	12,900	3%	100,900	24%
Rest of Toronto	868,200	1,030,600	1,134,400	1,195,000	162,400	19%	164,400	16%
Durham	118,200	166,900	279,800	374,000	48,700	41%	207,100	124%
Peel	280,800	488,300	703,800	799,100	207,500	74%	310,800	64%
Halton	107,000	166,600	281,900	351,900	59,600	56%	185,300	111%
Hamilton	177,000	187,500	211,700	229,600	10,500	6%	42,100	23%

Sources: Regional Official Plans; Greater Toronto Coordinating Committee (Durham)

4.2.2.2 Base Assumptions for Demand Modelling

The following key assumptions provide the basis for generating 2021 travel demand forecasts for the YRTP Network Scenario, as described below:

Road Network: Improvements to the arterial road system in York Region based on the 10-year York Region capital programme have been incorporated in the model. Expansion of the provincial highway system within the Region included the proposed extensions of Highway 427 and Highway 404, and the widening of Highway 400.

York Region Transit (YRT) Network: For transit improvements at the 2021 planning horizon, most of the recommendations from the *York Region Transit 5-Year Service Plan: Conventional Transit* are assumed to have been incorporated. This includes route extensions, transfer of YRT services to TTC service extensions, other route restructuring, and new

services in newly developed and previously unserviced areas. The base transit system in York Region for each horizon year is defined by York Region Transit's Five-Year Service Strategy route structure. The main components include:

- Route extensions to new areas of development;
- Re-orientation of existing routes to connect to York University/ Downsview TTC Station, Don Mills TTC Station and new GO Rail stations;
- Enhancements including the filling in of a basic grid system; and
- Enhanced continuous through-services, between York Region and Toronto.

YRT Route Restructuring: the following YRT services are assumed to be removed to avoid duplication with Quick Start or YRTP services:

- YRT Highway 407 Express Buses – Markham;
- YRT Highway 407 Express Bus – Unionville;
- GO Yonge 'B' Bus.

GO Rail: Increased services in all GO Rail corridors, consistent with GO Rail's 10 Year Capital Plan and 2021 Plan. This includes full all-day service on the Bradford, Richmond Hill and Stouffville GO Rail lines and new GO Stations located at Kennedy/Bloor-Danforth Subway and Leslie/Sheppard Subway.

GO Bus: Highway 407 Express Bus added to network, with York Region stops at Unionville, Langstaff and York University. A peak period headway of 10 minutes is assumed.

TTC: Rapid transit system is based on the present system, with extension of the Spadina Subway assumed to York University by 2021.

Socio-economic Factors: The model utilizes three transit friendliness measures within the mode choice sub-model, relating to urban density, land use mix, and auto ownership. The first two were estimated using population and employment forecasts at the traffic zone level. Auto ownership has been projected using a multi-variate auto-ownership model, relating car-ownership with such variables as average household income, household size, level of transit service, and urban density.

Auto Costs: Parking costs in real dollars are assumed to increase by 15% over existing conditions within the City of Toronto. The existing spatial coverage of parking costs will expand, consistent with strategies of the Toronto Parking Authority. Within York Region, a $5 parking charge is assumed at major nodes (e.g. Markham Centre, Vaughan Corporate Centre) and at employment locations in the YRTP corridors of Yonge Street and Highway 7. No parking charge is assumed at GO stations.

Fares: Current fare structure is assumed with the YRT three-zone system, GO Transit fare by distance and TTC flat fare. No increase in fares in real dollars is assumed for TTC, GO Transit and YRT services. YRTP is assumed to have the same fare as YRT services, with free transfers between YRT and YRTP services.

Fare Integration: It is assumed that current fare policies would be in effect in 2021, with no fare integration between TTC and YRT/YRTP and a double fare for many short cross-boundary transit trips across the York/Toronto boundary, consistent with current policies.

Service Policies: Closed door services of YRT/YRTP routes in Toronto is assumed. This reflects current policies, with YRT services operating in Toronto not permitted to serve internal Toronto trips.

4.2.2.3 YRTP Networks

The YRTP networks are assumed to operate in all four YRTP corridors. The rapid transit program, planned for implementation in stages commencing in 2005, is designed to begin building long-term rapid transit ridership and serve the Region's Corridors and Centres land use plans designed to support higher transit usage.

For purposes of this report, full implementation of YRTP is modelled assuming Bus Rapid Transit (BRT) in each of the four corridors. The ultimate YRTP network configuration could involve combinations of BRT, Light Rail Transit (LRT) or subway with the technology transitions taking place over time as required by demand and when funds are available. BRT ridership levels are also considered representative of the potential ridership that might be achieved with LRT technology operating the same corridors.

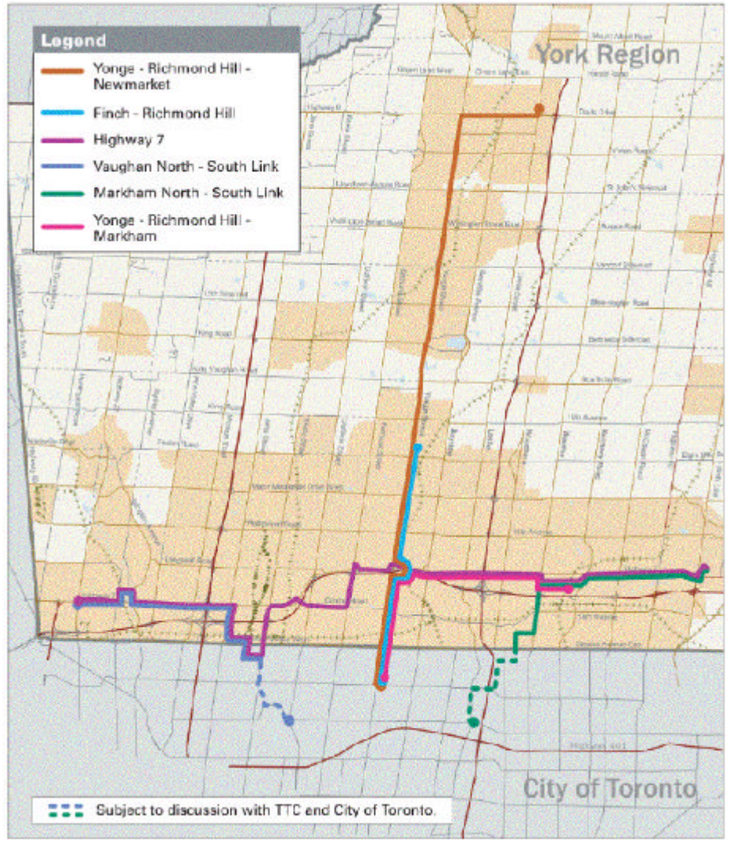
In the scenario modelled, BRT is assumed to be operating in dedicated bus lanes with traffic signal priority treatment at signalized intersections and other transit priority treatments, as required to maximize transit operations.

Route Structure

The route structure for YRTP services is comprised of six services as described below and shown in **Figure 4-5**.

Yonge: Newmarket-Finch TTC – An all day service operating on Yonge Street between Newmarket and the TTC Finch subway station in Toronto.

Markham Centre-Finch TTC – A peak period only service operating from Markham Centre on Highway 7 to the TTC Finch subway station via



Note: Alignments are representative; final alignment to be determined through the EA process

Figure 4-5
York Rapid Transit Plan Network

Highway 7, the Richmond Hill Centre Intermodal Terminal and Yonge Street.

Highway 7 – An all day service operating on Highway 7 between Markham-Stouffville Hospital in Markham and Highway 27 in Woodbridge with the route deviating to serve York University using a loop to the university via Keele Street and Jane Street.

Vaughan-Downsview TTC – An all day service operating on Highway 7 from Highway 27 to Jane Street, extending south to York University.

Markham-Don Mills TTC – An all day service operating on Highway 7 from Markham-Stouffville Hospital in Markham through Markham Centre to south on Warden Avenue, west on Denison Street, south on Esna Parkway,

continuing south on Pharmacy Avenue, west on Finch Avenue to Seneca College, south on Don Mills Road to the TTC Don Mills subway station.

Speed and Headway

Table 4-2 shows the speed and headway assumptions for YRTP services. The speeds are indicated by corridor segment and are based on speed and delay studies of existing conditions in the respective YRTP corridors, and estimates of performance based on posted speed limits, stop spacing, level of transit priority and other factors. Lower speeds are assumed on the Yonge Street Corridor south of Highway 7, given the high volume of buses, in the order of 80-120 buses per hour, in the peak direction.

Table 4-2
Speed and Headway Assumptions

Corridor/Segment	Segment Length (km)	YRTP (BRT)	
		Speed (km/h)	Service Frequency (Buses per Hour)
Yonge Street			
Finch Station to Steeles	1.9	20	120
Steeles to Hwy 7/ Richmond Hill Centre	4.3	25	120
Highway 7/ Richmond Hill Centre - Major Mackenzie	4.0	25	120
Major Mackenzie to 19th Avenue	4.1	25	120
19th Avenue to Newmarket	21.1	35	60
Finch Station to Newmarket	35.4	29.6	
Highway 7 (West)			
Highway 27 to Islington	5.8	35	30
Islington to Highway 400	4.3	30	30
Highway 400 to York U.	3.3	30	30
York U. to Yonge	13.6	35	30
Highway 7 (East)			
Yonge to Bayview	1.9	35	30
Bayview to Leslie	2.0	35	30
Leslie to Woodbine	2.1	35	30
Woodbine to Warden	2.1	30	30
Warden to Kennedy	2.5	35	30
Kennedy to MSH	8.1	35	30
Highway 27 – MSH	45.6	33.1	
Vaughan NS Link			
Highway 7 to Steeles	2.1	30	30
Steeles to York U.	2.2	30	30
York U. to Downsview TTC	5.9	30	30
Markham NS Link			
Markham Centre to Highway 407	1.7	30	30
Highway 407 to Steeles	3.0	30	30
Steeles to Don Mills TTC	6.3	30	30

Stations

The station spacing is assumed to be approximately one kilometre in the denser, built-up portions of the corridors and two kilometres in the lower density areas. The following inter-modal stations are assumed in York Region, allowing transfers between Go Rail, YRT/YRTP, and park-and-ride facilities:

- Richmond Hill Centre Intermodal Terminal – interface between YRTP/YRT services and the GO Richmond Hill Line and GO Highway 407 BRT;
- Unionville/Markham Centre Station – interface between YRTP/YRT and GO Stouffville Line and GO Highway 407 BRT; and
- York University Station - interface between YRTP/YRT services and the GO Bradford Line and GO Highway 407 BRT.

YRTP services extending into the City of Toronto will link to the TTC subway system at Finch Station (Yonge Line), York University Station (on an extended Spadina Line) and Don Mills Station (Sheppard Line).

Park-and-Ride Facilities

Table 4-3 shows the assumed location and number of parking spaces at park-and-ride lots serving YRTP services in 2021. Approximately 2,000 parking spaces are assumed for the 2021 model runs, with Richmond Hill Centre Intermodal Terminal at Yonge/Highway 7 as the main location. The Finch park-and-ride lot at the northern terminus of the Yonge Subway line is assumed at its current capacity.

Table 4-3
Park and Ride Lot Capacities

YRTP Corridor	Station	No of Parking Spaces
Yonge	Richmond Hill Centre (Langstaff) *	1,250
	19th/Gamble	200
	Bloomington	200
	Aurora	100
	Newmarket W	150
	Newmarket E	150

* Assumes 50% of the 2,500 spaces used by YRTP and 50% by GO Rail.

4.3 2021 RIDERSHIP FORECASTS

The following section presents the 2021 ridership forecasts for rapid transit services in the Yonge Street Corridor. BRT/LRT in dedicated lanes with extensive transit priority treatments is assumed, with each service operating on a one or two minute headway during peak periods. With blending of services between Finch Avenue and Highway 7, the effective rapid transit headway is 30 seconds over in this section.

4.3.1 Rapid Transit Passenger Volumes

Table 4-4 presents a 2021 ridership summary for the three YRTP services using Yonge Street. The peak hour volume in the peak direction is 6,800 at Steeles Avenue, comprising 1,000 passengers each on the Finch-Richmond Hill and Finch-Markham services, with the rest on the Finch-Newmarket service. The service from Newmarket is operated as an express south of Bernard with stops at Richmond Hill Centre and Finch terminal station. On a daily basis, the Yonge rapid transit services are forecast to carry approximately 85,000 riders.

Table 4-4
2021 Ridership Summary

Statistic	Finch - Richmond Hill	Finch - Newmarket	Finch - Markham (via Richmond Hill Centre)	Total
Headway (min)	2	1	2	
Average Speed (km/h)	32	33	30	
Route length (km)	15.1	36.1	16.7	67.9
AM Peak (3-Hour) Period				
Passenger Boardings	4,300	16,500	3,450	24,250
Passenger-km	15,300	206,600	20,000	242,200
Peak Hour Volume	1,000	4,800	1,000	6,800
Peak Point Location	SB @ Steeles	SB @ Steeles	WB @ Bayview	SB @ Steeles
Daily Boardings	15,100	57,800	12,100	85,000

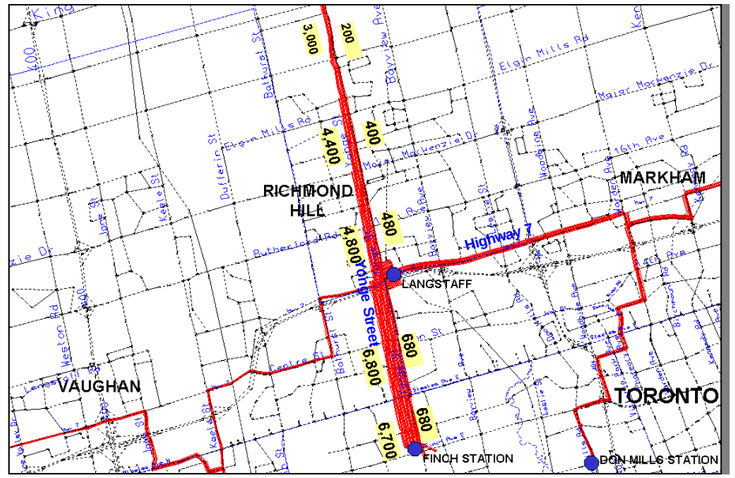


Figure 4-6
AM Peak Hour Link Volume – 2021 BRT

Figure 4-6 provides a plot of the link volumes for the rapid transit services, with total loadings at various sections of the network. On Yonge Street, the AM peak hour, peak direction volume increases from about 3,000 north of Elgin Mills to 4,800 at Richmond Hill Centre with the maximum of 6,800

passengers per hour at Steeles Avenue. South of Steeles Avenue, rapid transit vehicles would operate with TTC services and the YRTP Model estimates that the 2021 peak hour volume on TTC services on Yonge Street approaching Finch Station would be approximately 3,400 passengers per hour. These represent very significant volumes in York Region and Toronto, being near or at the practical limit of what can be effectively carried with at-grade BRT or LRT services.

Early in the rapid transit program and prior to the construction of new dedicated transitway infrastructure, York Region proposes to introduce new services with rapid transit characteristics but operating in mixed traffic with signal priority measures. This initiative is not part of the scope for this EA. Ridership on these services has also been modelled and is included as a Base Case in the discussion below for comparison to provide an indication of the attractiveness of full-featured BRT service.

Table 4-5 shows various ridership indicators such as peak volume, boarding, alighting, and passenger-km by segment within the corridor, for the AM peak hour for the Base Case and full YRTP (BRT) scenario. With YRTP services, the passenger boardings in the corridor is projected to increase from approximately 5,850 in the Base Case to 11,300, an increase of 93%. The peak load point volume at Steeles Avenue in the southbound direction increases from 4,000 to 6,700 (68%). Although smaller in magnitude, the maximum link volume for the segment from 19th Avenue to Newmarket more than doubles from 1,400 to 3,000.

Table 4-5
2021 AM Peak Hour Ridership by Segment for Yonge Corridor

Segment	Base Case				YRTP (BRT)			
	Link Volume (Peak Direction)	Ons	Offs	Passenger-km	Link Volume (Peak Direction)	Ons	Offs	Passenger-Km
Finch Station to Steeles	4,000	360	3,950	8,200	6,700	690	6,680	14,000
Steeles to Highway 7/ Richmond Hill Centre	4,100	1,080	800	19,000	6,800	4,060	2,280	31,200
Highway 7/ Richmond Hill Centre – Major Mackenzie	3,300	320	460	13,500	4,800	360	320	20,800
Major Mackenzie to 19th Avenue	2,800	1,550	320	10,600	4,400	1,530	620	18,000
19th Avenue to Newmarket	1,400	2,540	820	16,500	3,000	4,660	1,320	33,000
Corridor Total		5,850	6,350	67,800		11,300	11,220	117,000

a) York/Toronto Screenline Volumes

An examination of travel changes in the Yonge Street Corridor is shown in **Table 4-6** in the form of a screenline summary for Steeles Avenue from Bayview Avenue to Bathurst Street. The analysis compares peak period southbound passenger volumes in 2001 with 2021 BRT conditions. Over the 2001 to 2021 period, there is significant growth in total trips of approximately 43% in the corridor resulting from the large development growth projected in York Region and Toronto over this time period. With rapid transit service, transit ridership is projected to increase at a much higher rate, due to modal shift resulting from increased congestion and development densities in the corridor as well as a more viable transit alternative. With the introduction of rapid transit in the corridor, transit ridership for the AM peak period is projected to increase from 9,530 in 2001 to 22,610 in 2021. The corresponding modal split for the corridor (Richmond Hill/Aurora /Newmarket to Toronto) correspondingly increasing from 7% to 14% and from 59% to 78% for PD1 (see **Table 4-7**).

Table 4-6
AM Peak (3-Hour) Period Volume at Screenline North of Steeles (Bayview to Bathurst)

Service/Mode	2001 - Modelled		2021 – BRT	
	SB	NB	SB	NB
TTC / YRT / GO Bus	6,380	1,250	4,420	280
GO Rail*	3,150	-	5,790	-
YRTP Routes on Yonge	-	-	12,400	1,500
Transit subtotal	9,530	1,250	22,610	1,780
Auto-person trips	14,560	6,430	16,700	6,900
Park/kiss-and-ride trips	3,150		700	
Total	**27,240**	**7,680**	**40,010**	**8,680**

***** GO Rail includes Richmond Hill and Bradford Line trips from Aurora and Newmarket

Trips attracted to BRT routes over the planning period, comprise those presently using local YRT/GO bus services that are slated to be replaced by rapid transit in the corridor as well as growth in ridership to northern zones in Toronto. The latter is due to the improved connections to the Yonge Subway and increased attractiveness of BRT/TTC for travel to the north part of Toronto's central area that is beyond walking distance or a short subway trip from Union Station. The remaining transit trips in the corridor are those attracted to the corridor from feeder services due to the improved service of the Yonge Street BRT services.

GO Rail ridership on the Richmond Hill and Bradford lines, consisting mainly of trips destined to Toronto's PD1 zone, is projected to increase by 2,600 or 83% by 2021.

b) Travel pattern and modal split

Table 4-7 provides travel characteristics for Richmond Hill/Aurora/ Newmarket for 2001 and 2021 BRT conditions, indicating changes in total trips, transit trips and transit modal split between major origin-destination pairs. Total travel from these towns in the Yonge Street Corridor is projected to grow by 46% (from 109,000 to 159,000) between 2001 and 2021, with the predominant growth markets being within York Region and to the City of Toronto. Transit trips from these towns are projected to almost double in absolute numbers (from 10,500 to 19,600) under the Base Case, and to approximately 23,000 with YRTP (an increase of 119% from existing). The absolute number of trips to other Regions is relatively small by comparison.

Table 4-7
AM Peak (3-Hour) Period Total Trips and Transit Modal Split

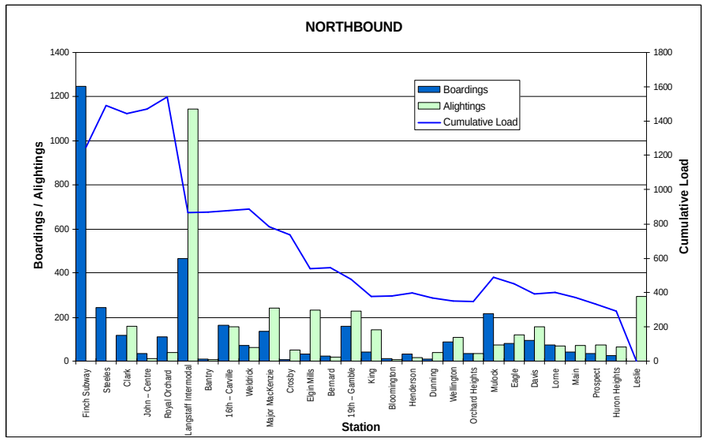
From	To	Total Trips (000's)			Transit Trips (000's)		Transit Modal Split	
		2001	2021	Growth	2001	2021-BRT	2001	2021-BRT
Richmond Hill + Newmarket + Aurora	RH + NM +Aurora	45.6	73.2	27.6	2.0	4.7	4.4%	6.4%
	Vaughan	8.3	13.0	4.6	0.2	0.6	2.0%	4.9%
	Markham	12.1	14.0	1.9	0.4	1.3	3.0%	9.2%
	PD1	10.3	15.0	4.6	6.1	11.6	59.3%	77.9%
	Rest of Toronto	23.5	27.7	4.2	1.7	4.0	7.4%	14.5%
	Other	9.1	16.0	6.9	0.1	0.5	0.8%	3.0%
Vaughan	Richmond Hill + Newmarket + Aurora	3.5	6.8	3.3	0.1	0.3	2.2%	4.5%
Markham		4.8	8.4	3.7	0.2	0.5	3.4%	6.4%
Toronto		10.7	13.7	3.0	0.5	1.2	4.5%	8.3%
Other		12.6	23.5	10.8	0.1	0.4	0.4%	1.8%
RH + NM +Aurora	**All**	109.0	158.9	49.9	10.5	22.7	9.6%	14.3%
All	**RH + NM +Aurora**	31.7	52.5	20.8	0.8	2.4	2.5%	4.7%
To / From / Within RH+NM+Aurora		186.3	284.6	98.3	13.3	29.9	7.1%	10.5%

c) Boarding and alighting patterns

Figure 4-7 presents the station boardings and alightings for the Yonge Street Corridor for the AM peak 3-hour period in a graphical form. The passenger boarding includes all those transferring from the east-west routes as well as the park-and-ride travellers accessing YRTP to travel to Toronto.

Richmond Hill Centre Intermodal Terminal is the major transportation hub on the YRTP network allowing transit riders from Vaughan, Markham, and Richmond Hill/Aurora/Newmarket to get between those places as well as to and from Toronto, highlighted by the boarding/alighting patterns. Passenger boardings at Richmond Hill Centre for the two Yonge Street YRTP routes during the AM peak (3-hour) period is of about 5,500 passengers, which represents 23% of the total boardings of 24,000 for the three routes.

For the three Yonge Street rapid transit services combined, approximately 12,000 passengers alight at Finch station to transfer to the subway during the AM peak (3-hour) period. Finch-Newmarket line carries approximately 9,300 passengers boarding the service north of Major Mackenzie Drive travelling southbound, which is approximately 50% of the southbound passenger boardings on this line. Boardings in excess of 1,000 passengers for the AM peak 3-hour period occur at the park-and-ride stations on Yonge Street at King, 19th Avenue/Gamble Road, Bernard, and Elgin Mills.



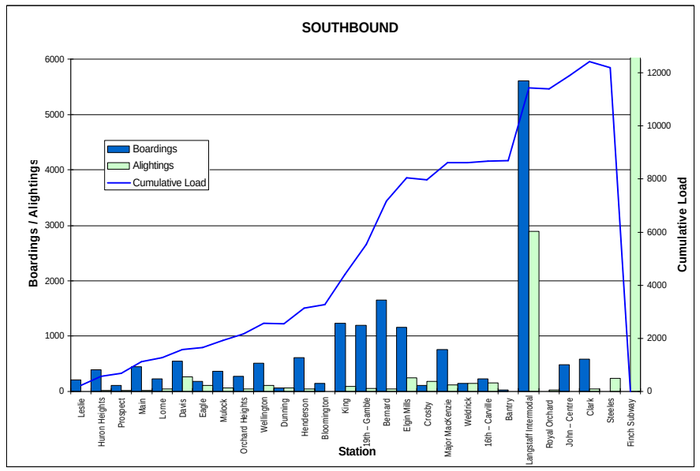


Figure 4-7
AM Peak (3-Hour) Period Boarding/ Alighting on Yonge Street Corridor – 2021 BRT

5. ALTERNATIVE METHODS OF IMPROVING PUBLIC TRANSIT

This chapter describes the analysis and initial screening of the alternative methods of improving public transit in the Study Area. Both the 1995 HOV/Rapid Transit Study and the Region's subsequent Transportation Master Plan (TMP), completed in 2002, recommended the introduction of rapid transit service as the most effective method of achieving a significant increase in transit mode split for the major travel patterns within the Region and across its boundary with Toronto. These studies analyzed a range of corridors leading to the rapid transit network of north-south and east-west corridors recommended in the TMP for implementation by 2031. As a first step in assessing the alternative methods, the findings of both prior studies provide the basis for the initial screening of north-south corridor alternatives.

Secondly, the potential rapid transit technologies are introduced and evaluated for application on the network. Following this network-wide technology screening, the analysis focuses on the Yonge Street Corridor Study Area for an assessment and initial screening of route alternatives. As a precursor to detailed evaluation of rapid transit alignments along the routes, described in Chapter 8, this chapter then compares generic alternatives for location of rapid transit infrastructure in a road right-of-way forming all or part of a route.

Finally, the alternative solutions for rapid transit vehicle maintenance are described and evaluated.

5.1 RAPID TRANSIT CORRIDORS

Primary corridor alternatives were developed mostly on the basis of potential ridership within the study area set up in the *York Region HOV/Rapid Transit Study* (1995) and Yonge Street Transitway *Need and Justification* Study (2002). As well, the location of the planned regional centres was a significant determinant in developing potential network configurations during these studies. The updated ridership analysis undertaken in the *Need and Justification* (*N&J*) study confirmed the findings of the *York Region HOV/Rapid Transit Study (HOV/RT Study)* as to the high demand corridors in the region. In addition, as outlined in the *HOV/RT Study*, the north-south corridors were separated geographically into two sections, namely north and south of the east-west transit corridor, Highway 7/407.

Corridor alternatives considered in these studies were:

- Highway 27;
- Highway 400/ Weston/ Jane/ Keele;
- Yonge/ Bathurst/ Dufferin/ Bayview;
- The Bradford and Richmond Hill GO Lines;
- Highway 404/ Leslie/ Woodbine; and
- Markham Road.

In view of the land use recommendations in the Region's Official Plan, Bathurst Street, Dufferin Street, Bayview Avenue and Markham Road were considered as options south of Highway 7/407 only. Also, the initial ridership screening conducted in the *HOV/RT Study* eliminated Highway 27 from further consideration.

South of Highway 7/407, the logical corridor for rapid transit to be linked efficiently to the existing Yonge subway line is within the Yonge Street right-of-way. It was noted that the use of any other corridor east or west of Yonge Street in this segment would significantly increase the route length and thus its construction cost. Also, it would increase travel time for all users without avoiding the road widening impacts necessary with all alternatives.

Further to the west, the logical corridor to link a York University extension of the existing Spadina Subway line to a Regional network is within the Jane Street right-of-way given the directness of the routing and the accessibility provided to the planned Vaughan Corporate Centre and adjacent development. This link, identified as the Vaughan North-South Link (VNSL) is being studied in detail in a concurrent EA study for York Region, the *Highway 7 Corridor and Vaughan North-South Link Public Transit Improvements*. South of Highway 7/407 in the east, the Highway 404/ Leslie/ Woodbine and Markham Road corridors are also being considered in detail in another study nearing completion, the *Markham North-South Link EA*.

North of the Highway 7/407 corridor, Weston Road, Jane Street, and Keele Street were eliminated in the *HOV/RT Study,* as the need for north-south rapid transit could be justified only in the central portion of the Region.

On the basis of potential ridership which would be attracted by rapid transit service in the remaining corridors, the *N&J Study* initial evaluation concluded that a transitway facility within/adjacent to the Highway 400 corridor would attract significantly less ridership relative to the other options. Accordingly, the Highway 400 corridor was dropped from further consideration due to the difficulty of providing good pedestrian access in the highway environment.

As a result, the analysis in the *N&J Study* focused on the Yonge Street and Highway 404 corridors in combination with sections of the GO transit Richmond Hill and Bradford rail corridors. It should be noted that the use of the northern GO Bradford rail corridor is being considered in a study, recently-initiated by the Region, the *North Yonge Street Corridor Public Transit Improvements EA*.

The analysis to select a preferred route within these remaining corridors is described later in this chapter in **Section 5.4**. Using existing transportation corridors such as these mitigates the impact of new rights-of-way on existing and planned development in the highly urbanized portions of the Study Area.

5.2 RAPID TRANSIT TECHNOLOGIES

5.2.1 Characteristics of Rapid Transit Technology Alternatives

Both *York Region's Transportation Master Plan* and the analysis and evaluation of alternative transportation solutions carried out during this EA have indicated that implementation of rapid transit service with the associated infrastructure will constitute an effective form of public transit improvement in the Yonge Street Corridor.

In the context of the above findings, the choice of the appropriate rapid transit technology for the service in the near and medium term must focus on cost effective surface rapid transit alternatives. An assessment of the suitability of the range of technologies currently proven in service in the industry during the TMP eliminated Diesel Multiple Units and Automated Guideway Transit from further consideration due to their incompatibility with requirements for insertion in the mature urban environment of the potential corridors. Also, the analysis concluded that it would not be possible to achieve the rapid transit performance objectives with a service based on conventional buses, other than in a feeder role.

The remaining surface alternatives included the bus rapid transit (BRT) or light rail transit (LRT) technology families. Also, in the evaluation and selection process, the need for flexibility to transition to a higher order technology becomes a key factor. In this context, extension of Toronto's heavy rail (subway) network is also discussed and considered in the network analysis although as noted later such extensions do not form part of the undertaking for this EA.

The selection of a rapid transit technology should utilize information on the specific situation produced by an objective EA. The general consensus of transit professionals is that there is no specific demand volume at which there is always a single, preferred surface rapid transit mode because of the importance of relative costs, benefits and impacts in decision making.

Two ridership level thresholds do, however, have important impacts on development of alternatives and mode selection:

- It is difficult to justify providing an exclusive lane for rapid transit if expected ridership is not higher than the number of people who would use the same road space in general traffic, i.e. 800-1,000 persons per hour on an arterial road lane or 2200-2400 per hour on a freeway lane;
- Above a certain demand level (7,000-10,000 persons per hour per direction), measures permitting BRT express service, partially grade separated rail transit (i.e., LRT) or fully grade separated rail transit (i.e. subway) are required to sustain reliable, high speed service.

Rapid transit modes and technologies can evolve in a particular corridor over time. As growth occurs and development patterns change, increases in transit demand may justify or even mandate more expensive and complex technologies over time. For example, rapid transit development in a corridor may begin with a conventional BRT service operating in mixed traffic with dedicated transit lanes along specific segments. Over time, as ridership increases, partially segregated transitways, station by-passes, larger, more complex vehicles, upgraded intelligent transportation systems and other technologies can be added. Eventually the point may be reached when ridership levels are so high that partially segregated LRT or even fully segregated heavy-rail transit could become warranted.

In addition, the subsequent EA demand forecasting, described elsewhere in this report, identified the likelihood that, ultimately, the southernmost segment of the corridor (Highway 7 to Finch Avenue) would experience demands warranting the total segregation of rapid transit from other modes. Given the right-of-way physical constraints and land use sensitivities in this segment, an underground alternative is the only practical ultimate solution, particularly south of Steeles Avenue.

In order to assess the effects of implementation and operation of rapid transit technologies on the environment it is essential to document the basic characteristics of each applicable technology family. As noted above, the candidate technologies for the Yonge Street Corridor are BRT and LRT and ultimately, subway in the southern segment. The characteristics of each are summarized below as background to the findings presented in subsequent chapters.

5.2.1.1 Bus Rapid Transit (BRT)

Transitway: BRT can operate mixed in with general traffic, and/or exclusive bus lanes, and/or segregated transitways. The operating speed, capacity and reliability increases with the degree of segregation from general traffic and grade separation.

Vehicle Technology: BRT may use either conventional buses or specialized rubber-tired BRT vehicles. Available propulsion options range from conventional diesel to clean diesel and CNG to turbine-electric hybrids and all-electric trolleys. Low-floor, multiple wide-door designs and optional guidance into stations speeds boarding and alighting thus reducing station dwell time. Vehicle lengths range from 12.2 metres to 18 metres for single units. 25.5 metres bi-articulated units are also used in some systems. Typical passenger capacities are 60 (single unit) to over 110 (bi-articulated unit) standing and seated passengers per vehicle.

System Capacity: Segregated BRT service with station bypass lanes is capable of handling over 12,000 persons per peak hour per direction, depending on the degree of segregation from other traffic and grade separation. The busiest BRT segment in North America, in downtown Ottawa, carries approximately 10,000 passengers per hour in the peak direction during the single peak hour. The practical capacity without overtaking capability at stations is in the 8,000 passenger per hour range.

Intelligent Transportation Systems (ITS): Contemporary BRT systems usually incorporate an ITS with an automatic vehicle location module that supports transit signal priority at intersections and real-time passenger information at stations, on-board and at home.

Stops or Stations: These generally comprise platforms varying in length from 15-55 m with shelters and passenger amenities. They are generally designed to be accessible by the disabled and may also include support facilities such as park and ride lots or passenger pick-up and drop-off areas. Station spacing is approximately 0.5 -1 km in built-up portions of corridors increasing to 2 km in lower density areas.

Off Board Fare Collection: Prepaid fares are required to reduce dwell times at stations and for passenger convenience. Options include fare gates and fare-paid, segregated platforms in stations and proof of payment systems using passes, smart cards or tickets.

Capital Costs: Total costs, including transitways, stations, ITS, vehicles, fare collection system, etc. range from $0.6M – $3.0M per two-way km for on-street BRT in mixed traffic using existing lanes to $15M - $30M for a partially segregated transitway with mostly at-grade intersections. Costs can increase to $60M+ per km for fully segregated, grade- separated segments. Implementation costs depend on the volumes to be carried, system complexity, the degree of segregation from general traffic and the type and degree of grade separation (e.g., at grade, in subway or elevated).

5.2.1.2 Light Rail Transit (LRT)

Transitway: LRT can operate mixed with general traffic (i.e. streetcar systems), and/or on exclusive lanes, and/or on segregated transitways. The operating speed, capacity and reliability increase with the degree of segregation from general traffic and grade separation.

Vehicle Technology: LRT vehicles range from all-electric to diesel propelled, high and low-floor car designs. Lengths vary from 14 metres (single unit) to 45 metres (bi-articulated unit). Typical passenger capacities are approximately 75 (single unit) to as high as 200 (bi-articulated unit) standing and seated passengers per car. Vehicles can be coupled to form up to 3 or 4 car trains depending on vehicle length and demand. Direct, no-step station platform to vehicle boarding and alighting through multiple wide doors, often on both sides of cars, can be provided.

System Capacity: LRT systems are capable of carrying up to 18,000 persons per peak hour per direction, depending on the degree of segregation from other traffic and grade separation. Approximately, 10,000 people per hour (peak hour, peak direction) use the busiest light rail segments in North America in downtown Calgary and on the Green Line in downtown Boston.

ITS: LRT systems have a signal system to control train operations, provide data and voice communications and enhance safety and security. Contemporary LRT systems also have ITS capabilities to provide transit signal priority at intersections and real-time passenger information at stations, on-board and at home.

Stops or Stations: These generally comprise platforms varying in length from 15 m (streetcars) to 90 m (multi-car trains) with shelters and passenger amenities. They are generally designed to be accessible by the disabled and may also include support facilities such as park and ride lots or passenger pick-up and drop-off areas. Station spacing is approximately 0.75 -1 km in built-up portions of corridors increasing to 2 km in lower density areas.

Off-board Fare Collection: Pre-payment of fares is required to reduce dwell times at stations, take advantage of efficiencies of train operation and for passenger convenience. Options include fare gates and fare-paid, segregated platforms in stations and proof of payment systems using passes, smart cards or date and time-validated tickets.

Capital Costs: Total costs including stations, ITS, vehicles, fare collection system, etc. range from $5M per km for single track diesel lines using former rail rights-of-way to $40M per double track km for partially segregated at-grade, electrified lines with mostly at-grade intersections. Fully segregated, grade separated electrified transitways can cost up to $100M per double track km. Implementation costs depend on volumes to be carried, system complexity, degree of segregation from general traffic and the degree and type of grade separation (e.g., at grade, underground or elevated).

5.2.1.3 Heavy Rail (Subway)

Running way: These high capacity systems require fully segregated and totally grade separated running ways.

Vehicle Technology: Vehicles always feature level, no-step station platform to vehicle boarding/alighting through multiple wide doors. Lengths vary from 15 m to 22.8 m (mostly single unit) coupled in trains of 4 to 8 cars. Passenger capacities are up to 185 standing and seated passengers per car. Power is usually collected from a third rail; although an overhead contact system (catenary wire) may be used in some cases (e.g., Boston MBTA Blue Line).

System Capacity: Up to 60,000 per peak hour per direction for a double track line. During the early nineties, the TTC carried over 30,000 passengers per hour on the Yonge line, south of Bloor Street in the peak direction during the peak hour. New York's Lexington Avenue Line carries over 63,000 passengers per hour per direction on a four track running way, two local, two express, with trains comprised of eight 23 m cars.

ITS: Heavy rail must have a signal system to control train operation, provide data and voice communications, and enhance safety and security. Some systems (e.g., Vancouver Sky Train) are fully automated. Contemporary heavy rail signal systems also provide real-time passenger information in stations, on-board and from home.

Stations: Generally underground or elevated with combinations of stairs, elevators and escalators to access platforms varying in length from 100 m to 200 m. Spacing is approximately 1 km in built-up portions of corridors to 3 km in less built-up areas.

Off-board Fare Collection: Fare pre-payment is required to reduce dwell times at stations, take advantage of efficiencies of train operation and for passenger convenience. Options include fare gates and fare-paid, segregated platforms in stations and proof of payment systems using passes, magnetic strip card, smart cards or date and time-validated tickets.

Capital Costs: Total costs, including cost of vehicles, ITS, and fare collection system range from $50 to $200M+ per double track km. Implementation costs depend on volumes to be carried, system complexity, and the type of grade separation (e.g., subway or elevated).

5.2.2 SCREENING OF ALTERNATIVE TECHNOLOGIES

5.2.2.1 Alternative Technologies

Candidate technologies for rapid transit in the Yonge Street Corridor outlined earlier in this chapter included BRT and LRT. As noted in **Section 7.2**, all alignment alternatives developed must meet the design criteria for both of the surface technologies, BRT and LRT.

The transit ridership forecasts for the planning period to horizon year 2021, described in **Chapter 4**, indicate that the peak direction passenger volume per hour at the peak load point in the corridor, about 6,800 to 7,100 pphpd across the across Steeles Avenue boundary, can be carried by both surface technology options. Therefore, within the study area, system capacity alone will not dictate technology selection during the planning period. Reliability of operations within congested portions of the corridor, particularly near the Toronto boundary will become a major consideration.

For example, on the short 2 km section between Steeles Avenue and Finch Subway Station, south of the Study Area, the peak volumes must be added to the passenger volumes likely to be carried by TTC bus services in 2021 (4,000 passengers per hour at present). The combined volumes are such that a surface rapid transit facility in this section in Toronto could become unreliable.

Consequently, at some point before 2021, the Yonge Street surface rapid transit system (the "Undertaking" in this EA) might have to be grade separated for reliable operation in the Toronto segment if the projected growth of transit demand materializes. Grade separation options, (e.g. an extension of the Yonge Subway into the Region or a 2 km underground segment for BRT or LRT), will likely be required in 10 to 20 years. Capacity and operational improvements of this nature south of Steeles Avenue, will require a subsequent EA study that should be commenced a suitable period in advance of implementation with the City of Toronto as a co-proponent. Alternatively, the effective service life of the surface transitway on Yonge Street in Toronto may be extended if GO Rail service enhancements on the three lines, serving downtown Toronto destined trips from the Region, continue to be implemented. Benefits of an extension of the Yonge Subway, potentially to Highway 7 are discussed later in this chapter.

5.2.2.2 Evaluation of Alternative Technologies

In order to assess the merits of various applications of the two surface rapid transit alternatives, BRT and LRT, a rapid transit network configuration analysis was undertaken to ensure that the findings of EA's for each corridor in the network support a comprehensive and coordinated network of rapid transit lines and technologies. This analysis was undertaken prior to making final recommendations in any single corridor, recognizing that decisions on investment and operations in one corridor will have impacts on the others and the network as a whole. The analysis summarized below focused on the relationships among the corridors, examining the degree to which decisions on technology, routing and termini in each corridor will influence, and in turn, was influenced by decisions in the other corridors.

After an initial screening and assessment of the effects of various Toronto Subway System extension options, the six network alternatives shown in **Figures 5-1 to 5-6** were compared. For the network evaluation, two sets of criteria were developed, one allowing a quantitative assessment and the other a qualitative comparison. The evaluation comprised analysis of the alternatives in terms of both sets with the combination forming the basis for selection of the preferred technology. Criteria used were the following:

5.2.2.2.1 Quantitative Criteria

- Capital cost (total cost of infrastructure and vehicles for entire length of route);
- Operating and maintenance costs (annual cost to operate service required for projected demand in 2021); and
- Ridership to be carried (link volume at the maximum load point in the peak hour, peak direction and the total incremental daily riders on the rapid transit network over and above the baseline alternative, bus service in mixed traffic with some signal priority).

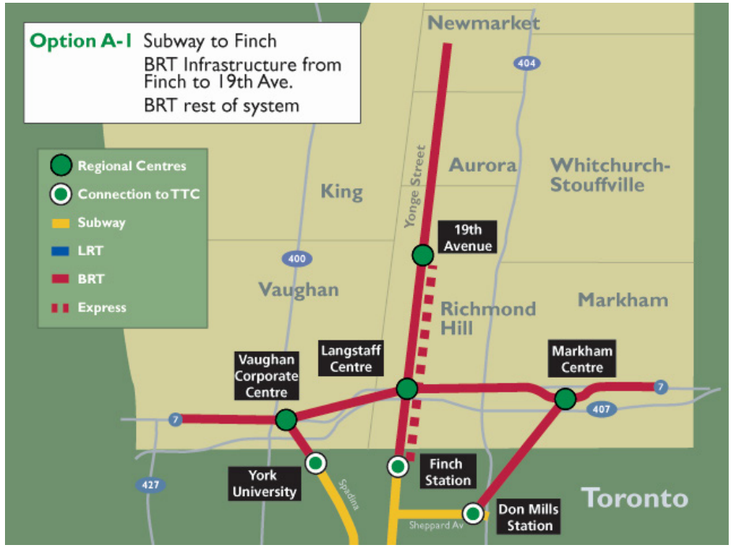


Figure 5-1
Option A-1 Subway to Finch BRT Infrastructure from Finch to 19th Avenue

Figure 5-3
Option A-3 LRT to Yonge Street / 19th Avenue

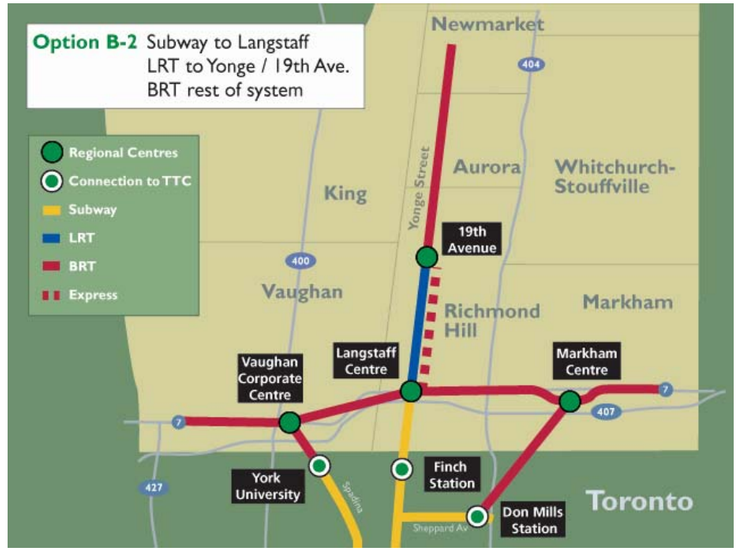


Figure 5-5
Option B-2 Subway to Langstaff

Figure 5-2
Option A-2 LRT to Yonge Street / 19th Avenue

Figure 5-4
Option B-1 Subway to Langstaff

Figure 5-6
Option B-3 Subway to Langstaff

5.2.2.2.2 Qualitative Criteria

- Network connectivity with each technology alternative (direct connections with other GTA operators and modes, service to logical termini, ability to provide direct service to most important markets);
- Quality of service provided by each technology alternative (expected total O/D trip times for key markets, speed and reliability at forecasted demand levels, proportion of service and ridership under conditions approaching capacity of alternative);
- Influence of technology alternative on land use (Smart Growth potential at planned station locations, ability to influence development along route);
- Effect of technology on environment (significant natural, social and heritage environmental issues); and
- Risk of technology choice (implementation time and difficulty, flexibility to address changes in expected markets, investment risk if system is upgraded/expanded or unexpected changes occur).

Also, assuming the Yonge Subway terminal remains at Finch Station, the study assessed the practical capacity of the existing and planned facilities for BRT and LRT alternatives between Finch Avenue and Steeles Avenue. It was determined that operating BRT and LRT vehicles in a shared right-of-way between Finch and Steeles Avenues was feasible, but would require reconfiguration of transit access to Finch Station. An allowance for this cost was included in the evaluation of capital cost estimates of both technology alternatives.

At this time, it is not possible to be more specific concerning infrastructure modifications at Finch Station to accommodate the significantly increased service levels expected in the future (e.g., a BRT or LRT ramp into the terminal or tunnel section). The need for, and nature of, modifications will depend on the conclusion of the transitway EA currently being carried out by the City of Toronto on the portion of Yonge Street between Steeles Avenue and Finch Station.

The results of the network evaluation are summarized in **Tables 5-1** and **5-2**. Actual numerical data reflect the relative merits of the alternatives for the quantitative criteria while, for the qualitative criteria, the alternatives have been assessed in terms of their response to the goals of each criterion. Findings are presented graphically depicting the rating incrementally from least desirable to most desirable.

Table 5-1
Evaluation Matrix (Quantitative)

	Baseline	A-1	A-2	A-3	B-1	B-2	B-3
Capital Cost (millions)	$525	$1,056	$1,800	$2,000	$2,700	$3,030	$3,230
Capital Cost in Region (millions)	$35	$35	$60	$60	$400	$400	$400
Annual O & M Cost (millions)	$72.5	$102	$99	$96.5	$108.5	$107.5	$104
Additional System Riders	N/A	30,000	30,000	30,000	42,500	42,500	42,500

Table 5-2
Evaluation Matrix (Qualitative)

	Baseline	A-1	A-2	A-3	B-1	B-2	B-3
Network Connectivity	⊙	◎	⊙	⊙	●	◎	⊗
Quality of Service	○	⊙	◎	◎	●	●	●
Land Use	○	⊙	◎	◎	⊗	●	●
Environmental Factors	⊙	⊙	◎	◎	●	●	●
Risk	○	●	◎	◎	●	◎	⊗

QUALITY RATING:
Least desirable ⊗ ○ ⊙ ◎ ● Most desirable

Based on this analysis of the alternatives, the following can be concluded:

1. The implementation of **Alternative A-1**, the all-BRT alternative as an initial phase, would provide a high proportion of the benefits of all of the other rapid transit systems examined.

2. The decision to convert rapid transit service from BRT to LRT will be based on the need to achieve the benefits of LRT technology or overcome potential deficiencies in BRT service noted below:

   - The higher capacity of LRT vehicles coupled to form trains reduces the frequency of transit movements through congested intersections and improves the overall reliability of the rapid transit service.
   - BRT service requiring vehicle frequency over 60 per hour without full grade separation is likely to lose attractiveness due to difficulties in maintaining schedule.
   - The need for more substantial, potentially grade-separated infrastructure at the key terminal locations such as Richmond Hill Centre and Finch subway station will justify design for, and operation of LRT technology at the outset.
   - Ridership levels resulting in significant loadings in LRT vehicles will yield reduced operating costs due to the improved driver/passenger ratio achieved with LRT.
   - If it becomes apparent that further northward extension of the Toronto Subway system into the Region on Yonge Street will never be affordable, initiating development of a rail-based rapid transit system in the Region will be an important catalyst in achieving the Region's Centres and Corridors land use planning objective.

3. The eventual extension of the Yonge subway to Highway 7 is highly desirable for the Region because:

   - it would create a high quality, high passenger volume transit node at Richmond Hill's Regional Centre providing the intermodal connection of surface rapid transit (BRT and LRT) lines in all YRTP corridors to GO Transit commuter rail and inter-regional BRT lines, and the TTC subway system.
   - it would eliminate the double transfer problem with LRT alternatives.
   - it would offer significantly better development opportunities than any surface rapid transit connection to Finch Subway Station.
   - it would overcome a potential problem with Alternatives A-1 through A-3. By 2021 the high passenger volume using surface transit (BRT and/or LRT) on Yonge Street moving to and from the Finch Station on both TTC and YRTP services will likely test the ability of a surface transitway to provide a reasonable level and quality of service.

The above subway extension benefits are based on current projections of future demand prepared by the Region. At this time, the extension is not among the TTC's priorities for future subway extension as identified by its 2003 Ridership Growth Strategy and 2001 rapid transit Expansion Study.

5.2.2.3 Strategy for Technology Application on Yonge Street Transitway

Based on the above conclusions and consideration of the characteristics of each alternative, the following incremental approach for technology use in the Yonge Street Corridor is proposed to meet the overall goals of the Region's strategic rapid transit vision in a cost-effective and proactive manner:

Step 1: Outside of this EA study and approval process, initiate a higher-frequency, limited stop transit service in the network corridors, including Yonge Street, with new vehicles operating in mixed traffic and incorporating rapid transit service features such as multi-door boarding, fare prepayment and priority at signalized intersections.

Step 2: When EA approvals have been obtained, implement Network Alternative A-1 incrementally by 2010 initially using BRT technology in all corridors. The BRT infrastructure would be constructed to design standards facilitating an ultimate conversion

to LRT technology when warranted. Network design would also include a master plan for the creation of a major intermodal hub at Richmond Hill Centre Intermodal Terminal.

Step 3: By 2012 following monitoring of ridership between 2007 and 2011, undertake a major review of the project to determine if the underlying assumptions about growth (population, employment and other activities) in York Region have taken place and if the ridership response to the YRTP service has also met expectations. During the monitoring, consult with the City of Toronto and TTC staff in relation to capacity and technology requirements and service integration. In addition, the consultations will review the TTC subway extension priorities at that time to establish if, and when an extension of the Yonge Subway to Highway 7 will be forthcoming.

Step 4: If the subway extension to Highway 7 is not programmed to be in place by 2021, implement Network Alternative A-2 by 2016 completing the transition from initial BRT to an LRT line from Finch Avenue to 19th Avenue. The surface right-of-way between 19th Avenue and Steeles Avenue would be shared by York Region BRT services from beyond 19th Avenue and LRT vehicles to avoid forcing a second transfer for a significant number of trips. TTC buses would also share the surface transitway between Steeles Avenue and Finch Station. This will require an additional EA, as the City of Toronto's current EA for the section of Yonge from Finch to Steeles Avenues does not include consideration of LRT facilities.

In order to carry the projected ridership volumes in 2021, the following service levels would be required on the Yonge Transitway for the surface technologies to be operated under this undertaking:

Segment	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
North of Major Mackenzie Drive to 19th Avenue	50 articulated buses (18m length) per hour. Buses at approx. 0.5km spacing or one per traffic signal cycle.	16 two-car LRT trains per hour (58m length)
Major Mackenzie Drive to Richmond Hill Centre	60 articulated buses (18m length) per hour or two buses per traffic signal cycle.	16 two-car LRT trains per hour (58m length)
Richmond Hill Centre to Steeles Avenue	85 articulated buses (18m length) per hour. Buses would operate in two-vehicle platoons with one or two platoon per traffic signal cycle.	20 two-car LRT trains per hour (58m length)

Note: The Yonge Street Transit Corridor north of 19th Avenue is the subject of a separate EA not yet underway. ToR were submitted for approval in April 2005.

As noted previously, major terminal access improvements at Finch Subway Station or a subway extension may be required to accommodate the YRTP vehicle frequencies listed above for the southernmost segment combined with future TTC frequencies. Lower frequencies, matching demand prior to 2021, could be accommodated in the short Toronto segment without major modifications at the existing subway terminals.

As discussed in **Section 5.2.2.1**, in the case that the projected growth of transit demand materializes, a surface rapid transit technology may not be capable of providing the operational reliability needed in 10 to 20 years. Also, an extension of the Yonge Subway northward may either be unaffordable or not a priority. Consequently, this EA has assessed and is seeking approval for the use of both BRT and LRT technologies. The use of BRT is planned as the initial technology and conversion to LRT technology for the rapid transit service when BRT reliability cannot be assured on the transitway between Steeles and 19th Avenues. Decision to convert to LRT technology would be subject to Regional Council Approval during open session. However, any works required on Yonge Street south of Steeles Avenue and at the Finch Subway Station, beyond those recommended in the City of Toronto's BRT EA, and/or any extension of the Yonge Subway are not part of this undertaking and would require a subsequent EA at some point in the future.

5.3 RAPID TRANSIT ROUTES

As indicated in **Section 5.1**, three candidate routes emerged from the *HOV/ RT Study.* These were Richmond Hill/Highway 404, Yonge Street, and Highway 404 and are illustrated in **Figure 5-7**.

As an initial screening step, the route alternatives were compared under the three broad categories of the social, economic and natural environment to determine which alternative was preferred relative to the other options available. In addition, the evaluation approach was based on establishing a clear rationale for eliminating options from further consideration based on a limited number of fundamental factors.

Generally, the advantages and disadvantages of each route can be summarized as follows,

- In terms of the social environment impacts, the Yonge Street route offers the best access to neighbourhood amenities and has the highest potential to improve mobility and lower vehicle collision rates. It is, however, the most disruptive of the three options in regards to existing development, given the relative isolation of the two other options. Because the long-term benefits to the community outweigh the potential short term construction effects that can be somewhat mitigated, the Yonge Street route is the preferred option from this point of view.
- Considering economic environment impacts, the positive effects of the Yonge Street route on accessibility, level of service and energy consumption make it the best candidate of the three options for higher ridership. By being located within the urban area, relative to the two other options, the Yonge Street corridor promotes greater intensification, compactness of development and support for employment centres. It is therefore more in conformity with the *Official Plan* objectives. Finally, although it is estimated that capital costs would be higher for the Yonge Street route construction, compared with the other options, operating costs would be lower relative to the longer, less urban alternatives. Overall, the Yonge Street route is therefore the preferred option from this point of view.
- In terms of the natural environment impacts, the north end of all three options is located within the Oak Ridges Moraine (ORM). The Yonge Street route is located within the Settlement Area, the Highway 404 Route within the Countryside Area, and the Richmond Hill/ Highway 404 Route partially within both areas. In addition, most options could have, to varying degrees, some impact on quality and quantity of groundwater, surface water and on greenland features (wetlands, ANSIs, ESAs and woodland). In summary, the Highway 404 route and Yonge Street route are both found acceptable from this point of view.

Overall, development of a segregated or partially exclusive right-of-way rapid transit facility within the **Yonge Street Route** is preferred based on the following:

- Due to its proximity to the existing and planned higher density urban development, in addition to providing the most cost-effective and efficient option relative to supporting the existing and planned transit network in the Region. Accordingly, positive influences on community accessibility and compact urban structure are expected while providing the capability to accommodate the forecast development in a sustainable manner.
- It provides the best opportunity to attract higher public transit ridership The potential disruptive effects created by construction can be mitigated to a significant degree based on experience in other jurisdictions with an extended phase-in of the construction and the intent to locate the transitway within the existing transportation/utility corridors or immediately adjacent to existing transportation/utility corridors.

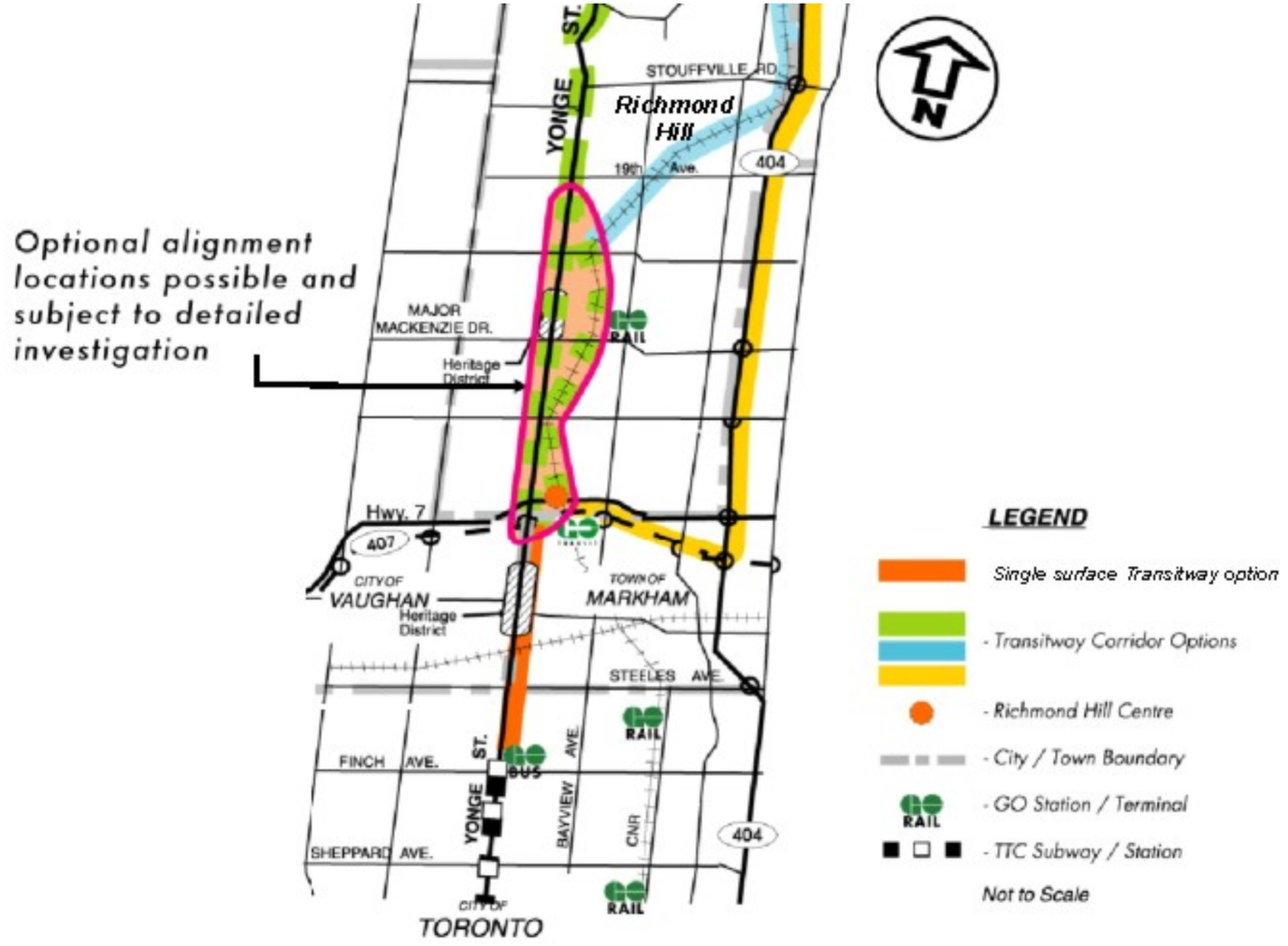


Figure 5-7
Short Listed Rapid Transit Route Options

- Given the proximity of the route to the existing and planned higher density urban development, the conflict with sensitive environmental constraint areas is limited and less than options locating the facility in a partially rural setting.

Based on the conclusion, specific alignments within the **Yonge Street Route** are analysed and evaluated in **Chapter 8**.

5.4 RAPID TRANSIT PHYSICAL INFRASTRUCTURE LOCATIONS

This section describes the process of selecting a typical location for the two lane bi-direction transitway on the Yonge Street Corridor. This physical infrastructure location is crucial to the impacts, caused by implementing the transitway, to the adjacent environment. The alternatives of the locations are described in **Section 5.4.1**.

5.4.1 Alternative Locations within a Road Right-of-way

The following alternative locations for rapid transit within an existing road right-of-way such as Yonge Street were considered in the first stage evaluation:

- Exclusive lanes in the median or centre of arterial streets - an exclusive two-way running way and stations in the median of the roadway with general vehicular traffic lanes in each direction either side of the transitway,
- Interior or off-set exclusive bus lanes - an exclusive two-way transitway, including stations, on one side of the roadway adjacent to the curb,
- Exclusive curb lanes - a partially-exclusive one-way transit lane in each direction adjacent to both curbs similar to the current arrangement south of Clarke Avenue to Finch Avenue e.g. HOV lanes.

From the range of alternatives listed in the ToR, the priority measures in mixed traffic were not evaluated as a stand alone option because it would not meet the fundamental objectives for the undertaking of improved travel time by avoiding general traffic congestion. Also, reversible contra-flow lanes in a roadway median were not considered desirable as a continuous location for rapid transit due to operational constraints. Finally, exclusive lanes in a segregated ROW was not included in the evaluation given that most of the preferred route will share the existing Yonge Street right-of-way with general traffic.

The configuration of the above alternatives is shown in **Figure 5-8** and an evaluation of the relative merits of each is presented in **Table 5-3**.

Table 5-3
Evaluation of Options to Locate a Transitway in a Roadway

FACTOR & INDICATOR	ALTERNATIVE: Exclusive Lanes in the Median	ALTERNATIVE: Exclusive Curb Lanes	ALTERNATIVE: Interior or Off-set Exclusive Bus Lanes	EXPLANATION OF RANKING
TRANSPORTATION QUALITY				
Transit Service Reliability	●	○	◐	• With a median transitway left turns across the transitway are confined to signalized intersections. This reduces the potential for interference by vehicular traffic and increases service reliability especially if transit can be given priority at signals when required. • A one-way curb side transitway requires right-turning vehicular traffic to share the lane with transit vehicles. Frequent interference due to this conflict and the potential for illegal parking reduces transit reliability significantly. • A two-way transitway on one side reduces interference to one side only but requires control of vehicular access to driveways to achieve reliability and safety.
Effect on Traffic Operations	◕	◕	◔	• A median transitway requires all left-turns to be at signalized intersections. Also U-turning must be permitted to allow traffic to reach mid-block destinations. This decreases the capacity at intersections. • A one-way curb-side transitway results in conflicts with both left and right-turning traffic at intersections and between them if mid-block left turns are permitted.
Overall level of safety in right-of-way	◕	◐	○	• A median transitway is considered the safest as it has the least number of conflicts with road traffic. The interface with pedestrians and left turning vehicles can be controlled at signalized intersections. • A two-way transitway along one side is considered the least safe due to the potential for confusion with transit vehicles running in the opposite direction to vehicular traffic on one side of the roadway and the conflicts with both left and right-turning vehicles.
Vehicle Access to Adjacent Properties	◐	◐	◔	• A one-way curb-side transitway must be shared by right-turning vehicles if access to adjacent properties is to be protected. • A two-way curb-side transitway requires strict control of access across the transit lanes or the addition of a service road to avoid conflicts with transit vehicles and provide access between intersections. • The median transitway option requires the provision of U-turns, either dedicated or at intersections to maintain access to adjacent properties.
HUMAN ENVIRONMENT				
Noise & Vibration Impacts	●	◐	◔	• A median transitway places transit operations be furthest from adjacent sensitive buildings and therefore has least impact on them. • A two-way curb-side transitway will be closest to adjacent buildings on one side producing the most severe noise and vibration impacts.
Passenger Convenience and Comfort in accessing Transitway stations	◐	●	◕	• A one-way curb-side transitway permits a more familiar platform arrangement for transit users but still requires a road crossing for one of the trip directions. Curb side platforms can be wider and feel safer as they are more remote from general road vehicles. • Median transitway station platforms require protective measures to overcome passenger discomfort due to road traffic passing behind a platform. • All locations require a road crossing for some passengers and trip directions. The two-way transitway on one side avoids a crossing for passengers originating on the same side.
Streetscape Improvement Opportunities	●	◔	◕	• A median transitway allows more opportunity for a distinctive streetscaping treatment. It also establishes a more visible identity for the transit system. • Streetscaping enhancements are limited to station sites on a one-way curb-side transitway. • A two-way curb-side transitway offers an unsymmetrical opportunity for streetscape improvements.
ECONOMIC ENVIRONMENT				
Capital & Operating Costs	◐	●	◕	• A median transitway will have the highest capital costs due to the wider cross section required at intersections where left turn lanes are reinstated. • Capital costs of curb-side transitways will be increased if service roads are required to permit mid-block access to adjacent properties. • A one or two-way curb-side transitway provides opportunities for combining platforms with adjacent sidewalks.
Land Acquisition Costs	◐	●	◕	• Where right-of-way must be acquired to accommodate the wider roadway, the relative costs will be similar to that of construction cost due to the cross sectional requirements for each alternative.

QUALITY RANKING: Most Preferred ● ◕ ◐ ◔ ○ Least Preferred

5.4.2 Preliminary Evaluation

A multi-criteria comparative evaluation of the alternative locations for transit within the road right-of-way considered the effect of each location under three main factors:

- transportation quality,
- the human environment and
- the community economic environment.

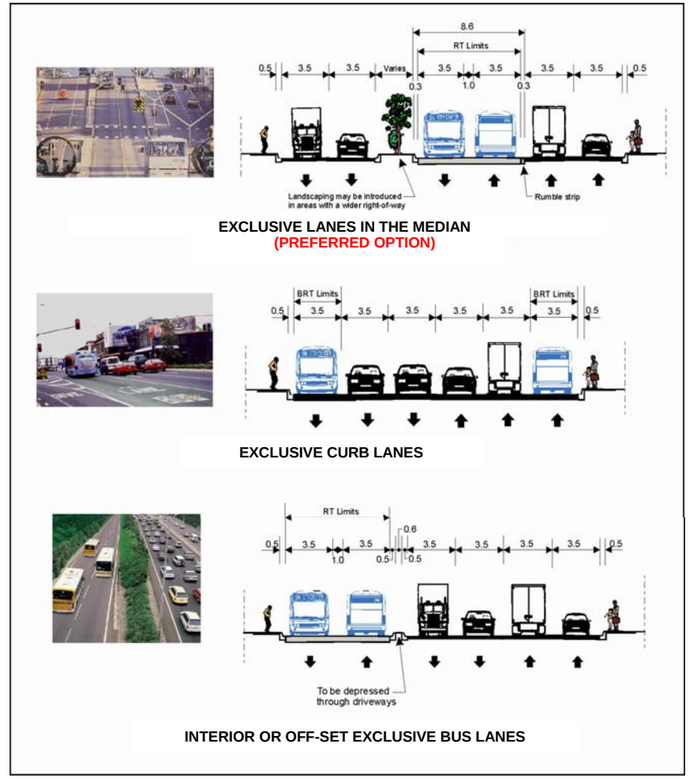


Figure 5-8
Options to locate Transit in a Roadway

Within each primary factor, the merits of each alternative were assessed against indicators considered most pertinent to the evaluation. The result of the evaluation is presented in Table 8-1.

5.4.3 Conclusion

The evaluation indicates that a median transitway is the preferred location for the following reasons:

- Transportation service quality will be highest;
- It is deemed the safest as it has the least potential conflicts with general traffic along the transitway and at intersections;
- It provides good opportunities to mitigate the impact on local traffic and property access issues; and
- It allows better streetscaping opportunities and reinforces the identity and visibility of the rapid transit system.

5.5 MAINTENANCE AND STORAGE OF RAPID TRANSIT VEHICLES

5.5.1 Background

Chapters 1 and **3** presented the background and justification for the Region's proposed Rapid Transit Network and the role of the Yonge Street Rapid Transit within the network. In **Section 5.2**, the technology options to achieve the *Transportation Master Plan*'s recommended rapid transit service were identified and outlined. As an addition to the present local, conventional bus services available to York Region's communities, rapid transit triggers the need to assess strategies for storage and maintenance of vehicles for all technologies likely to operate in the Region.

While storage and maintenance of the Region's present bus fleet is contracted out to the private operators serving the Region, York Region Transit (YRT) has indicated its intention to pursue development of a region-owned bus Maintenance and Storage Facility (MSF). Provision for such a facility has been made in the Region's 5-year capital budget. This objective raised the question of the relationship of conventional bus maintenance to that required for the potential rapid transit technologies.

In response, YRT management considered the two options, either an integrated facility with rapid transit fleet (including LRT vehicles when acquired) or a separate facility. The Region's agreement, in principle, to pursue the first option provided the basis for the study of potential sites for an integrated complex and the effects of each on the surrounding environment.

5.5.2 Alternative Solutions for Maintenance of Rapid Transit Vehicles

The configuration of the proposed rapid transit network and the strategy to implement service, technology and infrastructure incrementally over time are key factors in assessing solutions for maintenance of rapid transit vehicles. The feasibility and relative merits of each of the following alternatives are discussed below:

- Contract out maintenance and storage of new rapid transit vehicles to the present conventional bus service contractors or other transit operators in the Region;
- Purchase an existing facility from one of the present service contractors and expand the site to accommodate maintenance and storage of the rapid transit fleet; and
- Construct a new facility to service both rapid transit and conventional bus service vehicles.

a) Contracting Out Maintenance

The Region's present transit service contractors maintain and store conventional buses at privately owned facilities in various sectors of the region. These facilities are located in the closest proximity to the sector in which the Contractor provides service and are sized to accommodate between 50 and 75 vehicles at each location. The service and maintenance contracts are tendered for periods in the 3-5 year range.

While this option aims to concentrate vehicle maintenance at an existing location, major disadvantages in pursuing this option are:

- It offers no advantage over construction of a new facility in that significant expansion would be required at any one of the facilities to enable them to accommodate the spatial needs of both conventional and rapid transit fleets;
- The present facilities of the Region's contractors, as well as GO Transit, are not in optimal locations to service the overall rapid transit network proposed. Significant dead-heading of vehicles would be required to reach all corridors in the network;
- Convenient, low-cost light rail service connections from the network cannot be developed to the locations of the existing facilities; and
- The present short-term contracting basis for bus maintenance is incompatible with the longer term, incrementally expanding, needs of rapid transit fleet maintenance. The timing of necessary expansion to respond to fleet growth and/or a transition to rail technology may not coincide with the limits of existing contracts.

Given the above operational and contractual disadvantages and the fact that this alternative does not support the Region's objective of establishing

its own central maintenance facility, this option was not considered worthy of further analysis.

b) Purchase and Expand an Existing Facility

A variation on the contracting out option described above, would be the purchase of one of the existing facilities for conversion to a larger region-owned complex for rapid transit vehicle maintenance. For this option to be viable, the following conditions would have to be met:

- The existing facility would have to be located along one of the two primary routes of the proposed network, (Yonge Street and Highway 7) and allow convenient connections to it for either bus or rail technology;
- It would have to be possible to acquire sufficient property adjacent to the site of one of the existing facilities;
- Land uses surrounding the existing facility would have to be compatible with the operation of the expanded facility and available at a reasonable cost; and
- The expansion would have to allow continuity of operations at the existing facility unless the purchase was timed to coincide with the end of an existing service contract.

An assessment of the existing facilities available in York Region has revealed that none of them would meet the above criteria. Consequently, this alternative has been eliminated from further consideration.

c) Construction of a New Facility at a New Location

This alternative encompasses a variety of options. These range from provision of facilities for bus rapid transit only, to development of a site with capacity to become the central maintenance complex for both conventional bus and bus rapid transit fleets as well as the light rail transit fleet, if and when it is put into service.

In addition, a new facility can be designed in a manner responsive to the local constraints of any potential sites identified along the rapid transit routes. Also, this option allows flexibility in selecting the site, defining the scope of maintenance activities performed at the facility and establishing the size of fleet to be serviced at any time during its life and in its ultimate development.

The above advantages make construction of a new facility the preferred solution for the storage and maintenance of rapid transit vehicles and, if deemed necessary, other conventional transit vehicles. In addition, this alternative offers the maximum opportunity to meet the Region's commitment to facility ownership and centralization of operation and maintenance activities.

This conclusion has led to the analysis and evaluation of potential sites described later in the report. An assessment of the effects on the natural and social environment at the preferred site is also included in **Chapter 9** of the report.

6. EXISTING CONDITIONS IN CORRIDOR

6.1 TRANSPORTATION ENVIRONMENT

This Section introduces the various aspects of the transportation environment in which the project is proposed to take place. As for all Existing Conditions summaries, the Study Area includes the Yonge Street Corridor from Steeles Avenue to 19th Avenue in the Town of Markham, the City of Vaughan and the Town of Richmond Hill. The detailed transportation report is presented in **Appendix D**.

6.1.1 Local/Regional Transit Network

The existing bus routes operate in mixed traffic on Yonge Street. HOV lanes are located on a section of Yonge Street from the south study limit to just north of Clark Avenue. For the remainder of Yonge Street, the bus system operates without designated lanes or signal priority. The routes operating along Yonge Street consist of GO Transit bus routes and York Region bus routes. There are currently no TTC routes operating on Yonge Street north of Steeles Avenue.

6.1.1.1 GO Transit Bus Routes on Yonge Street

The Newmarket "B" GO Transit bus route operates from the Newmarket Bus Terminal on Davis Drive to the York Mills Station in the City of Toronto. The route serves all stops in the north end of the route (north of Bernard) but more limited stops in the south (flag operation). The service operates from 5 a.m. to 2 a.m. during the weekdays. A complete trip from Newmarket to York Mills during the AM peak hour is approximately 1 hour and 20 minutes in length. During the PM peak hour a northbound trip from York Mills Station to Newmarket Bus Terminal is approximately 1 hour and 34 minutes in length.

GO Transit also operates Newmarket "B" Express services. The service operates in the southbound direction from the Newmarket Bus terminal between 6:15 to 7:55 a.m. and from York Mills Subway in the northbound direction between 3:55 to 5:25 p.m. The duration of the express service is approximately 1 hour and 5 minutes during morning and 1 hour and 10 minutes during the evening.

6.1.1.2 York Region Bus Routes on Yonge Street

Route 99/99A – Yonge C operates on Yonge Street from the Richmond Hill Bernard Terminal to the TTC Finch Station. Frequent stops are made including Major Mackenzie Drive, Harding Boulevard, Baif Boulevard, Garden Avenue, Royal Orchard and Steeles Avenue. The service operates from 5 a.m. to 2 a.m. during the weekdays. During the AM peak hour, the duration of a trip from Bernard Avenue to Finch Station in the City of Toronto is approximately 35 minutes, and during the PM peak hour approximately 40 minutes from Finch Station to Bernard Avenue.

Several other north-south York Region Bus Routes operate along Yonge Street between Steeles Avenue and Highway 7. They include Bus Routes 1, 3, 5 and 77 which are detailed in **Appendix D**.

6.1.2 Existing Roadway Network

6.1.2.1 Arterial and Collector Roadways

Yonge Street is an arterial roadway extending from Lake Ontario in Toronto to north of York Region and beyond. Within the Study Area, Yonge Street, from Steeles Avenue to 19th Avenue is an arterial under the jurisdiction of the York Region, except for the section between Major Mackenzie Drive to Elgin Mills Road.

North of Steeles Avenue, Yonge Street consists of four basic lanes with an additional HOV lane in the north and south directions that extend from Steeles Avenue to a point just north of Clark Avenue.

North of Clark Avenue, Yonge Street narrows to four basic lanes until Langstaff Road. Through the Yonge Street and Highway 407 interchange, Yonge Street operates as a six lane facility to High Tech Road where it narrows to four basic lanes.

Arterial and major collector east-west roadways in the Study Area are listed from south to north in **Table 6-1**.

Table 6-1
Arterials and Major Collectors

Arterials and Major Collectors	Through Lanes on Yonge Street	Through Lanes on Cross Street
Steeles Avenue	3N 2S	2E 3W
Doncaster Avenue	3N 3S	2E 1W
Clark Avenue	3N 3S	1E 1W
John Street	2N 2S	1E 1W
Centre Street	2N 2S	1E 1W
Royal Orchard Boulevard	2N 2S	1E 1W
Highway 7	3N 3S	3E 3W
High Tech Road	3N 2S	2E 2W
Bantry Avenue;	2N 2S	2E 1W
Carrville Road/16th Avenue	2N 2S	2E 2W
Weldrick Road	2N 2S	2E 2W
Harding Boulevard	2N 2S	1E 1W
Major Mackenzie Drive	2N 2S	2E 2W
Crosby Avenue	2N 2S	1E 1W
Elgin Mills Road	2N 2S	2E 2W
Bernard Avenue	2N 2S	2E 1W
Silverwood Drive/Brookside Road	2N 2S	1E 1W
Devonsleigh Boulevard/Nottingham Drive	2N 2S	1E 1W
Gamble Road/ 19th Avenue	2N 2S	1E 1W

6.1.2.2 Intersection Control

The primary intersections and their type of control are summarized in **Table 6-2**.

Table 6-2
Primary Intersections and their Type of Control

Intersection	Signalized	Unsignalized (stop sign on minor street)
Steeles Avenue	✓	
Highland Park Boulevard		✓
Woodward Avenue		✓
Crestwood Road		✓
Grandview Avenue		✓
Doncaster Avenue	✓	
Glen Cameron Road	✓	
Morgan Avenue		✓
Clark Avenue	✓	
Arnold Avenue/Elgin Street	✓	
Thornridge Drive		✓
John Street	✓	
Jane Street		✓
Colbourne Street		✓
Thornhill Summit Drive/Centre Street	✓	
Royal Orchard Boulevard	✓	
Bay Thorn Drive/Thornhill Avenue		✓

Table 6-2
Primary Intersections and their Type of Control

Intersection	Signalized	Unsignalized (stop sign on minor street)
Helen Avenue		✓
Uplands Avenue	✓	
Kirk Drive		✓
Bunker Road		✓
Longbridge Road		✓
Langstaff Road/Hwy 407 EB Ramp	✓	
S-E 407 On Ramp		✓
N-E 407 On Ramp		✓
S-W 407 On Ramp		✓
SE-NS 407 Off Ramp	✓	
N-W 407 On Ramp		✓
Highway 7 Connection Ramp/Garden Avenue	✓	
High Tech Road	✓	
Roosevelt Drive		✓
Beresford Drive/Westwood Lane	✓	
Mackay Drive		✓
Bantry Avenue/Scott Drive	✓	
Dalemount/Edgar Avenue		✓
Northern Heights Drive/Oak Avenue	✓	
Spruce Avenue		✓
16th Avenue/Carrville Road	✓	
Hillcrest Mall Entrance	✓	
Observatory Lane/Baif Boulevard	✓	
Weldrick Road	✓	
Clarissa Drive		✓
Yongehurst Drive		✓
May Avenue/Richmond Hill Shopping Center	✓	
Harding Boulevard	✓	
Atkinson Street/Elmwood Avenue		✓
Major Mackenzie Drive	✓	
Arnold Crescent/Lorne Avenue	✓	
Centre Street	✓	
Richmond Street		✓
Wright Street/Dunlop Street	✓	
Bedford Park Avenue		✓
Crosby Avenue	✓	
Benson Avenue		✓
Hunt Avenue		✓
Levendale Road	✓	
Trayborn Drive		✓
Oxford Street	✓	
Elgin Mills Road	✓	
Leonard Street		✓
Canyon Hill Avenue/Bernard Avenue	✓	
Naughton Drive		✓

Table 6-2
Primary Intersections and their Type of Control

Intersection	Signalized	Unsignalized (stop sign on minor street)
Silverwood Avenue/Brookside Road	✓	
Devonsleigh Boulevard/Nottingham Drive	✓	
Gamble Road	✓	

6.1.2.3 Traffic Volume and Composition

The average annual daily traffic (AADT) along Yonge Street varies from 49,510 to 31,810 vehicles. Provided in **Table 6-3** is a summary of the 2002 AADTs for representative locations along the Yonge Street Corridor.

Truck movements make up approximately 5% of the vehicle composition during the peak hours and as previously noted, bicycle traffic on Yonge Street is very limited.

Table 6-3
Summary of 2002 AADT's

Location	AADT (Vehicles Per Day)
North of Steeles Avenue	49,510
North of Highway 7	38,330
North of Major Mackenzie	31,810
North of Elgin Mills Road	33,120

Notes: Based on automatic traffic recorder (ATR) counts provided by York Region

6.1.2.4 Peak Traffic Periods

The subject section of Yonge Street serves traffic and pedestrian movements associated with neighbourhood access, retail/commercial development demands, and through commuter traffic demands. The peak travel demands occur during the weekday AM and PM peak hours associated with commuter/work related travel.

Off-peak and weekend traffic levels are considerably less than those experienced during the weekday AM and PM peak periods.

6.1.2.5 Intersection Operations

Intersection capacity analysis was undertaken using the Highway Capacity Manual (HCM) methodology and in particular, the Synchro 5.0 software package. The analysis reflects the 2002 counts, current signal timings, and existing lane configurations. The AM and PM peak hour analysis results for both the signalized and unsignalized intersections are included in **Table 6-4** and **Table 6-5**, respectively. Full analysis summaries are included in Appendix A of the detailed report. The critical movements are defined as, turning movements approaching a v/c of 1.0 and/or Level of Service (LOS) "E" or "F".

Table 6-4
Existing AM Peak Intersection Operations

Signalized Intersection Operations Existing AM Peak						
Intersection Reference Yonge Street	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Steeles Avenue	88	F	149	F	>1.11	WBT and SBT are operating at capacity.
Doncaster Avenue	15	B	124	F	1.07	NBL is operating at capacity.
Glen Cameron Road	14	B	47	-	-	No capacity constraints
Clark Avenue	26	C	69	E	0.97	NBL, EBL and SBT are approaching capacity.
Arnold Avenue/ Elgin St.	31	C	93	F	1.02	SBL and SBT are operating at capacity.
John Street	14	B	45	-	-	No capacity constraints
Centre St./ Thornhill Summit Dr.	27	C	77	E	0.99	NBL and SBT are approaching capacity. Long SB queues
Royal Orchard Blvd.	13	B	44	-	-	No capacity constraints
Uplands Avenue	5	A	46	-	-	No capacity constraints
Hwy 407 EB Ramp/ Langstaff Road	15	B	86	-	-	No capacity constraints
E-NS 407 Off Ramp	7	A	50	-	-	No capacity constraints
Hwy 7 Connection Ramp/Garden Ave.	13	B	48	-	-	No capacity constraints
High Tech Road	12	B	45	-	-	No capacity constraints
Beresford Drive/ Westwood Lane	8	A	45	-	-	No capacity constraints
Bantry Avenue/Scott Dr.	14	B	46	-	-	No capacity constraints
Northern Heights Drive/Oak Avenue	5	A	49	-	-	No capacity constraints
16th Avenue/ Carrville Road	36	D	87	F	1.07	WBL is operating at capacity and SBT is approaching capacity.
Hillcrest Mall Entrance	4	A	52	-	-	Queuing from 16th Avenue
Observatory Lane/Baif Boulevard	14	B	42	-	-	Periodic queuing from 16th Avenue
Weldrick Road	18	B	40	-	-	No capacity constraints
May Avenue/ Richmond Hill Shopping Center	5	A	40	-	-	No capacity constraints
Harding Boulevard	10	A	45	-	-	No capacity constraints
Major Mackenzie Drive	29	C	42	-	-	No capacity constraints
Arnold Crescent/ Lorne Avenue	4	A	33	-	-	No capacity constraints
Centre Street	6	A	28	-	-	No capacity constraints
Wright St./ Dunlop St.	11	B	34			No capacity constraints

Signalized Intersection Operations Existing AM Peak						
Intersection Reference Yonge Street	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Crosby Avenue	7	A	34	-	-	No capacity constraints
Levendale Road	5	A	37	-	-	No capacity constraints
Richmond Heights Plaza	5	A	14	-	-	No capacity constraints
Oxford Street	6	A	34	-	-	No capacity constraints
Elgin Mills Road	24	C	44	D	0.96	SBL and WBL are approaching capacity.
Canyon Hill Avenue/ Bernard Avenue	24	C	36	-	-	No capacity constraints
Silverwood Ave./ Brookside Road	9	A	36	-	-	No capacity constraints
Devonsleigh Blvd./ Nottingham Drive	5	A	39	-	-	No capacity constraints
Gamble Road	7	A	39	-	-	No capacity constraints

Table 6-5
Existing PM Peak Intersection Operations

Signalized Intersection Operations Existing PM Peak						
Intersection Yonge Street @	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Steeles Avenue	88	F	151	F	>1.1	EBL, EBT, WBL, WBT, NBT, SBL are operating at capacity.
Doncaster Avenue	43	D	302	F	>1.1	WBL, NBL, NBT, SBL are operating at capacity.
Glen Cameron Road	21	C	148	F	>1.1	SBL is operating at capacity.
Clark Avenue	28	C	91	E	1.09	EBL and NBL are operating at capacity.
Arnold Avenue/Elgin St.	8	A	150	F	>1.1	SBL is operating at capacity.
John Street	15	B	46	-	-	No capacity constraints
Centre Street/ Thornhill Summit Drive	21	C	56	E	0.90	NBL operating is approaching capacity. Long NB queues.
Royal Orchard Blvd.	18	B	45	-	-	No capacity constraints
Uplands Avenue	7	A	89	F	0.98	SBL is approaching capacity.
Hwy 407 EB Ramp/ Langstaff Road	20	B	83	-	-	No capacity constraints
E-NS 407 Off Ramp	9	A	44	-	-	No capacity constraints
Hwy 7 Connection Ramp/Garden Ave.	25	C	47	-	-	No capacity constraints
High Tech Road	20	C	127	F	>1.1	SBL is operating at capacity
Beresford Drive/ Westwood Lane	4	A	51	-	-	No capacity constraints
Bantry Avenue/Scott Dr.	9	A	49	-	-	No capacity constraints
Northern Heights Drive/Oak Avenue	3	A	51	-	-	No capacity constraints
16th Avenue/Carrville Rd.	48	D	114	F	>1.1	EBL and WBL are operating at capacity. NBT and WBT are approaching capacity.
Hillcrest Mall Entrance	17	B	50	-	-	NB and SB queuing between 16th Avenue and Hillcrest Mall signals
Observatory Lane/Baif Boulevard	12	B	46	-	-	No capacity constraints
Weldrick Road	18	B	140	F	1.07	SBL is operating at capacity.
May Avenue/ Richmond Hill Shopping Center	6	A	39	-	-	No capacity constraints
Harding Boulevard	8	A	47	-	-	No capacity constraints

Signalized Intersection Operations Existing PM Peak						
Intersection Yonge Street @	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Major Mackenzie Drive	42	D	61	E	0.99	WBL, NBT and EBL are approaching capacity.
Arnold Crescent/ Lorne Avenue	5	A	30	-	-	No capacity constraints
Centre Street	7	A	29	-	-	No capacity constraints
Wright Street/Dunlop St.	12	B	30	-	-	No capacity constraints
Crosby Avenue	11	B	34	-	-	No capacity constraints
Levendale Road	10	B	34	-	-	No capacity constraints
Richmond Heights Plaza	13	B	52	-	-	No capacity constraints
Oxford Street	8	A	33	-	-	No capacity constraints
Elgin Mills Road	32	C	44	D	0.92	NBT, EBL are approaching capacity.
Canyon Hill Avenue/ Bernard Avenue	16	B	32	-	-	No capacity constraints
Silverwood Avenue/ Brookside Road	6	A	40	-	-	No capacity constraints
Devonsleigh Boulevard/ Nottingham Drive	5	A	41	-	-	No capacity constraints
Gamble Road	6	A	40	-	-	No capacity constraints

Based on a review of the above analysis, the following are apparent:

- The majority of the capacity constraints are located in the Thornhill core area between Steeles Avenue and Centre Street/Thornhill Summit Drive and also from north of Bantry Avenue to Weldrick Road;
- The Yonge Street/Centre Street/Thornhill Summit Drive intersection represents a key constraint in the road network in the AM and PM peak hours and 16th Avenue/ Yonge Street intersections represent key constraints;
- A number of the northbound and southbound left turn movements at the intersections are operating under permissive left turn control and thus are operating at capacity when opposing the peak through movement;
- The following intersections are operating at a good level of service during the AM and PM peak hours with v/c ratios below 1.0:

  - John Street
  - May Avenue / Richmond Hill Centre
  - Royal Orchard Boulevard
  - Uplands Avenue
  - Highway 407 EB Off-Ramp/Langstaff Road
  - E-NS Highway 407 Off-Ramp
  - Highway 7 Connection Ramp/Garden Avenue
  - High Tech Road
  - Beresford Drive/Westwood Lane
  - Bantry Avenue/Scott Drive
  - Northern Heights Drive/Oak Avenue
  - Observatory Lane/Baif Boulevard
  - May Avenue/Richmond Hill Shopping Centre
  - Harding Boulevard
  - Major Mackenzie Drive
  - Arnold Crescent/Lorne Avenue
  - Centre Street
  - Wright Street/Dunlop Street
  - Crosby Avenue
  - Levendale Road
  - Oxford Street
  - Elgin Mills Road
  - Canyon Hill Avenue/Bernard Avenue
  - Silverwood Avenue/Brookside Road
  - Devonsleigh Boulevard/Nottingham Drive
  - 19th Avenue/Gamble Road

Provided below is a summary of key operational constraints along the subject section of Yonge Street.

Yonge Street/Steeles Avenue: The left turn lanes on all approaches are operating over capacity during the PM peak hour. During the AM peak hour the southbound through lane is operating at a poor level of service.

Yonge Street/Doncaster Avenue: The westbound, northbound and southbound left turn lanes are presently operating at capacity during the PM peak hour. During the AM peak hour the northbound left turn lane is operating at capacity.

Yonge Street/Glen Cameron Road: The southbound left turn lane is operating at capacity during the PM peak hour. This is primarily due to the fact that it operates under permissive control. There are no capacity constraints during the AM peak hour.

Yonge Street/Clark Avenue: The northbound left turn and eastbound left turn lanes operate at capacity during the AM and/or the PM peak hours. Both these movements have heavy turning movements and coupled with the significant north-south capacity requirements, cannot be adequately served.

Yonge Street/Arnold Avenue/Elgin Street: The southbound left turn is operating at capacity during the AM and PM peak hours. The southbound left turn movement operates under permissive left turn phasing only. The southbound through lane is operating at capacity during the AM peak hour.

Yonge Street/Centre Street/Thornhill Summit Drive: This intersection accommodates heavy northbound left, southbound right and eastbound right turn movements during the peak hour, as it terminates as a collector roadway at Yonge Street. Accordingly, it is a challenge to provide sufficient green time for these movements, while maintaining north-south main phase green time for the through movements. During the AM and PM peak hours,

long vehicle queues occur in the peak travel direction. Southbound queues in the AM peak hour reach the Royal Orchard Boulevard intersection.

Yonge Street/16th Avenue/Carrville Road: 16th Avenue/Carrville Road is a major east-west arterial roadway in the Region. Accordingly, the through movements on both roadways require substantial green time. In addition, one or more left turn movements at the intersection are heavy during the peak hours. Overall, this intersection is operating at its theoretical capacity, during the peak hours.

During the AM and PM peak hours, the interaction between the 16th Avenue intersection and the Hillcrest Mall access and the advance phase and side street green time provisions at 16th Avenue intersection causes a major capacity constraint. As a result traffic queues are present in the northbound and/or southbound directions at the following intersections:

- Bantry Avenue/Scott Drive;
- Northern Heights Drive/Oak Avenue;
- Hillcrest Mall Entrance; and
- Baif Boulevard/Observatory Lane.

Richmond Hill – Major Mackenzie Drive to Crosby Avenue: Within the Richmond Hill historic retail district, the traffic signals operate under a 90 second cycle length. During field investigations, traffic progression in the peak direction, did not appear to be operating well. Based on discussions with the Town of Richmond Hill staff, it is our understanding that the interconnection between the signals is not currently functioning and progression through this area is not being attained. The intersections being affected are as follows:

- Major Mackenzie Drive;
- Arnold Crescent/Lorne Avenue;
- Centre Street;
- Wright Street/Dunlop Street;
- Crosby Avenue.

6.1.2.6 Neighbourhood Traffic Concerns

Based on field investigations and through discussions with area municipality staff, a number of roadways and neighbourhoods were identified as having existing neighbourhood traffic concerns. Provided below is a summary of the primary locations/neighbourhoods identified.

Grandview Avenue Neighbourhood: The Grandview Avenue Neighbourhood includes the areas bounded by Doncaster Avenue, Henderson Avenue, Steeles Avenue and Yonge Street. Under existing conditions, traffic diverts to these local roadways during the peak hours to avoid congestion along Steeles Avenue, specifically the Steeles Avenue/ Yonge Street intersection. Motorists attempting to negotiate a southbound left turn at the Steeles Avenue intersection, may use Highland Park Boulevard, Woodward Avenue and Grandview Avenue to gain access to the southbound left at the Steeles/Willowdale or Steeles/Henderson intersections.

South Richvale Neighbourhood: The South Richvale Neighbourhood is bounded by Highway 7, East Don River, Carrville Road and Yonge Street. Traffic speed and volume concerns are generally associated with Garden Avenue, Roosevelt Drive, Spruce Avenue, Oak Avenue and Edgar Avenue. As the East Don River precluded east-west travel from Yonge Street to Bathurst Street, the traffic concerns on Garden Avenue and Roosevelt Drive are generally associated with traffic generated by the neighbourhood, schools and community facilities.

The volume and speed concerns on the neighbourhood roadways in the northern portion of the South Richvale Neighbourhood are generally a result of congestion at the Yonge Street/Carrville Road/16th Avenue intersection. During the weekday and weekend peak hours the Yonge Street/Carrville Road/16th Avenue operates at capacity. As a result of these congested conditions, motorists choose to use the neighbourhood streets to circumvent the Carville Road/16th Avenue intersection.

The South Richvale Traffic Review showed weekday counts of 2,325 vehicles per day on Spruce Avenue and average speeds of 52 to 55 km/hr. Oak Avenue and Edgar Avenue, west of Yonge Street had daily volumes ranging from 1500 to 2000 vehicles per day with peak hour counts in the peak direction at around 100 vehicles per hour. Average speeds were recorded during the Spring and Fall months at approximately 55 km/hr.

6.1.3 Existing Right-of-Ways

Existing right-of-way (ROW) widths vary along Yonge Street. Over the years property acquisition through road widening and redevelopment has characterized Yonge Street by a mix of different widths. In general however the width of ROW is 36 metres (120 foot ROW) at the south limit of the Study Area to just south of Highway 407. Most buildings are well set back from property lines in this area except immediately south of Centre Street in the heritage district and at Royal Orchard Boulevard.

From Highway 407 to Major Mackenzie Drive, ROW widths increase to approximately 40 metres. Buildings are again well set back from property lines however new approved residential developments/buildings seem to be closer to property lines compared to more established buildings. This is evident in the condominium townhouses in this area from Beresford Drive to Northern Heights Drive on the east side of the road.

The Richmond Hill Central Business District from Major Mackenzie Drive to Benson Avenue has a narrow ROW width approaching 20 metres (66 foot ROW) and is constrained by buildings that are on existing lot lines. From Benson Avenue to Elgin Mills Road the ROW widens to a 35 metre ROW.

North of Elgin Mills Road the ROW further widens to a 40 to 50 metre ROW up to and beyond the study limits of 19th Avenue/Gamble Road.

6.1.4 Pedestrian/Cycling Network

Sidewalks are provided along the entire length of Yonge Street from Steeles Avenue to 19th Avenue. Currently, there are no on-road bicycle facilities provided on Yonge Street, nor are their bicycle paths or bikeways provided within the Yonge Street Corridor.

Pedestrian signal heads are provided at the majority of the signalized intersections in the Study Area. At the following locations Audible Pedestrian Signals (APS) have been installed to accommodate the visually challenged:

- Wright Street/Dunlop Street;
- Harding Boulevard;
- Royal Orchard Boulevard;
- Scott Drive/Bantry Avenue; and
- Observatory Lane/Baif Boulevard.

6.1.5 Pedestrian/Cycling Demand

6.1.5.1 Pedestrian Demand

Pedestrian activity varies considerably along Yonge Street within the project limits and is generally a function of the adjacent land use.

The following are high or active pedestrian locations or areas along the corridor:

Location	Characteristics
Yonge Street/Steeles Avenue intersection	- Key transit transfer area - Centerpoint Mall and specialty commercial
Yonge Street/Clark Avenue intersection	- High rise residential and specialty commercial
Arnold Avenue to Centre Street	- Residential, commercial and office/personal service uses
16th Avenue to Weldrick Road	- Key transit transfer area - Shopping centres - University of Toronto David Dunlap Observatory
Richmond Hill Central Business District	- Specialty commercial, retail, personal services, and institutional uses.

6.1.5.2 Cycling Demand

During field investigations, little bicycle travel was observed on Yonge Street. Given the volume and speed of traffic on Yonge Street, bicycle travel is limited to commuter/recreational intermediate to serious riders, i.e., inexperienced, casual and young cyclist would generally not be comfortable riding on Yonge Street.

6.2 NATURAL ENVIRONMENT

This Section describes the existing conditions in the Study Area related to natural sciences, including physiography and soils, geology/hydrogeology, aquatic habitat and communities, vegetation and vegetation communities, wildlife and wildlife habitat and designated natural areas. The detailed description of the Natural Environment is presented in **Appendix E**, *the Natural Sciences Report*. A summary of the main Natural Environment features is presented in **Figure 6-1**.

6.2.1 Physiography and Soils

The Study Area is located within the Peel Plain physiographic region, which extends through the central portions of the Regions of Halton, Peel and York. The Peel Plain is a level to undulating tract of clay soils with imperfect drainage, through which the Credit, Humber, Don and Rouge Rivers have carved deep valleys. A second physiographic region, the South Slope, surrounds the Peel Plain physiographic region, and it is possible the northern and southern ends of the study area occur in this region. The South Slope is the south slope of the interpolate moraine, but includes a strip to the south of the Peel Plain. The South Slope is smoothed, faintly drumlinized and is scored by tributary valleys of the Humber, Don and Rouge River systems (Chapman and Putnam 1984). There is a small portion of the Study Area, from north of Elgin Mills Road to 19th Avenue located within the Oak Ridges physiographic region. The Oak Ridges physiographic region is composed of sandy or gravely material and occasionally boulder clay. The Oak Ridges Moraine is considered a provincially significant landform that is protected from development by the Oak Ridges Moraine Conservation Plan of the *Oak Ridges Moraine Conservation Act*. Only the section of Yonge Street from just north of Elgin Mills Road to 19th Avenue/ Gamble Road is located in the Moraine and in a Settlement Area in which urban uses set out in municipal official plans are allowed.

The surficial soils surrounding Yonge Street in the Study Area are classified as Berrien sandy loam, Cashel clay, Chinguacousey clay loam, Malton clay, Oneida clay loam, Peel clay, Simcoe clay loam and Bottom Lands. Between 19th Avenue and Elgin Mills Road soils are predominantly Oneida

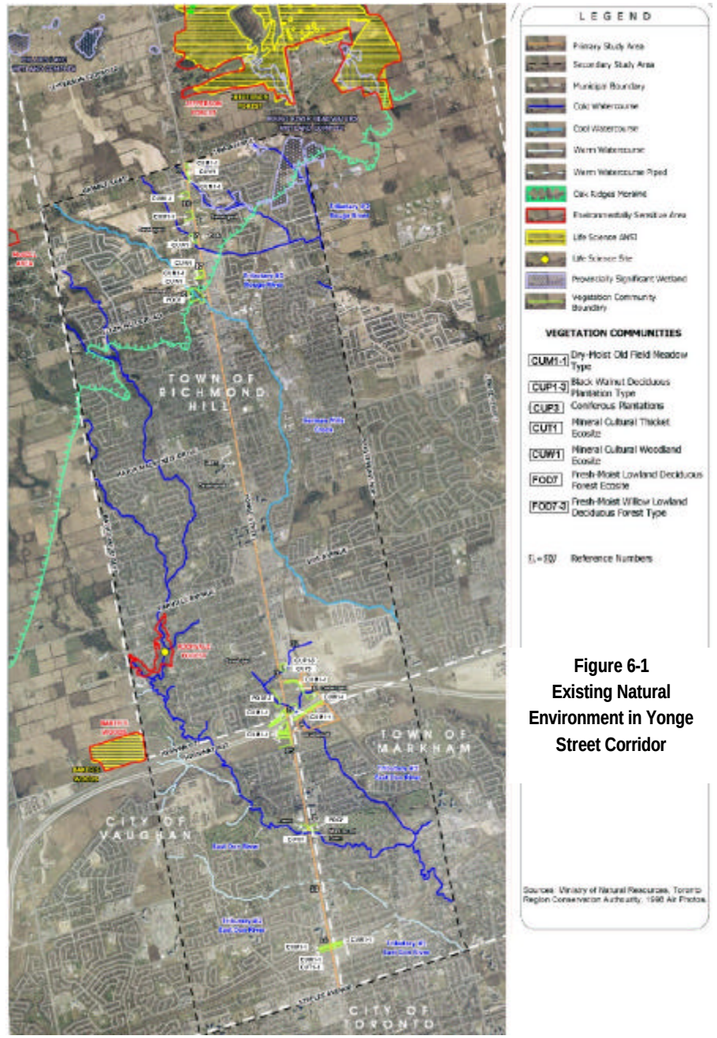


Figure 6-1
Existing Natural Environment in Yonge Street Corridor

clay loam, with some Berrien sandy loam, Chinguacousey clay loam and Bottom Lands. Between Elgin Mills Road and Major Mackenzie Drive soils are predominantly Chinguacousey clay loam with some Oneida clay loam. Between Major Mackenzie Drive and 16th Avenue surficial soils are mostly Simcoe clay loam with some Chinguacousey clay loam, Oneida clay loam and Bottom Lands. Between 16th Avenue and Highway 7 soils are almost entirely Chinguacousey clay loam with Bottom Lands surrounding one watercourse. Between Highway 7 and Centre Street surficial soils are mostly Cashel clay with some Peel clay, Chinguacousey clay loam and Bottom Lands. Between Centre Street and Steeles Avenue soils are predominantly Peel clay with some Malton clay, Cashel clay and Bottom Lands.

A detailed description of the types of soils and their main characteristics within the Study Area is presented in **Appendix H**, *the Geotechnical Investigation Report*, of this document.

6.2.2 Geology/Hydrogeology

An investigation of geologic and hydrogeological conditions along Yonge Street including field investigations was conducted in April 2003. The area of investigation included approximately 500 m on either side of Yonge Street between Steeles Avenue and 19th Avenue.

6.2.2.1 Surficial Geology

Surficial geologic mapping indicates that the proposed transit alignment within the study area is underlain primarily by three geologic units: (1) Newmarket Till (glacial till) that is comprised of dense sandy silt to sand matrix soils, (2) Peel Ponds glaciolacustrine (glacial lake) deposits that are comprised of silt and clay matrix soils, and (3) Halton Till (glacial till) that is comprised of clayey silt to silt matrix soils. The distribution of those units within the Study Area is shown in figures included in **Appendix H-A**, mapped as Units 3f, 7, and 4b respectively. Recent fluvial soil deposits (gravel, sand, silt, clay) cover a strip adjacent to the East Branch of the Don River. A few other types of geologic units occur in the study area, but they are located away from the proposed transit alignment and will not affect the overall susceptibility to impact as related to the proposed transit development.

A portion of the Oak Ridges Moraine complex is located within the Study Area. At Yonge Street, the area north of 20+550 and beyond to the east, west and north is considered part of the ORM, however, available data and geologic interpretations indicate that portions of the ORM sediment complex underlies much of the Yonge Street alignment. South of about 18+200, the deposit interpreted as part of the ORM complex becomes intermittent and a relatively thin deposit (on the order of 5 m to 10 m thick). North of this area, the deposit becomes a more dominant subsurface deposit. This deposit is primarily composed of sand and silt deposits but also includes relative coarse sand and gravel sediments in some areas. The relevance of this deposit is described in further detail below as it is one of the more important local aquifers (water-bearing units).

6.2.2.2 Distribution of Aquifers

Subsurface conditions along Yonge Street within the Study Area were reviewed by developing cross-sections, based on the York/Peel/Durham

water well database. These cross-sections are presented in **Appendix H-B** (Figures 9 to 15). Those sections were assembled based on information in the MOE water well database and supplemented by information from other local exploration programs that includes subsurface materials encountered and static water levels at the time of investigation.

The cross-sections prepared for the Study Area indicate that the geology consists of relatively thick overburden (soil) resting upon bedrock. The thickness of overburden ranges from about 36 metres at a location (11+200) north of Steeles Avenue as shown on Figure 9 of **Appendix H-B**, to over 105 metres thick at a location (18+600) north of Major Mackenzie Drive as shown on Figure 13 of **Appendix H-B**.

Some correlated features were observed in the subsurface depicted in the Yonge Street sections. A relatively large aquifer may be present near Elgin Mills Road, spanning from 18+200 to the northern limits of the alignment, as shown on Figure 14 of **Appendix H-B**. This local aquifer is part of the Oak Ridges Moraine complex, one of the more important regional aquifers. Other layers with significant lateral extent may also be present in the area, but available subsurface data is insufficient to reliably resolve such features. This aquifer lies well beneath the surface alignment along Yonge Street, except where Yonge Street crosses the East Don River. Between about 14+150 and 15+600 this aquifer may be within 10 m of the ground surface.

6.2.3 Horizontal Groundwater Movement

Given the physical setting of the study area, the water table surface is interpreted to be a subtle reflection of the ground surface topography trends. As such, groundwater will tend to move in the local downhill direction. In areas relatively close to a surface watercourse, within 100 to 200 m, shallow groundwater flow will be directed more toward the surface watercourse. In some areas, the presence of underground service trenches can result in complex flow patterns, at least locally.

Development of the proposed additional transit lanes has the potential to affect the quality of shallow groundwater. If quality effects were to occur, the affected shallow groundwater would move in the direction of the horizontal groundwater movement, which is also termed, “downgradient”. Active groundwater supply wells that are located on the downgradient side of the transit lanes would have greater susceptibility to quality effects. It is considered unlikely that active wells that are located upgradient of the proposed transit alignment would receive effects to shallow groundwater quality caused by the transit development, provided that the widened road does not encroach on the wells. To determine which side of the road has greater susceptibility to impact, the probable directions of shallow groundwater movement were interpreted along the proposed transit corridors, as shown on Figures 1 to 8 of **Appendix H-A**, based on topographic contours of 1:10,000 scale OBM mapping of the Study Area.

The direction of groundwater movement as indicated on the figures may change with distance away from the proposed transit alignment, depending on localized conditions. Some locations of the transit alignment are situated on probable groundwater flow divides, such as near to Hillcrest Mall, and the site specific direction of flow would have to be determined from field studies.

6.2.4 Groundwater Recharge/Discharge Areas

A *groundwater recharge* area is land where groundwater movement at the water table has a downward component. Infiltration through the ground surface in a recharge area will contribute to the available volume of groundwater. The amount of recharge per unit area depends on the climatic moisture surplus, and local conditions such as soil type, ground slope, vegetation, and impervious cover.

A *groundwater discharge* area is land where groundwater movement at the water table has an upward component. The water table in a discharge area is usually close to or at ground surface. Discharge areas usually include permanent surface watercourses and wetlands, depending on site-specific conditions.

In general, recharge areas provide the source of water that supplies discharge areas. Discharge areas will contribute baseflow to surface watercourses, if hydraulically connected. Decreases in recharge can result in a decrease of baseflow to a surface watercourse. Recharge areas and discharge areas were interpreted for the Study Area. Discharge areas are interpreted to occur at surface watercourses, and in floodplain areas adjacent to them. There are six locations where a surface watercourse is crossed by Yonge Street within the Study Area, as shown on Figures 2, 3, 6, and 7 of **Appendix H-A**.

The water well database indicates that some wells in the Study Area had a static water level, at the time of construction, which was located at the ground surface or above it, indicating artesian or flowing artesian conditions. The hydrogeologic sections also show artesian conditions at some locations. Along Yonge Street, there is a group of water wells with static water elevations close to ground surface located near Harding Avenue (about 17+300), near Levendale Avenue (about 19+600) and Elgin Mills Road (about 20+400). Wetlands are sometimes indicators of discharge areas, but almost none were identified adjacent to Yonge Street, with the exception of a small pond near Yonge Street and Harding Avenue (17+800). Wells were not present everywhere in the Study Area, and depth to static water level information was not available for all wells reported in the MOE database, so there may be other locations with artesian conditions or a shallow water table that are not documented by the available data.

Groundwater recharge will occur to varying degrees (depending on soil type and other factors) over the majority of the Study Area that is located above and between the discharge areas along surface watercourses and their floodplains. Areas substantially covered by impervious surfaces, such as by buildings, roads, and parking areas, will not contribute significant groundwater recharge. Recharge will mostly occur in recharge areas that have exposed soil, or vegetation-covered soils, including parks, lawns, golf courses, school-yards, cemeteries, undeveloped lots, open fields, and ditches.

6.2.5 Well Distribution

An inventory was compiled of the water supply wells that historically have been present in the study area, based on the MOE database of water supply wells. The MOE database documents the historic presence of about 400 water supply wells along Yonge Street portion of the Study Area. There is no information available to confirm which, if any, of the listed wells are still in operation. Also, it is noted that the MOE database typically does not include records for all of the wells that have been drilled in specific areas. The numbers of wells along one-kilometre sections relative to proposed transit alignment was counted, based on positions reported in the MOE water well database. This information is presented in **Table 6-6**. Counts provided should be considered as estimates, due to accuracy limitations of locations in the source database. Additional water supply wells may be located within the Study Area that are unregistered in the MOE database.

Table 6-6
Number of Historical Well Records by Station

Section	Number of Historical Wells	
	West	East
10+000 to 11+000	13	18
11+000 to 12+000	62	29
12+000 to 13+000	58	13
13+000 to 14+000	54	32
14+000 to 15+000	8	7
15+000 to 16+000	10	4
16+000 to 17+000	0	4
17+000 to 18+000	8	0
18+000 to 19+000	0	0
19+000 to 20+000	1	6
20+000 to 21+000	19	8
21+000 to 22+000	25	11
22+000 to 22+350	9	0

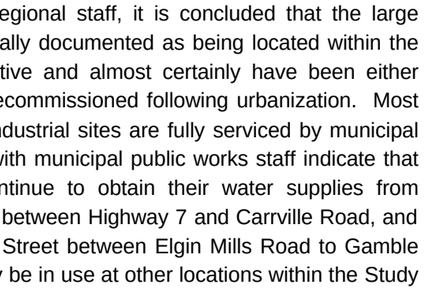
Based on discussions with Regional staff, it is concluded that the large majority of those wells historically documented as being located within the Study Area are no longer active and almost certainly have been either demolished, buried over, or decommissioned following urbanization. Most residential, commercial, and industrial sites are fully serviced by municipal water supplies. Discussions with municipal public works staff indicate that some individual residents continue to obtain their water supplies from private water wells in the area between Highway 7 and Carrville Road, and along the west side of Yonge Street between Elgin Mills Road to Gamble Road. Water supply wells may be in use at other locations within the Study Area.

6.2.6 Aquatic Habitats and Communities

A reconnaissance level survey of watercourse crossings along Yonge Street between Steeles Avenue and 19th Avenue was performed in March 2003. A field investigation of aquatic habitat was undertaken in May 2003. A total of nine watercourses cross the proposed rapid transit system between Steeles Avenue and 19th Avenue. A summary of habitat conditions present at the watercourse crossings is presented in Table 2 of **Appendix E**. The location of the watercourses is presented in Figure 2 of **Appendix E** and representative photos of watercourse crossings are presented in **Appendix E-C**.

The main watercourse crossings are as follows:

6.2.6.1 Don River:



Southern and central portions of the Study Area, between Steeles Avenue and Elgin Mills Road, pass through the Don River watershed. The main branch of the East Don River, designated a coldwater system by the Toronto and Region Conservation Authority (TRCA), crosses Yonge Street south of Royal Orchard Boulevard. A coldwater tributary of the East Don River crosses Yonge Street twice between Highway 407 and High Tech Road, although one of these crossings is piped. Two warmwater tributaries of the East Don River are piped under Yonge Street between Steeles Avenue and the main branch of the East Don River.

6.2.6.2 German Mills Creek

German Mills Creek, a coolwater tributary of the East Don River, crosses Yonge Street at Elgin Mills Road. This watercourse is piped on the downstream side for a distance of approximately 500 m.

6.2.6.3 Rouge River

The northern portion of the Study Area, between Elgin Mills Road and 19th Avenue, passes through the Rouge River watershed. One coldwater tributary of the Rouge River crosses Yonge Street between 19th Avenue and Nottingham Drive/Devonsleigh Boulevard. A second coldwater tributary of the Rouge River crosses Yonge Street between Brookside Road/Silverwood Avenue and Canyon Hill Avenue/Bernard Avenue.

A summary of fish recorded by the TRCA within the Study Area is presented in **Table 6-7**.

Table 6-7
Fish Collected by TRCA at Inventoried Watercourses

Species			Watercourse Sampled		
Scientific Name	**Common Name**	**Status**	**Main Branch of the East Don River**	**German Mills Creek**	**Tributary #2 of the Rouge River**
Carassius auratus	Goldfish		1991[b]		
Catostomus commersoni	White Sucker		2002[f], 1998[bdg], 1997[e], 1991[abd]		1985[n], 1984[n]
Clinostomus elongatus	Redside Dace	G4[1], S3[2], SC[3], THR[4]	1997[e]		
Cottus bairdi	Mottled Sculpin		2002[cf], 1998[bd], 1997[e], 1991[bd]		
Culaea inconstans	Brook Stickleback		1998[bd], 1997[e]		
Etheostoma nigrum	Johnny Darter		1998[bd], 1997[e], 1991[abd]		1985[n]
Lampetra appendix	American Brook Lamprey	G4[1], S3[2]	2002[f]		
Lepomis gibbosus	Pumpkinseed		1997[e]		
Luxilus cornutus	Common Shiner		1997[e], 1991[d]		
Micropterus salmoides	Largemouth Bass		1997[e]		
Oncorhynchus mykiss	Rainbow Trout		1998[g], 1997[e]		2000[p]
Pimephales notatus	Bluntnose Minnow				2000[p]
Pimephales promelas	Fathead Minnow		2002[f], 1998[b], 1997[e], 1991[d]	2002[k], 1998[l], 1991[m]	
Rhinichthys atratulus	Blacknose Dace		2002[ch], 1998[bdg], 1997[e], 1991[abd]	1998[m], 1991[m]	2000[p], 1985[n], 1984[n]
Rhinichthys cataractae	Longnose Dace		2002[ch], 1998[bdg], 1997[e], 1991[abd]		1985[n], 1984[n]
Salmo trutta	Brown Trout		2002[h], 1998[g], 1997[e]		
Salvelinus fontinalis	Brook Trout				1985[nq], 1984[nq]
Semotilus atromaculatus	Creek Chub		2002[fh], 1998[bdg], 1997[e], 1991[abd]	2002[k], 1998[jm], 1991[jm]	2000[p], 1985[n], 1984[n]

Notes
1 Global Rank (GRank) of the species is 'common.'
2 Provincial Rank (SRank) of the species is 'rare to uncommon.'
3 Species listed as 'special concern' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
4 Species listed as 'threatened' by the Ministry of Natural Resources (MNR).
a TRCA Station 3, located downstream of the confluence of the main branch and Tributary #2 of the East Don River (downstream from Bayview Avenue south of Steeles Avenue).
b TRCA Station 32, located downstream of the confluence of the main branch and Tributary #3 of the East Don River (downstream from John Street west of Bayview Avenue).
c TRCA Station DN021WM, located upstream from Yonge Street north of Centre Street.
d TRCA Station 41, located downstream of Highway 7 midway between Bathurst Street and Yonge Street.
e TRCA Station 58, located on Tributary #4, upstream of the confluence with the East Don River main branch (downstream from Bathurst St. south of Carrville Rd).
f TRCA Station DN022WM, located on Tributary #4, upstream of the confluence with the East Don River main branch (upstream from Bathurst St. south of Carrville Rd).
g TRCA Station 60, located downstream of Carrville Road east of Bathurst Street.
j TRCA Station 23, located downstream of 16th Avenue east of Yonge Street.
k TRCA Station DN011WM, located upstream of Weldrick Road east of Yonge Street.
m TRCA Station 38, located upstream of Elgin Mills Road west of Yonge Street.
n TRCA Station 10, located on Tributary #4 of the Rouge River, upstream of Elgin Mills Road west of Bayview Avenue.
p TRCA Station RR09, located on Tributary #2 of the Rouge River, upstream of Silverwood Drive east of Yonge Street.
q TRCA Station 8, located on Tributary #3 of the Rouge River, upstream of Yonge Street north of 19th Avenue

6.2.6.4 Rare, Threatened or Endangered Aquatic Species

One rare species was collected by the TRCA in the main branch of the East Don River to the west of the Study Area. Redside dace is designated Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), designated Threatened by the Ministry of Natural Resources (MNR) and has a Provincial Rank (SRank) of Rare to Uncommon (S3). A second species with a SRank of S3, American brook lamprey, was also collected by the TRCA in the main branch of the East Don River to the west of the study area. The records for both of these species are recent, although they were collected a considerable distance upstream of Yonge Street. A detailed summary of Fish Habitat Assessment can be found in **Appendix E**.

6.2.6.5 Vegetation and Vegetation Communities

The geographical extent, composition, structure and function of vegetation communities were identified through air photo interpretation and field investigations. Air photos were interpreted to determine the limits and characteristics of communities. A reconnaissance level field investigation of natural/semi-natural vegetation was conducted within the Study Area by LGL on March 3 and May 16, 2003. The investigation included the Yonge Street right-of-way and immediately adjacent areas between Steeles Avenue and 19th Avenue. The purpose of this investigation was to verify the limits of communities and to collect information on community composition, structure and function.

Vegetation communities were classified according to the Ecological Land Classification for Southern Ontario: First Approximation and Its Application (Lee et al. 1998). The community was sampled using a plotless method for the purpose of determining general composition of the vegetation and no attempt was made to determine the complete floral composition of the study area. Plant species status was reviewed for York Region, the Greater Toronto Area (Varga et al. 2000) and Ontario (Oldham 1999). Vascular plant nomenclature follows Morton and Venn (1990), with a few exceptions.

Much of the vegetation within/adjacent to the Study Area is of anthropogenic origin, resulting from past/present land use. Land use adjacent to the Study Area is predominantly medium- and high-density residential, commercial and industrial. Development of new residential, commercial and industrial areas is taking place in several locations adjacent to the Study Area. A total of 24 vegetation communities, comprising six community types, have been identified within/adjacent to the Study Area. These communities include cultural plantations, cultural meadows, cultural woodlands and deciduous forests. The vegetation communities identified are considered widespread and common in Ontario and secure globally (NHIC 1997). These communities are delineated in **Figure 6-1** in this Report and Table 4 of **Appendix H-F**.

To date, a total of 55 vascular plant taxa have been recorded. Twenty-eight (28) taxa, 51 percent of the recorded flora, are considered introduced and non-native to southern Ontario. A list of vascular plants identified within the Study Area is presented in **Table 6-8**.

Table 6-8
Working Vascular Plant Checklist

Scientific Name	Common Name	Status
Acer negundo	Manitoba Maple	Common
Acer platanoides	Norway Maple	Common
Alliaria petiolata	Garlic Mustard	Common
Amelanchier sp.	Serviceberry	Common
Amphicarpaea bracteata	Hog-peanut	Common
Bromus inermis ssp. inermis	Smooth Brome	Common
Carex cf. laxiflora	Loose-flowered Sedge	Common
Centaurea maculosa	Spotted Knapweed	Common
Chelidonium majus	Celandine	Common
Cornus alternifolia	Alternate-leaved Dogwood	Common
Cornus stolonifera	Red-osier Dogwood	Common
Daucus carota	Wild Carrot	Common
Dipsacus fullonum ssp. sylvestris	Common Teasel	Common
Eleocharis compressa	Flattened Spike Rush	Common
Geum aleppicum	Yellow Avens	Common
Geum urbanum	Urban Avens	Common
Hypericum perforatum	Common St. John's-wort	Common
Impatiens capensis	Spotted Touch-me-not	Common
Juglans nigra	Black Walnut	Rare[2]
Juniperus communis	Common Juniper	Rare[1, 2]
Juniperus virginiana	Red Cedar	Uncommon[3]
Lonicera tatarica	Tartarian Honeysuckle	Common
Lythrum salicaria	Purple Loosestrife	Common
Maianthemum stellatum	Starry False Solomon's-seal	Common
Melilotus alba	White Sweet Clover	Common
Myosotis laxa	Small Forget-me-not	Common
Phalaris arundinacea	Reed Canary Grass	Common
Picea abies	Norway Spruce	Common
Pinus nigra	Austrian Pine	Common
Pinus sylvestris	Scots Pine	Common
Poa compressa	Canada Bluegrass	Common
Poa pratensis ssp. pratensis	Kentucky Bluegrass	Common
Populus tremuloides	Trembling Aspen	Common
Potentilla recta	Rough-fruited Cinquefoil	Common
Prunus virginiana ssp. virginiana	Choke Cherry	Common
Quercus rubra	Red Oak	Common
Rhamnus cathartica	Common Buckthorn	Common
Robinia pseudo-acacia	Black Locust	Common
Rubus idaeus ssp. idaeus	Wild Red Raspberry	Common
Salix fragilis	Crack Willow	Common
Salix purpurea	Basket Willow	Common
Salix X sepulcralis	Weeping Willow	Common
Solidago altissima	Tall Goldenrod	Common
Solidago canadensis	Canada Goldenrod	Common
Solidago nemoralis	Gray Goldenrod	Common
Sorbus aucuparia	European Mountain-ash	Common
Tanacetum vulgare	Garden Tansy	Common
Taraxacum officinale	Common Dandelion	Common
Thuja occidentalis	Eastern White Cedar	Common
Trifolium pratense	Red Clover	Common
Ulmus americana	White Elm	Common
Ulmus pumila	Siberian Elm	Common
Urtica dioica ssp. dioica	Stinging Nettle	Common
Vicia cracca	Bird Vetch	Common
Vitis riparia	Riverbank Grape	Common

Notes: *Introduced taxa.
[1]Rare in the GTA (after Varga *et al.* (2000)).
[2]Rare in the York Region (after Varga *et al.* (2000)).
[3]Uncommon in the GTA and in the York Region (after Varga *et al.* (2000)).

6.2.6.6 Rare, Threatened or Endangered Plant Species

No plant species considered rare, threatened or endangered in Ontario were noted during field investigations. A total of three species that are considered regionally rare or uncommon were documented during field investigations: red cedar; black walnut; and, common juniper. While these species are considered rare or uncommon in the GTA and/or York Region, these species were planted and are not naturally occurring in the study Area.

6.2.7 Wildlife and Wildlife Habitat

Field investigations were conducted in March and May 2003 to document wildlife habitat and wildlife occupation and to characterize the nature, extent and significance of animal usage within the project limits.

To date, 37 species of birds and 13 species of mammals have been documented in the Study Area. No herpetofauna were observed during field investigations. Table 6 of **Appendix E** summarizes the wildlife habitat located within/adjacent to the Study Area. **Table 6-9** presents the species of wildlife documented in the Study Area during field investigations.

Table 6-9
Wildlife Species Documented in the Study Area

Wildlife	Scientific Name	Common Name	Status
Birds	*Accipiter striatus*	Sharp-shinned Hawk	Common
	Agelaius phoeniceus	Red-winged Blackbird	Common
	Anas platyrhynchos	Mallard	Common
	Ardea herodias	Great Blue Heron	Common
	Bombycilla cedrorum	Cedar Waxwing	Common
	Branta canadensis	Canada Goose	Common
	Buteo jamaicensis	Red-tailed Hawk	Common
	Cardinalis cardinalis	Northern Cardinal	Common
	Carduelis tristis	American Goldfinch	Common
	Carpodacus mexicanus	House Finch	Common
	Ceryle alcyon	Belted Kingfisher	Common
	Charadrius vociferus	Killdeer	Common
	Colaptes auratus	Northern Flicker	Common
	Columba livia	Rock Dove	Common
	Corvus brachyrhynchos	American Crow	Common
	Cyanocitta cristata	Blue Jay	Common
	Dendroica caerulescens	Black-throated Blue Warbler	Common
	Dendroica petechia	Yellow Warbler	Common
	Dumetella carolinensis	Gray Catbird	Common
	Gallinago gallinago	Wilson's Snipe	Common
	Hirundo rustica	Barn Swallow	Common
	Icterus galbula	Baltimore Oriole	Common
	Larus delawarensis	Ring-billed Gull	Common
	Melospiza melodia	Song Sparrow	Common
	Mimus polyglottos	Northern Mockingbird	Common
	Molothrus ater	Brown-headed Cowbird	Common
	Passer domesticus	House Sparrow	Common
	Picoides pubescens	Downy Woodpecker	Common
	Quiscalus quiscula	Common Grackle	Common

Wildlife	Scientific Name	Common Name	Status
	Spizella passerina	Chipping Sparrow	Common
	Stelgidopteryx serripennis	Northern Rough-winged Swallow	Common
	Sturnus vulgaris	European Starling	Common
	Turdus migratorius	American Robin	Common
	Tyrannus tyrannus	Eastern Kingbird	Common
	Vireo olivaceus	Red-eyed Vireo	Common
	Zenaida macroura	Mourning Dove	Common
	Zonotrichia albicollis	White-throated Sparrow	Common
Mammals	*Canis familiaris*	Domestic Dog	Common
	Felis domesticus	Domestic Cat	Common
	Mephitis mephitis	Striped Skunk	Common
	Microtus pennsylvanicus	Meadow Vole	Common
	Mustela vison	American Mink	Common
	Odocoileus virginianus	White-tailed Deer	Common
	Ondatra zibethica	Muskrat	Common
	Peromyscus sp.	White-footed (Deer) Mouse	Common
	Procyon lotor	Raccoon	Common
	Sciurus carolinensis	Gray Squirrel	Common
	Sylvilagus floridanus	Eastern Cottontail	Common
	Tamias striatus	Eastern Chipmunk	Common
	Tamiasciurus hudsonicus	Red Squirrel	Common

The Study Area consists of commercial, industrial and urban residential areas. The majority of the Study Area is open habitat of anthropogenic origin with little to no natural heritage features. Wildlife habitat is typical of an urban setting with species that are very tolerant of human disturbance. The most significant habitat constitutes the natural areas surrounding the main branch of the East Don River, German Mills Creek and tributaries of the Rouge River. The lowland areas surrounding the watercourses, with their mature trees and open meadows, provide nesting and dwelling habitat for wildlife species and, along with the deciduous forest community, provide significant flyways and travel corridors for birds and mammals.

6.2.7.1 Rare, Threatened or Endangered Wildlife Species

No regionally or provincially rare, threatened or endangered wildlife were identified in the Study Area.

6.2.8 Designated Natural Areas

Designated natural areas include areas identified for protection by the OMNR, TRCA and upper tier and lower tier municipalities. The location of designated areas within the broader study Area is shown **Figure 6-1** of this Chapter.

6.2.8.1 Oak Ridges Moraine

The northern portion of the Study Area, between Elgin Mills Road and 19th Avenue, is located on the Oak Ridges Moraine and is designated a Settlement Area according to the Oak Ridges Moraine Conservation Plan (ORMCP).

6.2.8.2 Environmental Significant/Sensitive Areas

There are no Environmentally Significant/Sensitive Areas (ESAs) within the Study Area. Richvale Forest ESA 71 is located to the west of the Study Area south of Carrville Road in the City of Vaughan.

6.2.8.3 Provincially Significant Wetlands

There are no Provincially Significant Wetlands (PSWs) within the Study Area. There are two PSWs to the north of the northern project limits. Philips-Bond-Thompson Lakes PSW is a wetland complex of swamps, marshes, kettle pockets and lakes extending from Bond Lake to west of Bathurst Street. Wilcox-St. George PSW is a wetland complex of marsh and swamp communities bounded by Bloomington Road, Yonge Street, Stouffville Road and Leslie Street.

6.2.8.4 Areas of Natural and Scientific Interest

There are no Areas of Natural and Scientific Interest (ANSIs) within the study area. Several ANSIs are located outside the project limits. Jefferson Forest Regional Life Science ANSI is a large forest block bordering Stouffville Road and Bayview Avenue in the Town of Richmond Hill to the north of the northern project limits. Richvale Forest Life Science ANSI is situated on the east branch of the Don River south of Carrville Avenue and east of Bathurst Street, west of the study area, in the Town of Richmond Hill. Baker's Woods Provincial Life Science ANSI is a mature, managed sugar maple bush located at the northwest corner of Langstaff Road and Bathurst Street, west of the Study Area, in the City of Vaughan.

6.2.8.5 Designated Woodlots

Very few woodlots exist within/adjacent to the Study Area. One very small, fragmented woodlot is located in the southeast corner of Yonge Street and High Tech Road. Other wooded areas within/adjacent to the Study Area include: a forested tract on the east side of Yonge Street south of Royal Orchard Boulevard along the main branch of the East Don River; a forested tract on the west side of Yonge Street north of Elgin Mills Road along German Mills Creek; and, a forested tract on the west side of Yonge Street south of Brookside Road on a tributary of the Rouge River.

6.2.8.6 Natural Corridors

Wooded areas along watercourses in the Study Area act as corridors for wildlife tolerant of an urban environment. These areas allow for wildlife movement along the watercourses to and from more protected areas surrounding the Study Area such as PSWs, ESAs and ANSIs. The Study Area is highly urbanized and very few natural areas in locations other than along watercourses are linked together.

6.2.9 Natural Heritage System

According to the York Region Official Plan, the entire Study Area is designated as Urban Area. Lands surrounding the East Don River and its tributaries are designated a part of the Regional Greenlands System, lands to the north of the northern project limits are designated Environmental Policy Areas and four Conservation Areas - Regional Forests are adjacent to the study area according to the OP. These natural heritage features are connected to other regional natural heritage features to the north of the Study Area and provide linkages that facilitate wildlife movement within/adjacent to the Study Area.

Within the Town of Richmond Hill, few natural heritage features exist within/adjacent to the Study Area. Several forested areas, designated Woodlots in the Richmond Hill Environmental Management Framework, are located to the north of the northern project limits and a number of these are linked via watercourse corridors surrounding tributaries of the Rouge River. The south end of the Study Area in Richmond Hill is virtually devoid of natural heritage features and few linkages exist.

According to the Town of Markham Official Plan, lands to the east of Yonge Street between Highway 7 and Steeles Avenue are primarily commercial, urban residential, institutional and industrial. Lands surrounding the East Don River and its tributaries in this area are designated Valleylands and some are associated with Woodlots and Other Significant Vegetation Communities. According to the Town of Markham Official Plan, these Valleylands are part of an Environmental Protection Area and are considered Activity Linkages.

According to the City of Vaughan Official Plan, lands to the west of Yonge Street between Highway 7 and Steeles Avenue are primarily residential and commercial. Lands surrounding the main branch East Don River are designated Valley Lands and a Hydrogeologically Sensitive Area. A small number of Woodland Areas occur adjacent to the main branch of the East Don River in this region, according to the City of Vaughan Official Plan.

6.2.10 Contaminated Sites

A review of data collected through searches of various public databases was completed to assess the potential for environmentally affected sites (potential chemical contamination) along the proposed route and route options. The databases included the Ontario Ministry of the Environment databases and publications, the Technical Standards and Safety Authority, research at the Metro Toronto Reference Library, York Region and a visual reconnaissance of the proposed route options. The databases provide information related to property uses, recorded spills, or other environmental data. As such the degree of site contamination at a particular site may be unknown. The risk rankings were assigned on the assumption that a chemical release had occurred in order to provide a relatively conservative assessment of potential risks along the route options. A detailed discussion of the risk ranking scheme and the criteria used is provided in Appendix I. The risk ranking scheme was developed to assist in the qualitative evaluation of possible subsurface environmental risks. A summation of properties which represent a potential environmental concern to transit route development is presented below in **Table 6-10**.

Table 6-10
Total Number of Properties Representing Potential Environmental Concern

Environmental Risk Ranking	Route Option		
	Yonge Street with Mixed Traffic	Yonge Street with Wedrick Avenue Option	CN Bala/GO Richmond Hill Option
Low	27	14	11
Medium	37	22	20
High	34	21	16
Total	98	57	47

The properties identified in the table below lie primarily adjacent to the alignment option listed. Although the properties with a ranked risk for potential environmental concern are listed, the potential for actually encountering environmental affected soils or groundwater within the construction for the transit corridor is unknown at this time. If the ranked properties are found to exhibit environmental degradation, the effects of this degradation may or may not be encountered within the proposed construction since the work may be shallow (e.g. associated with pavement reconstruction), or be outside the immediately affected area (e.g. a spill may be registered for a property, but outside the area of construction). Additional investigation will be required for future design phases of this work.

6.2.11 Drainage Patterns

6.2.11.1 Watersheds

The Study Area is located within two watersheds – Don River and Rouge River – and the overall drainage flows in a southeasterly direction. The watersheds and drainage pattern are shown on **Figure 6-2**. Both watersheds are within the jurisdiction of the TRCA.

The watercourses within the Don River watershed consist of the main branch of the East Don River, a major tributary known as German Mills Creek, and three minor un-named tributaries. The watercourses within the Rouge River watershed consist of two minor tributaries located within the headwaters area of the Rouge River watershed. All of the above watercourses in both the Don River and Rouge River watersheds originate within the ORM that crosses the northern portion of the Study Area (north of Elgin Mills Road).

6.2.11.2 Regulatory Flood Lines

Flood line mapping is available from the TRCA for two of the watercourses within the Study Area – the main branch of the East Don River and German Mills Creek. The flood line mapping for the main branch of the East Don River extends upstream of Yonge Street and indicates that Yonge Street would not be overtopped during the Regulatory flood event. TRCA is currently in the early stage of updating the Regional Floodlines for the east Don River, which includes Pomona Mills Creek. Once it is available, updated floodlines will be obtained to verify any effects of the undertaking. The mapping for German Mills Creek ends at Major Mackenzie Drive is not available where German Mills Creek crosses Yonge Street.

Fill regulation lines have also been established for the main branch of the East Don River and German Mills Creek. The fill regulation lines encompass the flood plain area and are used to define erosion hazard impact zone. The fill regulation line contains the area in which the placing or dumping of fill is regulated by the Conservation Authority in order to control flooding, pollution, and conservation of land. Fill regulation line extensions have been defined by TRCA for the other watercourses within the Study Area however these lines not gone through the registration process and do not have the same legal standing as the registered fill regulation lines.

The TRCA regulates all activities within Regulatory flood plain areas, whether currently mapped or not, as well as the lands within Fill Regulation Lines. Therefore, all proposed construction activities involving work that crosses or is adjacent to a watercourse will require approval from the TRCA.

6.2.12 Water Quality

6.2.12.1 Surface Water Quality and Quantity

The aquatic habitat provided by the watercourses is an indication of the current water quality. As noted previously, the two southerly tributaries of the East Don River are classified as warm water fisheries, German Mills Creek is a cool water fishery and the remaining watercourses – main branch of the East Don River and the Rouge River tributaries - are cold water fisheries.

The areas around these watercourses are highly urbanized and many of the older storm drainage systems discharge directly to the watercourses. Newer developments typically discharge to storm water management facilities that provide quantity and/or quality controls prior to storm runoff entering the watercourses. In addition, there are initiatives being implemented as part of a program to clean up the Don River. This includes two storm water management facilities located in Harding Park on the north side of Weldrick Road and adjacent to German Mills Creek. These facilities were constructed as a demonstration project to improve the water quality in German Mills Creek and subsequently improve the water quality further downstream in the East Don River.

The TRCA collects water quality data at a number of locations within the Don River watershed. The closest stations to the Study Area are as follows:

- Station D 85003 – East Don River at Steeles Avenue and Bayview Avenue; and
- Station DGM 17.0 – German Mills Creek at Steeles Avenue and Leslie Street

These stations are located approximately 3.5 km and 7 km respectively downstream of the Study Area. Although these stations are not located within the Study Area, the water quality observations support the classification of the East Don River as a warm water fishery and German Mills Creek as a cool water fishery. Samples are usually taken during dry weather periods and the available data for the two stations covering the period from 1996 to 2001 are summarized in **Tables 6-11 and 6-12**.

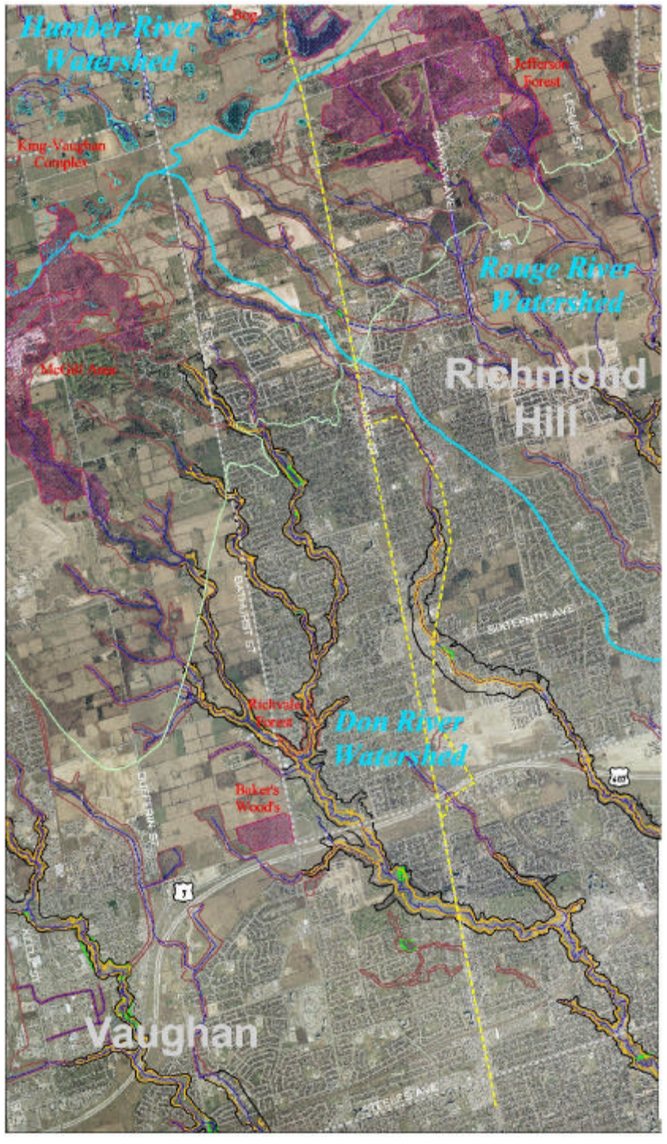


Figure 6-2
Watersheds and Drainage

Table 6-11
Don River, Bayview Avenue & Steeles Avenue - Station # D 85003

Don River, Bayview Ave. & Steeles Avenue - Station # D 85003 (data collected from May 30, 1996 to November 28, 2001)1								
Parameter	**Monitoring Season**	**#Obs**	**Min**	**Max**	**Mean2**	**Median**	**Guideline**	**% Meet Guideline**
Suspended Solids (mg/L)	May - Oct	13	2.0	28.0	10.6	7.0	25.0	92%
	Nov - Apr	10	1.0	22.0	7.1	6.5		100%
	all	23	1.0	28.0	9.1	7.0		96%
Chloride (mg/L)	May - Oct	13	8	241	97	94	250	100%
	Nov - Apr	10	94	3120	477	179		70%
	all	23	8	3120	262	127		87%
***E. Coli* (counts/100 mL)**	*May - Oct*	*14*	*5*	*2500*	*129*	*260*	*100*	*43%*
	Nov - Apr	*7*	*5*	*1600*	*68*	*160*		*43%*
	all	*21*	*5*	*2500*	*104*	*160*		*48%*
Phosphorus (mg/L)	*May - Oct*	*13*	*0.01*	*0.17*	*0.05*	*0.05*	*0.03*	*31%*
	Nov - Apr	*10*	*0.01*	*0.06*	*0.09*	*0.03*		*50%*
	all	*23*	*0.01*	*0.17*	*0.04*	*0.04*		*39%*
Unionized Ammonia (mg/L)	*May - Oct*	*8*	*0.000*	*0.031*	*0.008*	*0.002*	*0.02*	*75%*
	Nov - Apr	*9*	*0.000*	*0.003*	*0.001*	*0.000*		*100%*
	all	*17*	*0.000*	*0.031*	*0.004*	*0.001*		*88%*
Nitrate (mg/L)	*May - Oct*	*13*	*0.05*	*1.30*	*0.66*	*0.67*	*0.3*	*15%*
	Nov - Apr	*9*	*0.28*	*2.10*	*1.28*	*1.30*		*11%*
	all	*22*	*0.05*	*2.10*	*0.92*	*0.76*		*14%*
Water Temp. (ºC)	*May -Oct*	*13*	*7.0*	*29.3*	*17.0*	*16.0*	*213*	*77%*
	Nov - Apr	*9*	*-0.1*	*14.5*	*6.0*	*5.0*		*100%*
	all	*22*	*-0.1*	*29.3*	*12.5*	*12.9*		*86%*

Obs. = observations.
1. Prior to 1999 samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for *E. Coli.*
3. Approximate upper threshold for cold water fisheries.

Table 6-12
Don River, Leslie St. & Steeles Avenue - Station # DGM 17.0

Don River, Leslie St. & Steeles Avenue - Station # DGM 17.0 (data collected May 30, 1996 to October 27, 19981)								
Parameter	**Monitoring Season**	**#Obs**	**Min**	**Max**	**Mean2**	**Median**	**Guideline**	**% Meet Guideline**
***E. Coli* (counts/100 mL)**	*May – Oct*	*5*	*5*	*1900*	*154*	*160*	*100*	*20%*
Water Temp. (ºC)	*May - Oct*	*5*	*10.6*	*20.4*	*14.3*	*13.0*	*213*	*100%*

Obs. = observations.
1. Samples were not collected during the cold season (Nov.-Apr.)
2. Geometric mean used for *E. Coli.*
3. Approximate upper threshold for cold water fisheries.

6.3 SOCIAL ENVIRONMENT

This Section introduces all aspects pertaining to the Social Environment within the Study Area. It includes a summary of the land use distribution, the cultural environment and quality of life indicators such as air quality, noise and vibration.

6.3.1 Land Ownership Patterns

The Yonge Street Corridor is a distinct and vibrant transportation corridor that encompasses a wide variety of land uses. Yonge Street has historically been a focal point for mixed-use development consisting of higher density residential, institutional, retail and highway service commercial land uses. The combination of the recently developed mixed-use areas with the historical centres of the past (Thornhill and the Richmond Hill CBD) creates a mosaic of uses and densities which contributes to the unique character that makes Yonge Street the prominent choice for the development of a rapid transit corridor.

The properties in proximity to the alternative corridor alignments along the Yonge Street Corridor vary in size as the corridor itself has developed continuously over the course of history.

In general, the Yonge Street Corridor is surrounded by low-density residential development with the ever-increasing presence of recently developed medium and high-density infill projects (i.e. the CN Bala Subdivision). There are also a number of large industrial sites within the Newkirk Industrial Park along the CN Bala/GO Richmond Hill Line alignment. The largest underutilized property is University of Toronto's David Dunlop Observatory site, which is 193 ac. in size. This property is generally bounded by the CNR railway corridor, Hillsview Drive and Bayview Avenue. Along Yonge Street frontage between Highway 407 and Elgin Mills Road there are a number of retail commercial shopping centres, which occupy relatively large sites including the Hillcrest Mall and South Hill Shopping Centre.

The Yonge Street Corridor for the purpose of this EA commences at Steeles Avenue where commercial and office users are the primary land use components. Continuing northwards, towards Highway 407, high-density residential developments front on either side of the street, and as one enters into the Thornhill Heritage Conservation District, a wide variety of uses are present. Low, medium and high-density residential users, office uses, and two golf courses front on both sides of Yonge Street. To the north of the Thornhill Heritage Conservation District to Highway 407 the existing land uses include: commercial uses, a variety of residential uses and a large cemetery on the east side, just south of Highway 407.

The section of Yonge Street from Highway 7 north to Bantry Avenue, is designated as a Regional Centre by the York Region in its Official Plan. This area, known as the Bayview Glen Area is a cluster of new big box retail, commercial and office development on mainly the east side of the street and low density residential and older, established retail commercial areas on the west side of the street.

North of Bantry Avenue to 16th Avenue, there is an emerging presence of recently developed medium and high-density residential units, which occupy the east side of Yonge Street. On the NW corner of Yonge Street and Carrville Road is the regional shopping centre, Hillcrest Mall (585,000 sf). On the NE corner of Yonge Street and 16th Avenue, is the South Hill Shopping Centre (280,000 sf).

A number of retail shopping centres front onto Yonge Street between 16th Avenue and Major Mackenzie Drive including: Observatory Place (87,000 sf), Observatory Plaza (74,000 sf), Weston Produce Plaza (45,000 sf) and Richmond Centre (117,000 sf) all of which are scattered amongst the older established residential and commercial uses in this area. North of the Yonge Street and Major Mackenzie Drive intersection is the Richmond Hill Central Business District, the historical core of the Town of Richmond Hill. In the heart of the central business district there are a wide variety of uses, consisting mainly of established commercial uses which front onto Yonge Street. Amongst the commercial and office uses are places of worship (churches), which also front onto Yonge Street within the historical core.

On Yonge Street north of the historical district to Elgin Mills Road, commercial uses continue to dominate the west side of the road, but the Newkirk Industrial Park dominates the east side of the street from approximately Crosby Avenue north to Elgin Mills Road before it tapers to the east north of Elgin Mills Road.

As mentioned, on the west side of Yonge Street, south of Elgin Mills Road, there are some large-scale commercial shopping centres present. The Richmond Heights Shopping Centre (104,000 sf) at Yonge Street and Levendale Road and Oxford Square (64,000 sf) at Yonge Street and Oxford Street occupy the majority of the frontage up to Elgin Mills Road.

Continuing northbound past Elgin Mills Road, the commercial uses continue to dominate the land use fronting Yonge Street on both the east and west side, but the emerging presence of undeveloped land and older, historical buildings (i.e. Loyal True Blue & Orange building), the density of development decreases along the corridor to the north.

Heading towards the northern route boundary at 19th Avenue the transition from urban to rural begins to take shape as the land is less developed, and there is more open space and vacant land present. However, with the development of a long-term care facility, as well as some single and medium density residential uses on both the east and west side of Yonge Street in and around the 19th Avenue intersection increased intensification of northern limit of the Study Area is occurring.

6.3.2 Land Use Designations

6.3.2.1 Regional Official Plan

The Regional Municipality of York's Official Plan establishes an urban structure for the region, which is comprised of Regional Centres, which are connected by Regional Corridors, served by rapid transit.

Regional Structure of the OP designates the lands located to the east of the Highway 407 and Yonge Street interchange as a Regional Centre. The OP identifies Regional Centres as focal points, which contain concentrations of residential, human service, commercial and office activities. The OP states that Regional Centres should have the highest concentration and intensity of uses in the Region. In addition, the plan intends designated Regional Centres to be compact, pedestrian oriented, safe and accessible.

York Region's current Official Plan designated Yonge Street as a Regional Corridor and it also envisions that rapid transit service will be provided on Yonge Street to serve this Regional Corridor.

The Commissioner of Planning and Development Services (senior management team) submitted a report to York Region's Planning and Development Committee for their February 5, 2003 meeting entitled "Advancing the Region's Urban Structure – Policy Principles". This report recommended transit supportive development with the highest densities being located within the Regional Centres. Further it recommended overall densities in the Regional corridors and centres should achieve an average density of 2.5 FSI while simultaneously supporting stable residential communities.

The development of high-density uses along the corridor will support the introduction of a rapid transit system along the Yonge Street Corridor. Without the development of intensified areas, the extent of potential benefits from the transit system would not be realized.

With the principles put in place by the Region, it will ensure that the right form of development takes place that would complement a rapid transit system and the Region should work proactively and not allow for the possibility of lower density development along the corridor.

6.3.2.2 Municipal Official Plans

Town of Richmond Hill

The Town of Richmond Hill's Official Plan recognizes the existing commercial uses on the lands fronting onto Yonge Street between Highway 407 and Elgin Mills Road by applying a number of different commercial area designations to specific lands within the corridor.

The Plan applies the Central Business District Area designation to the lands fronting onto both sides of Yonge Street, north of Major Mackenzie Drive to Dunlop Street and Wright Street with one exception. The exception is an existing cemetery located on the west side of Yonge Street between Major Mackenzie Drive and Arnold Crescent, which is designated in the Mixed Residential Commercial Area. The Central Business District Area designation recognizes the historic core of the Town and seeks to preserve its historical significance

The implementation of the rapid transit service on the Yonge Mixed Traffic alignment would improve access to this historic commercial core and reinforce its current retail function without destroying its historical character

Hillcrest Mall and Oxford Plaza are both designated as Regional Commercial Areas by the Town's Official Plan. The stated intent of the Plan is that these two commercial nodes serve the needs of the entire Town of Richmond Hill and a portion of York Region. These two commercial centres would be best served by the introduction of rapid transit service along Yonge Street.

Markham

The Town of Markham's planning framework for the Thornhill district provides for the transformation of certain areas to more intensive and mixed-use development that will support transit improvements. These areas are found along Yonge Street and at nodes near Steeles Avenue and in the former Langstaff industrial area. Furthermore, Official Plan Amendment #1, the Thornhill Secondary Plan, envisions redevelopment and intensification along portions of Yonge Street.

In regards to a designated rapid transit service, the Thornhill Secondary Plan (Markham) provides for inclusion of HOV lanes for the realigned Langstaff Road. However, redevelopment has not occurred in the Langstaff area and therefore the transit and road improvements in Markham have not occurred.

Vaughan

The City of Vaughan's Thornhill- Vaughan Community Plan essentially reflects the established land use pattern and does not currently provide for significant change along Yonge Street. City staff have indicated that they will likely undertake further land use reviews, particularly near Yonge Street and Steeles Avenue, but not until there are major transportation improvements.

Also limiting possible development is Official Plan Amendment #210, the Thornhill Secondary Plan, which maintains the status quo. Furthermore, priority is given to the extension of the Spadina subway line to Highway 407 over the Yonge subway line extension, which is another contributing factor in the limiting of development.

6.3.2.3 Municipal Zoning By-Law

The great diversification and mix of densities that exist along the corridor are a result of the guidelines set out within the Official Plans and Zoning By-Laws of the region as well as the municipality. However, to achieve the intensification required by the Region, land re-designations will be required.

The Town of Richmond Hill does not have a consolidated version of their Zoning By-Laws, but rather, they have a complex, divided set of zoning by-laws that are very diverse. It can be understood that through the zoning by-laws that govern the area within and around the Yonge Street Corridor, the Town attempts to preserve the historical district, intensify land uses where it is feasible and will continue to build upon the success of the Yonge Street Corridor that exists within their boundaries.

6.3.3 Land Use along the Corridor

6.3.3.1 Residential Neighbourhoods

The residential areas along the Yonge Street Corridor are, generally speaking, low-density residential developments. Commencing in the south, South Richvale and the Langstaff residential areas consist of low density housing, both old and new with higher density townhouse and apartment development emerging in the Richmond Hill Centre node along Yonge Street and the GO Rail Line. Continuing northward into the North Richvale and Hillsview communities bordered by 16th Avenue to the south and Major Mackenzie Drive East to the north, significant higher density development has been added recently to the more mature mainly low density residential development. The older, established residential neighbourhoods of Old Richmond Hill exist north of Major Mackenzie followed by the newly developed residential areas north of Elgin Mills Road.

The neighbourhoods are a mix of established and newly developed areas, which surround the bustling Yonge Street Corridor infusing it with high levels of pedestrian traffic that are the vital components to the success of a transit system. With the intensification of Yonge Street north of Highway 7, came the development of underutilized sites leading to the creation of medium and high density residential developments that fit within the emerging streetscape pattern of Yonge Street with the new mixed-use development comprising the Bayview Glen Area.

6.3.3.2 Commercial Areas

The Yonge Street Corridor provides an endless supply of commercial uses, which are a combination of large regional shopping centres to big box retailers to small 'mom and pop' shops.

6.3.3.3 Business Areas

A wide variety of business areas exist within the Yonge Street Corridor. For the purpose of this EA, business areas are representative of employment areas. In this case, the Newkirk- Elgin Mills Industrial Area is the primary area of employment lands along the corridor. This area contains the industrial users who dominate the northern portion of the corridor between Yonge Street and the CN Bala Line in and around Elgin Mills Road.

Other than those lands mentioned, the remaining employment lands within the Town have been converted (i.e. Bayview Glen Area) to allow for mixed-use development rather than strictly employment/industrial development.

6.3.4 Future Development Plans

Recently designated and emerging areas of land development identified within the corridor include:

- The Bayview Glen Area in Richmond Hill at Yonge Street and Highway 7, which is a designated regional centre in the York Region Official Plan;
- The David Dunlap Observatory provides the potential for development of approximately 195 acres of land within the heart of Richmond Hill;
- Vacant industrial lands just south of Elgin Mills Road provide the possibility of future big box retail development; and
- Other smaller infill areas exist within the corridor for the replacement/ development (i.e. CN Bala Subdivision area and infill sites just south of 19th Avenue).

6.3.5 Recreation and Tourism Areas

The recreation and tourism areas within the Yonge Street Corridor cater to all members of society. From the vast majority of parks, community centres, arenas, libraries to the many shopping locales, the Yonge Street Corridor provides a plethora of activities for everyone.

The David Dunlap Observatory, home to a 23 tonne telescope, the largest in Canada, was used to discover the first observational evidence for the black hole in 1972, is a prime tourist attraction.

The Yonge Street Corridor provides access to endless acres of open space areas as well as countless amenities including hotels, dining and shopping

which are all important factors in the displaying the attractiveness of a community and more importantly, through the creation of a rapid transit system become much more accessible.

6.3.6 Services and Utilities

The major utilities located in the vicinity of the Yonge Street alignment have been identified through direct contacts with the respective companies, and these utilities are the following:

- TransCanada Pipeline;
- Markham Hydro;
- Vaughan Hydro;
- Richmond Hill Hydro;
- Watermains;
- Sanitary Sewers;
- Embridge Gas;
- Bell Canada;
- Rogers Cable;
- Futureway Communications Inc.; and
- Allstream Corporation (formerly AT&T Canada).

A thorough review of the necessary relocations or modification of utility plants will be undertaken during the detailed design stage.

6.3.6.1 TransCanada Pipelines

TransCanada Pipelines plant within the Study Area consists of a major natural gas transmission corridor and related facilities. Within York Region, this pipeline corridor remains roughly parallel south to Gamble Road/ 19th Avenue. It crosses Yonge Street on the south side of Gamble Road/19th Avenue in the Town of Richmond Hill. Within the Yonge Street Corridor, TCPL operates three pipelines with diameters of 508mm (20"), 762mm (30") and 914mm (36") respectively and roughly 1.8m below grade.

6.3.6.2 Vaughan/ Markham/ Richmond Hill Hydro

Along Yonge Street, an extensive network of service is provided by three providers, Vaughan Hydro, Markham Hydro and Richmond Hill Hydro, respectively. Vaughan Hydro operates aerial facilities along the west side of Yonge Street from Steeles Avenue to Longbridge Road, just south of Highway 407. Markham Hydro operates both aerial and buried facilities along the east side of Yonge Street from Steeles Avenue to Langstaff Road, just south of Highway 407. Richmond Hill Hydro operates both aerial and buried facilities along Yonge Street from Highway 407 to Gamble Road/19th Avenue. Currently under consideration is the Thornhill Revitalization Project undertaken by the Thornhill Heritage Authority. Working with the Vaughan and Markham Hydro, the project proposes to replace the aerial facilities with buried within the Thornhill Heritage District.

6.3.6.3 Watermains

The Regional Municipal of York operates four major watermains within the Yonge Street alignment. From Langstaff Road to Major Mackenzie Drive, a watermain travels east-west along the north side of Langstaff Road, turns north at Ruggles Avenue to cross Highway 407 and Highway 7 to meet Yonge Street. It then travels north along east side of Yonge Street, crosses over to the west side at 16th Avenue/Carrville Road and continues north to join the Major Mackenzie watermain. The remaining three watermains cross the Yonge Street at Highway 7, Major Mackenzie Drive and Elgin Mills Road. Further, the City of Toronto owns a watermain crossing Yonge Street at Arnold Avenue/Elgin Street in Thornhill.

6.3.6.4 Sanitary Sewers

Along Yonge Street, the Regional Municipal of York operates four major sanitary sewers. From Elgin Mills Road to Gamble Road/19th Avenue, a sanitary sewer travels along the east side of Yonge Street. The remaining three sanitary sewers cross Yonge Street at Steeles Avenue, north of Little Don River, and Highway 7, which also travels across Highway 407 and parallel to Langstaff Road south of Highway 407.

6.3.6.5 Enbridge Consumers Gas

Enbridge Consumers Gas operates pressure gas mains along both sides of Yonge Street, and at a number of side roads.

6.3.6.6 Bell Canada/ Rogers Cable/Futureway Communications Inc./Allstream Corporation

Bell Canada, Rogers Cable, Futureway Communications Inc. and Allstream Corporation all have extensive networks of buried and aerial plants within the Yonge Street alignment. Some of the aerial plants even share facilities with the hydro aerial plants.

6.4 CULTURAL HERITAGE RESOURCES

This section summarizes the main feature of the Cultural Heritage Resources found within the Study Area. It presents a synopsis of the historical development of the study corridor and identifies built heritage features and cultural landscape units that may be affected by the undertaking.

6.4.1 Environmental Assessment & Cultural Heritage Resources

The need for the identification, evaluation, management and conservation of Ontario's heritage is acknowledged as an essential component of environmental assessment and municipal planning in Ontario.

This analysis of cultural heritage resources in the Study Area addresses those above-ground, person-made heritage features over 40 years old. The application of this rolling forty year principle is an accepted federal and provincial practice for the preliminary identification of cultural heritage features that may be of heritage value. Its application does not imply however that all built heritage features or cultural landscapes that are over forty years old are worthy of the same levels of protection or preservation. The analysis throughout the study process addresses that part of the Environmental Assessment Act, subsection 1(c), that defines "environment" to include:

> *"...cultural conditions that influence the life of humans or a community"; as well as, "any building, structure, machine or other device or thing made by humans".*

Roadway design and construction may potentially affect cultural heritage resources in a number of ways. The effects may include displacement through removal or demolition and/or disruption by the introduction of physical, visual, audible or atmospheric elements that are not in keeping with the character of the cultural heritage resources and/or their setting.

6.4.1.1 19th Century Development

Yonge Street was planned by Lieutenant-Governor John Graves Simcoe as a military road to connect York (Toronto) on Lake Ontario to the naval base at Penetanghishene on Georgian Bay. Augustus Jones surveyed the route in the winter and spring of 1794 and 200 acre lots were laid out on either side of the right-of-way. By August of 1794, Yonge Street had been opened to just below Thornhill with the labour of the Queen's Own Rangers and settlers. Simcoe then arranged with William Von Berczy that he would contract the construction of a wagon road from York to Holland Landing for the end of 1795 in exchange for land in the Thornhill area and in Markham Township. Berczy defaulted and by the end of 1795 Simcoe had arranged for Augustus Jones to complete Yonge Street. Jones and the Queen's Rangers completed Yonge Street to Lake Simcoe early in 1796, although it was in very poor condition and impassable in many areas.

Between 1799 and 1812 the Northwest Company used the Yonge Street route and contributed money to improve the road conditions. By the late 1820s, Yonge Street was a regular stagecoach route from York to Holland Landing. The stagecoach trade ensured the economic prosperity of the early Yonge Street communities like Thornhill, Langstaff and Richmond Hill. It was established as a toll road in 1831 and portions were macadamized and toll-gates were built. The provincial government took over the upkeep of the road in 1846. By 1850 Yonge Street was macadamized as far as Holland Landing.

With the introduction of the railway in 1853 Yonge Street's monopoly on the north-south trade as the only viable overland transportation route was dealt a sever blow, threatening the livelihoods of the communities along its route. The new railway line bypassed both Thornhill and Richmond Hill on the west. The stagecoach service died out in the late 19th century. The interurban electric railway was established along Yonge Street from Toronto in the late 1890s serving many communities including Richmond Hill and Thornhill.

A number of individuals and groups who participated in the survey and construction of Yonge Street settled on land adjacent to the road. They included Provincial Land Surveyor Augustus Jones, members of the Queen's (York) Rangers, Berczy settlers, Mennonites, Comté de Puissaye settlers, Quakers and United Empire Loyalists. Thornhill, Langstaff and Richmond Hill in Vaughan and Markham Townships were early settlements along the road.

Richmond Hill, Langstaff and Thornhill are the three principal areas of settlement that were established in the early nineteenth century within the Yonge Street study corridor. Further detailed historical facts can be found in **Appendix F**.

6.4.1.2 20th Century Development

In 1911-13 the City of Toronto established the Langstaff Farm Jail on the east side of Yonge Street. The Langstaff Farm located on the west side east of Yonge Street at Highway 7 was sold in 1950 for residential subdivision development. Widening of both Highway 7 and Yonge Street have removed all traces of the community except the Langstaff name.

Several subdivisions were registered in the Thornhill area after World War I. The Toronto Ladies Golf Course and the Thornhill Country Club both opened in 1922 on opposite sides of Yonge Street just north of Centre Street in Thornhill. The Uplands Golf Course was also established in Thornhill during this period. Thornhill became a Police Village with its own political boundaries in 1931.

To the north of Richmond Hill the Loyal True Blue and Orange Home purchased 100 acres in Markham Township in 1919 to build an orphanage. The cornerstone of the existing building was laid in 1921 and officially opened on July 1, 1923. The Home served as an orphanage for 58 years until 1980. It continues to house community services and the Loyal True Blue and Orange Research Institute.

Post World War II ushered in a period of rapid growth for Richmond Hill and Thornhill. Commuters and the northward development of Toronto resulted in the existing subdivisions and the creation of new ones. Holy Cross Cemetery was opened on the east side of Yonge Street south of Langstaff Road in 1954.

In January 1971 the Regional Municipality of York was created with Thornhill being split once again between the Towns of Vaughan and Markham. Richmond Hill became a town within the new Region. Highway 407 was opened immediately south of Highway 7 in the 1990's.

6.4.2 Cultural Landscapes & Built Heritage Features

The Ontario Heritage Act gives the Ontario Ministry of Culture (MCL) the responsibility for the conservation, protection and preservation of Ontario's culture heritage resources. Section 2 of the Ontario Heritage Act charges the Minister with the responsibility to:

> *"...determine policies, priorities and programs for the conservation, protection and preservation of the heritage of Ontario"*

The MCL describes heritage buildings and structures, cultural heritage landscapes and archaeological resources as cultural heritage resources. Since cultural heritage sources may be adversely impacted by both public and private land development, it is incumbent upon planning and approval authorities to consider heritage resources when making planning decisions.

Two MCL guidelines assist in the assessment of cultural heritage resources as part of an EA. They are, Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments (October 1992), and, Guidelines on the Man-Made Heritage Component of Environmental Assessments (1980). The Guidelines on the Man-Made Heritage Component of Environmental Assessments state:

> *"When speaking of man-made heritage we are concerned with works of man and the effects of his activities in the environment rather than with moveable human artifacts or those environments that are natural and completely undisturbed by man."*

Both guidelines state that one may distinguish broadly between two basic ways of visually experiencing cultural heritage resources in the environment, that is, as cultural landscapes and as built heritage features. Cultural landscapes units are a geographical area perceived as a collection of individual person-made built heritage features set into a whole such as historical settlements, farm complexes, waterscapes, roadscapes, railways, etc. They emphasize the interrelationship of people and the natural environment and convey information about the processes and activities that have shaped a community. Built heritage features are individual, person-made or modified, parts of a cultural landscape such as buildings or structures of various types, cemeteries, planting and landscaping structures, etc.

The MCL Guidelines describe the attributes necessary for the identification and evaluation of any discrete aggregation of person-made features or cultural landscapes and the attributes necessary for the identification and evaluation of cultural features or built heritage features. Aggregations of individual cultural features usually form areas of homogenous character such as a rural area, a village, and a streetscape, etc. Heritage attributes, in relation to a property, are defined in the OHA as the attributes of the property that cause it to have cultural heritage value or interest.

6.4.2.1 Assessment Methodology and Highlights

For the purposes of this built heritage and cultural landscape assessment of the alternative routes the following tasks were undertaken:

- the identification of major historical themes and activities of the study corridor through historical research and a review of historical mapping;
- the identification of built heritage features and cultural landscape units within the Yonge Street Corridor study area through historical themes and mapping;
- a windshield survey of the Yonge Street Corridor Study Area from Gamble Road/19th Avenue in the north to Steeles Avenue in the south to identify any of built heritage features and principal cultural landscape units within and adjacent to the road right-of-way; and,
- A review of route alternatives and evaluation of the adverse effects to the cultural heritage resources due to the undertaking.

Highlights of the Study Area from a heritage point of view are as follows:

6.4.2.2 Public Recognition

In 1937, the Historic Sites and Monuments Board of Canada commemorated Yonge Street for being of historic importance as an early transportation route. The Province of Ontario has recognized Yonge Street with a historical plaque.

Vaughan

The study corridor includes the Thornhill Heritage Conservation District, which is designated under Part V of the Ontario Heritage Act. Soule's Inn located at No. 8038 Yonge Street is individually designated under Part IV of the Ontario Heritage Act. Municipal and provincial historical plaques commemorating the settlement of Thornhill (2), Holy Trinity Church and Holy Trinity Burying Grounds are found on Yonge Street in the Thornhill area.

Markham

The study corridor includes the Thornhill Heritage Conservation District, which is designated under Part V of the Ontario Heritage Act.

Richmond Hill

The Town of Richmond Hill protects through its Official Plan its historic core and has implemented design guidelines for the area. This area includes listed and municipally designated heritage structures. The properties designated under Part IV of the Ontario Heritage Act include Nos. 10066, 10100, 10111-10113, 10117-10123, 10132 and 10266 Yonge Street. Two provincial plaques stand along Yonge Street within the Yonge Street Corridor. They commemorate the founding of Richmond Hill (in front of the Town Hall) and Lieutenant-Colonel Robert Moodie (Yonge Street at Trayborn Drive north of Richmond Heights Plaza).

The former Jefferson schoolhouse located at No. 11575 Yonge Street, the John Palmer Sr. residence located at No. 9993 Yonge Street and the Richard Vanderburgh House at No. 376 Church South are designated under Part IV of the Ontario Heritage Act. Toll Road Antiques located on the east side of Yonge Street below 19th Avenue has a Richmond Hill historical plaque commemorating the home of Wm. Wright Senior.

6.4.3 Identification of Built Heritage Features & Cultural Landscapes

For the purposes of built heritage feature and cultural landscape identification, the following provides a brief description of the existing environment, the principal built heritage features and the principal cultural landscape units identified within the Yonge Street Corridor and the three route alternatives.

6.4.3.1 Description of the Existing Environment

The Yonge Street Corridor passes through three municipalities, namely, the Town of Richmond Hill, the City of Vaughan on the west of Yonge Street and the Town of Markham on the east side. For the most part, the Yonge Street Corridor Study Area is an area of primarily 20th century urban development consisting of commercial, industrial and some residential areas, hydro-electric transmission corridors and linear transportation corridors such as roads and railway lines. However, within the corridor there are discrete and distinctive areas associated with the historic cores of Richmond Hill and Thornhill, two 19th century settlement. Other individual 19th century buildings of varying types are located along the length of the Study Area corridor. However, they are, for the most part, confined to the core historical areas contained within the municipally designated heritage conservation district of Thornhill located in the City of Vaughan and the Town of Markham and the Richmond Hill historic core area.

6.4.3.2 Description of Identified Built Heritage Features and Cultural Landscape Units

Table 6-13 lists the cultural heritage features identified through a wind shield survey of the preferred route as standing within or adjacent to the Yonge Street Corridor Study Area between Gamble Road/19 Sideline in the north and Steeles Avenue in the south. The principal cultural landscapes are the two Thornhill Heritage Conservation Districts and the historic core of Richmond Hill. Although the built heritage features and cultural landscapes located within these three areas were not identified individually as part of the survey, they include 19th and 20th century residential, commercial, public and educational and religious buildings, cemeteries and recreational areas. Cultural heritage landscapes and individual 19th and 20th century buildings outside of the two districts and the historic core also comprise 19th and 20th century residences, religious, institutional, educational buildings and cemeteries.

Table 6-13
Cultural Heritage

Number	Feature	Type	Location/Description
1.	BHF	Residence	No. 11575 Yonge Street, east side, north of Gamble Rd., Town of Richmond Hill. Former school building S. S. # 4 Jefferson Public School. Designated under Part IV of the *Ontario Heritage Act*.
2.	BHF	Residence	Toll Road Antiques, no number, east side of Yonge Street, Town of Richmond Hill. Historical plaque to Wm. Wright Senior Home, dated 1895.
3.	BHF	Institutional Building	Loyal True Blue & Orange Home, No. 11181 Yonge St., east side, Town of Richmond Hill.
4.	CLU	Richmond Hill Historic Core (Central Business District)	Both sides of Yonge Street from Levendale Road in the north to Major Mackenize Drive in the south. Includes listed and designated heritage properties such churches, cemeteries, residences and commercial, public, educational and institutional buildings.
5.	CLU	Streetscape	Remnant residential streetscape on the east side of Yonge Street from Major Mackenzie Drive south to Elmwood Avenue in Richmond Hill. Of note it includes the John Palmer Sr. House at No. 9993 Yonge Street, which designated under Part IV of the *Ontario Heritage Act*, and No. 9985 and the residence to its south at Elmwood Avenue.
6.	CLU	Cemetery	No. 8361 Yonge Street, Holy Cross Cemetery, Town of Markham.
7.	BHF	School	No. 8210 Yonge Street, west side, City of Vaughan (Thornhill). Uplands Community Learning Centre. Former Langstaff Public School, 20th century institutional building, built in 1926.
8.	CLU	Thornhill Heritage Conservation District (Vaughan)	East side of Yonge Street in Town of Markham from Baythorn Drive in the north to Elgin Street in the south. Designated under Part V of the *OHA*. Contains numerous built heritage features of note including churches, cemeteries, residences, commercial buildings and recreational facilities (Toronto Ladies Golf Course, No. 7859 Yonge Street, established in 1922)
9.	CLU	Thornhill Heritage Conservation District (Markham)	West side of Yonge Street in City of Vaughan from Thornhill Avenue in the north to Arnold Avenue in the south. Designated under Part V of the *OHA*. Contains numerous built heritage features of note including churches, cemeteries (Holy Trinity Anglican Cemetery), residences, cemeteries, residences and commercial buildings and part of the Thornhill Country Club at No. 7994 Yonge Street, which was established in 1922. No. 8038 Yonge Street is designated individually under Part IV of the *OHA*.
10.	BHF	School	No. 7554 Yonge Street, west side, Thornhill Public School, at Arnold Drive, City of Vaughan (Thornhill). 20th century institutional building.
11.	BHF	Bethel Church	Langstaff Road East, west side at turn, now Greek Melkite Church.
12.	BHF	Residence	No. 75 Langstaff Road East, 20th century.
13.	BHF	Residence	No. 77 Langstaff Road East, 20th century.
14.	BHF	Residence	No. 376 Church Street South, s.w. corner of Weldrick Road. Designated under Part IV of the *OHA*.

Note: BHF Built Heritage Feature
CLU Cultural Landscape Unit

6.4.4 Archaeological Resources

The detailed report examining the potential for Archaeological resources within the Study Area is presented in **Appendix J**, *Stage 1 Archaeological Assessment*.

6.4.4.1 Previous Archaeological Research and Retained Sites

Three sources of information were consulted in order to compile an inventory of archaeological resources in the vicinity of the study area: the site records for registered archaeological sites (housed at the Ministry of Culture), published and unpublished documentary sources, and the files of Archaeological Services Inc.

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (O.A.S.D.), maintained by the Ministry of Culture. This database contains archaeological sites registered according to the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 kilometres east to west, and approximately 18.5 kilometres north to south. Each Borden block is referenced by a four-letter designator, and sites within a Borden block are numbered sequentially as they are found. The Study Area under review is located in Borden blocks AlGu and AkGu.

For the purposes of determining archaeological potential and identifying archaeological sites that may be impacted by the proposed transitway undertaking, the area examined comprised a 250-metre buffer surrounding all proposed Yonge Street Transitway routes, including the Yonge Street Corridor, the Langstaff Road corridor, the Weldrick Road corridor, and the rail line corridor. Eighteen archaeological sites have been registered within the buffer area. These sites are listed in **Table 6-14** below.

Table 6-14
Archaeological Sites Within ~250 Metres Of The Study Area

Borden No.	Site Name	Cultural/Temporal Affiliation	Site Type	Researcher(s)
AkGu-61	Soules' Inn	Historic Euro-Canadian	Inn	Archaeological Services Inc. 1995
AlGu-3	Murphy Goulding	Woodland	Village	A.J. Clark 1931 Archaeological Services Inc. 1987, 1989, 1994
AlGu-20	Silverpine 3	Early Archaic	Isolated Find	Mayer, Pihl, Poulton & Associates 1985
AlGu-21	Silverpine 4	Undetermined Precontact / Historic Euro-Canadian	Isolated Precontact Find / Historic Farmstead	Mayer, Pihl, Poulton & Associates 1985

Table 6-14
Archaeological Sites Within ~250 Metres Of The Study Area

Borden No.	Site Name	Cultural/Temporal Affiliation	Site Type	Researcher(s)
AlGu-34	Vanderburgh	Historic Euro-Canadian	Farmstead	Archaeological Services Inc. 1987
AlGu-45	Orion	Iroquoian	Hamlet	Archaeological Services Inc. 1987, 1988, 1996
AlGu-46	Bernard	Historic Euro-Canadian	Farmstead	Archaeological Services Inc. 1987, 1997
AlGu-94	Russell	Historic Euro-Canadian	Farmstead	Archaeological Services Inc. 1988
AlGu-95	Langstaff Jail Farm	Historic Euro-Canadian	Farmstead	Archaeological Services Inc. 1987, 1989
AlGu-107	Log Cabin	Historic Euro-Canadian	Farmstead	Archaeological Services Inc. 1989, 1994
AlGu-108	Carins	Undetermined Precontact	Isolated Find	Archaeological Services Inc. 1989
AlGu-109	Fornax	Undetermined Precontact	Isolated Find	Archaeological Services Inc. 1989
AlGu-113	Stooks-Langstaff-Atkinson	Historic Euro-Canadian	Farmstead	Archaeological Services Inc. 1990
AlGu-115	Elgin Yonge Centre	Late Woodland	Isolated Find	R. Pearce 1990
AlGu-118	No name	Archaic	Isolated Find	Ministry of Transportation 1991
AlGu-120	Over	Late Woodland / Historic Euro-Canadian	Iroquoian Village/Historic Industrial Complex	Ministry of Transportation 1991
AlGu-151	Royal Chapin	Historic Euro-Canadian	Homestead	Archaeological Services Inc. 1995
AlGu-223	John Hamilton	Historic Euro-Canadian	Industrial and Residential Complex	D.R. Poulton 1999

Of these 18 sites, 7 sites (the Soules' Inn site [AkGu-61], the Langstaff Jail-Farm site [AlGu-95], the Vanderburgh site [AlGu-34], the Fornax site [AlGu-109], the Over site [AlGu-120], the Elgin Yonge Centre site [AlGu-115], and the Royal Chapin site [AlGu-151]) have been registered within approximately 50 metres of Yonge Street. The Vanderburgh site (AlGu-34) is also in close proximity to Weldrick Road.

The Soules' Inn site (AkGu-61) is located at 8038 Yonge Street. The site, consisting of historic artifacts related to the use of the Inn, was identified by Archaeological Services Inc. in 1995, during Stage 2 archaeological survey by means of test pitting. The area was recommended as a candidate for further archaeological assessment, and in the same year (1995) Stage 3 and 4 archaeological excavation of the site was carried out by Archaeological Services Inc.

The Langstaff Jail-Farm site (AlGu-95) was identified during the course of survey for the Richmond Hill Archaeological Masterplan prepared by Archaeological Services Inc. in 1988. The site represents the location of archaeological remains dating to successive occupations on Lot 37, Concession 1 East of Yonge Street, Town of Richmond Hill, beginning with the construction of John Langstaff, Sr.'s house, circa 1846. Salvage excavation of the site was completed by Archaeological Services Inc. in 1990.

The Vanderburgh site (AlGu-34) is the original location of the historic Vanderburgh house, situated east of Yonge Street, northwest of Weldrick Road, and south of Clarissa Drive. Archaeological excavation at the site was conducted in 1987 by Archaeological Services Inc., during the process of moving the Vanderburgh house to its current location on the east side of Weldrick Road south of Church Street. The house was moved, and the site excavated, prior to the construction of the Tridel towers now standing at the site location. Excavations at the site yielded archaeological remains related to the occupation of the Vanderburgh house and an earlier occupation of a structure, the foundation of which was used to support the Vanderburgh house.

The Fornax site (AlGu-109) is the find location of a single precontact Aboriginal lithic artifact—a Haldimand chert scraper of undetermined cultural and temporal affiliation—identified by Archaeological Services Inc. in 1989, during archaeological survey of a ploughed field south of Gamble Road on the west side of Yonge Street.

The Over site (AlGu-120) was identified by the Ministry of Transportation in 1991, prior to the construction of the Highway 7/Highway 407 interchange with Yonge Street. This multi-component site, identified in a woodlot at the northeast corner of Highway 7 and Yonge Street, yielded remains of a 19th century Euro-Canadian industrial complex and of a Late Woodland (approximately 1400 AD to 1650 AD) Iroquoian village. At the time of site registration it was determined that the site would be completely impacted by construction of the Highway 7/Highway 407 interchange with Yonge Street, and mitigation was recommended.

The Elgin Yonge Centre Site (AlGu-115) is the find location of a single precontact Huron artifact (a Huron Incised-type ceramic rim sherd) dating to the Late Woodland period (approximately 500 AD to 1650 AD). The artifact was identified in fill of unknown origin found at the northwest corner of the intersection of Yonge Street and Elgin Mills, in Richmond Hill, and was registered in 1990 by Robert Pearce.

The Royal Chapin site (AlGu-151), a historic Euro-Canadian homestead site, was identified by Archaeological Services Inc. during Stage 1 and 2 Archaeological Assessment at the southwest corner of Yonge Street and Gamble Road in the Town of Richmond Hill. No further archaeological work was recommended for the site.

Based on the presence of these 7 sites within the Study Area, as well as on the presence of several watercourses, including German Mills Creek and the East Don River; the close proximity of several additional watercourses; and the intensity of historic land use within the Study Area; the subject lands have potential for the identification of historic and precontact archaeological sites in areas where archaeological potential has not been negated by intensive, recent construction disturbance.

Field review has confirmed that the majority of the Study Area has been disturbed by right-of-way construction and adjacent development, and is therefore without archaeological potential. Nonetheless, several properties scattered throughout the study area will require closer visual inspection or subsurface testing as part of Stage 2 archaeological assessment, and a small number of these areas of potential may extend into the margins of the rights-of-way within the Study Area limits. It is therefore recommended that:

- Prior to any land-disturbing activities within the Study Area, Stage 2 archaeological assessment should be conducted in accordance with Ministry of Culture Stage 1 – 3 Archaeological Assessment Technical Guidelines, in order to identify any archaeological remains that may be present within the Study Area limits.
- In the event that deeply buried archaeological remains are encountered during construction activities, the office of the Regulatory and Operations Group, Ministry of Culture should be notified immediately.
- In the event that human remains are encountered during construction, both the Ministry of Culture and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit, Ministry of Consumer and Commercial Relations should be notified immediately.

6.5 EXISTING NOISE AND VIBRATION LEVELS

This Section presents the results of the background noise and vibration monitoring within the Study Area. The detailed report for these topics can be found in **Appendix G**, *Noise and Vibration Impact Assessment*.

6.5.1 Predominant Land Uses

From a noise and vibration point of view, the predominant land use within the Study Area consists of a mix of residential, commercial, industrial, institutional and park/open space land uses. For the most part, the areas adjacent/closest to Yonge Street along the entire route are characterized by commercial uses. Residential uses are generally set back from Yonge Street, except for a few pockets of residential singles on the west side of Yonge Street between Bunker Road and Longbridge Road, and between Garden Avenue and Roosevelt Drive. The highest density of residences fronting onto Yonge Street is a concentration of townhouses extending north from Beresford Drive to about Northern Heights Drive. Several offices, institutional and industrial buildings also front onto Yonge Street at various points along the Corridor.

6.5.2 Approach Used

Noise limits applicable to transit development projects are contained in provincial protocols and the Ontario Model Municipal Noise Control By-law. Local municipal noise control by-laws also contain time and place restrictions on construction activities that in turn may have implications for such undertakings.

To determine the appropriate noise requirements for this project, meetings were held with the various relevant representatives from the Ontario Ministry of the Environment, including the Ministry's Environmental Assessment and Approvals Branch, Central Region Office and Air and Noise Unit. On the basis of these consultations, and the review of existing protocols for other transit projects, specific protocols for noise and vibration were developed for assessing this project. These are:

- for existing/future noise, the impacts were established based on the higher of either a daytime limit of 50 dBA or existing levels, and that nighttime limits be based on the higher of either 45 dBA or existing levels, determined either by traffic noise predictions and/or measurements;
- that mitigation be considered if the existing established sound levels at the closest receptor be exceeded by > 5 dBA;
- stationary noise sources be assessed in accordance with NPC-205;
- construction noise be assessed in accordance with NPC-115; and
- vibration impact be assessed in accordance with the MOEE/TTC Protocol.

Table 3.1 of the detailed report summarizes the key criteria specified in the above mentioned protocols and additional details on NPC-205 and NPC-115 are included in Appendix A of that report. Information on sound level terminology is also contained in this appendix.

6.5.3 Traffic Noise Prediction Results for Existing Conditions

Table 6-15 shows the traffic noise prediction results for existing conditions (2003) at the closest receptor location for each of the 15 road segments that were retained for the study for both daytime and nighttime.

The table shows high daytime and nighttime sound levels at receptors closest to Yonge Street in all segments of the corridor. The high existing noise levels reflect the high traffic volumes on Yonge Street.

Table 6-15
Predicted Existing Daytime and Nighttime Traffic Noise Levels

Section		Predicted Sound Level (dBA)		Closest Receptor Distance
From	To	Nighttime	Daytime	(m)
Steeles Avenue	Glen Cameron Road	67	66	25
Glen Cameron Road	Centre Street / Thornhill Summit Way	66	65	30
Centre St. / Thornhill Summit Way	Royal Orchard Blvd.	63	61	30
Royal Orchard Blvd.	Langstaff Road / Highway 407 EB Off-Ramp	66	65	25
Langstaff Road / Hwy. 407 EB off-ramp	Garden Avenue / Highway 7 Connection Ramp	63	62	50
Garden Avenue / Hwy. 7 Connection Ramp	High Tech Road	67	54	21
High Tech Road	Scott Drive / Bantry Avenue	65	64	30
Scott Drive / Bantry Avenue	Carville Road / 16th Avenue	65	64	29
Carville Road / 16th Avenue	Weldrick Road	67	66	20
Weldrick Road	Major Mackenzie Drive	60	59	100
Major Mackenzie Drive	Crosby Avenue	61	60	66
Crosby Avenue	Levendale Road	66	65	15
Levendale Avenue	Elgin Mills Road	62	61	75
Elgin Mills Road	Canyon Hill Avenue / Bernard Avenue	67	66	15
Canyon Hill Avenue / Bernard Avenue	Gamble Road / 18th Avenue	63	61	50

6.5.4 Sound Level Monitoring at Receptor Locations

The monitoring program consisted of at least 55 hours of noise monitoring at eight receptors along Yonge Street between Steeles Avenue and 19th Avenue between April 25 and May 5, 2003, as shown on **Table 6-16**. The receptor locations are shown below. The monitoring locations were

selected based on their proximity to Yonge Street and their potential to be affected by lane realignment on Yonge Street.

Table 6-16
Summary of receptor locations

Receptor #	Address	Monitoring Date	Monitoring Hours
1	11 Medeview	25-28 April 2003	55
2	7 Clark Avenue	2-5 May 2003	63
3	15 Dorian Place	2-5 May 2003	64
4	27 Baniti Crescent	25-29 April 2003	96
5	Mary Gapper Crescent (52 Addison Street)	2-5 May 2003	62
6	10057 Yonge Street	25-28 April 2003	67
7	6 Leonard Street	2-5 May 2003	63
8	3 Abitbi Street	25-28 April 2003	72

6.5.5 Background/ambient Sound Level Monitoring Results

The background sound level monitoring program was carried out in accordance with the procedures specified in Publication NPC-103. The monitoring was scheduled to include weekdays and weekends. However, most of the monitoring was conducted on weekends to obtain conservatively low background levels.

The detailed monitoring results are included in Appendix C of the Noise and vibration report. The data indicate that for the most part, daytime (7 am – 11 pm) sound levels at the receptors along the Yonge Street Corridor exceeded 50 dBA. Even at night time (11 pm – 7 am), the minimum measured sound levels were generally higher than 50 dBA.

The detailed monitoring results in detailed in Appendix C of the main report show the following key trends:

- consistently high sound levels during the daytime until at least midnight;
- lowest sound levels were generally recorded between 2 am and 5 am;
- weekend sound levels were generally lower than weekday sound levels;
- sound levels were highest for receptors closest to Yonge Street; and
- the range and distribution of sound levels at the monitoring locations indicate that the sound environment at these locations is typical of a "Class 1 Area" as defined earlier in **Chapter 3**.

6.5.6 Comparison of Traffic Noise with Measured Background Noise Levels

To assess the impact of road traffic noise at the receptor locations, a comparison was made between the measured background sound levels and STAMSON predicted sound levels at the same locations, based on the AADT traffic volumes. Equivalent daytime (16 hrs) and nighttime (8 hrs) L_{eq} sound levels were calculated for all complete days (24 hrs) of monitoring. The results are summarized in **Table 6-17**.

Table 6-17
Comparison of Measured With Predicted Traffic Noise Levels

Location	Address	Monitoring Date	Measured Equivalent Daytime (16 hr) and Nighttimes (8 hr) L_{eq} Sound Level (dBA)		Predicted Leq Sound Levels from AADT Traffic Volumes (dBA)		Closest Receptor Distance (m)
			Day	Night	Day	Night	
1	11 Meadowview Ave.	Apr 25	NA	53	56	57	66
		Apr 26	53	55			
		Apr 27	58	NA			
2	7 Clark Ave.	May 3	53	50	48	49	52
		May 4	54	50			
3	15 Dorian Pl.	May 3	64	60	58	59	15
		May 4	63	60			
4	27 Vaniti Cres.	Apr 26	60	56	61	62	29
		Apr 27	61	56			
		Apr 28	64	56			
5	Mary Gapper Cres.	May 3	60	50	53	54	136
		May 4	54	52			
6	10057 Yonge St.	Apr 26	59	54	63	64	19
		Apr 27	58	54			
7	6 Leonard St.	May 3	60	57	60	61	63
		May 4	59	56			
8	3 Abitibi St.	Apr 26	55	55	50	51	100
		Apr 27	54	53			

NA- not available

The data in the table show that the predicted daytime and nighttime traffic noise levels are most often within the range of the average measured sound levels at each receptor location, indicating the strong influence of road traffic on existing sound levels. However, as noted earlier, there are other factors which impact existing sound levels including institutional, commercial and industrial buildings in close proximity to the receptors.

6.5.7 Stationary Noise

6.5.7.1 Stationary Noise Source

From a noise perspective, the only significant stationary source associated with the Yonge Street Corridor rapid transit undertaking is the Maintenance Facility proposed in the Langstaff Industrial Area between Langstaff Road and the Canadian National Railway (CNR) line. The facility will include bus storage, office administration, locker rooms, bus shop (repair bays, cleaning, inspections), bus staging, fueling area, employee parking and LRT storage and shop. The LRT facilities will be located on the south part of the site.

Ultimately, about 300 buses will be stored at the site. It is anticipated that about 270 of these buses will be in service at any given time. Vehicle maintenance activities, including the use of compressed air, will be restricted to indoor garage facilities. LRT cleaning will also be undertaken indoors.

The proposed Maintenance Facility site is immediately south of Highway 407 and Highway 7 and is currently characterized by industrial land uses. However, an area to the immediate east of the CNR line has been zoned for future residential development by the Town of Markham.

6.5.7.2 Regulatory Requirements

Publication NPC-205 of the Model By-Law sets Sound Level Limits for Stationary Sources in Class 1 and 2 Areas (Urban). Details on NPC-205 are contained in the Noise/Vibration Supporting Document. Since the existing sound environment on Langstaff Avenue is currently dominated by road traffic and other industrial noises, this area is best defined as a "Class 1 Area".

6.5.7.3 Existing Noise Levels

The STAMSON noise model was used to predict background/existing traffic noise at the closest receptor location based on traffic volumes shown in **Table 6-18**. The table shows the predicted sound levels at the potential future receptors closest to the proposed Maintenance Facility for the years 2011 and 2021. The detailed STAMSON data sheets are included in the Noise/Vibration Supporting Document.

Table 6.18
Predicted Background Sound Levels at Closest Future Receptors

Year	AADT Volumes Highway 407 Eastbound	Receptor Distance (m)	AADT Volumes Highway 407 Westbound	Receptor Distance (m)	Daytime Sound Level (dBA)	Nighttime Sound Level (dBA)
2011	56,257	105	53,983	145	73.91	67.38
2021	62,142	105	59,630	145	74.18	67.65

The data in the table show nighttime sound levels of about 67 and 68 dBA at the closest potential future receptors. These predicted sound levels reflect the high traffic volume in the area, and are determined to be the appropriate sound level limits for future stationary noise sources such as the Maintenance Facility.

6.5.8 Existing Vibration Levels along Yonge Street

Background noise levels were measured as part of the detailed noise and vibration study at eight (8) locations along Yonge Street between Steeles Avenue and 19th Avenue. The same eight locations were chosen for vibration measurements. The vibration levels were measured on the ground surface through a mounted accelerometer. The accelerometer was connected to a vibration meter, whose output drove a paper chart. The whole system was calibrated using a Bruel and Kjaer vibration calibrator. The calibrator produces a level of 10 mm/sec velocity at 160 Hz.

The vertical vibration at each of the eight locations was collected over a 20-minute period. The period included pass-bys (at various speeds) of cars, vans, buses and trucks of various sizes. The results shown in Figures 6.1 through 6.8 in Appendix H present a sample of the collected data. The results show that there are no perceptible vibration levels from existing traffic at the closest sensitive receptor locations along the Yonge Street Corridor. Most of the values are well below 0.1 mm/sec. This is as expected since the traffic basically consists of rubberized-tire vehicles and the levels from such traffic is negligible unless there are some anomalies, such as an expansion joint, in the roadbed. The only vibration sensation that was detected by the transducer occurred when the equipment operator tapped adjacent to it.

6.6 EXISTING AIR QUALITY AND CRITERIA

Air quality manifests itself in two broad ways – through pollutant concentrations and through deposition of pollutants to various surfaces. Air quality is usually assessed through the examination of the pollutants that are linked with a particular project. In this case, the pollutants of concern are:

- dust (particles of sizes smaller than 44 microns): two specific size ranges are important – Total Suspended Particulate (TSP), which are those particles 44 microns in diameter and smaller, and PM_{10}, which are those particles 10 microns in diameter and smaller. Dust is blown up into the air by the wind, by the action of the wheels of a vehicle on road surfaces and directly from the exhaust of the engines;
- sulphur dioxide (SO_2): a gas formed by the combustion of sulphur impurities in the fuel. It is emitted in vehicle exhaust;
- carbon monoxide (CO): a gas formed by the incomplete combustion of carbon-based fuels. It is emitted in vehicle exhaust;
- nitrogen dioxide (NO_2): a gas formed when anything is burned in air. It is emitted in vehicle exhaust;
- Ozone (O_3): it is formed via a complex reaction involving VOCs, NO_x and OH; and
- carbon dioxide (CO_2): a gas formed by the complete combustion of carbon-based fuels, and is emitted from the exhaust pipes of all vehicles.

O_3 and TSP were not used in the air quality forecast work undertaken as part of this assessment. O_3 impacts were not assessed since they are expected to be insignificant (un-measurable) against the large changes expected from improvements in automobile engine technology over the period of the project. TSP was not assessed because the larger particles only affect visibility, while the PM_{10} has been associated with health impacts.

A detailed report, Air Quality Impact Assessment Report, is presented in **Appendix K**.

6.6.1 Existing Environmental Conditions

Data on existing environmental conditions was collected and applied in the air dispersion modelling for the study area. This data includes:

- Climate and Meteorological Data;
- Air Quality Standards;
- Historical and Measured Air Quality Data;
- Predicted Atmospheric/ Vehicle Emissions;
- Odours from Diesel Exhaust; and
- Greenhouse Gas Emission

6.6.1.1 Climate and Meteorological Data

The key parameters of the meteorology and climatological conditions that must be taken into account are wind, temperature and atmospheric structure.

Wind

Wind fluctuations over a very wide range of time and space scales accomplish dispersion and strongly influence other processes associated with it. There are two significant components – direction and speed.

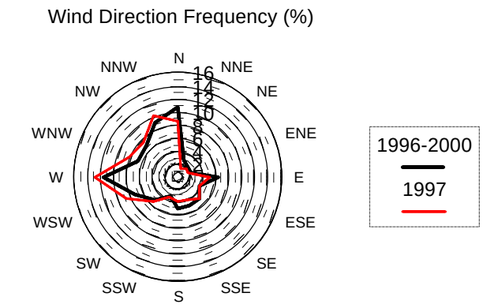
Direction

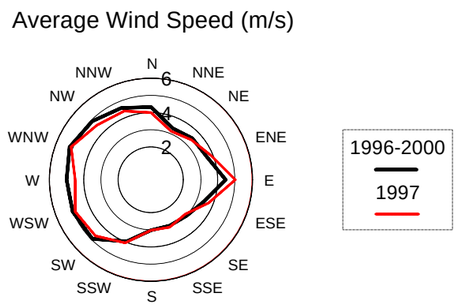
Wind direction is reported as the direction from which the wind blows and is based on surface (10 m) observations. Over the course of a year, wind usually blows in all directions, but with varying frequencies. Certain directions occur more frequently than others. These are known as the prevailing wind directions.

Figure 6-3 (wind rose) presents a wind rose with the 6-year average (1996 – 2001) and 2001 data for Pearson International Airport. Wind direction in the area varies considerably over the period. The prevailing winds are from the north and the west, with winds blowing from these sectors approximately 45 percent of the time. A single year of meteorology (2001) was used for the modelling because it was the base year for the study and the same year's traffic counts were used for the emission calculations.

Speed

The concentration of dust in the air decreases with increasing wind speed, as a result of dilution and good dispersion of gases and particles throughout the atmosphere. The distribution of average wind speed at the Pearson International Airport station is presented in **Figure 6-3**. The average wind speed, based on the 1996-2001 period, is 4.0 m/s, with calms (i.e. wind speeds less than 1 m/s) occurring approximately 5% of the time.





Note: Percentage of Calms = 5.71 %

Figure 6-3
Wind Rose – Toronto Pearson International Airport 1996-2001

Temperature

There are two key temperature effects that influence air quality – temperature near the surface and temperature aloft.

Temperature near the Surface

Temperature near the surface can greatly affect the dispersion of particulate matter. When it is hot, the surface can dry out, making particulate matter available to be picked up by the wind. Cool temperatures, on the other hand, enable the surface to retain moisture longer, thereby reducing windblown dust. The project location is typical of the Southern Ontario lakes region with relatively cool spring and fall seasons, hot humid summers and cold, wet winters.

Temperature Aloft

The change in temperature vertically is the key controlling parameter in the dispersion of gases and particles.

Atmospheric stability is an inherent feature of the vertical temperature structure. It is a measure of the amount of vertical motion in the atmosphere, and hence the atmosphere's ability to mix pollutants. A stable atmosphere has little vertical motion (is less turbulent) and cannot disperse pollutants as well as a more turbulent, unstable atmosphere. A number of classification schemes have been developed for describing stability classes. The details of these classification schemes can be found in **Appendix K** Section 2.1.3.

A statistical summary of the atmospheric stability using the Turner method, based on the results of the PCRAMMET Model (U.S. EPA regulatory meteorological pre-processor) is presented in **Table 6-19**. This table outlines the distribution of stability classes for Pearson International Airport for the 1996 to 2001 period. Stable conditions can produce higher concentrations near the ground because of reduced vertical mixing. These conditions occur approximately 30% of the time.

Table 6-19
Stability Class Distribution 1996-2001 in Percent for Toronto Pearson International Airport

Stability	1996	1997	1998	1999	2000	2001	Period Average
A	0.72	.73	0.65	0.31	0.36	0.34	0.52
B	4.51	4.5	4.83	4.32	3.95	4.07	4.36
C	9.57	10.26	11.35	11.54	10.47	10.43	10.60
D	54.5	55.67	51.82	53.15	58.34	58.25	55.29
E	13.49	13.23	14.51	14.53	13.66	13.67	13.85
F	17.21	15.61	16.85	16.15	13.21	13.22	15.38

Note: Class A – Least stable class
Class D – Neutral atmosphere
Class F – Most stable

Atmospheric Structure

The structure of the atmosphere is also defined by the vertical temperature change in another fundamental way – by setting a limit on the vertical dimension through which pollutants can mix.

This vertical extent through which a plume of pollutants can be mixed is called the "mixing height". With a higher mixing height there is a larger volume of air available within which the pollutants can mix, producing lower concentrations.

For modelled 1-hour ground level concentrations as opposed to the annual and 24-hour average, mixing height can be very important. The use of variable mixing heights, that are as close as possible to the actual conditions, improves the ability of the model to accurately predict downwind concentrations.

Mixing height is calculated from the vertical temperature profile measured by weather balloon ascents. The data measured in Buffalo, the closest upper air station to Toronto, is representative of conditions over Toronto since mixing height is a regional parameter. This data of existing condition was used by the air quality model.

The surface values and the twice-daily upper air measurements are processed through the U.S. EPA meteorological pre-processor (PCRAMMET) to combine surface and upper air measurements into the hourly mixing heights, which are required by the model. Mixing heights calculated to be less than 10 m, were set to 10 m.

6.6.1.2 Air Quality Standards

Total Suspended Particulate (TSP)

Total Suspended Particulate (TSP), is often used to characterize air quality near a dust source. TSP is measured with a high-volume (Hi-Vol) sampler over 24 hours and consists of particles less than 44 µm in diameter. An annual average is calculated as the geometric mean of these samples measured every six days.

Under *Ontario Regulation 337*, an ambient air quality criterion is set for TSP. The ambient air quality criterion for TSP is 120 µg/m^3 averaged over 24 hours, and the annual geometric mean of the 24-hour samples is 60 µg/m^3. The air quality criteria for TSP are summarized in **Table 6-20**.

Table 6-20
Provincial Air Quality Criteria for TSP

Provincial: Ontario Ministry of the Environment		
Pollutant	**Averaging Period**	**Ambient Air Quality Criteria**
Total Suspended Particulates (TSP)	24 hours	120 µg/m^3
	1 year*	60 µg/m^3

Source: MOE (2001a)
Note: * Geometric Mean

The ambient TSP standards and criteria were set to prevent a reduction in visibility. Particles with a radius of 0.1 to 1.0 µm are most effective at reducing visibility. In a rural area where TSP levels are on the order of 30 µg/m^3, the visibility would be about 40 km. At 150 µg/m^3, a common urban concentration, the range would be reduced to about 8 km. The MOE 24-hour criterion of 120 µg/m^3 is based on a visual range of about 10 km.

TSP was not assessed because the larger particles only affect visibility, while the PM_{10} has been associated with health impacts.

Fine Particulate Matter PM_{10} and $PM_{2.5}$

Many studies over the past few years have indicated that fine particulate matter (PM_{10} and $PM_{2.5}$), a mixture of chemically and physically diverse dusts and droplets, in the air is associated with various adverse health effects in people who already have compromised respiratory systems and suffer from asthma, chronic pneumonia and cardiovascular problems. However, the available studies have not been able to link the adverse health effects in such people to any one component of the pollution mix.

The current 24-hour regulatory limits for fine particulate matter are presented in **Table 6-21** as follows:

Table 6-21
Air Quality Criteria for PM_{10} and $PM_{2.5}$

Provincial: Ontario Ministry of the Environment			
Pollutant	**Averaging Period**	**Guideline Level**	**Ambient Air Quality Criteria**
PM_{10}	24 hours	Ontario Interim	50 µg/m^3
$PM_{2.5}$	24 hours	Proposed CWS	30 µg/m^3

Dustfall

In developing an Ambient Air Quality Criterion (AAQC) for dustfall of 7 g/m^2/30 days, the MOE used soiling data (e.g. surface build-up of dust) from various Ontario towns between 1951 and 1955, which indicated areas of relatively low soiling (11 to 15 g/m^2/30 days), relatively moderate soiling (17 to 24 g/m^2/30 days) and relatively heavy soiling (26 to 34 g/m^2/30 days) (WHO, 1961). The air quality criteria for dustfall are summarized in **Table 6-22**.

Table 6-22
Provincial Air Quality Criteria for Dustfall

Provincial: Ontario Ministry of the Environment		
Pollutant	**Averaging Period**	**Ambient Air Quality Criteria**
Dustfall	1 month	7.0 g/m²/30 days
	1 year+	4.6 g/m²/30 days

Source: MOE (2001a)
Note: + Geometric Mean

Criteria Air Contaminants (NO_X, SO_2, CO, O3)

Criteria Air Contaminants (CACs), including nitrogen oxides (NO_x), sulphur oxides and carbon monoxide (CO) are common air pollutants released into the air typically by activities such as the combustion of fossil fuels.

Nitrogen dioxide (NO_2) is a reddish brown, highly reactive gas that is formed in the atmosphere through the oxidation of nitric oxide (NO). NO_x, the term used to describe the sum of NO, NO_2 and other oxides of nitrogen, play a major role in the formation of ozone (O_3).

Sulphur dioxide (SO_2) is a colourless gas that smells like burnt matches. It can be oxidized to sulphur trioxide, which, in the presence of water vapour, is readily transformed to sulphuric acid mist. SO_2 can be oxidized to form acid aerosols and is a precursor to sulphates, which are one of the main components of respirable particles in the atmosphere.

CO is a colourless, odourless, and at high levels a poisonous gas, formed when carbon in fuel is not burned completely. It is a component of motor vehicle exhaust, which contributes about 60 percent of all CO emissions nationwide. High concentrations of CO generally occur in areas with heavy traffic congestion.

O_3 is formed via a complex, non-linear chain of photochemical reactions involving reactive species of VOCs, NO_x and the hydroxyl (OH) radical. The amount of O_3 formed depends on the strength of the sunlight, the concentrations of NO_x and the availability of OH radicals to drive the reaction mechanisms. O_3 toxicity occurs in a continuum in which higher concentrations, longer exposure duration, and greater activity levels during exposure cause greater effects. Short-term acute effects include pulmonary function changes, increased airway responsiveness and airway inflammation, and other symptoms.

A recent study shows that 21% and 58% of the SO_2 and NO_x emissions from the City of Toronto are due to transportation sources (RWDI, 2001).
The MOE AAQCs for NO_x, SO_x, CO and O_3 are shown in **Table 6-23**.

Table 6-23
MOE Ambient Air Quality Criteria for Criteria Air Contaminations

Compound	CAS No.	Ambient Air Quality Criteria (AAQC)			
		Annual (µg/m³)	24-hour (µg/m³)	8-hour (µg/m³)	1-hour (µg/m³)
Nitrogen Oxides	10102-44-0	NS	200	NS	400
Sulphur Dioxide	7446-09-5	5	275	NS	690
Carbon Monoxide	630-08-0	NS	15,700	36,200	NS
Ozone	10028-15-6	NS	NS	NS	165

Note: NS – No Standard

6.6.1.3 Historical and Measured Air Quality Data

Historical Ambient Monitoring Data

Table 6-24 outlines the measurement history at the MOE monitoring locations in, or near, the Study Area, and presents a summary of the parameters monitored. The table shows that historically SO_2 and CO have been well within the accepted standards, while O_3 and PM_{10} concentrations have been observed at values about 50% higher than the standard occasionally.

NO_x and $PM_{2.5}$ have exceeded the standard from time to time by as much as double the allowable concentration. In summary, the historical data outlines a reasonably clean airshed with occasional periods during which it is significantly compromised.

Table 6-24
Historical Air Quality Data

Pollutant	Averaging Time	Sampling Period	MOE Criteria	Location #1 – Stouffville Works Yard		Location #2 – Yonge and Hendon	
				Min.	Max.	Min.	Max.
SO_2	24-hr (µg/m³)	1998-1999	275	ND	ND	3	45
	% of Standard		100%			1%	16%
O_3	24-hr (µg/m³)	1998-2000	82*	17	161	19	124
	% of Standard		100%	21%	196%	23%	151%
NO_X (as NO_2)	24-hr (µg/m³)	1998-2000	200	7	258	14	377
	% of Standard		100%	4%	129%	7%	189%
CO	1-hr (µg/m³)	1998-1999	36,200	ND	ND	0	7,615
	% of Standard		100%			0%	21%
PM_{10}	24-hr (µg/m³)	1998-2000	50	5	65	ND	ND
	% of Standard		100%	10%	130%		
$PM_{2.5}$	24-hr (µg/m³)	1998-2000	30	ND	ND	4	58
	% of Standard		100%			13%	193%

Note: * Calculated equivalent standard ND = No Data

Measured Ambient Monitoring Data

Figure 6-4 presents the location of the existing MOE, as well as the study initiated, air quality monitoring locations. All stations with 5-digit name are MOE stations. These locations were used to characterize the existing air quality in the Study Area by dividing the Study Area into four zones. These zones are defined as follows:

1. The Stouffville Works Yard Monitoring Location, where the MOE currently has an Ozone (O_3) and Weather Monitoring Station (Station 48002), is representative of the area between Highway 48 and York/Durham Line;
2. The Yonge and Hendon Monitoring Location was co-located with the MOE Station (Station 34020) that measures Sulphur Dioxide (SO_2), Ozone (O_3), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO) and Fine Particulate (PM_{10}). Measurements at this station will be representative of the air quality along the Yonge Street Corridor from Highway 400 to

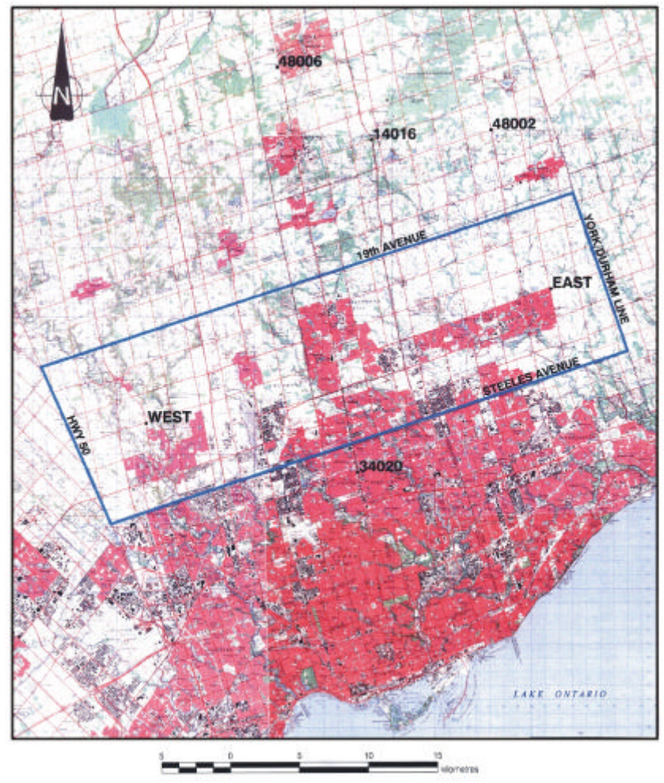


Figure 6-4
MOE Monitoring Locations

Highway 404;

3. The #2 Aitken Circle Monitoring Location was sited near the intersection of 16th Avenue and Kennedy Road and will be representative of the air quality from Highway 404 to Highway 48; and
4. The Woodbine Centre Monitoring Location was sited in the snow removal works yard near the intersection of Highway 27 and Rexdale Boulevard. This location will be representative of the air quality between Highway 50 and Highway 400.

Table 6-25 presents a summary of the data from the project sampling stations in terms of average, maximum, minimum and percentage of the Ambient Air Quality Criteria (AAQC) set by the Province of Ontario. This table confirms the historical data, with SO_2 and CO well within the applicable standards. It further shows that PM can be up to 3 times the standard from time to time. This is further confirmed by the dustfall results that show, for the period of sampling, loadings over double the applicable standard. Daily average NO_x and O_3 concentrations during the monitoring period were below the standard. The data also show, for the Highway 7 Corridor, that NO_x levels are equivalent to those in other corridors.

These data are used as part of the model characterization of the existing and future scenarios.

Table 6-25
Summary of Project Air Quality Monitoring

Pollutant	Averaging Time	MOE Criteria	Location #1 – Works Yard Stouffville (48002)			Location #2 – Yonge and Hendon (34020)			Location #3 – 16th & Kennedy (EAST)			Location #4 – Woodbine Centre (WEST)		
			Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.
SO_2	24-hr (µg/m³)	275	11	7	9	6	2	4	9	4	4	4	4	4
	% of Standard	100%	4%	3%	3%	2%	1%	1%	3%	1%	1%	1%	1%	1%
	30-hr (µg/m³)	45*	2	2	2	4	4	4	3	2	3	5	5	5
	% of Standard	100%	5%	4%	5%	9%	8%	8%	7%	6%	6%	11%	11%	11%
O_3	24-hr (µg/m³)	82*	19	10	15	17	7	11	16	3	16	35	3	16
	% of Standard	100%	24%	12%	19%	21%	9%	13%	19%	3%	20%	43%	3%	20%
	30-hr (µg/m³)	14*	48	45	47	40	35	37	40	36	38	38	36	37
	% of Standard	100%	346%	325%	337%	287%	251%	263%	286%	254%	269%	269%	257%	264%
NO_X	24-hr (µg/m³)	200	53	49	51	150	140	145	77	18	62	107	21	62
	% of Standard	100%	26%	24%	25%	75%	70%	73%	39%	9%	31%	53%	10%	31%
	30-hr (µg/m³)	33*	12	11	12	40	36	38	26	25	26	45	0	29
	% of Standard	100%	37%	35%	36%	121%	108%	115%	79%	76%	77%	136%	0%	87%
CO	1-hr (µg/m³)	36,200	406	406	406	813	418	447	1,626	406	424	813	406	427
	% of Standard	100%	1%	1%	1%	2%	1%	1%	2%	1%	1%	2%	1%	1%
PM_{10}	24-hr (µg/m³)	50	ND	ND	ND	ND	ND	ND	130	14	44	101	14	52
	% of Standard	100%							259%	28%	89%	202%	29%	103%
$PM_{2.5}$	24-hr (µg/m³)	30	ND	ND	ND	ND	ND	ND	58	7	27	88	15	44
	% of Standard	100%							194%	24%	89%	293%	45%	146%
Dustfall (inorganic fraction)	30-hr (µg/m³)	7	ND	ND	ND	ND	ND	ND	ND	ND	16	ND	ND	11
	% of Standard	100%									228%			164%

Note: * Calculated equivalent standard
ND = No Data

6.6.2 Overall Assessment of Existing Air Quality

The existing air quality in the area can be described as fairly good because:

- The historical SO_2 and CO concentrations are well within all applicable standards;
- The historical data also shows the PM concentrations can be up to two times the standard from time to time. This was confirmed by project specific sampling that found values up to three times the standard;
- Daily average NO_x and O_3 concentrations during the project sampling were found to be below the standards, although historically there have been occasional exceedances of the standard.

7. PLANNING AND DESIGN PARAMETERS

This Chapter sets out the desirable features and standards for designing the rapid transit system encompassing both infrastructure and service. The development of the design alternatives (alignments and technologies) in **Chapter 8** is based on meeting the design criteria in this Chapter.

7.1 RAPID TRANSIT DESIGN OBJECTIVES

Rapid transit services and infrastructure in the Yonge Street Transitway will be designed to provide the essential features for its role as an important new member of the family of transit services available to the Region's communities, as defined in the Transportation Master Plan. This family is intended to comprise:

- Local services through neighbourhoods and business districts using conventional buses of various sizes;
- Rapid transit service operating on a regional network fed by local services and inter-connected with commuter services and rapid transit in Toronto and adjacent regions; and
- Long distance inter-regional commuter service provided by GO Transit buses and trains.

The primary objectives in designing the rapid transit infrastructure and service are to achieve the following:

- A flexible, permanently integrated high-performance system with a strong customer-oriented identity;
- An integrated assembly of elements appropriate to urban environment for current and future market(s) to be served;
- High service speeds offering superior travel times competitive with those of the private automobile;
- Demonstrated service reliability providing high frequency (an average wait of 5 minutes) and a high degree of on-time performance;
- Comfort and convenience by providing a smooth ride, level boarding in a user-friendly, quality station environment, easy transfers between systems and innovative fare pre-payment and passenger information services; and
- Environmental compatibility manifested by reductions in energy use, pollution, noise and visual intrusion as well as environmentally sensitive urban design.

The key components of the ultimate Yonge Street Corridor Transitway are as follows:

- An exclusive two-lane, at-grade transitway that uses the centre median of an existing street ROW to enable operation of both Bus Rapid Transit (BRT) and Light Rail Transit (LRT) rapid transit services with no loss of current traffic capacity, or a segregated exclusive ROW remote from existing streets such as alongside rail rights-of-way;
- High-frequency BRT service of 3 minute headway or less during peak travel periods;
- Transit signal priority to speed the movement of buses through busy intersections and limited stops (approximately 1 kilometre station spacing) to improve overall travel times;
- Attractive BRT stations, designed and landscaped for integration with the surrounding communities (the Transitway alignment includes high-density commercial and residential nodes, and a commercial heritage district);
- Access facilities at stations to encourage and support pedestrian and bicycle modes of transportation;
- Proof-of-payment fare policy and systems to speed passenger boarding and facilitate "smart card" technology;
- "Real-time" passenger information displays at stations and on-board vehicles;
- Intelligent Transportation Systems (ITS) technology to track vehicles and interface with transit priority measures for reliable service; and
- Integrated communications to increase public awareness and overall ridership with a corresponding decrease in automobile use.

7.2 DESIGN CRITERIA

In the York Region network, rapid transit facilities will initially use BRT technology and convert to LRT technology as such time when BRT service reliability can no longer be assured.

This section outlines the basic criteria adopted for the planning and design of the main components of the facilities for each technology.

Transitway alignment geometry will influence the system riding quality, especially for standing passengers. The design aims to provide alignments which reduce sags, crests and directional changes to a minimum, consistent with reasonable economy. In developing the rapid transit alignment, consideration must be given to the following:

- Safety;
- BRT and LRT horizontal and vertical alignment standards;
- Sight distance and visibility;
- General appearance;
- Passenger comfort;
- Impact on at-grade crossings;
- Intended operating and service plan;
- Adjacent roadways and railways;
- Vehicle performance;
- Impact on adjacent property;
- Underground and overhead utilities;
- Cost-effectiveness;
- BRT and LRT horizontal and vertical clearances; and
- Type of construction.

7.2.1 Bus Rapid Transit (BRT)

The BRT rapid transit system is one in which predominantly exclusive rights-of-way with on-line stations are provided for the use of the rubber-tired vehicles delivering the service. These rapid transit vehicles can operate on and off the rapid transit ROW and therefore offer the opportunity to link certain feeder and line haul express services to reduce the need for passengers to transfer. In the early stages of system development, BRT services may be provided by buses operating in exclusive bus or HOV lanes in streets or even in mixed traffic.

Wherever practical, BRT station design will allow vehicles to pass other vehicles that are picking up and dropping off passengers. This means that skip stop and express services can be combined with local stopping services in the same ROW. The typical BRT operating configuration consists of a high frequency service running the full length of the corridor and stopping at each station. It provides a service not unlike that of LRT except the vehicle used is rubber tired (usually articulated for greater capacity). On top of this service various express services can be overlain and, where appropriate, services can be started or terminated off of the transitway.

Passengers access the service as they would an LRT service by walking or cycling to the stations, transferring from feeder buses and by using park-and-ride and pick-up/drop-off facilities where provided. In addition, some trips could be made without a transfer.

7.2.1.1 BRT Design Criteria

Table 7-1 summarizes the principal BRT running way design criteria adopted for the development of alternative designs for transitway facilities. These criteria have been developed with possible future conversion to LRT in mind.

Table 7-1
Summary of BRT Running Way Geometric Design Criteria

CRITERIA	Preferred min./max.	Absolute min./max.
Design Speed – Transitway between stations	90 kph	40 kph
Design Speed – Station and Business Dist. Areas	-	50 kph
Design Speed - Arterial Ramps and Access Roads	-	40 kph
Stopping Sight Distance: 90 kph design speed	-	236 m
60 kph design speed	-	84 m
Minimum Horizontal Curve Radius, Transitway	200m	50 m
Minimum Horizontal Curve Radius, Stations and CBD	120m	50 m
Minimum Horizontal Curve Radius, Access Ramps	-	45 m
Minimum Horizontal Curve Radius in Maintenance Facility	30m	15m
Minimum Turning Radii at Intersections	25m	15 m
Maximum Transitway Superelevation (above 50 kph)	-	7%
Maximum Superelevation at Stations	-	2%
Minimum Tangent at end of Station Platforms	20 m	14 m
Maximum Grade of Transitway	3%	7%
Minimum Transitway Grade between Stations	0.5%	0.35%
Maximum Grade in Stations	0.5%	4%
Transitway Grade: Access Roads and Ramps	6%	10%
Minimum Grade in Stations	0.5%	0.3%

7.2.2 Light Rail Transit (LRT)

Light rail transit is a flexible, rail-based transit mode that can operate in a variety of urban ROW settings. Depending on the degree of segregation of the ROW, it is a relatively low cost form of rail technology and is usually electrically propelled, obtaining power from overhead catenary wires.

LRT can provide a broad range of passenger capacities due to its ability to use coupled vehicles. It can operate in exclusive or semi-exclusive lanes or in mixed traffic on tracks embedded in the street. The overhead power supply feature allows LRT systems to interface safely with other at-grade transportation modes and with pedestrians.

The electrically powered vehicles are virtually pollution free (a major benefit for a region with air quality concerns) although the primary power generating source may produce some pollution. Vehicles are generally bi-directional, low-floor and articulated with multiple doors on both sides. LRT has the ability to be placed into built-up urban areas and is designed to operate harmoniously with vehicular and pedestrian traffic. It is possible for light rail vehicles to share a transitway with buses operating in a BRT service as the vehicle dynamic envelope is similar to a BRT lane width. Also, LRT vehicles can be operated on existing railway tracks assuming compatible facilities and temporal separation of service from freight operations.

7.2.2.1 LRT Design Criteria

Table 7-2 provides a summary of the LRT running way geometric design criteria.

Table 7-2
Summary of LRT Running Way Geometric Design Criteria

CRITERIA		Preferred	Absolute
Horizontal Alignment			
Minimum Radius of Circular Curves:	On Running Line	250 m	100 m
	In Stations	Tangent	800 m
	In Yards	50 m	35 m
Minimum Length of circular curves:		Design Speed (V) /2	35 m
Minimum length of spiral curves, the greater of the following:			
- considering roll rate or		$8.75E_a$ x V	14 m
- considering vehicle torsion		$400E_a$	14 m
- considering lateral acceleration		$6.45E_u$ x V	14 m
Minimum Length of tangent between spiral curves		100 m	25 m
Minimum Length of tangent track preceding a point of switch		15 m	10 m
Minimum Length of tangent beyond the ends of platforms		20 m	15 m
VERTICAL ALIGNMENT			
Maximum Gradient:	On running line	4.5%	6.0%
	In Stations	0.3%	0.5%
Minimum Grade on running lane		0.3%	0.0%
Minimum Length of vertical curves		100 m	60 m
Maximum Length of vertical curves		-	200 m
Maximum applied superelevation on running track (E_a)		110 mm	130 mm
Maximum unbalanced superelevation (E_u):	On running line	75 mm	100 mm
	In turnouts		90 mm

7.3 STATION DESIGN FEATURES

The stations are normally unattended and their design will stress passenger safety, convenience, comfort, low maintenance and accessibility. The station location and layout will facilitate convenient transfer between the Rapid Transit service and local service and also to any pick-up/drop-off facility, where provided. Stations will be fully accessible to persons with disabilities and configured to allow convenient access by pedestrians and cyclists. Space for bike lockers will be identified adjacent to sidewalks near most stations.

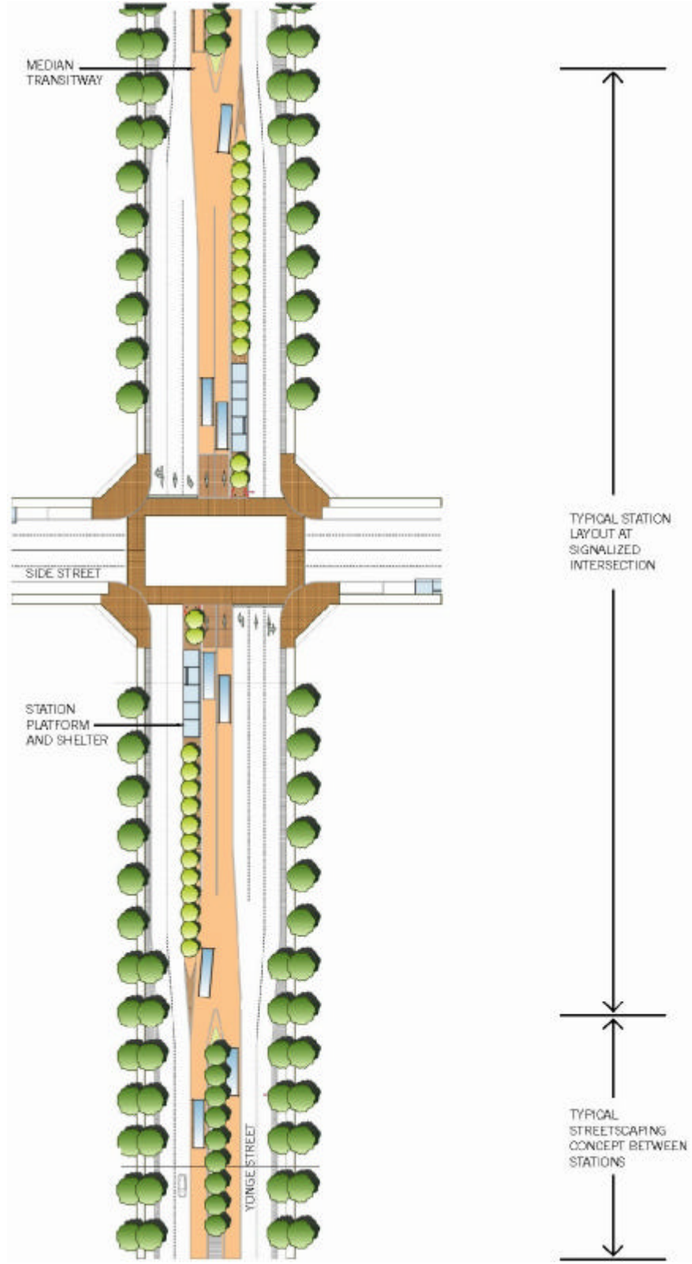


Figure 7-1
Typical Two-Lane Exclusive Transitway

Stations are normally spaced such that the majority of walk-in passengers walk less than 400 m to and from the station however, some passengers can be expected to walk up to 600 m. This provision results in spacings between 0.8 and 1.5 km.

The preferred station layout consists of two parallel side-loading platforms preferably offset head-to-head on either side of an intersection or mid-block pedestrian crossing as illustrated in **Figure 7-1**. Through major stations with high passenger volumes the transitway is widened to four lanes with a central fenced median to allow buses to bypass and pull out around stopped buses. Where hourly one-way bus volumes are less than the maximum capacity, a reduced space station configuration is recommended as illustrated.

Passenger shelters, benches, system maps, real-time passenger information and other amenities are provided on each platform. All designs emphasize durability and minimal ongoing maintenance needs.

7.4 FARE COLLECTION

The facilities provided at the stations will be those required for a fare system based on the off-board purchase of passes and tickets. Provision for pass and ticket dispensing machines and sufficient space for totally off-board fare collection in a protected environment wherever practical is a requirement of the station design.

7.5 STORAGE AND MAINTENANCE FACILITY PLANNING CRITERIA

The preference for development of a joint facility providing storage and maintenance for YRT buses and Rapid Transit vehicles was discussed in Chapter 2, Section 2.8. This decision results in the need for planning criteria for a facility accommodating conventional bus as well as rubber-tired rapid transit and light rail vehicles.

The planning criteria adopted for site selection, development of the conceptual layout of the facility and the components to be included are listed below:

7.5.1 Site Selection Considerations

The following aspects have been considered in the selection of potential sites for the maintenance and storage facility:

- Proximity of site to network operations centroid;
- Suitability of site size and configuration, preferably rectangular – (parcel up to 8 ha or 20 acres required);
- Site ownership and acquisition timeline and cost;
- Site topography, specifically grading and drainage requirements;
- Compatibility with surrounding neighbourhood (zoning, land uses & security);
- Site vehicular access and surrounding traffic conditions;
- Site servicing & utility relocation requirements;
- Flexibility for expansion and inclusion of light rail vehicle maintenance; and
- Environmental conditions and constraints.

7.5.2 Site Layout Considerations

The dimensions and shape of the site must allow bus maintenance elements to be arranged in a configuration producing the most efficient bus circulation plan on the site, which should be predominantly counter-clockwise. The location of the main elements must recognize both their spatial requirements and the desirable relationship between them. Elements should be located adjacent to others that are part of the same functional system in the facility operation. These systems generally comprise the following relationships:

- fueling-cleaning-storage;
- maintenance-parts-storage; and
- administration-driver facilities-storage.

In the maintenance building, repair bays should permit entry and exit with a drive-through pattern avoiding the need to reverse buses. A primary factor in developing the layout for the facility is the site's ability to accommodate a light rail yard and shop complex incorporating convenient double track access to a storage area with sufficient storage track length as well as a loop track. The latter avoids the need for reverse moves between storage, wash and shop tracks. The main entry and exit location must be selected to minimize impact on external traffic flow along with generous site distances for transit vehicles entering and exiting the site.

7.5.3 Functional Requirements

The maintenance and storage facility is to be planned to provide, ultimately, full tertiary services including major repairs such as engine and transmission rebuilding, testing, body repair and painting. It will require the following functions to fulfil the maintenance requirements of an ultimate rapid transit fleet that may include both BRT and LRT vehicles:

7.5.3.1 Bus and BRT vehicles:

- capacity to store and maintain between 250 and 300 vehicles including both standard and articulated vehicles;
- a service area for fuelling, inspection, interior cleaning, washing and fare recovery;
- a maintenance area including up to 15 repair bays, workshops, and parts, battery and tool storage;
- a vehicle staging area and storage lanes that may be either interior or exterior; and
- a body repair area including a preparation bay and paint booth.

7.5.3.2 LRT vehicles:

- a storage yard with capacity for 45-50 vehicles, 27 and 30 m in length;
- a shops complex with overhead crane and including interior cleaning and inspection tracks, heavy repair track(s) for major component and truck removal, wheel turning lathe, body repair track and paint booth;
- workshops and parts, battery and tool storage for mechanical, electrical and electronic component repairs;
- wash and circulation tracks; and
- a test track.

7.5.3.3 Common facilities:

- management and administration offices and training centre;
- drivers' area including locker rooms, washrooms, day rooms, rest area;
- control centre and dispatching office;
- central parts storage;
- a maintenance of way building and materials storage area;
- waste disposal facilities;
- substation; and
- employee parking.

8. PRELIMINARY SCREENING OF ALTERNATIVES

This chapter describes the development of alternative alignments during the EA phase and the preliminary screening of these possible alternatives. In general, the Terms of Reference (ToR) and the Study Area, as defined in **Chapter 2**, guided the limits for alignment alternatives. However, during the EA phase constrained areas were revisited to ensure that alternatives were not inadvertently missed. The ToR indicated that the Study Area should be considered as a southern section from Steeles Avenue to the Highway7/Langsatff area and a northern section from the Highway 7/Langstaff area to 19th Avenue/Gamble Road. Yonge Street alone was identified as a possible route alternative between Steeles Avenue and the Highway 7/Langstaff node. Between Highway 7/Langstaff and 19th Avenue/Gamble Rd. two primary alignment alternatives were identified in the ToR; Yonge Street and parallel to the Richmond Hill GO Line adjacent to CN Rail's Bala Subdivision.

8.1 INFLUENCING FACTORS (OPPORTUNITIES AND CONSTRAINTS)

Review of the southern section confirmed the ToR conclusions that no opportunity could be found to develop feasible alternatives for a transit right-of-way in this area. Notable constraints in the area are the East Don River, an environmentally sensitive cold water stream, the Holy Cross Cemetery and the fully developed residential lands between these two on both sides of Yonge Street. South of the East Don River the CN Rail Bala Subdivision provided some opportunity for a transit right-of-way however opportunities for a return route to Yonge Street were not available because of the intensity of development and the lack of existing roadway corridors.

In the area north of Highway 7/Langsatff several opportunities were identified for an east west connection from the Yonge route to a Richmond Hill GO line route primarily due to the close proximity of the Richmond Hill GO Line to Yonge Street. These opportunities were located along existing east west roads that currently connect Yonge Street with the Richmond Hill GO line and are more fully discussed below.

Alternatives that best meet the objectives previously defined in **Chapter 7** were developed for the length of the Study Area. The Region's previous Rapid Transit Need and Justification Study recommended that a transitway be confined to the Yonge Street Corridor south of Highway 7 and to routes between the Richmond Hill GO line and Yonge Street north of Highway 7. Therefore the initial set of alternatives considered related to design alternatives within the Yonge Street ROW and alignment alternatives in the pre-defined area between Highway 7 (Langstaff area) to 19th Avenue/Gamble Road.

8.2 SCREENING OF ALTERNATIVE ALIGNMENTS

The analysis and screening of alternatives was conducted in two stages. The first stage, that analyzed and evaluated preliminary alternatives, was intended to screen out poor alternatives and identify those that merited further analysis. In the second stage, the best alternative from those carried forward was determined.

The initial set of alternatives was screened using either a high-level review by the team or a detailed analysis depending on the complexity of the alternative. The results of the screening were presented at the TAC meetings and their concurrence or comment sought prior to presentation to the public at various stages of the project.

Once a shortlist of alternatives was identified, a formal methodology was developed to compare the alternatives. The chosen alternatives were refined to a level that would allow the comparison to include all features of the alternative. The evaluation methodology was further defined in **Chapter 9**.

8.2.1 Alternative Route Alignments – South of Highway 7

8.2.1.1 Thornhill Tunnel

In the Thornhill Heritage District, extensive discussions have taken place with the community and the consultant carrying out the community revitalization and beautification study for the Town of Markham and City of Vaughan. Options to reduce the widening of Yonge Street to accommodate the transitway through the community have been investigated. These have included the feasibility of pre-building a section of a future subway tunnel for use by Yonge Street road traffic in the intervening period until such time as the subway is extended north to Highway 7. A shallow underground section as illustrated in **Figure 8-1**, independent of any future subway has also

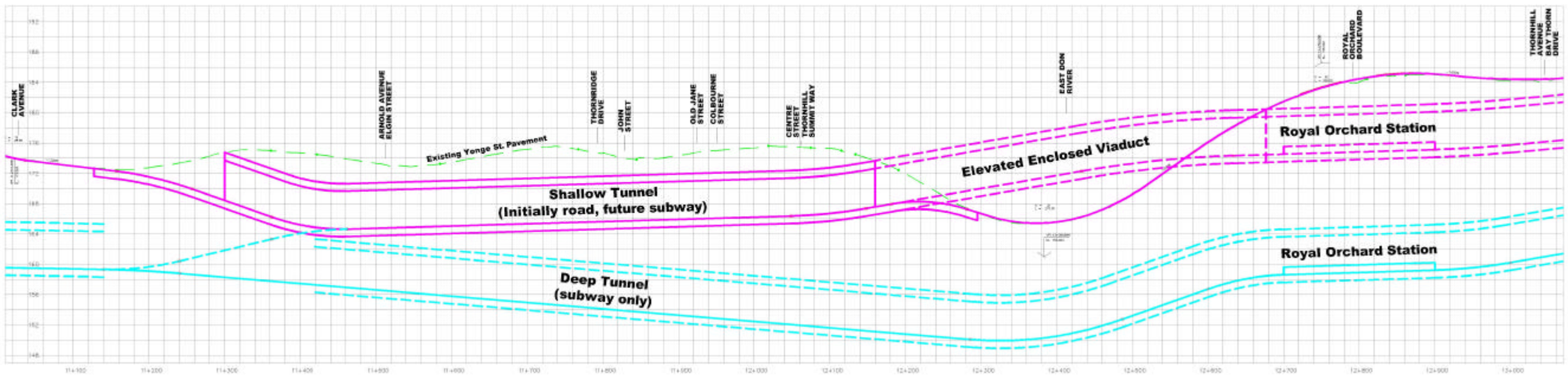


Figure 8-1
Thornhill Tunnel Alternative Route Alignments

been considered and found to require a length of one kilometre to avoid the ramps at each end conflicting with major intersections at John and Arnold Streets. The construction cost premium over a surface alignment for this latter option is estimated to be near $100 million.

More detailed analysis of the other underground option has shown that placing two lanes of road traffic into a shallow, pre-built subway tunnel requires the future subway to cross the West Don River valley on a flat profile viaduct with enclosed tracks to minimize noise impact. Consequences of this shallow option are increased subway construction cost over the traditional bored tunnel, extensive temporary disruption of Yonge Street traffic and significant visual intrusion of the viaduct on the valley landscape. For these reasons, the dual-use underground option was not considered to be a viable and environmentally acceptable alternative.

8.2.2 Primary Alternative Route Alignments – North of Highway 7

A number of possible alternative routes were considered between Yonge Street and the Richmond Hill/GO Line. The primary options included:

8.2.2.1 The Yonge Only Alignment – Mixed Traffic Option in Richmond Hill

This option considered a median transitway from Steeles Avenue to 19th Avenue/Gamble Road with a short mixed traffic segment in Richmond Hill. Because of property restrictions through the Richmond Hill Business District (CBD), a mixed traffic option is proposed through this segment. Transit vehicles would share the existing roadways with general-purpose traffic. Stations would be located either side of the CBD; one immediately south of Major Mackenzie Drive and the second near the Wright Street/Crosby Avenue area. The Major Mackenzie Station would be in the median while the Wright/Crosby Station would be curbside.

Preliminary Evaluation

The option was characterized by a median transitway from Steeles Avenue to 19thAvenue/Gamble Road. To keep property impacts to a minimum the initial cross-section included a one metre median separator. This was continuous except at currently signalized intersections. All other intersections were made “right in-right out” to allow good transit performance along the corridor. Stations were located at approximately 1 km apart as previously discussed in **Chapter 5**. The major signalized intersections were retained and stations were proposed at the following roads:

- Steeles Avenue
- Meadowview Avenue
- Clark Avenue - Station
- John Street – Station
- Centre Street/Thornhill Summit Way - Station
- Royal Orchard Boulevard - Station
- High Tech Road
- Scott Drive/Bantry Avenue – Station
- Carrville Road/ 16th Avenue
- Weldrick Road – Station
- Harding Boulevard
- Atkinson Street – Station
- Major Mackenzie Drive
- Crosby Avenue – Station
- Elgin Mills –Station
- Canyon Hill Avenue/ Bernard Avenue – Station
- Silverwood Drive/ Brookside Road
- Devonsleigh Boulevard/ Nothingham Drive
- Gamble Road/19th Avenue – Station

Signals permitting left turn and U-turns are also at intermediate intersections. Two lanes of general-purpose traffic were maintained in the northbound and southbound directions. Left-turn arrangements were maintained as existing. Right-turn exclusive lanes were generally eliminated unless warranted to reduce impacts at intersections especially if it was felt that these right-turns were being used as bus stops.

A short section through Richmond Hill between Major Mackenzie Drive and Benson Avenue was kept as a mixed traffic operation.

Because the corridor ROW was wider north of Elgin Mills Road a more generous cross-section was proposed. This included a 2 m landscaping strip on either side of the transitway and a passing lane at stations.

This option was considered viable and was carried forward.

8.2.2.2 The Yonge Only Alignment – Tunnel Option in Richmond Hill

This option is similar to the above option except that a tunnel is proposed to alleviate the effect of the mixed traffic bottleneck in the Richmond Hill CBD. The tunnel would start south of Major Mackenzie Drive and would return to grade north of Levendale Avenue. Stations would be located at both entrances to the tunnel with retaining walls. A two-lane tunnel is proposed that would have to be 12 metres below the surface at its deepest point to meet the LRT grades that would be needed in case the system is upgraded in the future.

Preliminary Evaluation

To determine the feasibility of this option a concept design of the tunnel was undertaken as shown in **Figure 8-2**.

The tunnel would allow transit vehicles to bypass the Richmond Hill CBD from south of Major Mackenzie Drive to just north of Levendale Road. Stations would be located at the entrance to the tunnel in an approach area that would be open at the top but with retaining walls in the median to allow for the introduction of the grade difference. The south station would be located in the median across the Atkinson Street/Elmwood Avenue intersection restricting access to “right in-right out” where these streets meet with Yonge Street. The gradient in the tunnel would be 0.6% to provide good drainage along the tunnel. The north end of the tunnel would require a +4.0% grade to match with existing Yonge Street grades.

Consequently the north station would be located north of the tunnel area where grades are less steep.

The method of construction of the tunnel would be “cut & cover” and would result in considerable disruption to the CBD area especially in the area where a depth of up to 12 metres would be required. Tunneling was not considered economical or feasible as some areas of the tunnel were close to existing ground.

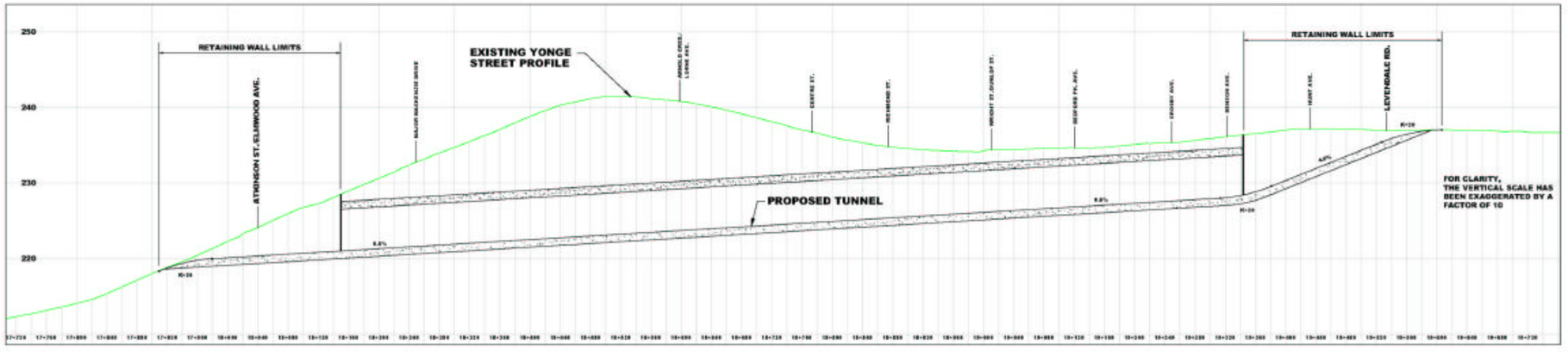
This option was initially carried forward and presented at the second Open House but was eliminated once the cost of construction was estimated at $115 million. The travel time saved by having rapid transit separated from traffic was not considered to be worth the additional cost of construction.

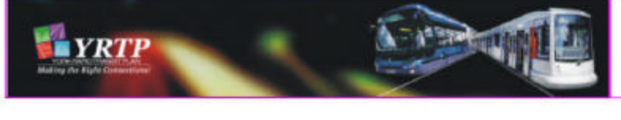
8.2.2.3 The Yonge/CN Bala/Richmond Hill GO Line

The option starts at Steeles Avenue in the Yonge Street medium and turns north to Langstaff Road East. At the intersection the alignment turns east and follows the Langstaff Road East and turns north to cross under Highway 407 and Highway 7 using the existing CN Bala/Richmond Hill GO line bridge structures on the west side of the railway line. It then proceeds northerly to either the Radcliff or Quebecor properties south of Elgin Mills Road. The alignment along the CN Bala/Richmond Hill GO Line crosses Bantry Avenue, 16th Avenue, Weldrick Road, Major Mackenzie Drive, Center Street and Crosby Avenue before it swings towards Yonge Street again. North of Industrial Drive where the transitway is proposed to rejoin Yonge Street, the median transitway continues north to the 19th Avenue study limit.

LEGEND:

- PROPOSED SURFACE TRANSITWAY
- RETAINING WALL
- PROPOSED UNDERGROUND TRANSITWAY
- EXISTING PROPERTY LIMITS
- PROPOSED STATION





SCALES

STATIONS

PROPOSED TRAFFIC LANES

EXISTING ROADWAYS

EXISTING RIGHT OF WAY

RICHMOND HILL CENTRAL BUSINESS DISTRICT TUNNEL OPTION

8-2
FIGURE

8

Preliminary Evaluation

This option was developed more fully to investigate its impacts. The median transitway follows the Langstaff Road East alignment immediately adjacent to Highway 407. A number of design options for the arrangement between Langstaff Road East and the transitway were developed and are more fully described in **Chapter 7**. The transitway proceeds north on the west side of the CN Bala/Richmond Hill GO Line in a protected ROW to approximately 200 metres south of 16th Avenue. The alignment has been developed to connect with a proposed potential maintenance facility south of Langstaff Road East and the intermodal station opposite the existing GO Langstaff Station as per the Langstaff Gateway, Gateway Facility and Area Requirements Review Study Report, (November 1998).

For both route options, a preliminary layout for the intermodal station was developed, which included a Pick Up/Drop off area facility. An arrangement to connect these facilities with the Highway 7 Transitway and the Yonge Transitway was also developed to ensure feasibility of the system.

At the north end of the protected ROW, 200 metres south of 16th Avenue, the transitway was planned to continue on the west side of the CN Bala/ Richmond Hill GO Line with at-grade crossings at Weldrick Road East, Centre Street and Crosby Avenue. The Major Mackenzie Drive crossing required a widening of the existing grade separation. Stations were located along the CN Bala/Richmond Hill GO Line grading at the same east west roadways as those on the Yonge only Alignment attenuation as follows:

- Bantry Road,
- 16th Avenue,
- Weldrick Road East,
- Major Mackenzie Drive, and
- Crosby Avenue.

In order to connect the alignment to Yonge Street at the north end a number of options were developed north of the Richmond Hill CBD but south of Elgin Mills Road. Options north of the Elgin Mills area were not considered because of the extent of residential development already existing and the undesirable impacts any options may have in that area.

The options included the Quebecor, the Radcliff, the Industrial Drive and the Elgin Mills options as shown in **Figure 8-3** on the following page. The Elgin Mills option was eliminated due to its extensive impacts on industrial and commercial buildings adjacent to the CN Bala/Richmond Hill GO Line. The Industrial Road option was also eliminated as the Emford Road corridor was too narrow to allow both vehicular traffic and transitway enough room to operate without major inconvenience.

The Quebecor and the Radcliff options, which were previously identified in the ToR of this project, were carried forward with this alternative.

It was noted that some important impacts or issues resulted from this overall alternative were as follows:

- Property impacts on industrial/commercial and residential units;
- Environmental impacts on watercourses;
- Issues related to having railway crossings with transitway crossings in close proximity to each other; and
- Access issues related to having station locations at grade separations.

Nevertheless the option was carried forward due to its benefit potential on redevelopment of this corridor and because of the fact that it avoided the Richmond Hill CBD area.

8.2.3 Secondary Alternative Route Alignments – North of Highway 7

In addition to the above primary options a number of additional or secondary options were investigated and illustrated in **Figure 8-4**. The purpose of these options was to look for alternatives that would keep the transitway along Yonge Street as much as possible and rejoin the CN Bala/Richmond Hill GO line in order to avoid the mixed traffic section at the Richmond Hill CBD. With this objective in mind the following options were evaluated:

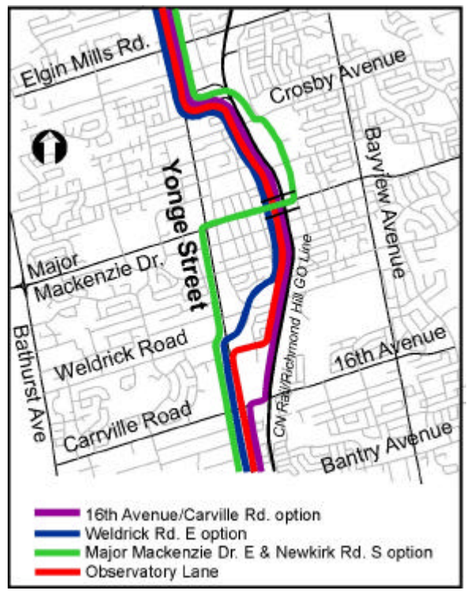


Figure 8-4
Secondary Alternative Route Alignments

8.2.3.1 Yonge/CN Bala/Richmond Hill GO Line via Major Mackenzie Drive East and Newkirk Road South

This option would keep transit on Yonge Street as far north as Major Mackenzie Drive just south of the Richmond Hill CBD. In developing this option it was difficult to connect the transitway with the CN Bala/Richmond Hill GO Line because of the existing Major Mackenzie Drive grade separation over the railway and the close proximity of development on both the north and south sides of Major Mackenzie Drive. The alternative of continuing the transitway to Newkirk Road South was considered as an option to try and solve this tie-in issue.

Preliminary Evaluation

This option allows the median transitway to be in the Yonge Street Corridor as far north as the south limit of the constrained Richmond Hill CBD area. At Major Mackenzie Drive the transitway would proceed easterly to the CN Bala/Richmond Hill GO Line and then follow it northerly.

The option would require at least three signalized intersections along Major Mackenzie Drive and would result in turn restrictions to right in right out only at another five intersections. The connection with the CN Bala/ Richmond Hill GO Line, because of the grade separation, would require a separate transitway alignment in the northwest quadrant of the Major Mackenzie Drive CN Bala/Richmond Hill Line intersection. This alignment would encroach on the property of the condominium building and form a major visual intrusion.

To avoid this situation it was determined however, that staging in the Major Mackenzie Drive median across the grade separation and using Newkirk Road South was an option (Newkirk Road South). Adding a separate median transitway would impact properties because of the limited ROW width on Newkirk and would create operational issues with access to adjacent commercial/industrial lands. The return route to Yonge Street further complicates this as there is no convenient way to cross back over to the west side of the rail line. Construction of an additional grade separation is not practical.

The option was screened out because of the above impacts.

8.2.3.2 Yonge/CN Bala/Richmond Hill GO Line via 16th Avenue/Carrville Road

The CN Bala/Richmond Hill GO Line is closest to Yonge Street in the block between Bantry Avenue and 16th Avenue/Carrville Road. Maintaining the

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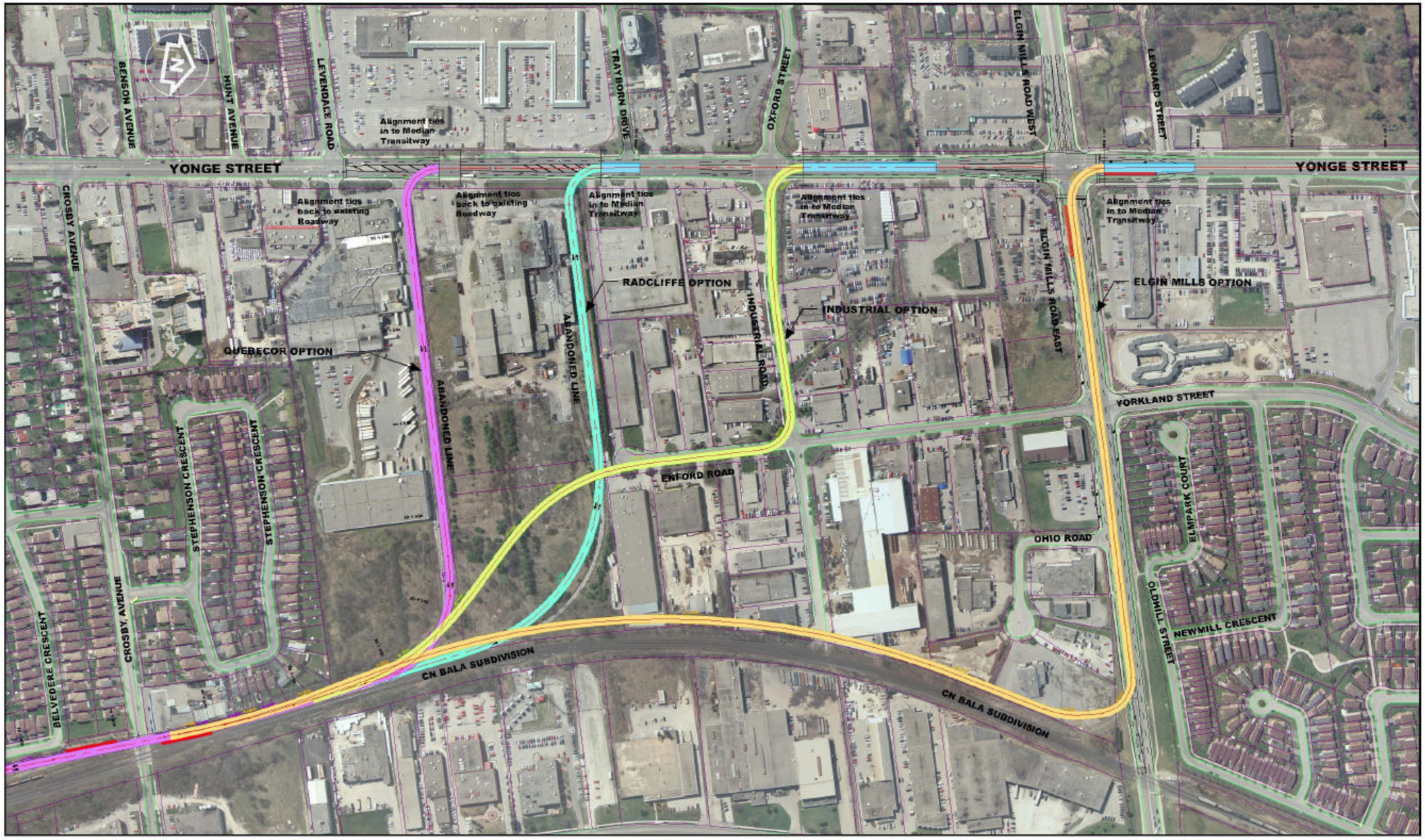

YRTP YORK REGION TRANSIT PLAN Making the Right Connections

20m 0 40m

SCALE

STATIONS

PROPOSED TRAFFIC LANES

EXISTING ROADWAYS

EXISTING RIGHT OF WAY

ALIGNMENT OPTIONS CONSIDERED AT THE NORTH TIE-IN POINT BETWEEN CN LINES AND YONGE STREET

8-3

FIGURE

8

median transitway along Yonge Street as far north as Hillcrest Mall was considered advantageous. The proximity of the rail corridor to Yonge Street in this area would also minimize the length of diversion. The option of a connection at 16th Avenue/Carrville with the CN Bala/Richmond Hill GO Line was considered worthy of consideration.

Preliminary Evaluation

This option had good merit because of the close proximity of the CN Bala/Richmond Hill GO Line to Yonge Street therefore reducing out of the way travel.

The option however was not carried forward because of the inability to find an alignment that was workable that could connect the transitway with the CN Bala/Richmond Hill GO Line. The narrow right-of-way along 16th Avenue, the grade differences due to the existing grade separation of 16th Avenue over the railway and the need to maintain the existing service road arrangement to adjacent lands that occupy all the public lands in the area.

8.2.3.3 Yonge/CN Bala Richmond Hill/GO Line via Observatory Lane

This option was considered, again, because of the relatively close proximity of Yonge Street to the CN Bala/Richmond Hill GO Line. A direct connection would be possible on this route as the rail line and the Observatory Lane are at approximately the same elevation.

Preliminary Evaluation

The ROW on Observatory Lane however, was found to be narrow (23 metres). The cross-section would include two narrow traffic lanes, two transitway lanes and narrow sidewalks with no boulevard. Observatory Lane is a local road with a number of commercial developments on either side of the road and a number of single-family homes. The median option would result in considerable disruption to access, primarily to the driveways of the single-family homes. This arrangement would also bring the new road edge very close to adjacent residential properties as a result of the narrow ROW width. A curbside transitway was not feasible, as it would result in "landlocking" of adjacent development.

For the above reasons the Observatory Lane option was not carried forward.

8.2.3.4 Yonge/CN Bala/Richmond Hill GO Line via Weldrick Road East

This option was considered at the request of a member of the public at the Second Open House. A specific advantage of Weldrick Road East is the limited number of intersecting roads making it less disruptive to transit.

Preliminary Evaluation

This option was not considered prior to the Second Open House as it did not offer the usual advantages of being in close proximity to the CN Bala/ Richmond Hill GO Line. In addition Weldrick Road East is considered a collector road with both commercial and residential accesses fronting on it.

However, as the option was further investigated it was found to be more practical due to a wider ROW than Observatory Lane and additional convenient private property access arrangements.

A median transitway was proposed in the section from Yonge Street to Church Street South. There is currently only one access on the south side of this section to a condominium building and three accesses on the north side to the same development. Clarissa Drive has access onto Weldrick Road in this section but also connects with Yonge Street. With this limited number of accesses, a median transitway was found to be operationally acceptable.

East of Church Street a separate transitway was proposed on the south side of the road. The transition from a median transitway to a curbside one would be accommodated through the Church Street signalized intersection. The south side transitway was found operationally feasible, as it would maintain good access to the many existing single homes fronting onto Weldrick Road East. At the east end of the road a signalized intersection would be installed to allow safe access to the only private driveway on the south side (to a condominium complex). The intersection would also allow a transition from a south side transitway to a north side one. This is required to facilitate a connection with the CN Bala/Richmond Hill GO Line corridor and avoid conflict with the future planned grade separation of the CN/Bala Richmond Hill GO Line with Weldrick Road East.

Weldrick Road East has a 26 metre ROW, which would be sufficient to allow future four-laning and inclusion of a median transitway. The option was carried forward as its impacts were deemed to be mitigable.

8.2.4 Preferred Alignments

The above screening of alternative alignments resulted in carrying forward three main options:

- Yonge Street;
- Yonge/CN Bala/Richmond Hill/GO Line via Weldrick Road East; and
- Yonge/CN Bala/Richmond Hill/GO Line.

The above three alternatives were considered the only alternatives worthy of further consideration. The options were developed further in detail and the results of the evaluation are documented in Chapter 7 in order to determine a preferred alternative. The three routes considered are shown schematically in **Figure 8-5**.

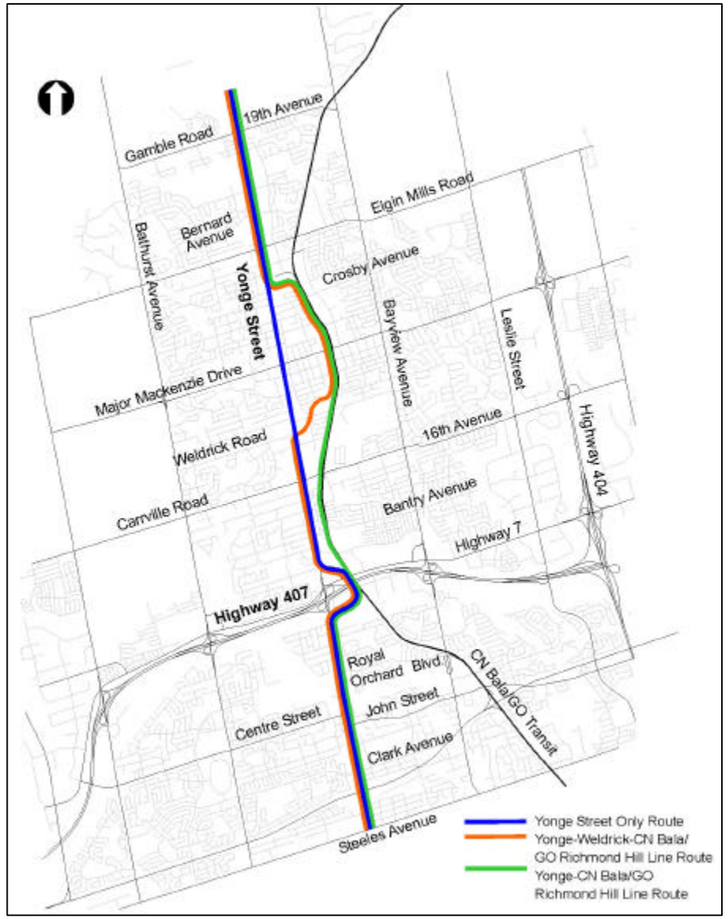

Figure 8-5
Primary Route Options

9. SELECTION OF PREFERRED DESIGN

9.1 EVALUATION METHODOLOGY

In order to select the preferred design for the undertaking the following methodology was adopted:

- Each primary route alternative was developed fully so that all effects could be determined;
- For each of the primary alternatives viable section design alternatives were also developed;
- Section design alternatives were evaluated and the best design alternative was carried forward for that preferred alternative;
- "Objectives" of the undertaking were identified – see **Chapter 5**;
- For each preferred alternative, "Factors" were developed that were considered important in choosing between alternatives;
- For each factor, quantifiable "Indicators" were selected;
- The Objectives, Factors and Indicators were distributed to the project team and TAC members, and comments were received to ensure that they were appropriate. The input of discipline sub-consultants was of paramount importance to ensure that the indicators reflected the effects of the alternatives as they relate to the discipline;
- An evaluation methodology was developed to rank alternatives;
- The evaluation was conducted by the project team and presented to the TAC members for their input; and
- A preferred design was selected.

9.2 DEVELOPMENT & EVALUATON OF SECTION DESIGN ALTERNATIVES

Design alternatives were developed for three main areas:

- Langstaff Road Connection from Yonge Street to the intermodal station;
- The connection from the intermodal station to Yonge Street north;
- Alignments in the vicinity of the GO Richmond Hill Station at Fox Run Crescent.

In addition to the above local areas, the Quebecor and Radcliff alignment alternatives connecting the CN Bala/Richmond Hill GO Line with Yonge Street at the north end were also considered as design alternatives and carried forward with these alternatives.

9.2.1 Langstaff Road Connection from Yonge Street to the Intermodal Station

Two design arrangements were investigated for the location of the transitway adjacent to Langstaff Road. These comprised either a median transitway or a transitway located adjacent to the Highway 407 alignment with Langstaff Road to the south. See **Figure 9-1**. The option of locating the transitway south of the road was not considered feasible, as vehicular access to adjacent lands would be disruptive to transitway operations and would create a barrier between the road and adjacent lands.

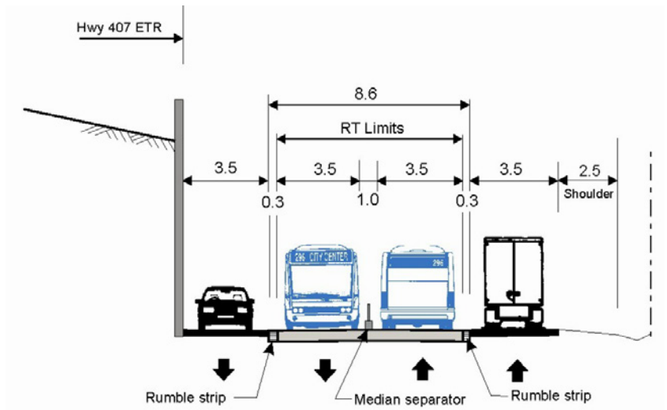

Figure 9-1 (A)
Transitway in Langstaff Road Median

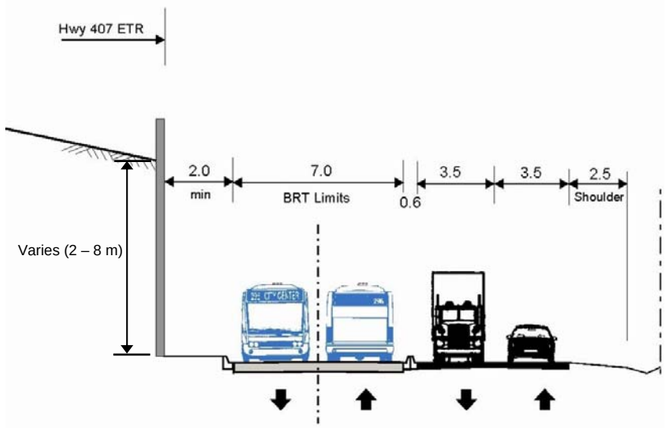

Figure 9-1 (B)
Separate Transitway Preferred

For the same reasons and since there are no accesses required on the north side, a north side transitway was considered more favourable. This location will not require a transitway crossing of Langstaff Road at the west end where the transitway would proceed north to the intermodal station. Maintaining Langstaff Road East adjacent to lands to the south was therefore considered the preferred design option.

A second design alternative in the Langstaff Road and Yonge Street area was considered. This featured a less curved exit from Yonge Street at the Highway 407-terminal/Langstaff Road intersection with Yonge Street while the second one consisted of an option that more closely followed the existing Langstaff Road as shown in **Figure 9-2**.

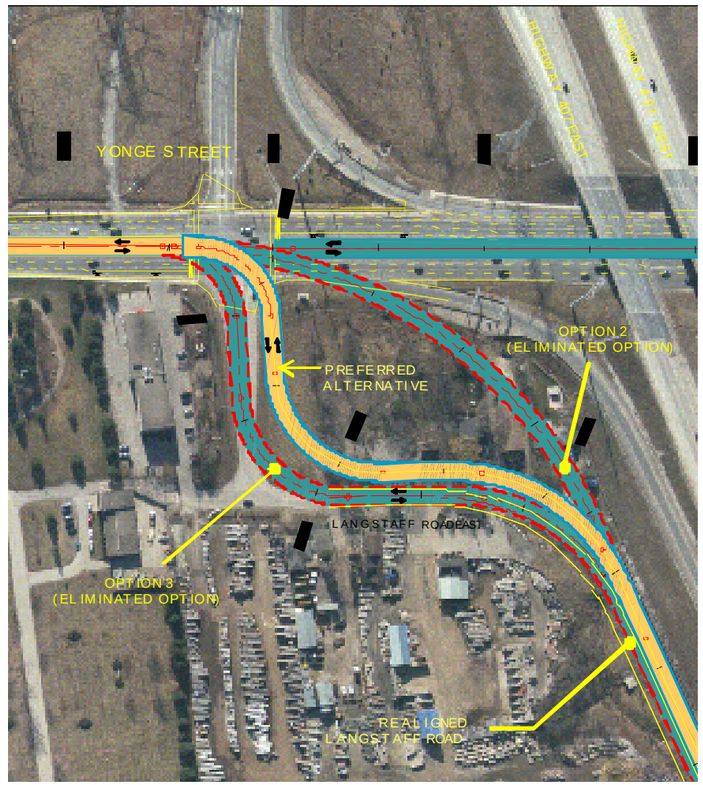

Figure 9-2
Alternative Designs at Langstaff Road

The less curved option was considered advantageous from the point of view of transitway operations, as the larger radius would allow easier access and less track maintenance in the event an LRT option was used. However in reviewing this arrangement it was found that the transitway would interfere with the Highway 407 ramp. Vehicles accessing the ramp

from Yonge Street could inadvertently use the transitway roadway despite signing. For this reason and the lack of a better solution this latter alternative was eliminated. For a final arrangement of this area with the alternatives see **Figure 9-6** in the plates following.

9.2.2 The Connection from the Intermodal Station to Yonge Street to the North

Two alternatives were identified as shown in **Figure 9-3**. These are the High Tech Road and the Yonge Street Highway 7 Connection Ramp options of linking the intermodal station with Yonge Street.

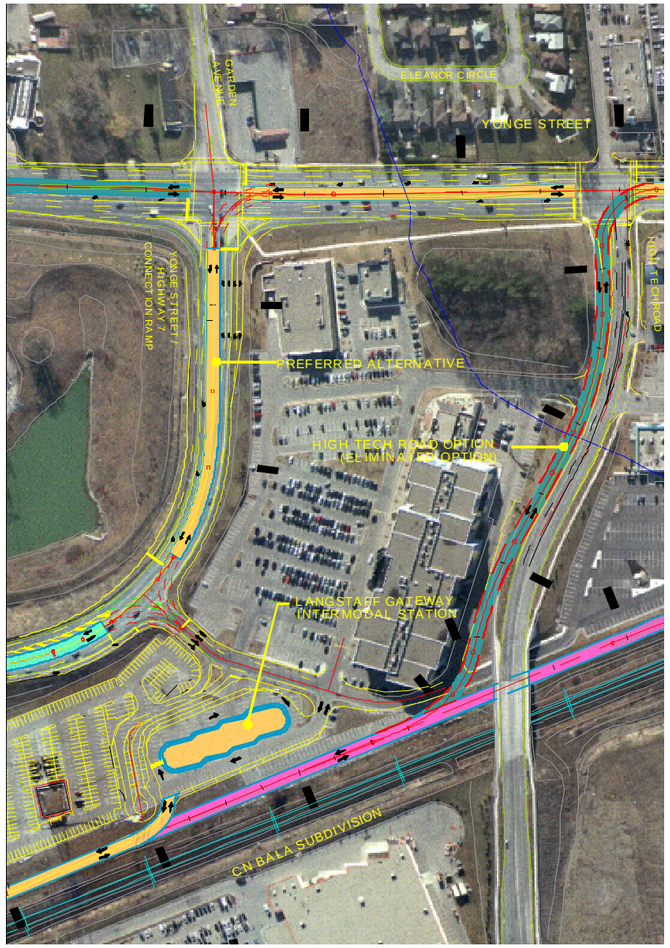

Figure 9-3
Richmond Hill Centre Intermodal Station Access Alternatives

The High Tech Road option was initially identified as it had the advantage of providing a separate ROW that would not interfere with general purpose traffic compared with the Yonge Street/Highway 7 Connection Ramp. Disadvantages of the option however were:

- The need to realign High Tech Road to allow sufficient room for incorporation;
- Reconstruction of the retaining wall between the bridge and the movie theatre;
- Conflict with the rear public entrance to the movie theatre; and
- Prohibition of traffic access other than transit behind the movie theatre at the pinch point.

For the above disadvantages the option was eliminated in favour of the Yonge Street/Highway 7 Connection Ramp.

9.2.3 Alignments in the vicinity of the GO Richmond Hill Station at Fox Run Crescent

This option was developed along the CN Bala/Richmond Hill GO Line south of Major Mackenzie Drive East in order to mitigate the impact of the proposed transitway corridor on the west side of the railway line on 18 residential townhouse units located at Fox Run Crescent. The option realigned the CN tracks to the east sufficiently enough to avoid impacting the homes or commercial units on the east side and to allow inclusion of the transitway. Several disadvantages resulting from this rail re-alignment option were:

- Widening of the Major Mackenzie Drive East bridge to the east would be required;
- Narrowing or reconstruction of the GO Richmond Hill station platforms would be required;
- Although the transitway would not impact the units directly it could not be moved sufficiently far away to avoid adverse effects on the residences as shown in **Figure 9-4**; and
- The option was expensive and staging of construction would be disruptive to the railways.

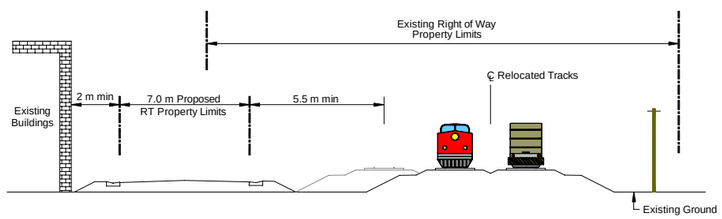

Figure 9-4
Realigned Track Configuration at Fox Run Crescent

This option was eliminated in favour of acquiring the units. This decision is further confirmed as the existing location and proximity of the Fox Run Crescent units to the railway lines is too close and not in accordance with current CN standards.

The option of tunnelling below the units was also considered. However this was found to be prohibitively expensive and impractical as the transitway would have to go over Major Mackenzie Drive East in order to allow pedestrian connectivity with the railway station. This was found not to be geometrically feasible due to the short distance between the bridge and the residential units.

Therefore, the options of maintaining a constant ROW for the transitway west of the railway without realignment and acquiring the residential units was considered the preferred design option for the Yonge/CN Bala Richmond Hill GO line alternative.

The result of the above evaluation and the final three alternatives as developed and ready for evaluation are shown in **Figures 9-5 to 9-8**. These plates were displayed at the Third Open House.

9.2.4 Quebecor & Radcliff Options

As part of the Richmond Hill GO line route alternative, a number of options were developed to reconnect to Yonge Street as shown in Figure 8-5 in Chapter 8. The preliminary screening of these options shortlisted the Quebecor and Radcliff options and these were carried forward as part of the Richmond Hill GO Line alternative. The options were evaluated against each objective to select a preferred alignment in order to carry forward a single route alignment to compare with the Yonge Street alignment. However, when comparing these two alignments, it was found that they both had good attributes as both followed existing rail spur alignments to the existing industries. As there was little to distinguish the alignments, both were carried forward

9.3 EVALUATION OF ALTERNATIVES

Chapter 7 documented the planning, design and performance objectives for the Yonge Transitway identified during the EA. Goals and indicators were developed and submitted to TAC members to confirm their applicability. To ensure a traceable process an attempt was made to choose indicators that are quantifiable so that subjective evaluations are minimized.

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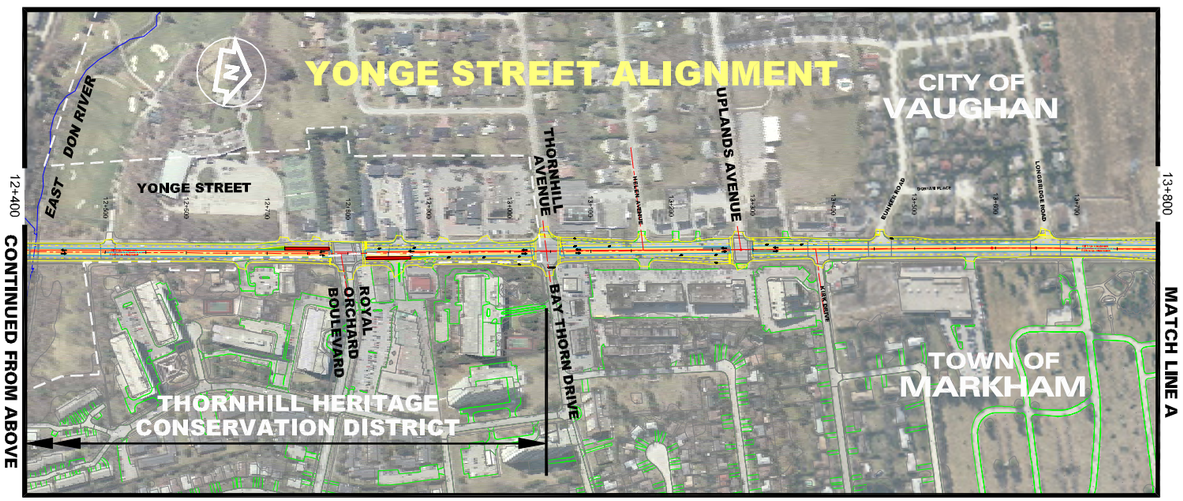


YONGE STREET ALIGNMENT
CN BALA / GO RICHMOND HILL LINE
WELDRICK ALIGNMENT
ELIMINATED OPTION

PROPOSED STATION
PROPOSED TRAFFIC LANES
PROPOSED LANDSCAPE

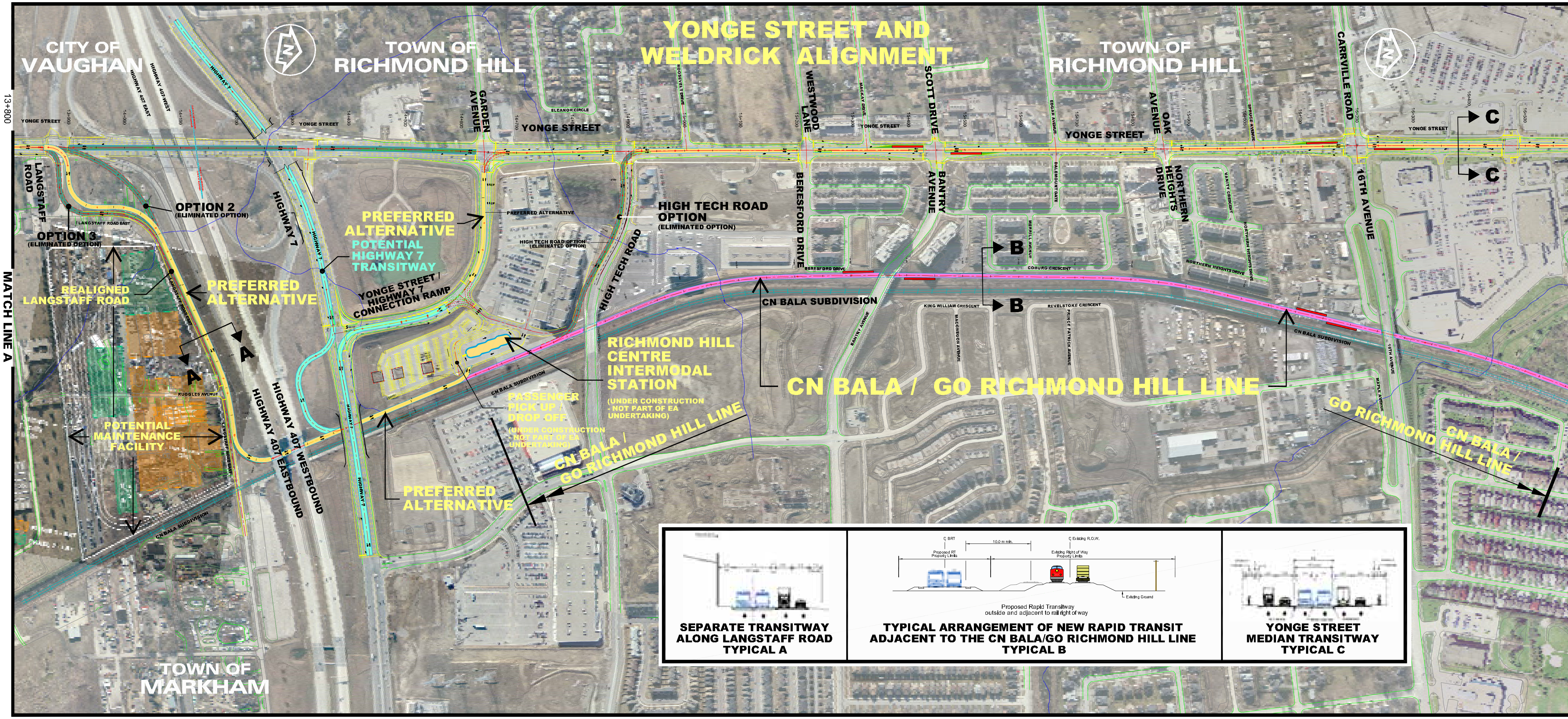
EXISTING ROADWAYS
EXISTING RIGHT OF WAY
MUNICIPAL BOUNDARIES
CITY OF VAUGHAN
TOWN OF MARKHAM

20m 0 40m
Horizontal
SCALE

ROUTE ALIGNMENT OPTIONS FOR THE YONGE STREET CORRIDOR STEELES AVENUE TO LONGBRIDGE ROAD

9-5
FIGURE

METRIC



YONGE STREET ALIGNMENT		PROPOSED STATION		EXISTING ROADWAYS	
CN BALA / GO RICHMOND HILL LINE		PROPOSED TRAFFIC LANES		EXISTING RIGHT OF WAY	
WELDRICK ALIGNMENT		PROPOSED LANDSCAPE		MUNICIPAL BOUNDARIES	CITY OF VAUGHAN / TOWN OF MARKHAM
ELIMINATED OPTION					

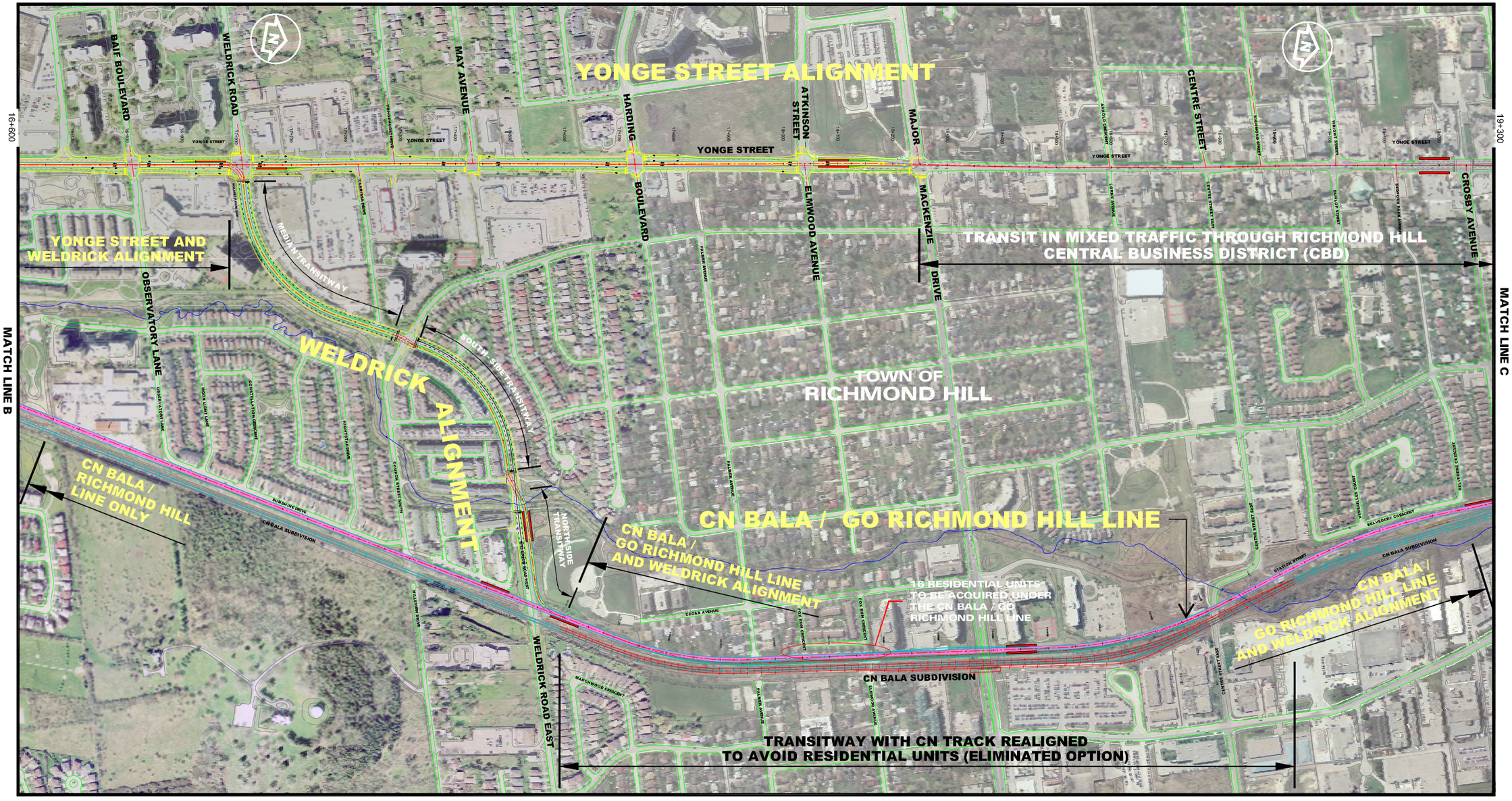
YRTP Making the Right Connections!

20m 0 40m Horizontal
SCALE

ROUTE ALIGNMENT OPTIONS FOR THE YONGE STREET CORRIDOR LANGSTAFF RD. TO CARRVILLE RD./16TH AVENUE

9-6
FIGURE

METRIC



YONGE STREET ALIGNMENT
CN BALA / GO RICHMOND HILL LINE
WELDRICK ALIGNMENT
ELIMINATED OPTION

PROPOSED STATION
PROPOSED TRAFFIC LANES
PROPOSED LANDSCAPE

EXISTING ROADWAYS
EXISTING RIGHT OF WAY
MUNICIPAL BOUNDARIES
CITY OF VAUGHAN
TOWN OF MARKHAM

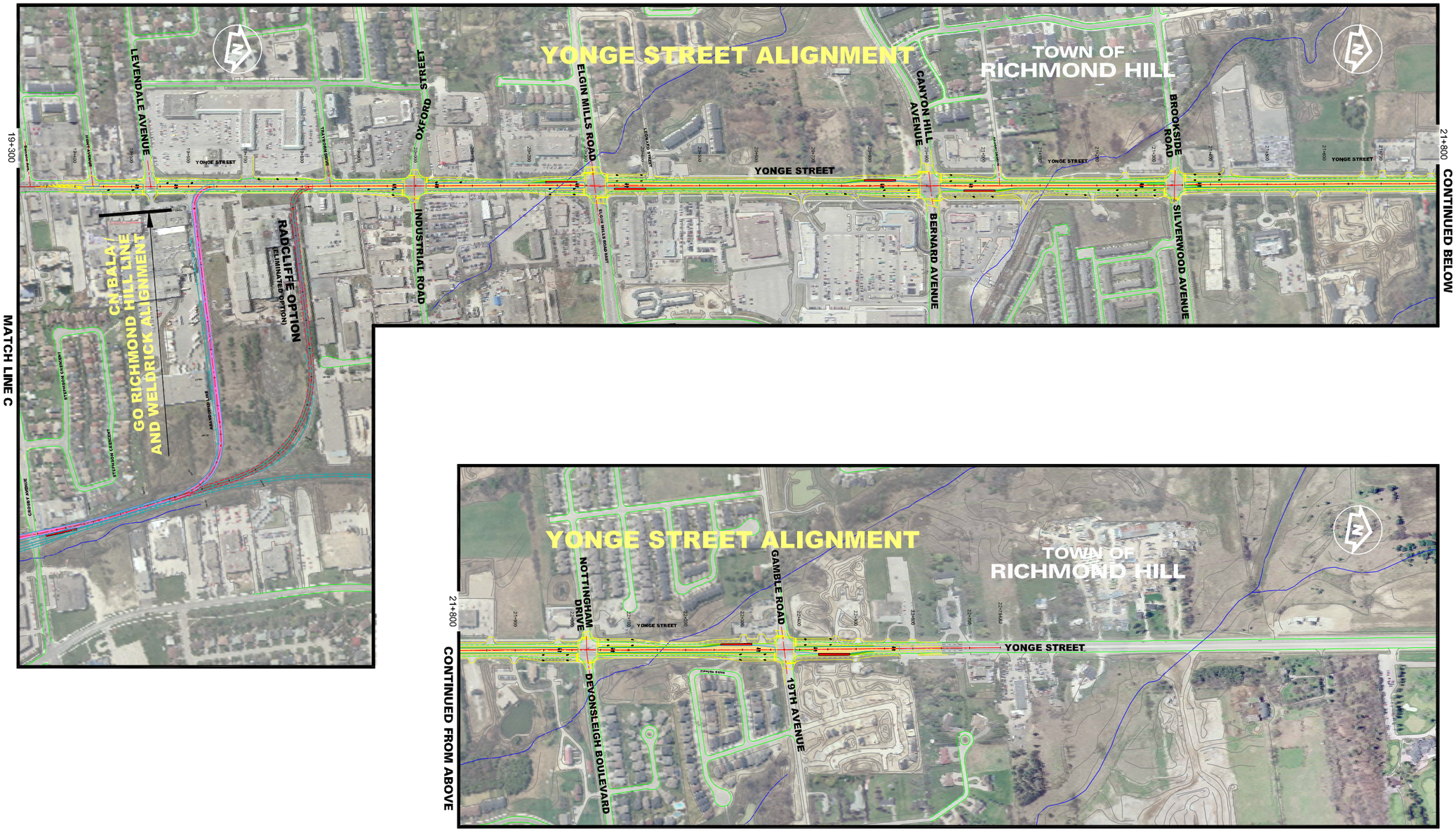
YRTP

20m 0 40m
Horizontal
SCALE

ROUTE ALIGNMENT OPTIONS FOR THE YONGE STREET CORRIDOR BAIF BOULEVARD / OBSERVATORY LANE TO CROSBY AVENUE

9-7
FIGURE

METRIC



YRTP

20m 0 40m
Horizontal

SCALE

ROUTE ALIGNMENT OPTIONS FOR THE YONGE STREET CORRIDOR BENSON AVENUE TO GAMBLE ROAD/19TH AVENUE

9-8

FIGURE

For the evaluation, each alternative was ranked using a system of indicators to reflect the degree to which it met the goal being considered relative to the other alternatives. The quantity unit was chosen to ensure that it represented the responsiveness to the goal it was satisfying. Once alternatives had been ranked in terms of all indicators, they were then ranked according to their response of each goal.

An overall best alternative was then chosen for each primary objective by summarizing the degree to which each of the goals were met. A general synopsis of alignment evaluation findings was tabulated at the bottom of each objective to explain the rationale behind the decision. This included a description of the advantages and disadvantages of each alternative and its merit regarding the objectives and goals.

Screening of the route alternatives is described in **Chapter 8**.

The evaluation of alternatives, including all results, is shown in tabular form in **Tables 9-1 to 9-5**. These tasks were presented for public review at the third series of public open houses.

9.4 SELECTION OF PREFERRED ALTERNATIVE

The evaluation leads to the conclusion that the transitway alignment located entirely on Yonge Street; i.e., the Yonge Street – Mixed Traffic Option is recommended as the Preferred Transitway Alignment for the following reasons:

- The Yonge Street alternative has the potential to attract 7-10% more AM peak period transit boardings in the corridor, both home and work-based, and provides the most convenient pedestrian access to major community activity centres along the corridor such as shopping malls, community centres, and old Richmond Hill.
- Rapid transit will reinforce the "main street" role of Yonge Street by encouraging mixed use redevelopment and intensification of existing adjacent land use, particularly around station nodes outside of and within the old Richmond Hill district.
- The reduction in service speed likely in the short section of mixed traffic operation through old Richmond Hill will not increase overall travel time compared to the GO Rail alignment because the overall length of the Yonge route is two kilometres shorter. Also, traffic signal optimization incorporating transit priority can reduce the speed penalty.
- Although the transitway insertion will require a change in traffic patterns and a small reduction in through traffic capacity on Yonge Street, it will cause no other significant adverse effects on adjacent communities, such as noise, displacement of residences, road closures, barrier effects etc.
- A transitway on Yonge Street offers good access to stations and local transit, and can support a major improvement in the urban design of the corridor. These benefits are much less achievable with a transitway along the GO Rail corridor because of its industrial character and frequent freight rail service.
- Although marginally more costly to construct, transitway construction, mostly within the existing street right-of-way, avoids significant property acquisition and displacement of residential units that would be required for the alternative GO Rail alignments.
- Assuming the urban structure of the north-south corridor through Richmond Hill is to be concentrated around Yonge Street, rapid transit service entirely on the street will best support this planning objective.

Although a transitway along the GO Rail corridor does avoid some of the traffic integration issues on Yonge Street, its ability to attract transit ridership along the north-south spine of YRTP depends on the degree to which surrounding land use can be changed to broaden the Yonge Street urban corridor, particularly around stations. This is in doubt particularly with respect to residential uses because of the continuing presence of CN freight operations and their effect on the station environment.

9.5 MAINTENANCE AND STORAGE FACILITY DESIGN ALTERNATIVES

Design alternatives for a consolidated Maintenance and Storage Facility meeting the planning criteria set out in **Chapter 7**, are dependent on the availability of sites that will accommodate the functional requirements defined in **Section 7.5**. An investigation of potential sites, conducted in consultation with municipal property services staff, revealed four options.

These locations, shown in **Figure 9-9**, were determined to be the only alternative sites to which reasonable service connections could be developed from the primary network alignments, Yonge Street and Highway 7. This feature was particularly important for any ultimate facility required to support LRT technology on the network. The four sites identified are described below.

a) Langstaff Industrial Land in Markham

This site is located in the Langstaff industrial area immediately south of Highway 407 and east of Yonge Street in the Town of Markham. The present zoning and land use is industrial, largely businesses supporting the construction and automotive industries, along with some of the site in use as new automobile storage.

Neighbouring uses include the Langstaff Road and Highway 407 rights-of-way to the north, the CN Rail Bala Subdivision to the east, the Holy Cross Catholic Cemetery to the south and Langstaff Road and provincial government owned land to the west. The site slopes gradually westward from the east boundary along the rail right-of-way to a low point at a tributary of the East Don River which crosses the site diagonally in its western half. Access to the site is available directly from Langstaff Road on the north side.

b) Highway 407 Parkway Belt Land near Bathurst Street in Vaughan

The construction of Highway 407 resulted in a large parcel of surplus Parkway Belt land south of the Highway between Bathurst and Dufferin Streets approximately 2.5 km from the Yonge Street Corridor. Most of this

Figure 9-9
Maintenance and Storage Facility Sites Considered

Table 9-1
Evaluation of Alignment Alternatives for Objective A

EVALUATION OF ALIGNMENT ALTERNATIVES (LANGSTAFF ROAD TO SOUTH OF ELGIN MILLS) - OBJECTIVE A: To Improve mobility by providing a fast, convenient, reliable, and efficient rapid transit service										
Goals		Typical indicators measuring route's ability to achieve goals	Unit of measure	Yonge Street Only		Yonge Street/ Weldrick/ GO Line Option		GO Line Option	
A1	Maximize inter-regional and local transit connectivity	Connections to inter-regional services and existing gateways	No. of crossing services (GO, TTC, etc.)	◑	GO connection at Langstaff	◕	GO connections at Richmond Hill and Langstaff	◕	GO connections at Richmond Hill and Langstaff
		Compatibility with proposed network	Relative measure	◕	Best connectivity with local transit	◑	Good connectivity with local transit	◔	Worst connectivity with local transit
A2	Maintain flexibility to expand network?	Potential for additional stations	# of stations	◔	Smaller route length	◕	Potential for additional station at Weldrick/CN	◑	Longer route length
		Number of stations with potential for surface expansion capability	#	◑	At grade route, many parking lots, etc.	◑	Mostly at grade, parking lots, etc.	◔	Many grade separations
A3	Alignment geometry that maximizes speed and ride comfort and minimizes safety risks and maintenance costs	% of route > 3% grade	%	◕	8 % of route	●	1 % of route	●	0.1 % of route
		No. of running way sections > 3.5%	#	◑	1 (420m in length)	●	1 (25m in length)	●	1 (10m in length)
		No. of curves < 100 metres	#	●	0 curves	◔	7 curves	◕	2 curves
		No. of curves > 100 metres and < 300 metres	#	●	0 curves	◑	3 curves	◕	2 curves
A4	Increase attractiveness of rapid transit service	Projected travel time along each alternative	Travel time	◕	35kmph for 4.7 km, 20kmph for 1.1km	◑	35kmph for 6.9km plus many curves	◕	35kmph for 6.9 km
		Daily boardings (24 hours)	Daily boardings	●	Serves higher density mixed uses	◕	Less density in rail corridor	◑	Less density in rail corridor
		Route features with potential to reduce service reliability	Constraints/# of intersections	○	20 intersections, 1.1km mixed traffic	◑	16 intersections	◕	5 intersections
A5	Station locations that maximize ridership potential of rapid transit service	Existing and future residents or residences within 500 m walking distance of station	No. of residents	◕	Estimate from aerials at station locations	◑	Estimate from aerials at station locations	◔	Estimate from aerials at station locations
		Existing and future employment within a 500 m walking distance of a station	No. of employment centres	◕	Estimate from aerials at station locations	◑	Estimate from aerials at station locations	◔	Estimate from aerials at station locations
A6	Maximize convenience of access to rapid transit system	Number of stations with bus transfer facilities (off-street, on-street)	No. of stations	●	All stations have bus transfer facilities	●	All stations have bus transfer facilities	●	All stations have bus transfer facilities
		Number of stations with potential for park-and-ride facilities	No. of stations	◕	Little potential outside of Gateway	◕	Little potential outside of Gateway	◕	Little potential outside of Gateway
		Number of stations with potential for passenger pick-up/drop-off facilities	No. of stations	◕	No grade separations	◑	Some grade separations	◔	Many grade separations
		Number of stations with other travel modes (taxi/bikes/Wheel Trans)	No. of stations	◕	Taxis, bikes, etc already on Yonge	◑	Estimated from other two options	◔	Little opportunity for other travel modes
		Ease of accessibility by the disabled	Identify facilities and their ease	●	At grade route and convenient access	◑	Estimated from other two options	◔	Grade separations are inconvenient
		Average transfer time at connection points between facilities and modes; ease of transfers	Avg. transfer time	●	All at grade transfers	◕	Most transfers are at grade	◑	Many grade separated transfers

SYNOPSIS OF ALIGNMENT EVALUATION FINDINGS			
Objectives And Goals: ● Inter-regional transit connectivity ● Speed, safety, ride comfort ● Station catchment ● System expansion flexibility ● Service quality and effectiveness ● Convenience of access	• Generally good system quality and access that will attract most trips, both home and work-based. • Yonge St. traffic activity limits transit frequency and could reduce transit system reliability. • Connects to GO Rail at Langstaff only but best connects to local transit.	• Provides average system quality and access. • Will attract mainly home-based trips from existing and new development. • Reduces adverse effects of Yonge St. traffic activity on service reliability and allows additional stations. • Connects to GO Rail at Langstaff and Richmond Hill.	• Provides average system quality and access. • Will attract mainly home-based trips from existing and new development. • Reduces adverse effects of Yonge St. traffic activity on service reliability and allows additional stations. • Connects to GO Rail at Langstaff and Richmond Hill.
PREFERRED OPTION FOR OBJECTIVE A	●		

LEGEND: Least Responsive ○ ◔ ◑ ◕ ● Most Responsive

Note: The above indicators were presented to the public at Open House #2. Certain indicators shown at that time have been removed from this evaluation as there was no significant difference in the response of the three alignment options in meeting the goal.

Table 9-2

Evaluation of Alignment Alternatives for Objective B

EVALUATION OF ALIGNMENT ALTERNATIVES (LANGSTAFF ROAD TO SOUTH OF ELGIN MILLS) - OBJECTIVE B: To protect and enhance the social environment in the corridor									
Goals		Typical indicators measuring route's ability to achieve goals	Unit of measure	Yonge Street Only		Yonge Street/ Weldrick/ GO Line Option		GO Line Option	
B1	Minimize adverse effects on and maximize benefits for communities in corridor	Potential for displacement/disruption of unique and distinctive community features	No. of unique & distinctive community features disrupted	◑	Some potential	◑	Some potential	◕	Little to no potential
		Number of persons and residential units displaced by location	No. of residential units	●	None	○	16 units	○	16 units
		Potential for change in interaction among community groups	Relative Change	◑	Median barrier may restrict interaction	◕	Estimated from other two options	●	Stations on one side may pormote connectivity
		Number, land area and type of community features/ services affected	No. of community features	◕	Little to none	◕	Little to none	●	None
		Construction effects	Constructability Review	◑	4.7km on major arterial	◑	3km on arterial, 1.1km on residential	◕	Mostly on its own right of way
B2	Maintain or improve road traffic and pedestrian circulation	Number of intersections with restricted access	No. of intersections	○	10 intersections	◔	7 intersections	●	0 intersections
		Number of residential driveways with restricted access	No. of driveways	●	0 driveways	●	0 driveways	●	0 driveways
		Potential for infiltration of neighbourhoods by diverted traffic	Rating	○	Substantial level of diverted traffic	◔	Significant level of diverted traffic	●	No diverted traffic
		Loss of residential street parking	Length of resident street parking loss	●	None	◕	Some through Weldrick	●	None
		Change in level of pedestrian cross-movements	Rating	◕	Transitway on shorter route length	◑	Transitway on longer route length	●	None
		Number of pedestrian paths severed or made more indirect	No. of pedestrian paths severed	◑	At least 5 severed	◔	At least 7 severed	●	0 severed
		Number of stations with the potential to increase traffic and parking on local streets	No. of stations	◕	Side streets close to stations, etc.	◑	Side streets close to stations, etc.	◕	Side streets close to stations, etc.
		Number of unique signalized intersections required	Rating (No. of unusual signalized intersections)	●	0 along route	○	7 along route	◑	4 along route
		Number of signalized intersections affected - more complex, greater demands	Rating (No. of signalized intersections)	◔	13 along route	◔	15 along route	●	4 along route
		Number of unsignalized intersections affected	Rating (No. of unsignalized intersections)	◔	9 along route	◑	6 along route	●	0 along route
		Length of road with temporary restricted capacity or blocked during construction	Length of road	◔	4.7km - arterial	◔	3km - arterial and 1.3km - residential	◕	1km - side roads
B3	Maintain a high level of public safety and security in corridor	Number of locations with potential to decrease public safety	No. of location & degree of safety	◑	Motorists not used to u-turns, etc	◔	Many unique intersections	◑	Stations next to rail line is concern (running, etc)
		Effect of transitway insertion on emergency vehicle circulation	Rating	◑	May use transitway, median restriction	◕	Estimated from other two options	●	No effect
B4	Minimize adverse noise and vibration effects	Sound - Minimize the number of residences impacted by operations	Number	◕	Relative Evaluation	◔	Relative Evaluation	◑	Relative Evaluation
		Vibration - Minimize number of residences impacted by operations	Number	◕	Relative Evaluation	◔	Relative Evaluation	◑	Relative Evaluation
		Construction - Minimize the number of residences impacted	Number	●	Relative Evaluation	◑	Relative Evaluation	◕	Relative Evaluation
B5	Minimize adverse effects on cultural resources	Minimize the number of built heritage features and cultural landscape displaced (loss or relocation) in the study area	No. of features	●	0 features	◑	1 - BHF	○	2 - BHF
		Minimize the number of built heritage features and cultural landscape disrupted in the study area	No. of features	○	2 - CLU	●	0 features	◑	1 - CLU
B6	Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	Visual impact on people living and working in and visiting the community	Rating	●	Best potential for visual integration	◑	Big impact on single unit homes	◑	Difficult to integrate with surroundings
		Number of viewing opportunities blocked or degraded by transit facility	Rating	◑	Potential blocking of businesses	◔	Impact on single unit homes	◕	Little degradation, next to tracks

SYNOPSIS OF ALIGNMENT EVALUATION FINDINGS			
Objectives And Goals: ● Effects on communities. ● Public safety and security. ● Effects on cultural resources. ● Road traffic and pedestrian circulation. ● Noise and vibration. ● Community vistas and street aesthetics.	• Causes very few adverse community effects, provides good access and offers good urban design potential. • Insertion in Yonge St. results in greatest traffic impact and a higher safety risk. • Reduces effect of system noise and vibration. • Avoids displacement of residential properties.	• Displaces 16 townhouse units and causes minor adverse community effects. • Offers some urban design potential. • Partial diversion from Yonge St. reduces traffic impact and safety risk but increases potential for adverse noise and vibration effects.	• Displaces 16 townhouse units but minimizes other adverse community effects. • Urban design potential low. • Full diversion off Yonge St. minimizes traffic impact and safety risk. • Increases potential for rail incident and adverse noise and vibration effects.
PREFERRED OPTION FOR OBJECTIVE B	●		

LEGEND: Least Responsive ○◔◑◕● Most Responsive

Note: The above indicators were presented to the public at Open House #2. Certain indicators shown at that time have been removed from this evaluation as there was no significant difference in the response of the three alignment options in meeting the goal.

Table 9-3
Evaluation of Alignment Alternatives for Objective C

EVALUATION OF ALIGNMENT ALTERNATIVES (LANGSTAFF ROAD TO SOUTH OF ELGIN MILLS) - OBJECTIVE C: To promote a sustainable environment by protecting and enhancing the natural environment in the corridor									
Goals		Typical indicators measuring route's ability to achieve goals	Unit of measure	Yonge Street Only		Yonge Street/ Weldrick/ GO Line Option		GO Line Option	
C1	Minimize adverse effects on Aquatic Ecosystems	Number of aquatic ecosystems displaced or disturbed within zone of potential facility effects	No. of aquatic ecosystems	◕	2 Crossings	◔	5 Crossings	◔	6 Crossings
		Type of aquatic ecosystems displaced or disturbed within zone of potential facility effects	Type of aquatic ecosystem (lentic or lotic)	◑	Estimated from LGL input	◑	Estimated from LGL input	◑	Estimated from LGL input
		Extent of aquatic ecosystems displaced or disturbed within zone of potential facility effects	Area (ha) or length (m) of aquatic ecosystems	◕	Estimated based on number of crossings	◔	Estimated based on number of crossings	◔	Estimated based on number of crossings
		Significance of aquatic ecosystems displaced or disturbed within zone of potential facility effects	Significance of aquatic ecosystems (habitat type, community type, presence of species-at-risk, etc.)	◕	Estimated from LGL input	◑	Estimated from LGL input	◔	Estimated from LGL input
C2	Minimize adverse effects on Terrestrial Ecosystems	Number of terrestrial ecosystems displaced or disturbed within zone of potential facility effects	No. of terrestrial ecosystems	◕	4 terrestrial ecosystems	◔	8 terrestrial ecosystems	◔	8 terrestrial ecosystems
		Type of terrestrial ecosystems displaced or disturbed within zone of potential facility effects	Type of terrestrial ecosystems (wetlands, forests, thickets, fields, etc.)	◕	Estimated from LGL input	◔	Estimated from LGL input	◔	Estimated from LGL input
		Extent of terrestrial ecosystems displaced or disturbed within zone of potential facility effects	Area (ha) of terrestrial ecosystems	◕	Estimated from # of ecosystems	◔	Estimated from # of ecosystems	◔	Estimated from # of ecosystems
		Significance of terrestrial ecosystems displaced or disturbed within zone of potential facility effects	Significance of terrestrial ecosystems (uncommon vegetation communities, significant concentration of animals, animal movement corridors, rare or specialized habitats, presence of species-at-risk, etc.)	◕	Estimated from LGL input	◔	Estimated from LGL input	◔	Estimated from LGL input
C3	Minimize adverse effects on corridor hydrogeological, geological and hydrological conditions	Potential effects on municipal and private wells	No. and type of wells	●	Insignificant difference between alternatives: the road widening required to implement the transitway in all three alternatives does not encroach on the wells.	●	Insignificant difference between alternatives: the road widening required to implement the transitway in all three alternatives does not encroach on the wells.	●	Insignificant difference between alternatives: the road widening required to implement the transitway in all three alternatives does not encroach on the wells.
		Number of recharge/discharge areas affected	No. and area (ha) of recharge/discharge areas	●	Insignificant difference between alternatives: the areas of impervious surface required by all three alternatives are similar. The locations where the watercourses pass are common to all three alternatives.	●	Insignificant difference between alternatives: the areas of impervious surface required by all three alternatives are similar. The locations where the watercourses pass are common to all three alternatives.	●	Insignificant difference between alternatives: the areas of impervious surface required by all three alternatives are similar. The locations where the watercourses pass are common to all three alternatives.
		Potential effects on aquifers	No. and depth of aquifers	●	Insignificant difference between alternatives: all three alternatives pass Elgin Mills Road where a relatively large aquifer may be presented. Also, as the geology consists of relatively thick overburden, the construction of the surface transitway will not likely to have impact to the aquifer.	●	Insignificant difference between alternatives: all three alternatives pass Elgin Mills Road where a relatively large aquifer may be presented. Also, as the geology consists of relatively thick overburden, the construction of the surface transitway will not likely to have impact to the aquifer.	●	Insignificant difference between alternatives: all three alternatives pass Elgin Mills Road where a relatively large aquifer may be presented. Also, as the geology consists of relatively thick overburden, the construction of the surface transitway will not likely to have impact to the aquifer.
		Area within floodplain	Length of Transitway (km)	●	One floodplain crossing	◑	1.1km German Mills Creek	◑	1.3km German Mills Creek
		Potential for adverse effects on surface water quality/ quantity	Effects	●	Existing corridor	◔	Adjacent to German Mills Creek	◔	Adjacent to German Mills Creek
		Number of sites with issues of potential subsurface environmental concern	Number of sites	○	95 sites (from Golder)	◔	67 sites (from Golder)	◑	55 sites (from Golder)

SYNOPSIS OF ALIGNMENT EVALUATION FINDINGS			
Objectives And Goals: ● Protect Natural Environment. ● Effect on terrestrial ecosystems. ● Effect on Hydro-geological conditions. ● Effect on aquatic ecosystems.	• Has least adverse impact on aquatic and terrestrial ecosystems and surface water quality.	• Potential for some impact on aquatic and terrestrial ecosystems in north part of GO Rail corridor. • Requires mitigation of local flood plain impact.	• Potential for some impact on aquatic and terrestrial ecosystems along GO Rail corridor. • Requires mitigation of local flood plain impact.
PREFERRED OPTION FOR OBJECTIVE C	●		

LEGEND: Least Responsive ○◔◑◕● Most Responsive

Note: The above indicators were presented to the public at Open House #2. Certain indicators shown at that time have been removed from this evaluation as there was no significant difference in the response of the three alignment options in meeting the goal, including effects on air quality.

Table 9-4

Evaluation of Alignment Alternatives for Objective D

EVALUATION OF ALIGNMENT ALTERNATIVES (LANGSTAFF ROAD TO SOUTH OF ELGIN MILLS) - OBJECTIVE D: To promote smart growth and economic development in the corridor									
Goals		Typical indicators measuring route's ability to achieve goals	Unit of measure	Yonge Street Only		Yonge Street/ Weldrick/ GO Line Option		GO Line Option	
D1	Support Regional and Municipal Planning Policies and approved urban structure	Conformity with, and support for, policies of official plans and urban structures of Region, internal and adjacent municipalities, including GTA	Rating	●	Estimate from aerials, land use input	◑	Estimate from aerials, land use input	◔	Estimate from aerials, land use input
		Conformity with land use designations, including compatibility with existing development	Rating	●	Estimate from land use input	◑	Estimate from land use input	◔	Estimate from land use input
D2	Provide convenient access to social and community facilities in corridor	Service to planned centres, major and minor	Rating	●	Town Hall, York Gen. Hospital, etc.	◑	Estimated from other two options	◔	Not close to planned centres
		Proximity to community facilities, hospitals, educational institutions, community centres, local government offices etc.	Rating	◕	Close to above	◔	Not close to Hospital or Town Hall	◔	Not close to Hospital or Town Hall
D3	Minimize adverse effects on business activities in corridor	Number, land area and type of industrial uses displaced	Number of land area and type of industrial uses displaced	●	Estimate from aerials, land use input	●	Estimate from aerials, land use input	◑	Estimate from aerials, land use input
		Number, land area and type of retail, office and service commercial businesses displaced	Number of land area and type of retail, office and service businesses displaced	●	Estimate from aerials, land use input	●	Estimate from aerials, land use input	●	Estimate from aerials, land use input
		Length of route with potential for an increase in business activity	Length of route	◑	Already a mature route	◑	Mature route plus residential	◕	Greater potential
		Number of business entrances/exits affected by transitway insertion	Number of business entrances/exits affected by transitway insertion	○	52 driveways	◑	29 driveways	●	0 driveways
		Percentage of total parking potential lost	Percentage of total parking potential lost	◕	Some parking may be lost	◕	Some parking may be lost	●	None
D4	Protect provisions for goods movement in corridor	Inventory of major truck routes, delivery and loading areas, manufacturing operations affected by transitway insertion	Rating	◑	Lots of businesses and delivery routes on Yonge	◕	Estimated from other two options	◕	May impact some businesses
D5	Promote transit-oriented development	Opportunities for re-development	Rating	◑	Designated vacant sites	◑	Underutilized commercial sites	◕	More opportunity
		Potential opportunities for development and higher order uses, at stations, terminals, and along the corridor	Rating	◕	No significant difference	◕	No significant difference	◕	No significant difference

SYNOPSIS OF ALIGNMENT EVALUATION FINDINGS			
Objectives And Goals: ● Promote Smart Growth / Economic Development. ● Regional/Mun. Plans and Urban Structure. ● Access to community facilities. ● Effect on business activities. ● Goods movement. ● Promote transit-oriented development.	• Conforms well with planning policies and offers good access to community facilities. • Little commercial/ industrial land req'd but modifies access to businesses. • Encourages re-development around stations on Yonge St.	• Requires rezoning for transit-supportive development in north. • Stations remote from some community facilities. • Some commercial land req'd (likely low cost). • Avoids most impact on N. Yonge St. businesses. • Requires redevelopment around stations along CN.	• Requires rezoning to widen zone with transit-supportive development opportunities. • Stations more remote from community facilities. • Some commercial land req'd (likely low cost). • Avoids most impact on Yonge St. businesses. • Requires redevelopment around stations along CN.
PREFERRED OPTION FOR OBJECTIVE D	●		●

LEGEND: Least Responsive ○ ◔ ◑ ◕ ● Most Responsive

Note: The above indicators were presented to the public at Open House #2. Certain indicators shown at that time have been removed from this evaluation as there was no significant difference in the response of the three alignment options in meeting the goal.

Table 9-5

Evaluation of Alignment Alternatives for Objective E

EVALUATION OF ALIGNMENT ALTERNATIVES (LANGSTAFF ROAD TO SOUTH OF ELGIN MILLS) - OBJECTIVE E: To maximize the cost-effectiveness of the rapid transit system									
Goals		Typical indicators measuring route's ability to achieve goals	Unit of measure	Yonge Street Only		Yonge Street/ Weldrick/ GO Line Option		GO Line Option	
E1	Minimize capital cost of vehicles, facilities and systems required	Estimate of cost of capital works including: elevated, at-grade, cut and cover, tunnelled or open cut running way, stations, systems and major utility relocation works	$	◑	Estimate (higher staging costs, shorter length)	◔	Estimate (higher staging costs, longer length, bridge and additional station)	◕	Estimated (low staging costs, longer route, bridge)
		Estimated vehicle fleet cost	$ (No. of fleet to be required, Frequency of the service, Length of service)	●	Slightly shorter route	◕	Slightly longer route	◕	Slightly longer route
E2	Minimize cost effects of/on adjacent properties to implement facilities	Estimated value of residential land to be acquired	Nature of residential land to be acquired	●	Minor widening of existing right-of-way	◔	At least 16 units and some property	◔	At least 16 units and some property
		Estimated value of industrial land to be acquired	Nature of industrial land to be acquired	●	Minor widening of existing right-of-way	◑	Right-of-way across Quebecor property	◔	At 16th Ave, Quebecor, etc.
		Estimated value of commercial land to be acquired	Nature of commercial land to be acquired	●	Minor widening of existing right-of-way	◕	At least one property	◕	One at least
		Potential for costs associated with management of contaminated soils or ground water	Relative assessed cost-risk	○	95 sites (from assessment)	◔	67 sites (from assessment)	◑	55 sites (from Golder)
		Potential risk to adjacent utilities and structures from underground construction operations	Number of parcels adjacent to deep excavations	◑		◕		●	
E3	Minimize adverse effects of alignment characteristics on operating and maintenance costs	Influence of route length on O & M costs	$ (route length)	●	4.7km route	◑	6.9km route	◑	6.9km route
		Influence of alignment characteristics on O & M costs	$ (no. of stations, ease of access of maintenance vehicles)	◕	5 stations, good horizontal, moderate vertical	◑	6 stations, bad horizontal, good vertical	●	5 stations, good horizontal, good vertical

SYNOPSIS OF ALIGNMENT EVALUATION FINDINGS				
Objectives And Goals: ● Maximize Cost-effectiveness of rapid transit. ● Effect on Capital Costs. ● Property required. ● Effect on operating and maintenance costs.		• Capital cost +/- $260 million. • Minimal property cost. • Lowest O&M costs due to alignment being shortest.	• Capital cost +/- $300 million. • Property cost to be assessed. • O&M costs marginally higher due to longer alignment.	• Capital cost +/- $250 million. • Property cost to be assessed. • O&M costs marginally higher due to longer alignment.
PREFERRED OPTION FOR OBJECTIVE E		●		

LEGEND: Least Responsive ○ ◔ ◑ ◕ ● Most Responsive

Note: The above indicators were presented to the public at Open House #2. Certain indicators shown at that time have been removed from this evaluation as there was no significant difference in the response of the three alignment options in meeting the goal.

land has since been developed as a major regional recreation centre. A potential maintenance facility could be located on the remaining land at the east end of the parcel between the Highway ROW and a parallel Hydro ROW to the south.

The site is generally level and the nearest private land use is a residential neighbourhood south of the Hydro ROW. Access to the site is possible from Bathurst Street on the east side however, to reach the Highway 7 rapid transit corridor, a crossing of Highway 407 would be required.

c) Industrial Land south of Elgin Mills Road in Richmond Hill

This third alternative location for a facility is on privately owned industrial land between Yonge Street and the CN Rail Bala Subdivision south of Elgin Mills Road. Surrounding land use is mostly industrial; however, the Richmond Hill Municipality would prefer the portion of any land fronting Yonge Street to be redeveloped as commercial. Also, a new residential development abuts the southern boundary of the Quebecor Plant site which would be required for ultimate BRT and LRT maintenance and storage. Generally the land is fairly flat although a creek in a shallow ravine crosses it on the east side.

Access to a site is possible from Yonge Street or indirectly from local roads serving the Newkirk Industrial Park.

d) Highway 407 Parkway Belt Land near Bayview Avenue in Markham

Vacant land between Highways 7 and 407, immediately east of the Bayview Avenue interchange and German Mills Creek is a fourth potential location for a maintenance facility. However, the site has been identified as a potential station with a park-and-ride lot for the Highway 407 BRT service proposed by the MTO. If this station site continues to be protected, the land would not be available for a maintenance facility.

The only land use adjacent to the site is a new multi-family residential development on the eastern boundary of the site. This, along with the existing highway rights-of-way imposes a major constraint on the size of parcel available for a maintenance facility.

9.5.1 Evaluation of Alternative Sites

The four sites described above were assessed for suitability in terms of the planning criteria defined in **Chapter 5** and the findings of the evaluation are summarized in **Table 9-6**.

Table 9-6
Evaluation of Potential Sites for a Maintenance & Storage Facility

Selection Factor	SITE ALTERNATIVES			
	Langstaff Industrial Land in Markham	407 parkway belt to the west of Bathurst St.	Industrial Land south of Elgin Mills Rd. in Richmond Hill	407 parkway belt to the east of Bayview
Proximity to rapid transit corridors and YRT network operations centroid	Good access to both Yonge and Highway 7 corridors, located very near YRT operations centroid	Fair access to Highway 7 but 2.5km west of Yonge corridor and YRT operations centroid	Good access to Yonge corridor but remote from Highway 7 and YRT operations centroid.	Good access to Highway 7 but 2 km east of Yonge corridor. Fairly near YRT operations centroid
Site size and configuration – (parcel up to 8 ha or 20acres req'd)	Sufficient land of a suitable shape could be acquired	Some of new recreation facilities must be acquired to obtain a suitable size.	Sufficient land of a suitable shape could be acquired	Only minimum size available, approx. 4.5 ha
Site ownership and acquisition cost	Multiple parcels, mostly privately owned Acquisition cost: Market value	Privately owned? Part of Concord/ Thornhill sports/ recreation park Market value	2 large parcels privately owned Acquisition cost: Market value	ORC land, MTO protecting for 407 BRT station. Acquisition cost: Market value?
Site topography (grading and drainage requirements)	Moderate grading and terracing works required	No major grading requirements	No major grading requirements	Moderate grading required.
Compatibility with surrounding neighbourhood, (zoning, land uses & security)	Good – adjacent land use now mainly industrial. Site separated from future residential by CN Rail r.o.w.	Fair – buffer to adjacent recreational use could be developed.	Fair – industrial/ commercial on north, south and east. Yonge frontage to be reserved for commercial use	Poor to fair – High density residential on east side, highway r.o.w. on west, north and south.
Site access and surrounding traffic conditions	Good for BRT vehicles. Rail access from Highway 7 more difficult.	BRT access reasonable. Rail access costly due to separation from Highway 7 by 407.	Good – access from Yonge is feasible but in high traffic zone.	Good – access from Highway 7 is feasible but in high traffic zone.
Site servicing & utility relocation requirements	Potentially no difficulty.	Potentially no difficulty, but access requires easement across Hydro r.o.w.	Potentially no difficulty	Potentially no difficulty
Flexibility for expansion and inclusion of LRV maintenance	Incremental BRT facility expansion and addition of LRT yard and shops is feasible.	Site size is con-strained by ex. Sports Park. Likely too small for both technologies.	Sufficient property for the ultimate MSF needs could be acquired.	Site size insufficient for a facility to serve both technologies.
Environmental conditions and constraints	Creek impact and potential contamination due to prior uses	Mitigation of potential effects on adjacent uses may be required.	Site remediation likely necessary due to existing industrial uses	Proximity to TRCA flood plain and future residential development.

From this evaluation, the following key conclusions were reached:

The site in the Highway 407 Parkway Belt, east of Bayview Avenue, does not merit further consideration due to:

- incompatibility with adjacent land use;
- insufficient area for the potential ultimate maintenance needs of both technologies; and
- the likelihood that the MTO would want to continue to protect it for other transit uses.

The site in the Highway 407 Parkway Belt, west of Bathurst Street, should not be pursued further because:

- the assembly of sufficient area for ultimate facility requirements will require acquisition of a substantial part of the new sports and recreation park;
- the site's location requires approximately 3 km of deadheading before transit vehicles reach the Yonge Street Corridor;
- access to the site for LRT vehicles would require a crossing of Highway 407 to reach the Highway 7 corridor and a 3 km service connection along the corridor to access the Yonge Street revenue line until such time as LRT service is required on the Highway 7 west segment; and
- LRT vehicle access to the site could be complicated by the proximity of the Hydro lines in the adjacent right-of-way.

A site on the Newkirk Industrial Park lands, south of Elgin Mills Road, has some potential; however, the following issues make it less attractive than the Langstaff Industrial Area site:

- the desire to protect the Yonge Street frontage for commercial or mixed use makes the remaining site depth restrictive for facilities layout and limits expansion flexibility;
- the floodplain of the creek across the easternmost portion of the site constrains the layout of facility components;
- use of the Quebecor property would require measures to mitigate noise impact on the adjacent residential development, although acquisition of industrial properties to the north instead, would avoid this impact; and
- while the site offers direct access to the Yonge Street Corridor, rapid transit vehicles would have to deadhead 5.5 km to reach the Highway 7 Corridor revenue line.

The site in the Langstaff Industrial Area best meets the criteria for location of a central maintenance and storage facility because:

- both the Yonge Street and Highway 7 rapid transit corridors can be accessed directly from the site without deadheading;
- it is reasonably close to the centroid of the Region's local service network;
- the surrounding land use is compatible with the maintenance activities proposed on the site;

- the area required for ultimate maintenance and storage needs could be acquired within the industrial zoning limits;
- earthworks, slopes and retaining walls to grade the existing topography to the required levels are reasonable;
- access and egress for transit vehicles is remote from the heavily-trafficked sections of Yonge Street and Highway 7;
- mitigation of any noise and visual intrusion effects is feasible;
- although the site requires acquisition of several parcels, some are government owned and the remainder are owned by only a few private companies or individuals;
- the future impact on the creek at the west end of the site can be mitigated when the LRT storage yard is constructed; and
- the site can be serviced easily from existing mains and no major utility relocations are required.

For the above reasons, the Langstaff site is recommended as the preferred location for the ultimate BRT and LRT maintenance and storage facility. The proposed configuration of the components and the effects of their construction and operation are described in **Chapter 10**.

10. THE UNDERTAKING

10.1 DESCRIPTION OF THE UNDERTAKING

As indicated in **Chapter 9**, the Yonge Street Only Alternative was recommended as the Technically Preferred Transitway Alignment for the Undertaking. Based on this alignment, the main features of the Undertaking will comprise the following:

- A 12.5 km two-lane, median transitway in the Yonge Street Corridor between Steeles Avenue and 19th Avenue approved for both BRT and LRT vehicle technologies;
- A one kilometre section of transit operation in mixed traffic in the Richmond Hill Central Business District;
- Stations including appropriate amenities located at arterial or major collector east-west roads at:
  - Meadowview Avenue
  - Clark Avenue
  - John Street
  - Royal Orchard Boulevard
  - Scott Drive/ Bantry Avenue
  - Carville Road/ 16th Avenue
  - Weldrick Road
  - Major Mackenzie Avenue
  - Wright Street/ Crosby Avenue
  - Elgin Mills Road
  - Canyon Hill Avenue/ Bernard Avenue
  - Gamble Road/ 19th Avenue
- BRT and LRT alignments from Yonge Street to access the Richmond Hill Centre Intermodal Terminal currently under construction on York Region's land north of Highway 7 at Langstaff opposite the existing GO Langstaff Station;
- A Storage and Maintenance Facility on the south side of Highway 407 east of Yonge Street;
- Streetscaping of the entire right-of-way, and
- Crossings in the median with approximately 100 m spacing to be provided along Yonge Street to reinstate current operations of most Emergency Response Services vehicles.

The complete Yonge Street Corridor Undertaking is shown in **Figures 10-1 to 10-22** at the end of this chapter. At the time of writing this report, the City of Toronto had not finalized a preferred design for the Yonge Street Surface Transitway Improvements Class EA Study between Finch and Steeles Avenues, and, therefore, two plans were developed for the possible tie-in with this project. **Figure 10-2** shows the proposed Yonge Street median transitway tying into the existing HOV lanes south of Meadowview

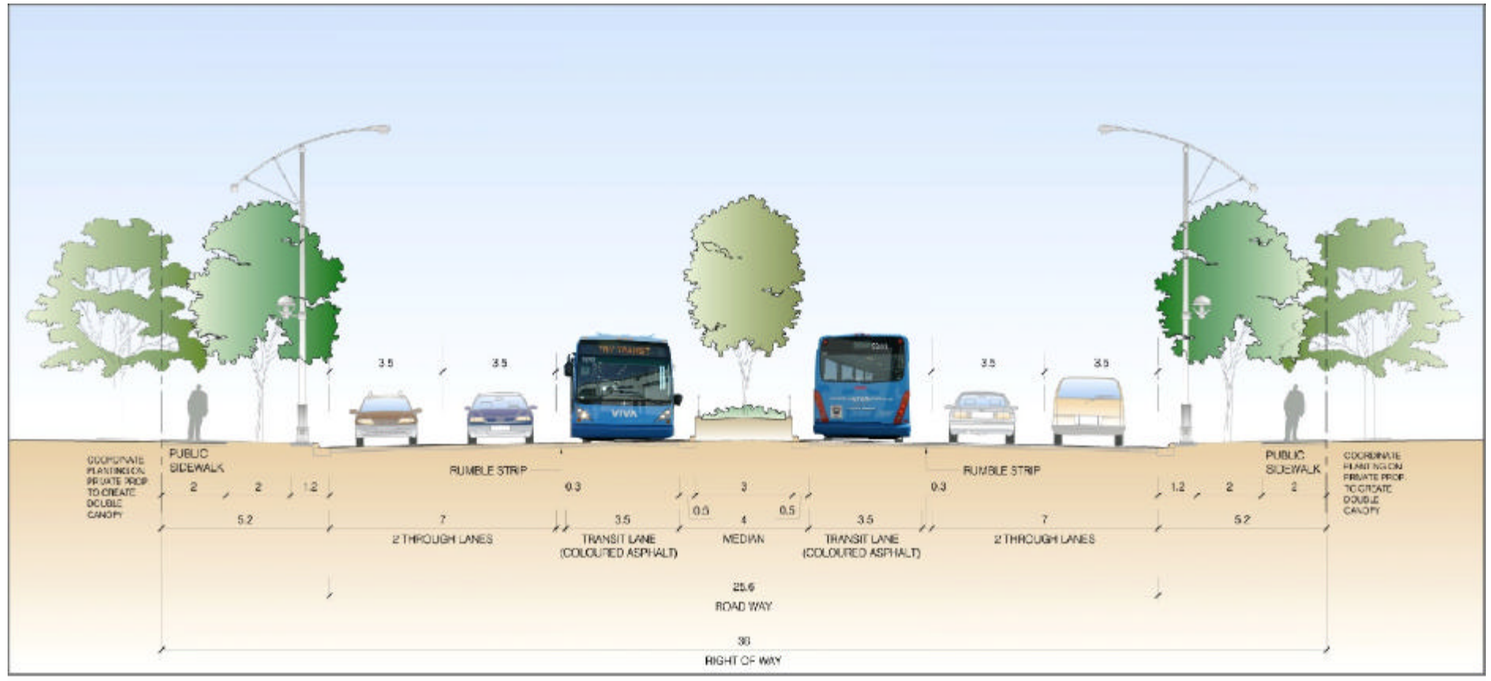


Figure 10-23
Typical Transitway Cross-Section for BRT between Stations

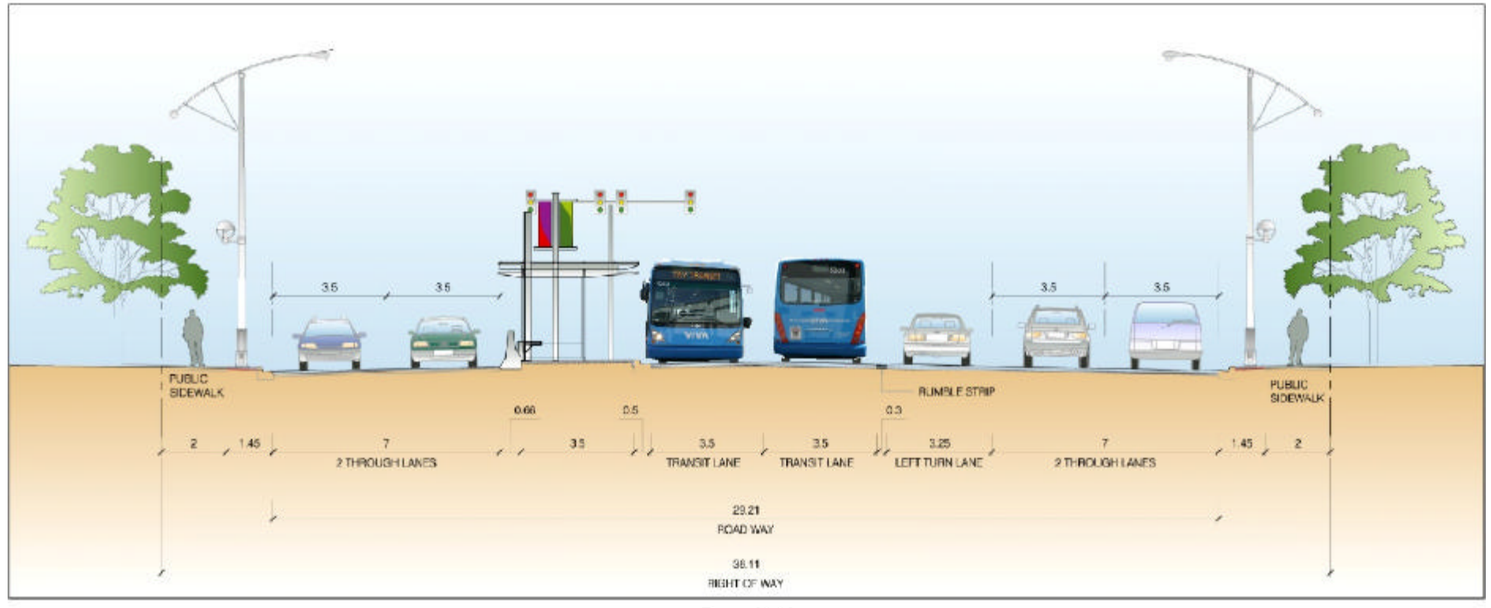


Figure 10-24
Typical Transitway Cross-Section for BRT at Station

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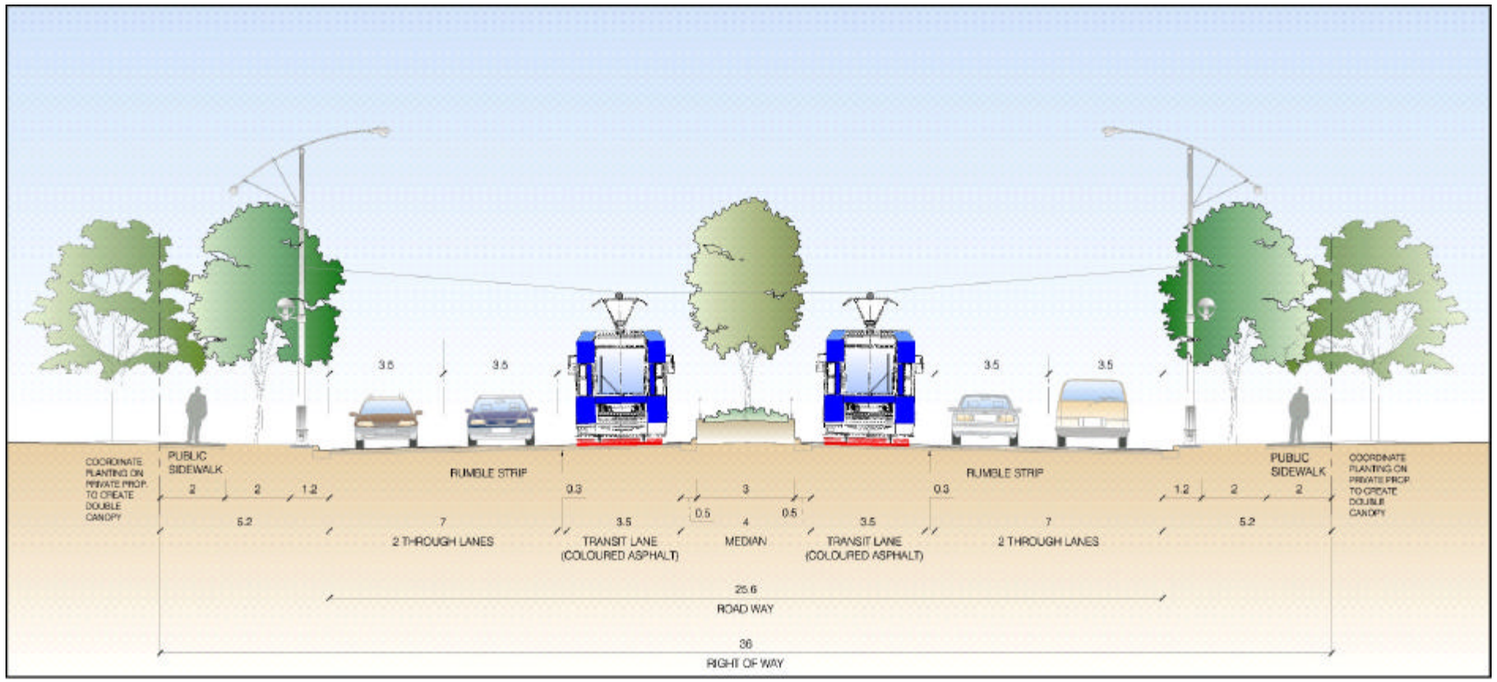


Figure 10-25
Typical LRT Transitway Cross-Section for LRT between Stations

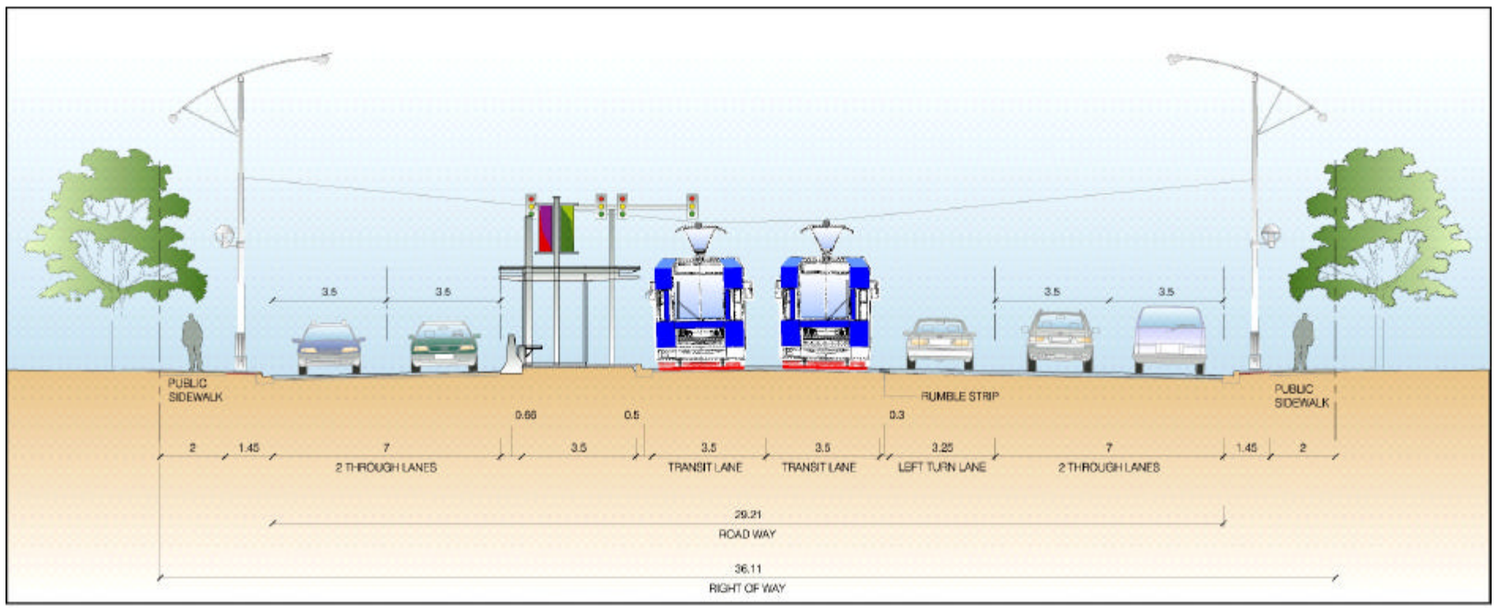


Figure 10-26
Typical Transitway Cross-Section for LRT at Station

Avenue in the event a median solution is not selected as the preferred option in the Toronto study. If a median solution is selected, **Figure 10-1** shows the continuation of the median transitway to Steeles Avenue with a potential station at Meadowview Avenue in light of the close proximity of Toronto's currently proposed stop at Athabaska Avenue south of Steeles Avenue. Consultation with the City of Toronto will continue during the detailed design to develop a satisfactory interface solution.

The proposed cross-section for the transitway is shown in **Figure 10-23** to **Figure 10-26**.

10.1.1 Transitway Elements

Existing Yonge Street is designated as a major arterial road with two lanes in each direction except between Steeles Avenue and Clarke Avenue and between the ramp terminals at Highway 407 where three lanes of traffic in each direction exist. The preferred design maintains this two lane arrangement along the entire corridor. The third HOV lane between Steeles Avenue and Clarke Avenue will be replaced by the median transitway. The three lane section at Highway 407 will remain unchanged and will not include a median transitway as the structure for Highway 407 does not have sufficient width to allow adding transit lanes. A traffic analysis indicated that three lanes of general purpose traffic are needed in this section due to competing traffic demand to and from Highway 7 and Highway 407 to Yonge Street. The proposed transitway route will therefore have to follow the Langstaff Road alignment to the intermodal station at Langstaff and then proceed to Yonge Street via the Highway 7/Yonge Street Connection Ramp.

Lane Widths: The existing cross-section of Yonge Street includes two 3.66 m lanes in each direction and a 4.75 m centre left turn lane. These will be replaced with 3.5 m general purpose traffic lanes and 3.5 m transit lanes. A 300 mm width rumble strip is proposed to delineate and provide separation between the transit and general purpose lanes. The transit lanes and the traffic lanes are proposed flush next to each other so as to facilitate crossing of emergency vehicles and for easier snow clearance in the winter.

In the Heritage area of Thornhill between Arnold Avenue/ Elgin Street and East Don River crossing, a lane reduction was adopted in order to provide sufficient pedestrian sidewalk width adjacent to existing heritage buildings. The lane reduction was negotiated at length with the Study Team of the Thornhill Village Revitalisation Project that was being undertaken at the time. The team members included local municipal representatives (councillors) and technical staff from both the City of Vaughan and the Town of Markham. The project was being undertaken under the Municipal Class EA process and therefore included a comprehensive public

consultation program. The reduced cross-section was presented at a number of their workshops and public information centres. The revised lane widths in this area consisted of the following reductions:

- Traffic Lanes reduced from 3.5 metres to 3.25 metres;
- Transit Lanes reduced from 3.5 metres to 3.3 metres;
- Left Turn lanes at 3.25 metres;
- Median separation reduced from 4.0 metres to 1.0 metre between John Street and East Don River crossing.

The above reductions resulted in a pedestrian sidewalk width of 3.0 metres at the narrowest point between the buildings.

The short section of transitway with the reduced lane width will require a local speed reduction.

Streetscaping: A streetscaping plan was adopted for the Yonge Street EA Transitway. The plan was developed in conjunction with local municipalities. A number of workshops were held to try to determine the optimum plan for Yonge Street in order to create a streetscape that would be a catalyst for transit compatible development and to attract transit ridership. The vision for the roadway was developed in the presence of technical staff from the City of Vaughan, the Town of Markham, the Town of Richmond Hill and York Region.

In order to fully mitigate the effects of roadway widening in the Thornhill Heritage District, the streetscaping plan has been developed with the intent of achieving the standard 5.2 m boulevard width wherever practical through the district. Right-of-way widening for this purpose will be pursued at the time of transitway implementation where existing development permits cost effective acquisition and through the site plan approval process in other areas that are redeveloped over time.

The following are some of the Urban Design Principles on which the current planning design or future detail design should be based:

Consistency and Coherency: To avoid a circumstantial and inconsistent look to the corridor, it is important to establish a consistent cross-section and curb line. The corridor should also communicate a legible and understandable look that clearly puts forward the idea of transit as the future.

Identity: The transit system should be broken down into subsystems that have their own character and sense of place that riders can identify with. Heritage districts should be designed to reflect the heritage of Yonge Street as well as the specific area in question. Green Technology should be the principle on which amenities be designed to such as solar power for everything from lighting, to ticket dispensing to heating of bus shelters. Landscaping and tree planting are identified as essential in portraying a green image.

Environment and the "Median": A range of climate issues can be dealt with through careful planning, e.g. trees can be planted to provide shelter from the wind and shade for pedestrians as well screening from the road for adjacent buildings. Trees also act as a solid body for air pollutants to settle on and therefore reduce negative effects in the atmosphere. The type of materials and colour in paving the transitway itself and the sidewalks, splash strips, etc. should be carefully chosen to reinforce the identity and character of the transitway that is proposed.

The "Median" is the Message: A number of options were developed for providing a landscaping plan within the corridor. This included three main alternatives:

- a median landscape area with transit either side;
- two landscape areas either side of the transitway separating the transit from the roadway; and
- a minimal separator in the median (1 metre) with landscaping at the outer curb areas only.

In choosing between these options some fundamental requirements were established such as the need for landscaping in the public space especially in the boulevard. In addition, it was recognized that paving for transit would create additional hard asphalt areas that would result in extensive and undesirable expanses of asphalt once appended to the existing road surface. To alleviate this it was established that median landscaping was necessary.

The option with two landscape areas either side of the transitway could only accommodate a 2 m landscape width due to the constrained nature of the Yonge Street Corridor. This is especially true if the remainder of the cross-section is to include some landscaping in the boulevard area as was established desirably. This width of two metres was found inadequate, as it was insufficient to allow vegetation to grow especially in the winter months where salt/spray splash would not allow it to survive.

The option of no median was considered unacceptable, as it did not meet the fundamental requirements of breaking up wide expanses of asphalt and did not result in an aesthetic look to the corridor and did not provide a mid-crossing refuge for pedestrians crossing Yonge Street.

The only viable alternative was therefore to have a median of at least 4 metres in width to allow tree growth. To limit salt/snow splash it is recommended that trees should be housed in raised planters. A buried irrigation system will be desirable and only select species of trees that were known to be more resistant to salt spray would be chosen. Native, non-invasive plant species will be considered. Evergreens will also be selected in certain locations to ensure that some landscaping remained in the winter months.

The above arrangement has been used successfully in many locations in a northern American environment and was arrived at in consultation with the team's landscape architect.

The streetscaping plan for the Yonge Street Transitway EA is shown in **Figure 10-27**. The plan depicts a design for two areas of Yonge Street; a typical design at an intersection in the vicinity of stations and areas that are located mid block between intersections.

Mixed-Traffic Operation: For a short section of Yonge Street within the Richmond Hill CBD between Major Mackenzie Drive and Levendale Avenue, the transit vehicles will operate in mixed-traffic within the general traffic lanes. Within this section, BRT will operate similar to local bus services stopping at curb-sided stations while LRT will operate in the median similar to TTC's streetcars in Toronto. The transition of transit vehicles to/from exclusive median RT lanes to mixed traffic must occur at signalized intersections to provide the transit vehicle a dedicated phase to make a safe transition. BRT will diverge from the median transit lane to the right-most general traffic lane. As it approaches the end of the mixed-traffic section, the BRT vehicle will merge to the left and cross the rumble strip to enter the transitway. Within the mixed-traffic section, LRT vehicles will remain in the median, sharing the median lanes with general traffic.

Network: The transitway is part of a complex network reflecting how people move through the community. The linkages that connect private vehicles, drop off, Park-and-Ride, bicycles, local transit buses, GO Transit buses, etc. to the future transitway should be designed with an integrated approach making the experience of transitioning to transit services efficient and effortless.

Signage: A consistent approach to all types of signage, directional, proprietary advertising, etc. should be developed for the corridor to minimize visual clutter and the chronic symptom of competitive "sign wars".

Snow Plowing: The clearing, storage and removal of snow along traffic and transit lanes must be carefully planned. A generous splash and storage strip must be provided on the sidewalk side of the curb.

Emergency Response Services (ERS) Considerations: Currently, a two-way, mostly continuous median left turn lane allows access across the median into existing local streets and properties on both sides of Yonge Street. This random access is available to all vehicles including ERS vehicles such as fire trucks, emergency medical response vehicles (ambulances) and police cars. With the introduction of a raised, landscaped median between the dedicated transit lanes this access will be restricted to signalized intersections at regular intervals along the alignment.

In order to mitigate the effect of this change in traffic operations, the transitway design assumes ERS vehicles will use the dedicated transit lanes and incorporates a crossing treatment in the raised median to permit left turn access by ERS vehicles. The design was developed in consultation with representatives of ERS groups operating along Yonge Street through meetings and workshops. The objective of the design was to reinstate current operations of most ERS vehicles using the existing two-way median left turn.

The proposed typical median crossing treatment is shown in **Figure 10-28** (following this page). The crossing consists of an inclined 3.5 m wide opening to allow an emergency vehicle to reach the opposing transit lane from which a left turn can be made either to an existing roadway/driveway or to reach the curb facing opposing traffic. Semi mountable curbs will be used at the crossings and to limit access to ERS vehicles only, regulatory signing will be provided and the appropriate by-law enforced.

Generally, the proposed spacing of these crossings is approximately 100 m and they will be placed strategically to ensure effective access. **Figure 10-28** also shows a typical treatment of a section of the alignment between Observatory Lane and May Avenue as an example. This diagram illustrates how ERS vehicles would use the dedicated transit lanes in-lieu of the existing two-way median left turn lane, either at intersections or after a median crossing to access sideroads or driveways. When an ERS vehicle is using the transit lane in the normal direction, transit vehicles will be required to move to the right into general traffic lanes to allow ERS vehicles to pass. When a transit lane is being used in the opposing direction for a left turn manoeuvre, transit vehicles will stop, as is currently the case, to avoid the possibility of collisions between ERS and transit vehicles.

It is anticipated that a detailed crossing plan will be developed for Yonge Street from Steeles Avenue to Gamble Road/19th Avenue in consultation with ERS organizations during the detailed design phase to ensure that all properties and streets can be accessed safely and within current response times.

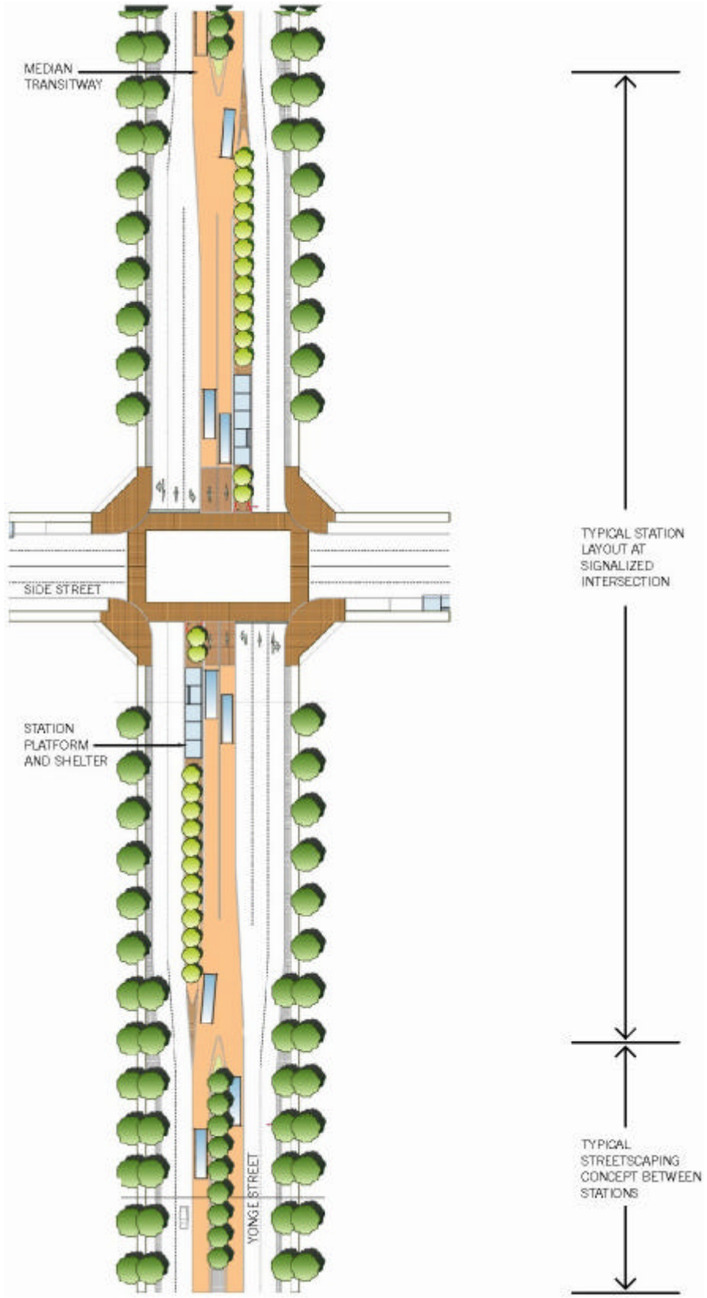


Figure 10-27
Streetscaping plan for Yonge Transitway

Other items: These include street lighting and public art. For street lighting it was stressed that light spillage is to be avoided and excess light reduced. Heritage or decorative lighting is to be included in the appropriate section of Yonge Street.

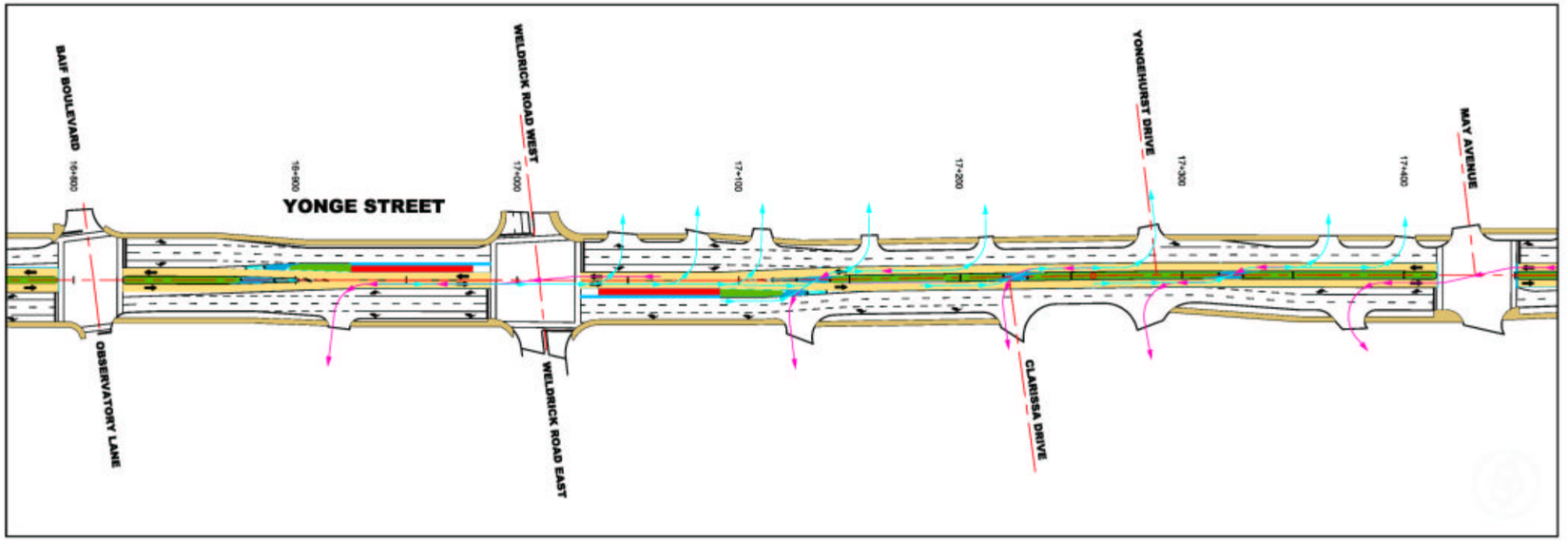
For public art it was articulated that the design components, such as paving, light standards, benches, stations, etc. should include the provision for a rich variety of public art that will express community character throughout the Corridor.

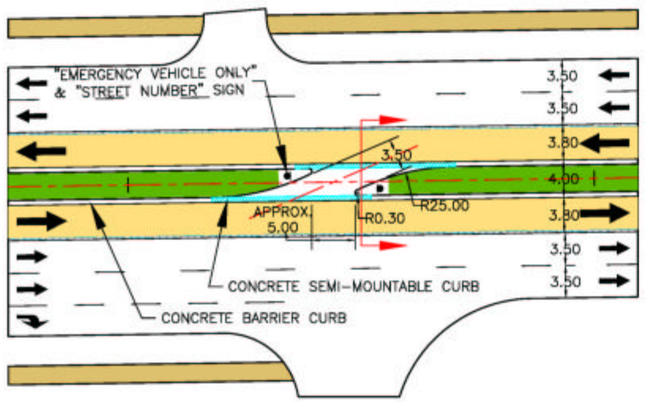
10.1.2 Horizontal Alignment

The existing Yonge Street is a relatively straight road. Horizontal alignment for the new transitway follows the existing alignment through most of the alignment. The only two areas where changes to the existing alignments are proposed include:

- **The Thornhill Heritage District:** One horizontal curve of 250 m radius is proposed in the area of Thornhill Summit Way to minimize effects on the Thornhill Heritage District and to transition from a minimal width median to a 4 m wide landscaped median. A second curved section in this area avoids impact on an existing heritage building immediately north of Royal Orchard Boulevard to the west and existing mature trees located south of Baythorn Drive on the east side. The minor curvature comprises an S type curve made up of a 3,000 m radius and a combination of 1,600 m and 2,500 m radius return curves.

- **The Area South of Richmond Hill Centre Intermodal Terminal:** Transitway access to the Richmond Hill Centre Intermodal Terminal commences south of Highway 7/407 and uses the Langstaff Road East ROW. To achieve this, a 50 m radius curve is introduced followed by a curve of 35 m radius at the Yonge Street Langstaff Road East intersection. The transitway then continues north of the existing Langstaff Road East and through a 50m radius curve crosses beneath the Highway 7/407 structures in a dedicated 10 m ROW until it reaches the intermodal terminal. Connection from the intermodal terminal back to Yonge Street to the north is made via the Yonge Street/Highway 7 Connection Ramp at Garden Avenue again requiring a 50 m radius curve. The Langstaff Road East route was chosen primarily because the existing structure opening beneath Hwy 407 at Yonge Street limits further widening to accommodate dedicated transitway lanes.





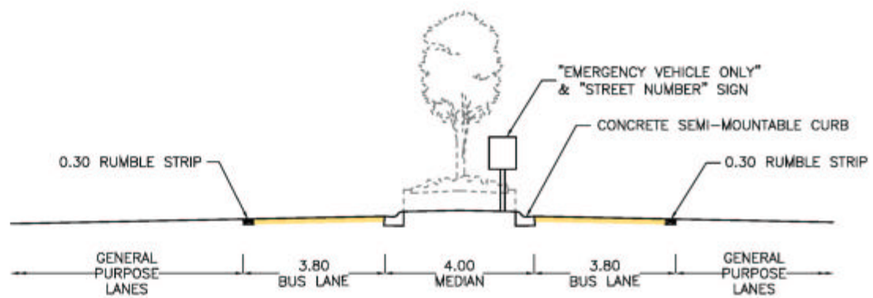


Figure 10-28
Proposed Typical Median Crossing Treatment

The remaining curves on the Yonge Street alignment have a 3500 m radius to achieve minor alignment adjustments to optimize the use of the existing ROW. Generally, the roadway design conforms to an 80 km/hr design speed in accordance with the Geometric Design Manual for Ontario Highways. The area along the Langstaff Road East area allows a design speed of 50 km/hr.

10.1.3 Vertical Alignment and Pavement Widening

Vertical alignment for the Yonge Street transitway will follow the vertical profile of the existing road. In order to obtain good ride quality and the required service speeds for transit smooth profiles must be obtained for the median transit lanes. A best-fit vertical profile has been designed to allow for this.

Additional pavement width is required for the dedicated transit lanes and the landscaped median resulting in general widening of the curb lines and in some areas, local ROW widening. Pavement depths for the transit lanes may be different from those of the traffic lanes as well as the landscape median. With the above changes in mind it is anticipated that complete reconstruction of the cross-section is required.

Whenever possible ROW widening or impact on commercial properties including parking has been avoided by the construction of retaining walls or other grading measures to limit impacts.

The proposed vertical alignment generally allows an 80 km/hr design speed for general purpose traffic. Vertical alignment standards for BRT as stated in Chapter 7 are met.

An area in the East Don River valley has a gradient that is in excess of the maximum of 6.0% for LRT technology. However, the section in question is very short in length and since any changes to the existing 7.0% grade would result in impacts on the river valley, it is proposed to maintain the existing grade. One curve at Station 11+425 has a sub-standard length of 45.5 m (minimum 60 m). The curve has a generous K value of 65 and because of the impacts on the adjacent entrances it is proposed to retain this curve.

The vertical alignment for some portions of the running ways results in grades at stations that do not meet minimum gradient standards for both BRT and LRT. Usually this was limited to one platform of the station. It is proposed in these areas that low retaining walls be used in the median area to correct such deficiencies when LRT technology is introduced. One notable station where minor corrections cannot be used is the Major Mackenzie Drive station located south of the intersection. In this area a substantial vertical realignment in this area is required to provide a 2% grade in the platform area for LRT operation. The resulting retaining walls could be in excess of 2 m in height (See **Figure 10-16** of the selected design).

In the detailed design phase it is suggested that a review of this structure be undertaken in conjunction with the standards. For BRT it may be possible to keep the platform at the prevailing 4% grade or close to it. For future LRT use a structure would have to be designed and it is suggested that a review at that time be undertaken to consider alternatives structure types with emphasis on aesthetic considerations or investigate the possibility of locating the station elsewhere depending on ridership needs.

10.1.4 Intersection Design

Intersection design has been undertaken in accordance with the Geometric Design Manual for Ontario Highways. An important feature of new intersections is the ability for general purpose traffic to negotiate U-turns at intersections. Signalized intersections have therefore been designed to allow for the trucks of size WB17 to make a U-turn with signal protection. However, it is anticipated that most heavy vehicles adopt an alternative routing to reach destinations to avoid making U-turns. Non-signalized intersections have been designed to maintain existing turning radii. Right and left turn lanes with appropriate lengths have been incorporated into the design based on traffic needs. Property will be acquired as part of the highway/transit improvements to provide for adequate day-lighting triangles for all the intersections.

Some intersections, for example the Arnold Avenue/Elgin Street intersection, have been designed with turning radii that may not allow full clearance for single unit inter-city buses (TAC-B12, 2.6m x 12.2m) to negotiate these intersections. This reduction in standard was necessitated in the Thornhill Heritage area in
order to provide additional sidewalk area for pedestrians as part of the negotiations that were undertaken with the Thornhill Village Revitalisation Project team.

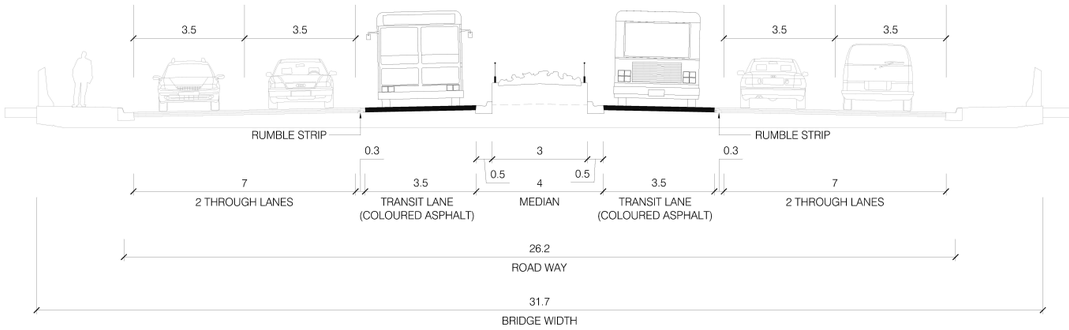


Figure 10-29
Yonge – CNR Bridge

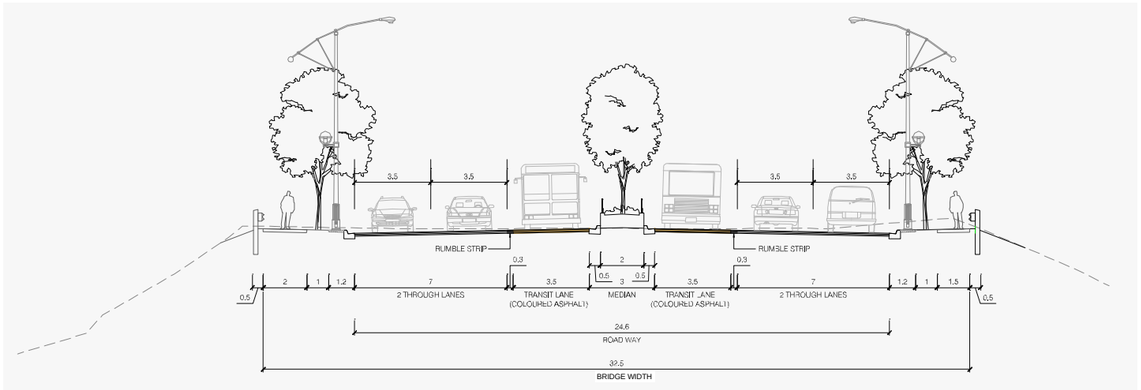


Figure 10-30
East Don River Crossing Culvert

10.1.5 Structures

No significant changes to any of the existing structures will be required as a result of the Yonge Street Transitway. Along the Yonge Street alignment there are currently five major structures that will require incorporation of transit lanes on the roadway surface. These are:

- The Yonge Street CNR bridge structure over the York Subdivision railway line at Station 10+700;
- The East Don River Crossing culvert at Station 12+410;
- The Highway 407 eastbound and westbound bridge structures over the GO Richmond Hill line; and
- The Highway 7 bridge structure over the GO Richmond Hill line.

The following is a description of how the transit lanes are proposed to cross either on or below these structures:

a) The Yonge Street CNR bridge structure over the York Subdivision railway line at Station 10+700

This current crossing consists of two lanes of traffic and an HOV lane in each direction of 3.66 m in width, a 4.0 metre continuation of the centre left turn lane, and 2.5 metre sidewalk either side. The proposed cross-section will include the 3.5 metre lanes for transit and general purpose lanes with the rumble strip. A slightly reduced width of sidewalk of 1.8 metres is proposed. Reduction in the median landscape width will allow no additional widening for the bridge as shown in **Figure 10-29**.

b) The East Don River Crossing culvert at Station 12+410

This current crossing consists of two lanes of traffic in each direction of 3.66 m in width, a 4.0 metre continuation of the centre left turn lane, and 1.5 metre sidewalk either side. The proposed cross-section will include the 3.5 metre lanes for transit and general purpose lanes with the rumble strip. A slightly reduced width of sidewalk of 1.8 metres is proposed. Reduction in the median landscape width will allow no additional widening for the bridge as shown in **Figure 10-30**.

c) The Highway 407 eastbound and westbound bridge structures over the GO Richmond Hill line, and The Highway 7 bridge structure over the GO Richmond Hill line

The new transit lanes are proposed to cross below the above structures. Previous studies and construction had allowed for a two lane transit to cross these structures to the west of the Richmond GO Railway lines. Additional room had allowed for this and therefore no changes are anticipated to these structures as a result of the new crossings. See **Figures 10-31 to 10-33**.

10.1.6 Stations

The station designs were developed based on the criteria outlined in Chapter 7. The objective was to develop a typical or prototype station that incorporated a set of common elements that would create a clear identity and allow for ease of installation and maintenance.

The prototype station includes:

- Consideration of the station precinct and the connections to the local community as part of the station development;
- Far-side stops, with the end of the passenger platform located as close to the pedestrian crosswalk as possible;
- Distinctive, modular shelters to provide weather protection and contribute to the visual identity of the system;
- Provision for amenities including fare collection equipment, signage, system maps and real-time passenger information.
- Opportunities to incorporate art to enhance the image of the system and to incorporate elements of the historic nature of the station areas or the corridor;
- Full accessibility to person's with disabilities; and
- Well lit platforms and access areas to enhance safety and security.

The station precinct includes the station site itself and consideration of how pedestrians access the transit service from the local neighbourhood. This includes the sidewalk system, crosswalks and signage and wayfinding systems. The identity of the system and the access to the system are clearly defined by the various prototype elements. The design of the prototype station considered the recommendations of the Thornhill Village Revitalization Project team.

Far-side stations allow vehicles to pass through signalized intersections before stopping at the platform, minimizing lost time at signals and minimizing vehicle-pedestrian interfaces. This also places the vehicle beyond the crosswalk so that passengers leaving the station do not interfere with the vehicle's departure.

Modular shelter design allows for a consistent image to be created through a design that is responsive to the level of passenger usage. The platform area is a consistent size across the system, designed to allow for two vehicles to be stopped at any given time. The shelter is sized based on anticipated station loads and can be expanded as the system grows.

Fare collection equipment, signage, system maps and information will be presented in a similar manner at each station. This predictability of information and placement enhances the passenger's experience.

In many newer transit systems art is incorporated into the stations through stand-alone or integrated art. This provides an opportunity to enhance the public's perception of the system and increases the level of safety and security. This art can reflect the current or historical context of the station of community. In many cases the art at several stations is linked into a common theme to provide variation, yet allow for a complete story to be told. Integrated art has become the more common method as stand-alone art generally requires more space and is seen as distinct from the station whereas integrated art joins the function of the station with the aesthetic.

There are two variations to the prototype station based on the anticipated volumes of buses and the requirement for a passing lane. One prototype layout for a typical two-lane BRT station, as shown in **Figure 10-27**, allows for an express vehicles overtake a stationary vehicle using the opposing lane with vehicle-activated signal control. This prototype station will be used at the majority of station locations listed at the beginning of this chapter. Where space permits, a second prototype layout of a passing lane for express services can be added to the cross-section. An example of the second prototype at Canyon Hill Avenue/ Bernard Avenue and Gamble Road/ 19th Avenue locations are shown in **Figures 10-20** and **10-22**. Exceptions to these prototypes are at the Wright Street/ Crosby Avenue location, where the transitway will operate in mixed traffic in the curb lanes, and at the Richmond Hill Centre intermodal terminal currently under construction.

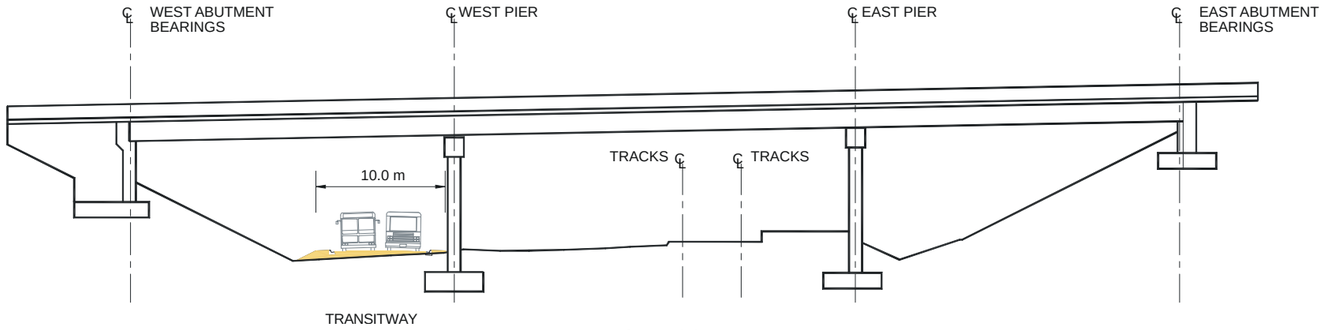


Figure 10-31
Transitway under Highway 407 Eastbound

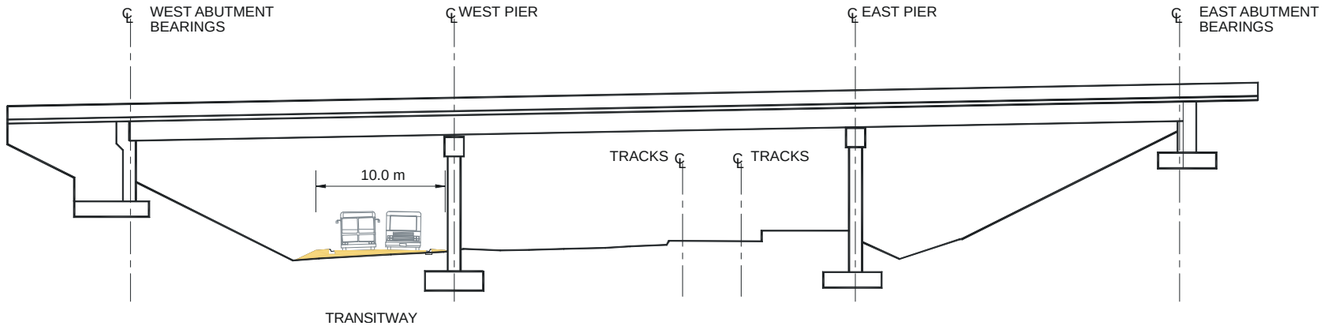


Figure 10-32
Transitway under Highway 407 Westbound

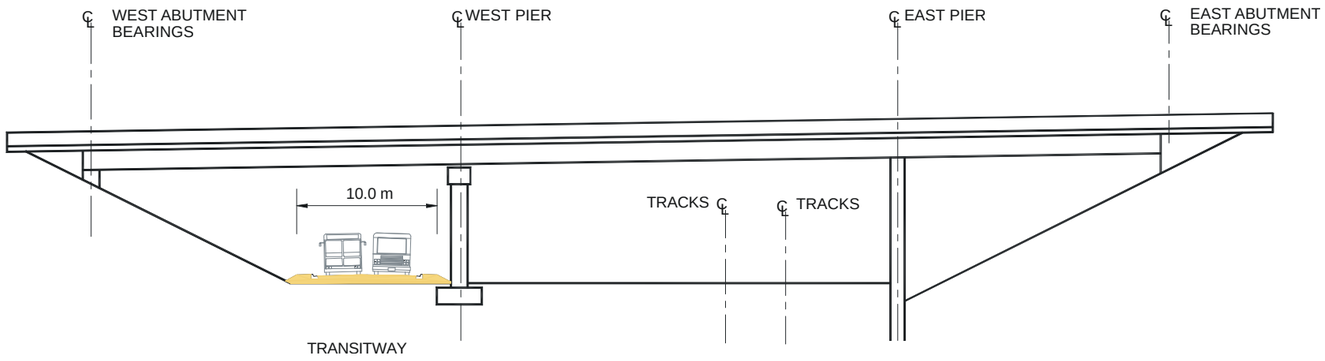


Figure 10-33
Transitway under Highway 7

The Richmond Hill Centre Intermodal Terminal location (**Figure 10-9**) currently under construction will be a larger facility designed to allow for connections between the Yonge Street and Highway 7 routes as well as the GO Transit rail and bus facilities, local YRT services, and the park-and-ride lot immediately adjacent to the site. The terminal will use many of the prototype elements including larger versions of the standard shelter and similar signage and system information materials. The intermodal nature of the terminal will require additional facilities to direct passengers to all facilities and provide clear wayfinding.

Figure 10-9 shows the planned BRT alignment to access the intermodal station. When LRT is operated under this undertaking, the routes to access the site from Yonge Street will remain the same. LRT alignment across Richmond Hill Centre Station site will be defined in detail through future Site Plan Approval process, or any amendments to this EA required, at time of transition to LRT technology.

York Region has carried out modifications to the Regional terminal at Finch Subway Station to accommodate the first phase of rapid transit that will operate in mixed traffic on Yonge Street. Further modifications required as service frequency increases during the planning period will be implemented by York Region in collaboration with GO Transit, when required.

Through the historic portion of Richmond Hill, where Yonge Street narrows, the transitway transitions to mixed traffic operation in the curb lanes. The station at Crosby Avenue is in the middle of this section. The station will consist of two platform areas incorporated into the sidewalks rather than in the median of the roadway. Clear delineation of the station area will be achieved through the use of the prototype elements including the shelter and associated street furniture. Landscaping elements will be located along the sidewalk in this area.

10.1.7 Park and Ride Facilities

Although integration with YRT local services as feeders is a primary objective, the Region's rapid transit plan includes a commitment to undertake a parking need assessment and management study to perform an operational review on feeder services, to determine the requirements for parking spaces and how these required parking spaces will be provided and implemented. The installation of parking facilities, wherever practical, cost-effective and primarily in the general areas noted earlier in this Chapter, will encourage access to the system by private cars. During the study, local municipalities and, where opportunities exist, private property owners will be consulted to identify potential locations for park-and-ride facilities. The allocation of parking spots may be feasible at regional centres and business locations to allow for the integration of the transit system. Options to be investigated could include vacant land owned by municipalities, shared use

of municipal parking lots or garages, sharing of commercial parking lots and joint development in the vicinity of key transitway stations. Park and ride facilities will be implemented in accordance with the study recommendations respecting site planning and EA regulatory requirements. Any new separate facilities will be subject to the requirements of a Class or Individual EA as appropriate. The Region will not assume that parking spaces will be available on GO Tranist-owned lands at the GO Langstaff Station.

10.2 SERVICE PLAN

10.2.1 Near-Term Service Design

Initially, the service design for the south Yonge Street transitway is expected to be generally the same as that for York Region's proposed in-street enhanced rapid bus service, scheduled to begin operation in fall of 2005. This is described as follows:

Routing – staying strictly on the corridor, as defined in this report (i.e. no branching or inter-lining with local routes);

Stop Policy – stopping at all stations, as defined in this report (i.e. no express or semi-express operation or other stop variation);

Vehicle Allocation – 18-metre articulated vehicles, which are being used for Quick Start and would continue to be used on the corridor in subsequent near-term phases;

Span of Service – 7 days per week and approximately 18 hours per day (6:00 am to 12:00 midnight, with slightly later early morning starts Saturdays and Sundays), although service could operate later in the evening as ridership builds, for example, to 1:00 or 2:00 am, the same as the local/core service now provided by YRT;

Service Frequencies – a minimum 5-minute service north of Richmond Hill Centre Intermodal Terminal (Highway 7) during weekday peak periods (12 vehicles per hour in each direction), a 3.3 minute service south of Richmond Hill Centre Intermodal Terminal (18 vehicles per hour, due to the addition of the Yonge-Markham peak-period route with a 10-minute frequency) and a 15-minute service along the entire corridor during all other times. These frequencies are expected to increase within a year or two of the 2005 enhanced service implementation and the implications of this are discussed in the next section.

10.2.2 Longer-Term Service Design Concepts

Once the initial service design is implemented, ridership is expected to grow considerably over the next 15 years. Ridership modeling has produced forecasts for 2006 (i.e. the initial enhanced service) and 2021, while estimates have been made for 5-year increments in between (i.e. for 2011 and 2016). These forecasts are shown in the analysis and tables in this section.

Because of the expected high ridership growth, various service design scenarios of greater complexity and higher efficiency will need to be considered for longer-term time horizons. If the 2021 forecasts prove to be true, the required service frequencies under the basic service design could be as high as every 40 seconds, which would be quite inefficient and difficult to operate reliably. The actual need, feasibility and potential timing of alternative service concepts will depend on the actual ridership growth.

Potential service scenarios and design parameters to accommodate longer-term growth are described in this section, along with their potential impacts. These include estimates of the potential bus volumes along the corridor and, specifically, at certain points along the corridor where there is expected to be significant traffic congestion (Thornhill Village and Richmond Hill Village). In addition, the analysis only addresses BRT options in order to assess the potential impacts on the corridor and at key points.

The design parameters of this analysis include:

- Potential service design strategies, including express operations and branching, where justified by demand; and
- Projected peak-hour frequencies and vehicle volumes at four key points on the corridor, based on the proposed operating strategies and forecast peak-hour, peak-direction passenger volumes.

The proposed service design strategies have been developed only at a conceptual level for the purpose of this analysis. The strategies have generally been designed to achieve several specific objectives, including:

- Maximizing the potential service coverage through branching, while keeping service frequencies at "rapid-transit" levels (e.g. 5 minutes or better) on the various parts of the corridor itself;
- Providing quicker express service on longer trips, again without unduly lowering frequencies at individual stations; and
- Keeping vehicle volumes through Richmond Hill Village only to the levels needed to serve demand north of and within the village.

In general, the approach to service design starts with a base service on the corridor, with all vehicles stopping at all stations. As ridership demand grows, the base service is progressively augmented with express service for longer trips (specifically trips to Newmarket and Aurora), along with "branches" of the base service onto adjacent streets at specific points. The branching approach allows direct BRT service to be offered to a broader market while also providing some relief to the otherwise high bus volumes that would occur at outer portions of the corridor (e.g. North Richmond Hill).

The remainder of this section outlines potential service design scenarios for planning years 2011, 2016 and 2021. The tables in each section summarize the specifics of the scenario along with the projected peak-hour, peak-direction ridership, required service frequencies and resultant vehicle volumes. For the tables below:

- "Vehicles" assumes articulated buses for all scenarios;
- "Vehicles/Hour" includes all BRT vehicles on the corridor, including those running express;
- "Stn. Freq." indicates the true frequency of service at the stations, not including expresses; and
- Local services are not included.

2011 Scenario

For 2011, projected service requirements are:

- A 10-minute service operating from Newmarket to Finch Avenue;
- A 10-minute service operating from Bernard to Finch Avenue, which, combined with the Newmarket service, provides an overall 5-minute service south of Bernard;
- A 10-minute service operating from Markham on Highway 7, then on Yonge Street from Richmond Hill Centre Intermodal Terminal to Finch Avenue, which, combined with the above, provides an overall 3-4 minute service between Richmond Hill Centre Intermodal Terminal and Finch Avenue;
- All trips from Newmarket operate express between Bernard and Finch (note that this would require the ability for express buses to pass other buses stopped at stations within the corridor, which is addressed elsewhere in this report); and
- A branch route (or routes, perhaps from the Richmond Hill GO Station or Bayview or Bathurst) joins the corridor at Major Mackenzie Drive.

The peak-hour (articulated) vehicle volumes and frequencies on each route branch are shown in **Table 10-1**. **Table 10-2** shows the total peak-hour (articulated) vehicle volumes and average station frequencies along the corridor.

Table 10-1
Peak-hour Vehicle Volumes and Frequencies – 2011

Yonge Corridor – A.M. Peak Hour – Peak Direction – 2011		
Branch	**Frequency (m:s)**	***Vehicles/Hour***
Newmarket (express)	3:45	*16*
Bernard	6:00	*10*
Highway 7 (joins at Richmond Hill Centre)	10:00	*6*
New Branch (joins at Major Mackenzie)	10:00	*6*

Table 10-2
Total Peak-hour Vehicle Volumes and Frequencies – 2011

Yonge Corridor – A.M. Peak Hour – Peak Direction – 2011				
North of:	**Passengers**	**Stn. Freq. (m:s)**	**Vehicles/Hour**	**Pass./Veh.**
Bernard	1000	3:45	16	62
Major Mackenzie	1400	6:00	26	54
Richmond Hill Centre	1800	3:45	32	56
Steeles	2400	2:44	38	64

2016 Scenario

For 2016, the same services as for 2011 are assumed, but with the following additional operating scenario:

- Additional branch (or branches, perhaps from Bayview or Bathurst) joins the corridor at Richmond Hill Centre Intermodal Terminal (Highway 7).

The peak-hour (articulated) vehicle volumes and frequencies on each route branch are shown in **Table 10-3**. The total peak-hour (articulated) vehicle volumes and average station frequencies along the corridor are shown in **Table 10-4**.

Table 10-3
Peak-hour Vehicle Volumes and Frequencies – 2016

Yonge Corridor – A.M. Peak Hour – Peak Direction – 2016		
Branch	**Frequency (m:s)**	**Vehicles/Hour**
Newmarket (express)	2:00	30
Bernard	4:00	15
Major Mackenzie Branch(es)	10:00	6
Highway 7 Branch(es)	5:00	12

Table 10-4
Total Peak-hour Vehicle Volumes and Frequencies – 2016

Yonge Corridor – A.M. Peak Hour – Peak Direction – 2016				
North of:	**Passengers**	**Stn. Freq. (m:s)**	**Vehicles/Hour**	**Pass./Veh.**
Bernard	1900	2:00	30	64
Major Mackenzie	2600	4:00	45	58
Richmond Hill Centre	3000	2:51	51	59
Steeles	4000	1:49	63	64

2021 Scenario

For 2021, the same services as for 2016 are assumed, but with increased frequencies. **Table 10-5** shows the peak-hour (articulated) vehicle volumes and frequencies on each route branch. The total peak-hour (articulated) vehicle volumes and average station frequencies along the corridor are shown in **Table 10-6**.

Table 10-5
Peak-hour Vehicle Volumes and Frequencies – 2021

Yonge Corridor – A.M. Peak Hour – Peak Direction – 2021		
Branch	**Frequency (m:s)**	**Vehicles/Hour**
Newmarket (express)	1:15	48
Bernard	2:00	30
Major Mackenzie Branch(es)	10:00	6
Highway 7 Branch(es)	5:00	12

Table 10-6
Total Peak-hour Vehicle Volumes and Frequencies – 2021

Yonge Corridor – A.M. Peak Hour – Peak Direction – 2021				
North of:	**Passengers**	**Stn. Freq. (m:s)**	**Vehicles/Hour**	**Pass./Veh.**
Bernard	3000	1:15	48	62
Major Mackenzie	4400	2:00	78	47
Richmond Hill Centre	4800	1:40	84	50
Steeles	6100	1:15	96	65

10.3 MAINTENANCE AND STORAGE FACILITY

10.3.1 Facility Location

The selected site for the Rapid Transit Maintenance and Storage Facility is strategically located just south of the junction of the Yonge Street and Highway 7 rapid transit lines. It enables efficient serving of both lines with minimal deadhead operations.

As illustrated on **Figure 10-34**, the site is bounded by Langstaff Road East and Highway 407 to the north, Yonge Street to the west, CN Bala Subdivision to the east and the Holy Cross Cemetery to the south. Occupying an area of 11ha in its ultimate development, the Langstaff Maintenance and Storage Facility will have the capability of servicing and storing a fleet comprising up to 300 buses and 50-55 light rail vehicles. When operating at capacity, the facility will employ approximately 700 personnel.

The likely configuration, shown in **Figure 10-34**, is based on initial development for bus-based rapid transit and local service on the northern half of the site, with the southern portion protected for future installation of light rail workshops and storage yard.

10.3.2 Existing Environment

Land Use

At present, the entire site is zoned for industrial use so rezoning will not be necessary to establish the facility. Adjacent land use comprises the Catholic Archdiocese cemetery to the south, the CN Bala subdivision right-of-way and industrial land that is to be rezoned residential in the future to the east and a small parcel zoned for mixed use between the site and Yonge Street to the west. North of the site, across Langstaff Road are the Highway 407 and Highway 7 rights-of-way.

Socio-economic Environment

Community activities that will be affected by the establishment of the Maintenance and Storage Facility will be firstly, the business operations presently carried out by the five owners of parcels to be acquired and secondly, funeral services taking place at the adjacent cemetery. The businesses displaced will have to be able to obtain alternative locations in the Region and measures to avoid adverse noise effects on the cemetery will be required.

Also, transit vehicles will need to cross Langstaff Road to enter and exit the Facility from the transitway on the north side of the road. Measures to maintain public safety at the crossing will be required.

Natural Environment

The only feature of the natural environment on the site is a watercourse crossing the western end from north-south. This coldwater tributary of the East Don river, Pomona Mills Creek, crosses under Highway 407 and emerges at Langstaff Road on the north side of the proposed Maintenance Facility. After passing through an enclosed and channelized portion across a stone supply business presently on the site, the watercourse continues in an open channel with no instream cover, some riparian vegetation and moderately stable banks. The watercourse comprises one main channel with two culvert inflow streams on east and west sides. At the end of this reinforced channel, the watercourse continues south and east within a natural channel for a distance of approximately 140 m until it enters the Holy Cross Catholic Cemetery. This watercourse has been heavily modified through the site by clearing of riparian vegetation, channelization, stream bank reinforcement using vertical armour stone and concrete retaining wall and enclosure in a culvert. Extensive erosion is occurring in areas that have not been fortified.

10.3.3 Site Development Phasing

The Maintenance and Storage Facility will provide bus and rail storage and maintenance for the York Rapid Transit Services as well as the Region's local bus system. The site will be developed in phases. The first phase will encompass the servicing of the site, including grading, drainage and underground services plus the construction of a bus service center, internal circulation roads and initial employee parking facilities. The second phase of the project will include the construction of an LRT maintenance facility with expanded parking, storage tracks and mainline access tracks. The Operations Control Centre will also be expanded to oversee the LRT operations.

The conceptual design for the Facility involves the realignment of the watercourse along the west boundary of the property to optimize use of the site. The length of the watercourse to be realigned is approximately 350 linear meters (700 m^2). The length of the realignment is approximately 450 m (900 m^2). There is an opportunity to create at least 200 m^2 of new fish habitat at this location. There is also an opportunity to enhance this highly degraded watercourse through natural channel design. As a result, the watercourse realignment is anticipated to result in a net gain in the productive capacity of this watercourse.

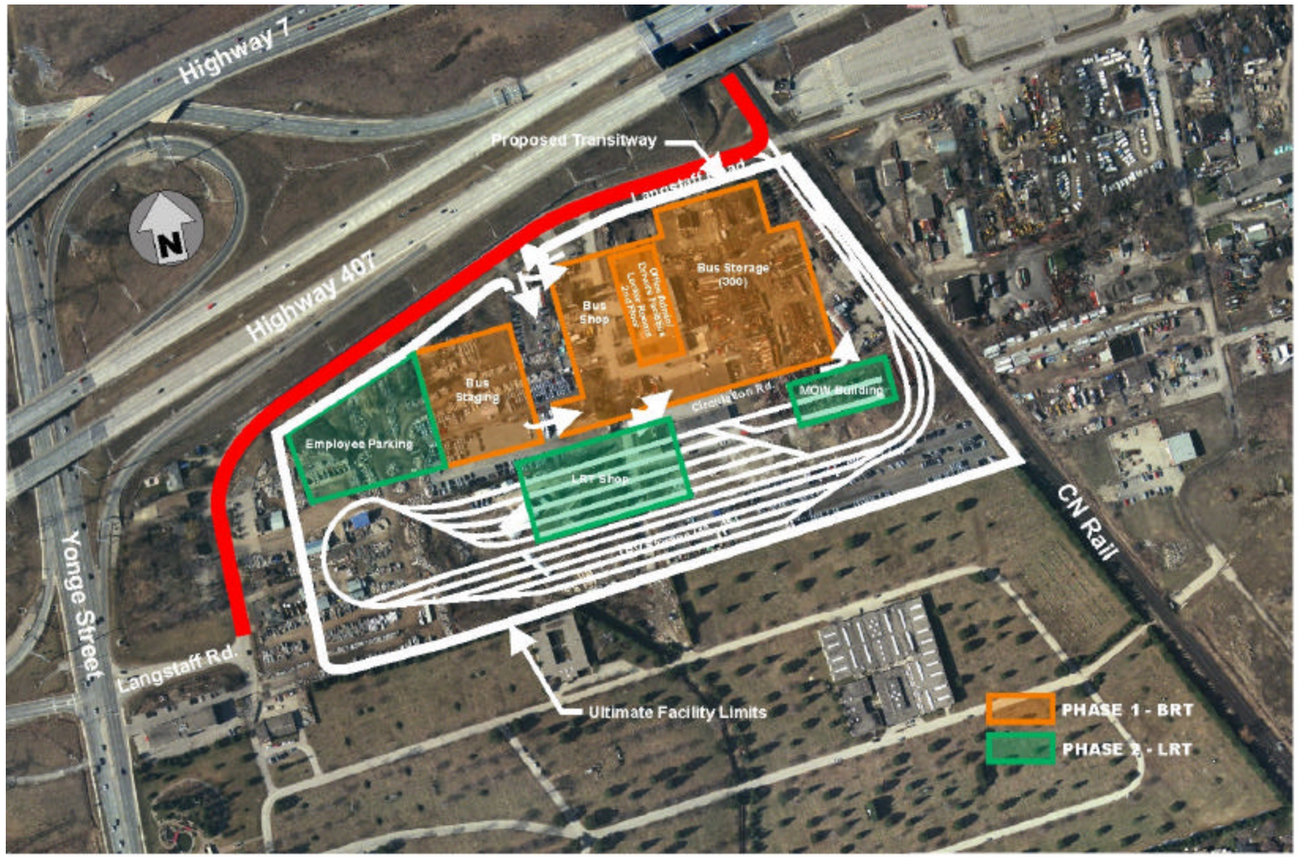
The site plan for the proposed Facility will be prepared during detailed design. Negotiations will occur with regulatory agencies during detailed design to address the proposed realignment and naturalization of this watercourse.

10.3.4 Bus Operations

The York Regional Transit System BRT fleet will be stored and serviced at the BRT Transit Maintenance Center. The Center will be sized to accommodate a fleet of 250 to 300 buses. Rapid transit service on the network will operate 20 hours per day.

BRT Operating Personnel

Bus operations dispatchers stationed in the Operations Control Centre will oversee all operations on the BRT system including within the Maintenance and Storage Facility. Bus moves in the facility will be performed by a combination of maintenance technicians and bus drivers. Approximately 550 to 600 employees, including drivers will support the BRT system operations and maintenance.



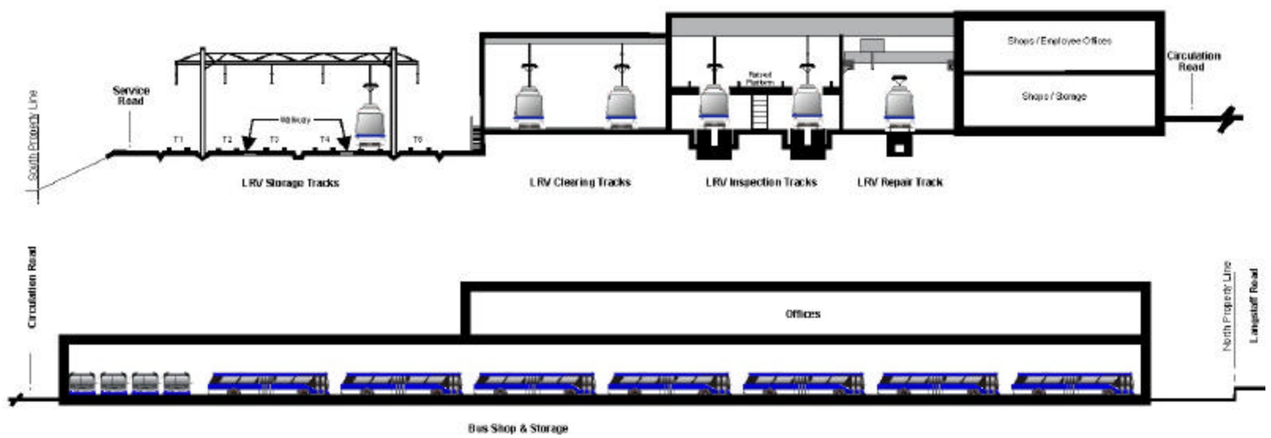


Figure 10-34
Bus Shop & Storage

Bus Movements in the Facility

Bus dispatchers establish the lists of buses that are available for the BRT routes after consultation with the maintenance coordinators. The dispatchers then determine the sequence of bus moves that will be made during the day. The majority of all bus moves at the facility are associated with delivering buses to the BRT routes for passenger service and their return.

The circulation roads within the BRT portion of the ultimate facility are designed for a one-way counter clockwise flow. Bus drivers will board the buses in the storage garage and proceed out of the building by way of the north exits, turn left and exit the complex onto Langstaff Road. Buses returning from service will enter the site at the northern entrance and proceed south to the outdoor parking area for staging in advance of fuelling and cleaning.

BRT Service Operations

The BRT Maintenance and Storage Facility will operate 24 hours per day in support of BRT service. Bus moves from the site will be made at predetermined times as required by the BRT service schedules. It is estimated that of the 300 buses to be accommodated at the site ultimately, 260 will be in service during peak period weekday operations. Typical bus schedules for BRT system operations will be as follows:

- 05:30 to 07:00 Build-up night service in preparation for morning peak service (230 buses depart site);
- 07:00 to 09:00 Morning peak service (260 buses in service);
- 09:00 to 09:45 Reduce to mid-day service (125 buses return to the site);
- 09:45 to 15:15 Mid-day service (125 buses in service);
- 15:15 to 16:30 Build-up to afternoon peak service (125 buses depart site);
- 16:30 to 18:00 Afternoon peak service (250 buses in service);
- 18:00 to 19:30 Reduce to evening service (150 buses return to site);
- 19:30 to 21:30 Evening service (100 buses in service);
- 21:30 to 22:30 Reduce to night service (40 buses return to site);
- 22:30 to 01:30 Night service (60 buses in service);
- 01:30 to 02:30 Reduce to late night service (30 buses in service);
- 02:30 to 05:30 Late night service (30 buses in service).

10.3.5 Bus Maintenance Activities

Bus moves are made to support maintenance activities including servicing, cleaning, preventive maintenance and repairs. Most moves originate from the outdoor bus staging area on the west side of the garage to either the servicing area or the shop.

Bus service technicians will pick-up the buses from the staging area and proceed into the garage at the southwest corner for fueling and cleaning. After fueling and cleaning, the buses will be driven to their parking bays in preparation for their return to service.

Buses scheduled for preventive maintenance or corrective maintenance will enter the garage at the northwest corner. Following maintenance, the bus will either proceed directly from the shop to the parking bays or will exit the shop just north of the fueling and cleaning entrance. Bus test drives will involve operating the bus around the Maintenance Facility site and/or operation of the bus on the municipal roads.

10.3.6 LRT Operations

The LRT Maintenance and Storage Facility will operate 24 hours per day and will be sized to accommodate a fleet of 50 LRT vehicles.

LRT Operating Personnel

A train dispatcher stationed in the Operations Control Centre will oversee all operations on the line and within the yard. Train operations within the yard will be performed by a combination of maintenance technicians and train operators. Maintenance technicians will typically perform internal yard moves such as train moves between the storage tracks and the maintenance building. Train operators will generally drive trains from the storage tracks to the mainline and visa-versa. Approximately 140 employees will support the LRT operations.

LRT Vehicle Movements

The train dispatcher will establish the lists of cars and trains that are available for passenger operations and those trains that are required for maintenance after consultation with the maintenance coordinator. The dispatcher will also establish the sequence of train moves that will be made during the day, including the time at which specific train moves are to be made.

The train dispatcher will set up the route on the signal control system (CRT monitor) for all train moves. Maintenance technicians or train operators will board the train and set up the train for operations in the appropriate direction. Once the operator is on-board and the train is ready to proceed, the train dispatcher will be notified by way of the train communications equipment. The dispatcher will authorize the operator to proceed when the route has been set and at the appropriate time. The cab-signal display on-board the train will also identify the route to the operator. The train dispatcher will also look after train moves made by MOW vehicles.

LRT Service Operations

Train movements between the yard and the mainline will be made at predetermined times to either increase or decrease the number of trains in service. It is estimated that approximately 45 of the 50-train fleet will be used in regular week day service. Typical train schedules for LRT system operations will be as follows:

- 05:30 to 06:00 Pre-load the lines in preparation for start of service;
- 06:00 to 07:00 Morning service;
- 07:00 to 07:30 Build-up to morning peak service;
- 07:30 to 09:00 Morning peak service;
- 09:00 to 09:30 Reduce to mid-day service;
- 09:30 to 15:15 Mid-day service;
- 15:15 to 16:30 Build-up to afternoon peak service;
- 16:30 to 18:00 Afternoon peak service;
- 18:00 to 19:30 Reduce to evening service;
- 19:30 to 21:30 Evening service;
- 21:30 to 22:30 Reduce to night service;
- 22:30 to 12:30 Night service;
- 12:30 to 01:00 All trains return to the yard.

Making Service (Pre-loading the lines)

Approximately 25 to 30 trains will be dispatched to make service. Trains will be routed to the north to the Yonge Street Richmond Hill Centre Intermodal transit center. These trains will deadhead to either the transit center or possibly to other predetermined locations along the lines in preparation for service start-up. Yonge Street trains will proceed either north or south and Highway 7 trains will proceed east or west from the transit center. Train dispatching intervals for loading the system prior to the start of revenue service will be as low 2 minutes. Coincidental train moves will likely occur in the yard during this period. Trains will be routed along both yard access tracks towards the transit center.

An additional 15 to 20 trains will be dispatched from the yard to build-up the fleet to the peak period service levels. Trains will be removed from service after the peak periods and in preparation for the night service.

System Shutdown

At the end of the day, trains will be taken out of service at the terminal stations and will deadhead back to the yard. Trains will either be routed to

the maintenance facility for servicing or to the storage tracks should the maintenance facility tracks be occupied.

As described in the following sections, trains will be cleaned prior to being positioned and stored for the morning build-up.

10.3.7 LRT Maintenance Operations

Train moves will be made to support maintenance activities including servicing, preventive maintenance and repairs. Most moves originate from the storage tracks or the mainline with destinations of the maintenance facility or the storage tracks. Bi-directional moves will be made on all tracks.

Trains returning from service at the end of their operating day will be cycled through the maintenance facility for interior cleaning. They will either be routed directly to the maintenance facility or will be temporarily staged in the storage tracks if a position in the service building is not available.

After interior cleaning, the trains will exit the west end of the service building and travel around the west yard loop into the storage tracks. Depending on the cleaning cycle employed, train exteriors may also be washed at the automatic car wash track located at the west end of the service building.

Preventive inspections will be performed monthly. For a fleet of 50 LRT vehicles, 2 to 3 inspections will be performed on a typical weekday. Undercar blowdowns are typically performed in advance of an inspection. The blowdowns are performed in the maintenance facility on Track 1. Trains will be routed from the storage tracks to the Track 1 by way of the west loop track and then from the blowdown to Track 3 or 4. This requires a reversing move either at the east or west side of the maintenance building. Trains will normally be routed to Track 2 for an interior clean and wash following an inspection and then routed to the storage tracks.

Trains requiring repairs or that are scheduled for component change-outs can be routed to the maintenance building from the storage tracks or the directly from the mainline. Train testing will be performed following major equipment change-outs and after maintenance of the on-board train control system. Testing will be performed on the most southerly storage track.

10.3.8 Maintenance-of-way Operations

Equipment Storage

Rail-borne equipment used to maintain the LRT running way and wayside equipment would include such things as:

- a diesel operated recovery vehicle;
- a motorized crane;
- a motorized flat car;
- an overhead maintenance car;
- a flat car;
- a snow blower.

The plant equipment will be stored on the tracks in and around the Maintenance of Way building located in the southeast corner of the facility.

Equipment Movements

Equipment movements are made from the Plant track to the mainline prior to the end of revenue service so that they can be positioned to commence work at the end of passenger service operations. Plant trains return to the yard before and during service delivery in the morning.

10.4 PROJECT ACTIVITIES

There are three distinct phases to the project: Pre-construction; Construction; and Operation. The activities associated with each of these phases are presented below:

1. **Pre-construction Phase:** This phase includes the completion of preliminary and detailed engineering and streetscape designs and preparation of contract drawings and specifications. This phase also involves obtaining all necessary permits, as well as approvals from regulatory agencies.
2. **Construction Phase:** This phase involves all activities related to construction such as: removals, grading, excavation, filling, construction and replanting for the entire construction period.
3. **Operation Phase:** This phase begins with the first day of transitioning operation, and covers the general operational activities such as maintenance and monitoring, on an as required basis.

10.4.1 Pre-construction Phase

This stage includes completion of preliminary and detailed engineering and streetscape designs and preparation of contract drawings and specifications. Issues to be addressed and resolved during preliminary design include but are not limited to:

- Potential funding sources for construction of the project;
- Property acquisition
- Phasing requirements for infrastructure design;
- Construction staging of the design;
- Resolution of transit arrangement for the section between Steeles Avenue to Finch Avenue;
- Landscaping materials;
- Heritage element design;
- Utility relocation strategy and design;
- Street lighting design, frequency and location;
- Street furniture;
- Public art;
- Storage & Maintenance Facility design;
- Vehicle types and operational plans;
- Design of stations and their amenities;
- Traffic signal design;
- Coordination with local transit routes and transfer strategies;
- Fare collection strategies;
- Sewer design and watermain design; and
- Pavement design for running ways and roadways.

Other pre-construction activities include:

- Site surveying as required;
- Obtaining approvals for construction access and working areas;
- Geotechnical investigations including drilling of boreholes to determine existing soil and groundwater conditions;
- Archaeological and waste contamination investigations;
- Advance utility relocation or burying contracts; and
- Coordination with other projects in the vicinity of the corridor.

10.4.2 Construction Activities

Physical construction activities will include but not limited to:

- Installation of traffic accommodation measures as required by staging plan;
- Clearing and grubbing of vegetation within the grading limits for construction of the project;
- Stripping and topsoil within the grading limits;
- Excavation of road surface including sidewalks and medians;
- Trenching and installing new below grade infrastructure and burying overhead services where necessary; and
- Removing existing asphalt and disposing at approved facility;
- Removing redundant structures and disposing of debris;
- Preparing road bed including cutting and filling and lying granulars;
- Potentially salvaging existing granulars/asphalt for reuse;
- Pouring concrete for curb, barriers, retaining walls, planters and sidewalks;
- Constructing buildings in the Storage and Maintenance Facility;
- Fabricating and erecting station elements including amenities;

- Laying granular and application of hot mix asphalt;
- Installing lighting, heritage lighting and traffic signals;
- Final grading and topsoil application;
- Asphalt line painting; and
- Installing landscaping features such as sod, shrubs, trees, paving stones irrigation systems, station amenities and street furniture.

Throughout the construction stage, various associated activities, which can have potentially adverse environmental effects will need to be mitigated, as outlined in Section 10.4.

10.4.3 Operation Phase

Once construction is complete, monitoring of the Yonge Street Transitway will be initiated. This will include:

- Monitoring traffic and transit ridership volumes to determine the potential for future modifications;
- Accidents to analyze safety conditions;
- Traffic signals timing; and
- Landscape health.

Routine maintenance activities include:

- Spring sweeping of road, sidewalk and boulevards;
- Snow and ice removal in the winter;
- Landscape maintenance including grass cutting, shrub and tree pruning in the summer; and
- Replacement of any landscaped material.

10.5 PROJECT STAGING

There will be opportunities to stage project activities during the construction phase. Staging the project will be beneficial in maintaining the best possible level of service during construction, including maintaining accesses to all properties as well as maintaining city/town and utility services such as water, sewer and hydro. This will include staging of activities in terms of activities across the corridor (cross-section staging), or sections/portions along the corridor (component staging).

Although specific plans to stage the project will not be determined until the detailed design phase, it is useful to present staging opportunities in general terms in this environmental assessment study so that potential effects can be assessed.

Because of the generous platform width required for the new project, staging of construction should be easy and should have the ability to maintain pedestrian and road traffic as currently exists during construction. The basic strategy would be:

- Construct the additional widening on one side of the roadway to its required width;
- Shift existing traffic to the side where new widening has been constructed. If necessary a temporary surface over the landscape median/station areas may have to be constructed;
- Operate traffic to one side. Set up temporary signals to align with new traffic lanes at signalized intersections;
- Construct remainder of the roadway while maintaining access to existing properties by staged construction; and
- Finalise construction and open to traffic to its final configuration.

10.6 DESIGN ATTRIBUTES AND BUILT-IN MITIGATION

For this project, “built-in mitigation”: is defined as actions and design features incorporated in the pre-construction, construction and operational phases, that have the specific objectives of lessening the significance or severity of environmental effects which may be caused by the project.

The Yonge Street Transitway will be designed and implemented with the benefit of planning, road and transit design engineering, landscaping design, and environmental best management practices. Regard shall be given to the legislation, policies, regulations, guidelines, and best management practices of the day. Where possible, mitigation measures will be prescribed in the construction contracts and specifications. Examples of practices that should be employed, based on current standards, are described below. These will be applied and refined during the pre-construction, construction and operational phases of the project.

Construction and Traffic Management Plan

A Construction and Traffic Management Plan will be developed to manage the road’s transportation function for all travel modes including equipment and material deliverables at various times during the construction period. The objective will be to maintain clear pedestrian safe routes and to maintain existing traffic as close as possible to its current conditions. The plan will also outline the road signage program.

Emergency Response Plan

The preparation of an Emergency Response Plan to be used by the contractor is included to allow full emergency services access during the construction period, such that anytime there is a method to access all residential, commercial and other land uses in the event of an emergency. Additionally, the emergency response plan should include provisions for providing temporary services to end users in the event of a construction related service outage or other service disruption. A spills response and reporting plan will be prepared and adhered to by the contractor. Spills or discharges of pollutants or contaminants will be reported immediately. Clean up shall be initiated quickly to ensure protection of the environment.

Management of Contaminated Materials

Studies will be completed to confirm the potential for the project to interact with contaminated soil or groundwater. Where the potential is confirmed, a plan to remediate the environment to the applicable standards will be prepared. The Ministry of the Environment and Construction Manager would be notified immediately upon discovery of any contaminated material encountered within the construction area. If contaminated materials or contaminated groundwater are encountered within the construction limits, these are to be removed and disposed off in accordance with all applicable Acts and regulations. Treatment and discharge of contaminated groundwater are also to be in accordance with applicable legislation and regulations.

Construction Waste Management Plan

During construction there will be some excess materials that must be disposed off the site of the project. These could include concrete rubble, asphalt, earth and road right-of-way appurtenances such as signs and lighting and utility poles. During the detailed design stage a waste management plan will be developed to ensure that surplus material is recycled wherever practical and to describe the methods to be used by the Contractor for disposal of all other surplus material in accordance with provincial or local municipal practices and guidelines.

Geotechnical Investigations

Geotechnical investigations will be required to confirm groundwater and subsurface conditions and potential impacts that will need to be considered in the detailed design of the project.

Archaeological Assessment and Monitoring

Based on the existing conditions, there were areas identified as having archaeological potential. Accordingly, it is recommended that a Stage 2 Archaeological Assessment be conducted by a licensed archaeologist, prior to construction. During actual construction, it may be necessary to monitor deep excavations, by a licensed archaeologist. The results of the Stage 2

assessment should be used to determine this level of monitoring. If during the course of construction, archaeological resources are discovered, the site should be protected from further disturbance until a licensed archaeologist has completed and any necessary mitigation has been completed.

Storm Water Management Plan

A Storm Water Management Plan will be prepared, in accordance with the MOE's *Storm Water Management Planning and Design Manual (2003)*, in detail to identify the rate and volume of anticipated storm water runoff and the means to accommodate it, and to identify the means of achieving MOE guidelines for water quality of storm water runoff. This includes the identification, in the detailed design phase, of the overall storm water management system requirements, methods of detention and filtration, and any control mechanisms necessary to achieve runoff quantity and quality targets. This plan, when prepared during the detailed design phase, will take into account the opportunity that exists to use specific locations within the identified right-of-way as retention areas to assist in the objective to improve storm water runoff quality to further off-site (i.e., outside the right-of-way) treatment. This plan will also comply with the applicable provisions of the *Oak Ridges Moraine Conservation Plan*, such as Sections 45(6), 45(8), 46(1), 46(2), 46(3) and 47(1).

To meet the basic criteria of providing water quality treatment for the increase in impervious area, storm water management needs to be provided for approximately 12% of the right-of-way. The storm water management facilities to be included as part of the proposed transitway will be developed during the detail design phase.

The Yonge Street Corridor is mostly urbanized and there are generally limited opportunities to provide storm water management for the Yonge Street/transitway runoff. In addition, only a small section of the overall corridor currently outlets to a storm water management facility. The existing roadway runoff has a greater impact on the downstream watercourse than the potential increase in runoff due to the proposed transitway. Storm water management should therefore be developed as part of an initiative to provide treatment on a watershed basis rather than trying to manage the incremental change resulting from the proposed transitway. This type of initiative would be separate from the current EA for the Yonge Street Corridor Public Transit Improvements.

The storm water management options to be considered during detail design of the transitway are identified by locations in **Appendix M**.

Erosion and Sediment Control Plan

During the detailed design phase, a detailed plan will be prepared by the Contractor to manage the flow of sediment into storm sewers. This plan will be based on best management practices including the Guideline of Erosion and Sediment Control at Urban Construction sites. Provision for inspection of erosion and sedimentation control measures during construction will be identified in permit approvals. Catchbasin filters and straw bales in roadside ditches will be used to control erosion and sedimentation during construction. Sediment fences will be used where construction is adjacent to watercourse crossings.

Landscape Plan

A detailed Landscape Plan will be prepared to guide the species selection, location and planting details for all proposed plantings and other streetscaping elements within the corridor. The plan will be prepared by a professional landscape architect with experience in plantings along arterial roadways.

Lighting Treatment Plan

A lighting treatment plan in accordance with local and regional municipal standards will be prepared during the pre-construction phase. The lighting treatment plan will include lighting fixtures and illumination along the various sections of the corridor. A lighting audit of the preferred lighting design plan will be conducted to ensure clear sight lines and appropriate illumination.

Public Communications Plan

The requirement for a Public Communications Plan stems from the need to keep the public informed about the work in progress and the end result of the construction activity. Residents and other stakeholders must be aware of scheduled road closings and other disruptions to normal service ahead of time in order that their activities can be planned with minimum disruption. The Public Communications Plan should detail how to communicate the information to the public, what information should be disseminated, and at what project stages the communications should take place.

11. ASSESSMENT OF THE PREFERRED DESIGN

11.1 ASSESSMENT METHODOLOGY

An impact analysis was undertaken to identify the potential effects, both positive and negative of the pre-construction, construction and operational activities required for project implementation. In the case of negative effects, mitigation opportunities and methods were also identified. The evaluation criteria and indicators established during the alternatives evaluation process were used as the basis for assessing the effects of the preferred design on the social, physical and natural environments. The effects analysis involved applying the following steps:

Step 1: Identify and analyze activities where the project, as described in **Chapter 10** may interact with existing environmental conditions, as described in **Chapter 6**.

Step 2: Acknowledge predetermined project activities that act as built-in positive attributes and/or propose mitigation measures that can be implemented during construction or operation of the undertaking, as outlined in **Section 10.4**

Step 3: Identify the residual environmental effects, if any.

Step 4: Identify opportunities for further mitigation of residual effects, if possible/practical, including monitoring.

Step 5: Determine the significance of the residual environmental effects, after further mitigation. The potential effects of project implementation were described based on their level of significance.

Step 6: Recommend monitoring activities during the construction or operation of the undertaking.

Professional experience, analysis, simulation and judgement formed the basis for identifying environmental effects and mitigation measures. The analysis was based primarily on comparing the existing environment condition with the anticipated future environment, prior to, during, and after construction. The prediction of effects considered:

- The interaction between a project activity and the valued environmental components;
- The effects of the project activities on the environmental values; and
- The combined effects of multiple activities and/or multiple effects.

Within this context, consideration was given to:

- The magnitude, spatial extent, and duration of effects;
- The proportion of a population or community affected;
- Direct or indirect effects; and
- The degree to which the effect responds to mitigation.

In this assessment, "residual" environmental effects are defined as changes to the environmental caused by the project, and vice versa, when compared to existing conditions and taking into account all built-in mitigation measures. Potential residual environmental effects were assessed as to their significance, including spatial and temporal considerations, and were categorized according to the following definitions:

"Positive effect" means an effect that will contribute to the wellbeing or health of a valued environmental component.

"Negligible" means an effect that may exhibit one or more of the following characteristics:

- nearly-zero or hardly discernible effect; or
- affecting a population or a specific group of individuals at a localized area and/or over a short period in such a way that the effect is similar to random small changes but would have no measurable effect on the population as a whole.

"Insignificant" means an effect that may exhibit one or more of the following characteristics:

- not widespread;
- temporary or short-term duration without permanent consequences;
- recurring effect lasting for short periods of time during or after project implementation;
- affecting a specific group of individual in a population or community at a localized area or over a short period, but not affecting the integrity of the population or community; or
- not permanent, so that after the stimulus (i.e., project activity) is removed, the integrity of the environmental component would be resumed.

"Moderately Significant" means an effect that may exhibit one or more of the following characteristics:

- not widespread with mostly local effects;
- requires further investigation;
- permanent reduction in species diversity or population of a species, but not in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural reproduction or immigration would not return that population, or any species dependent on it, to its former level within several generations; and
- could be alleviated with additional detailed design.

"Significant" means an effect that may exhibit one or more of the following characteristics:

- widespread;
- permanent transcendence or contravention of legislation, standards, or environmental guidelines or objectives;
- permanent reduction in species diversity or population of a species in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural reproduction or immigration would not return that population, or any species dependent on it, to its former level within several generations (including the consequences of a short-term construction effect);
- permanent loss of critical/productive habitat; and
- permanent alternation to community characteristics or services, established land use patterns, which is severe and undesirable to the community as a whole.

The definitions of significance were adopted for use in this assessment because many of the impacts cannot be quantified in absolute terms, although changes and trends can be predicted. The definitions provide guidance and were intended to minimize personal bias. This is important because the analyses are sometimes based on professional judgement and limited information.

Once the potential effects were predicted, additional mitigation measures were identified. Often these mitigation measures were sufficient to reduce potential negative effects to an insignificant or negligible status.

Monitoring is important to verify the accuracy of predicting effects. Monitoring measures were recommended to determine what effects would actually occur with project implementation, and may result in the modification of mitigation measures to improve their effectiveness. Identified monitoring measures included inspection, surveillance and compliance monitoring.

11.2 ASSESSMENT RESULTS

An environmental effect requires consideration of all project activities and their interaction with the environment. Pre-construction, construction and operational activities were assessed. **Table 11-1** describes these project activities and their interaction with the environment and location, the

potential effects, mitigation measures, residual effects and their significance, and monitoring recommendations. Project stages are coded as follows:

P – Pre-construction
C – Construction
O – Operation

11.3 PROJECT-RELATED EFFECTS AND MITIGATION

The evaluation of project-related effects was performed using the primary Rapid Transit Plan objectives and related goals developed for the evaluation of alternatives in selecting the preferred alignment. These objectives are:

- To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service
- To protect and enhance the social environment in the corridor
- To protect and enhance the natural environment in the corridor
- To promote smart growth and economic development in the corridor

Goals defined by professionals on the study team are subsets of these objectives and refer to an environmental value or criterion. The effect of the proposed undertaking in terms of each environmental value was rated using a qualitative scale ranging from a positive or beneficial effect through negligible to a potentially significant negative effect as described in the above methodology.

ANALYSIS OF ENVIRONMENTAL EFFECTS AND MITIGATION

11.3.1 OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service

Generally, the undertaking has the ability to improve mobility within the Region and provide good connectivity with inter-regional transit services. From this point of view, the proposed transitway will have an overall positive effect on transit ridership in the Region. The planned alignment characteristics and geometry will provide a fast, convenient and reliable service in most respects. Although grades at some stations exceed LRT standards, the BRT technology, proposed for initial implementation, will be accommodated in every case. The recommended mitigation, to provide for future LRT technology when needed, will be local modifications to the running way and station platform configuration at the stations where standards are not met.

The operations at the maintenance and storage facility proposed for the undertaking will have some effects on its immediate traffic environment. However, the facilities location and the mitigation measures available will minimize any potential adverse effects. Attractiveness of the rapid transit service is implicit to the design of the undertaking, however, achieving the desired transit speed may affect the capacity for general traffic movements of certain intersections. In this respect, the effect on traffic may be moderately significant. Strategic location of stations is an important element of the success of the transitway. The proposed locations for stations generally achieve this goal which and make a positive contribution to maximizing ridership.

The analysis of environmental effects and mitigation under this objective is presented on the following page in **Table 11-1**.

Table 11-1
Assessment of Environmental Effects for Objective A - Mobility

GOAL	Environmental Value/ Criterion	Environmental Issues/ Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service												
A1	Maximize Inter-regional and local transit connectivity	Connections to inter-regional services and future gateways	✓		✓	Hwy 7 and Hwy 407 crossing	Better connection to GO Stations and future provincial inter-regional transit station will improve ridership on all transit services	Yonge Street transitway will provide a direct connection from the Richmond Hill Centre Intermodal Terminal to GO Rail's Langstaff Station. It will also have a connection to York's Hwy. 7 transitway and the future provincial transit corridor along Hwy. 407.	Increased potential for infill development around Langstaff Station	R.O.W protection along the GO Line corridor to achieve an additional connection	Positive effect	Monitor ridership and the need to develop connection to GO Richmond Hill Station
		Compatibility with proposed local network	✓		✓	Entire Corridor	Inconvenient transfer between local transit and Yonge Rapid Transit may discourage transit ridership	Stations generally located on east-west local transit routes ensuring convenient transfers between services. Integrated fare system proposed.	Project may change the configuration of local transit.	Local services will be configured as a grid where practical, providing community coverage and feeder roles	Positive effect	Regular review of effectiveness of local service plans.
A2	Maximizes speed and ride comfort and minimizes safety risks and maintenance costs with an optimized alignment geometry	Grade in East Don River Valley at 7% hence > min. LRT standard of 6%	✓		✓	East Don River Valley	LRT vehicle may not be able to negotiate grade	Length of grade is extremely short, < 100 m	None expected	None required	Negligible	None required
		Grades at station in excess of standards	✓		✓	Southbound Platform at Clark Avenue	Running way grade at platform is approaching a 6% grade. LRT may not be able to negotiate grade	Proposed platform grade reduced to 3% and will be adequate for BRT operation.	May encounter problems for LRT operation	Consider relocating the station for LRT	Moderately Significant	Review situation once LRT is needed
		Grades at station in excess of LRT standards	✓		✓	Southbound platform at John Street	Running way grade at platform is on a 2% grade. LRT may not be able to negotiate grade	Reduced gradient at station to 1.8% in the southbound direction. And 1.2% in the northbound direction.	May not be feasible for LRT operation	Revise profile for LRT using small retaining walls	Insignificant	Redesign running way once LRT is needed
		Grades at station in excess of LRT standards	✓		✓	Southbound platform at Royal Orchard Blvd	Running way grade at platform is in excess of 3%. Only an issue for LRT as LRT may not be able to negotiate grade	Redesign vertical profile to reduce downward grade. Since the direction of travel is in a downgrade direction concern is not serious.	Remains in excess of standard for LRT	Revise profile for LRT using small retaining walls	Insignificant	Redesign running way once LRT is needed
		Grades at station in excess of LRT standards	✓		✓	Both platforms at Scott Drive/Bantry Avenue	Running way grade at platform grade in excess of LRT standard. LRT may not be able to negotiate grade	Redesign vertical profile to reduce grade either side of intersection.	None	None required	Negligible	None required
		Grades at station in excess of BRT & LRT standards	✓		✓	Both platforms at Major Mackenzie Drive	Running way grade at platform grade in excess of BRT & LRT standards	A 4.0% grade is to be maintained for BRT. A revised alignment is shown in the plates for LRT to reduce the grade to 2.0%.	Concerns remain for LRT Station with regard to urban integration and visual impacts	Review design of LRT station or consider relocating the station once LRT is being considered	Moderately Significant	Review location of station/design/integration once LRT is needed
		Grades at station in excess of LRT standards	✓		✓	Both platforms at 19th Avenue/ Gamble Road	Running way grade at both platforms grade in excess of LRT standard. LRT may not be able to negotiate grade	A 4.0% grade is to be maintained for BRT.	Running way grade at platform in excess of LRT standard. LRT may require grade reduction.	Consider relocating the station once LRT is needed	Moderately Significant	Review location of station/design once LRT is needed
A3	Maximize operational efficiency of maintenance and storage facility	Location of facility and access routes	✓	✓	✓	Langstaff Industrial Area	Potential effect of transit vehicle access to facility on local traffic circulation	Preferred facility location enables transit vehicles to enter or leave the transitway directly through a single signalized crossing of Langstaff Road. Deadheading on neighbourhood roads is avoided.	Minor delay to traffic on Langstaff Road at crossing.	Signal timing adjustments can reduce any delay	Insignificant	Monitor signal operations.
A4	Increase attractiveness of rapid transit service	Travel time and service reliability	✓		✓	Entire Corridor	Adjustments to signal timing to achieve progression and minimize delay to rapid transit.	Micro-simulation of rapid transit operation and general traffic movements during detailed design will be used to optimize signal timing. Transit speed will be increased to maximum achievable with reasonable intersection operation.	Delay to transit or intersecting traffic may be unacceptable. May affect intersection capacity for general traffic movements.	Modification of inter-section signal timing.	Moderately significant	Pursue an on-going intersection performance monitoring program
A5	Locate stations to maximize ridership potential and convenience of access for all users	Residents or employees within walking distance of stations. Accessibility for mobility impaired	✓		✓	Entire Corridor	Stations at locations without transit-oriented land use and convenient access could discourage rapid transit use.	Station locations selected to serve supportive land use. Facilities designed with weather protection, direct barrier free access and attractive streetscapes within surrounding residential neighbourhoods.	Continued dependence on automobile if land use objectives not achieved	Greater emphasis on supportive land use	Positive effect	Regular review of land use and new or infill development potential during detailed design phases for transitway and stations.

11.3.2 OBJECTIVE B: To protect and enhance the social environment in the corridor

Overall, the various goals set to protect and enhance the social environment are largely achieved. The assessment in terms of the related environmental values indicates that most adverse effects are generally mitigated by the built-in attributes of the design and benefits for the communities within the corridor can be maximized.

In particular, the undertaking will very likely improve community cohesion as well as access to municipal and community facilities within the corridor. While some improvements to road traffic and pedestrian circulation safety are anticipated, the removal of random left turn access inherent in the adoption of a median location for the transitway requires road users to modify their travel patterns. This transitway configuration, although preferable to curb-side options, will restrict left turn access to regularly spaced signalized intersections for vehicles and widen the roadway for pedestrians. In both cases, these effects are significantly mitigated by permitting U-turns at the signalized intersections for general traffic where necessary and by the introduction of a centre median refuge to allow for a two-stage pedestrian crossing at signalized intersections only.

Generally, the spacing of the signalized intersections has been dictated by existing signal locations and, where their spacing is excessive, by an analysis of the optimum location for an intermediate new signal permitting U-turns. Examples of this analysis are the Thornhill East Don River valley between Centre Street and Royal Orchard Boulevard and the portion of Yonge Street between Uplands Avenue and Langstaff Road in north Thornhill. In the latter portion, the location of the intermediate signal has been selected after an evaluation of the turning movements generated by local streets such as Kirk Drive, Bunker and Longbridge Roads as well as traffic generators such as the Holy Cross Cemetery and an adjacent fitness centre. Details of this evaluation are included in **Appendix D**.

Preserving and improving public safety and security in the corridor was an important consideration in development of the design concept. Several features of the median transitway design were able to, not only allow frequent access across the median for Emergency Response Vehicles, but also provide pedestrians with a safer environment in the widened roadway where the median becomes a refuge.

In addition, noise and vibration studies at representative sensitive receptors have demonstrated that the combined effect of median transitway operation and general traffic on the widened Yonge Street roadway will not result in a noticeable increase in noise or vibration levels for residents.

A number of Built Heritage Features (BHF) and Cultural Landscape Units (CLU) were identified within the corridor, principally in the Thornhill Heritage Conservation District. The preferred alignment will not affect existing cultural resources and in some instances can be a catalyst for renewal and enhancement of the street environment. For example, considerable community and municipal liaison took place in developing design solutions to address concerns about the widening of Yonge Street in the Thornhill Heritage District. A parallel community revitalization study allowed the development an integrated urban design and streetscaping plan. As an example of the outcome of the collaborative studies, the integration of transitway facilities in the most constrained portion of Yonge Street in Thornhill is illustrated in **Figures 11-1 and 11-2**. The transitway and station shown incorporates the minimum lane width standards adopted to avoid unacceptable impact on designated heritage buildings on both sides of the street.

Figures 11-1 and 11-2
Streetscaping Concept for Transitway in Thornhill Heritage District

Through the Old Richmond Hill Business District, the width of the existing ROW and proximity of buildings fronting Yonge Street precludes road widening to accommodate dedicated transit lanes. As discussed in **Chapter 9**, significant property impacts have been avoided by curtailing the median transitway locally and using the existing mixed traffic lanes for rapid transit operation. This measure assumes that traffic flow will be improved by the implementation of recommendations of the Town of Richmond Hill's downtown parking re-organization study.

The introduction of the median transitway largely fits into the existing Yonge Street ROW. In some cases, small strips of the ROW will be required to accommodate the Region's standard boulevard width of 5.2 m and its resulting grading slopes. Retaining walls have been used in the event the grading slope encroachments are not feasible. Between Steeles Avenue and Centre Street, property required along both sides of Yonge Street is estimated to be 0.3 ha. Between Centre Street and Highway 7, the property required is estimated to be 0.2 ha. Between Highway 7 and Major Mackenzie Drive, the property required is estimated to be 0.8 ha. Between Major Mackenzie Drive and 19th Avenue, the property required is estimated to be 0.2 ha. The Maintenance and Storage Facility will require approximately 13 ha of property.

A Stage 1 Archaeological Assessment, conducted during the study, indicated the absence of archaeological sites within the project impact area. As is usually the case, a Stage 2 archaeological study will be conducted during the construction phase for the transitway.

At the Steeles Avenue, two interface plans were developed to integrate with City of Toronto's Yonge Street Surface Transitway Improvements Class EA Study, as described in Section 10.1. The impact of these two options on the environment is minimal. The HOV interface option does not require widening and therefore, does not disturb the existing environment. The fundamental difference between the options in terms of impact on the environment is also minimal except that the median interface option will require a narrow strip of rights-of-way along Yonge Street and a modification on traffic circulation, much the same as the rest of the transitway, such as right in-right out operation on minor cross streets and accesses and U-turn operation at Steeles Avenue. The median will in turn create a safer environment for pedestrian crossing.

Finally, the introduction of a transitway, even in a highly developed urban context, has the potential to worsen the visual aesthetics of the road. In consultation with the municipalities and the public, a concerted effort was made to establish urban design and streetscaping principles to be followed in transitway insertion design for the entire corridor, offering the potential for a significantly enhanced street environment.

The analysis of environmental effects and mitigation related to this objective is presented below in the continuation of **Table 11-2**.

Table 11-2
Assessment of Environmental Effects for Objective B - Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/ Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B1	Minimize adverse effects on and maximize benefits for communities in corridor	Potential displacement of community features		✓	✓	Entire Corridor	Potential displacement or loss of unique features.	Avoided known locations of distinct features to minimize impact; Incorporated streetscaping and road furniture to enhance corridor and community environment.	None expected	None expected	Negligible	Future community consultation
		Effect on Community Cohesion			✓	Entire corridor	Median transitway in widened Yonge Street may be perceived as a barrier between east and west communities	Provided safe crosswalks with median refuge. Improved streetscaping in order to create a more pedestrian-friendly environment	None expected	None necessary	Overall positive effect	None required
		Community facility utilization			✓	Entire corridor	Improved transit access increases demand on facilities and services within the corridor.	Municipality can expand services and facilities through the increased development charge revenue.	Community facility expansion could impact existing communities.	Include mitigation measures in community facility expansion.	Positive effect	Monitoring of registration levels at the various facilities.
B2	Maintain or improve road traffic and pedestrian circulation	Potential transition to Toronto transit system, south of Steeles Avenue, in the event a curb reserved bus lanes option is selected as the preferred design for Toronto's Yonge St. EA Study. (Ultimate transit system provisions have not been identified south of Steeles Avenue.)			✓	Intersection Yonge/Steeles Avenue	A transition from a median transitway system to curb- side transit provisions will require a dedicated phase and transition area at a signalized intersection on Yonge Street.	Given the existing and future operating conditions at the Yonge Street/Steeles Avenue intersection, it is not recommended that the transition, if required, be located at the Steeles Avenue intersection. It is recommended that the transition from the median RT system to the HOV system be undertaken at a less critical intersection such as Yonge Street/Meadowview Avenue. Accordingly, two alternative configurations have been provided for the preferred alternative between Steeles Avenue and Meadowview Avenue, i.e, HOV configuration or RT median design.	None expected	None necessary	Insignificant	Ongoing discussions with City of Toronto Staff regarding Class Environmental Assessment status / recommendations for Yonge Street from Steeles Avenue to Finch Avenue.

Table 11-2
Assessment of Environmental Effects for Objective B - Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/ Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
		Access to minor side streets and properties along Yonge Street.	✓	✓	✓	Entire Corridor	Median transitway will eliminate random left turns into minor side streets and properties thereby requiring an alternative access route	U-turns provided at major intersections for safe manoeuvres into side streets and to properties. Random permissive left turns eliminated thus increasing safety. Develop traffic management plans for construction.	Conflict with U-turns and Right Turns on Red from side streets at Meadowview Av., Uplands Av., Langstaff Road East, Weldrick Road, Devonsleigh Blvd may decrease safety	None necessary	Moderately significant	Monitor traffic and prohibit Right Turns On Red movements from the side street at these locations if necessary
		North-south vehicular and RT capacity on Yonge Street.			✓	Glen Cameron Road and Arnold Avenue/Elgin Street	The required pedestrian crossing times at these locations have the potential to reduce the green time allocated to the north-south traffic flows on Yonge Street. A two-stage crossing would reduce the time required.	A centre median refuge will allow for a two-stage pedestrian crossing decreasing the required east-west phase time.	Reduction in pedestrian level of service	None necessary	Negligible	The decision to implement these special provisions should be deferred until post-operation conditions are monitored and the need is identified.
B2	Maintain or improve road traffic and pedestrian circulation	Potential for Traffic Infiltration			✓	Thornridge Drive Jane Street Colbourne Street Helen Street Spruce Avenue	The preferred RT design will restrict left turn access at these Yonge Street intersections. Non-residential traffic may choose to use neighbourhood roadways to gain access to alternative routes.	Provide U-turns at signalised intersections. Increased the number of signalised intersections on Yonge Street to provide direct access to side streets.	Infiltration may remain.	Traffic management measures or alternative access arrangements would be undertaken, as required.	Moderately Significant	Undertake "before" and "after" traffic volume observations on affected roadways to determine any changes in traffic infiltration levels
		Potential for Traffic Infiltration			✓	Woodward Avenue/Grandview Avenue/Highland Park	Southbound left turns at the Highland Park, Woodward and Grandview intersections will be restricted in the preferred RT design. This additional restriction may divert traffic to Doncaster Avenue, Meadowview Avenue, Glen Cameron Road and Clarke Avenue, and ultimately to Henderson Avenue.	Traffic management measures such as turn restrictions could be implemented during detail design.	Infiltration may remain.	Traffic management measures or alternative access arrangements would be undertaken, as required.	Moderately Significant	Undertake "before" and "after" traffic volume observations on affected roadways to determine any changes in traffic infiltration levels. Traffic management measures such as turn restrictions, partial closures or traffic calming would be implemented, as required in consultation with City of Toronto.
		Parking Prohibitions in Richmond Hill Commercial Business District.			✓	Richmond Hill CBD	RT operations during the "shoulder" periods may necessitate parking restrictions.	Existing parking prohibition may not be sufficient during shoulder period. It is recommended that on-street parking should be restricted in both directions during the peak periods.	None expected	None necessary	Insignificant	Monitoring of "shoulder" periods prior to and after the peak periods will need to be undertaken to determine the need to extend the parking restriction at specific locations in the CBD.
		NB/SB U-turn movements and the corresponding side street right-turn-on-red (RTOR) movements			✓	Meadowview Avenue Uplands Avenue Langstaff Road East Weldrick Road Devonsleigh Blvd	The estimated future u-turn movements at these intersections are greater than one per cycle and conflicts between the u-turns may result in conflicts and right-turn-on-red (RTOR) movements should be monitored.	None required	None expected	None necessary	Significant	Monitor the intersection operations and conflict potential. If necessary, prohibit RTOR movements from the side street at these locations.
B3	Maintain a high level of public safety and security in corridor	Access for emergency vehicles	✓	✓	✓	Yonge Street	Incorporation of median and construction will have adverse effects on Emergency Response Services (ERS) access and time	U-Turns provided at intersections. Consultation with emergency services representatives to develop access across the median at 75-100m intervals for Emergency Response Vehicles only.	Some risk may remain as access method will change after implementation of mitigation	Address during detail design in consultation with ERS staff.	Insignificant	Obtain feedback from ERS staff on performance of access provisions.
B4	Minimize adverse noise and vibration effects	Noise effect for BRT and LRT due to Widening of Yonge Street			✓	Entire corridor in proximity of residential uses	Combine effect of median Transitway operation and general traffic on the widened Yonge Street roadway may result in increased noise levels for residents.	Modeling of future traffic activities indicated that expected noise increases will not exceed the 5dB threshold at which mitigation measures are required. BRT and LRT sound levels expected to be marginal to none.	None expected	None necessary	Negligible	Conduct audit measurements to confirm compliance once the Transitway is fully operational.
		Vibration effect for BRT and LRT due to Widening of Yonge Street			✓	Entire corridor in proximity of residential uses	Combine effect of median Transitway operation and general traffic on the widened Yonge Street roadway may result in increased vibration levels for residents.	Modeling of future traffic activities indicated that expected vibration increases will not exceed the protocol limit of 0.1 mm/sec for LRT. BRT vibration levels are expected to be negligible.	None expected	None necessary	Negligible	Conduct audit measurements to confirm compliance once the Transitway is fully operational.

Table 11-2
Assessment of Environmental Effects for Objective B - Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/ Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
		Noise and vibration due to BRT and LRT vehicle maintenance and storage activity			✓	Langstaff Road	No adverse environmental effect. Vehicle maintenance noise levels experienced by nearest sensitive receptors will not exceed ambient levels by more than acceptable limits.	All maintenance activities, including the use of compressed air, will be performed in enclosed garage areas screened from any future residential development east of the site by retaining wall along CN Rail R.O.W.	None expected	None necessary	Negligible	Conduct audit measurements to confirm compliance once the facility is fully operational.
		Noise and vibration due to vehicle movements within the Maintenance and storage facility			✓	Langstaff Road	No adverse environmental effect. Vehicle movement noise levels experienced by nearest sensitive receptors will not exceed ambient levels by more than acceptable limits	A 6 m high retaining wall will be constructed along the east property line of the Maintenance Facility. Internal BRT vehicle movements will be shielded by the wall, thus reducing noise levels in the direction of the closest potential receptors. While the LRT lines are outside the wall, noise from LRT will be buffered by the existing elevated (6 m high) CN rail bed.	None expected	None necessary	Negligible	Conduct audit measurements to confirm compliance once the facility is fully operational.
B4	Minimize adverse noise and vibration effects (continued)	Noise due to BRT vehicle idling within the Maintenance Facility			✓	Langstaff Road	Vehicle idling noise levels experienced by nearest sensitive receptors will potentially exceed ambient levels by more than acceptable limits	A 6 m high enclosure wall will be constructed along the east property line of the Maintenance facility.	Excess Noise With the vehicle exhausts at roof height, the proposed 6 m high fence does not seem to provide adequate shielding.	A building enclosure is recommended to mitigate against the excess noise due bus idling noise. Further data and discussions are necessary to confirm the appropriate mitigation measures.	No significant effects are anticipated after mitigation.	Conduct audit measurements to confirm compliance once the facility is fully operational.
		Noise & vibration to be experienced during construction activities		✓		Entire Corridor	Potential adverse environmental effects from noise and vibration resulting from construction activities.	Construction equipment to comply with MOE NPC-115 noise emission standards. Further, construction activities to comply with local noise by-laws, especially time and place restrictions.	Short-duration noises from safety devices such as back-up beepers.	If practicable, measures such as temporary hoarding may be used to mitigate residual noise under certain limited circumstances.	No significant effect is anticipated after mitigation. However, due to the very nature of the work, certain noise sources are likely to be audible at nearby receptors.	Monitoring may be undertaken in response to certain specific complaints relating to noise and vibration. However, on-going or continuous monitoring is not recommended.
		LRT movements around curves in track			✓	Langstaff Road	Potential noise exceedance	None	Based on the available data, the LRT wheel squeal noise is predicted to marginally exceed the sound level limit.	No. Exceedance determined to be insignificant based on the available data.	Negligible	Conduct audit measurements to confirm compliance once the facility is fully operational.
B5	Minimize adverse effects on cultural resources	Displacement of Built Heritage Features (BHF) Displacement of Cultural Landscape Units (CLU)		✓		75 & 77 Langstaff Road East, Markham	The potential development of intermodal bus and admin. facility will occur with the likely removal of the two BHF's - 75 & 77 Langstaff Road East, Markham	Although these buildings are old they are not designated heritage buildings	None expected	None required	Negligible	None required
		Disruption of Built Heritage Features (BHF) Displacement of Cultural Landscape Units (CLU)		✓		Thornhill Heritage District Conservation, Vaughn & Markham.	There is potential for disruption from changes in the visual, audible and atmospheric environment to cultural heritage features within the heritage district areas.	Considerable community and municipal liaison to address concerns. Developed streetscaping and urban design plan to identify opportunities to mitigate effects of widened roadway. Reduced transit and traffic lane widths to minimise impacts. Relocated station platforms to more desirable locations. Adjusted road/transit alignment to balance impacts on either side.	Detail design must address concerns of community.	Liaise with community and municipalities to obtain desired detail design solutions, especially for architectural treatment of stations in heritage districts	Positive effect	None required
		Disruption of Built Heritage Features (BHF) Displacement of Cultural Landscape Units (CLU)		✓		Richmond Hill CBD area.	There is potential for disruption from changes in the visual, audible and atmospheric environment to cultural heritage features within the Central Business District areas.	Median transitway eliminated as an option through the CBD. A mixed traffic option has been chosen. Stations limited in the area	None expected	None	Negligible	None required

Table 11-2
Assessment of Environmental Effects for Objective B - Social Environment

GOAL	Environmental Value/ Criterion	Environmental Issues/ Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE B: To protect and enhance the social environment in the corridor												
		Possible impacts to areas with potential for identification of archaeological sites.	✓			Entire Corridor	There is potential for identification of archaeological sites within the project impact area.	Stage 2 Archaeological Assessment: field survey to identify any sites that may be present within the proposed impact area. If areas of further archaeological concern are identified during Stage 2 assessment, such areas must be avoided until any additional work required by the Ministry of Culture has been completed. Mitigation options, including avoidance, protection, or salvage excavation must be determined on a site-by-site basis. If no potentially significant archaeological sites are identified during Stage 2, it will be recommended to the Ministry of Culture that the areas assessed be considered free of further archaeological concern.	Archaeological sites may be identified during the course of Stage 2 Archaeological Assessment.	Needs for further mitigation, possibly including Stage 3 Archaeological Assessment (test excavation) and Stage 4 Archaeological Assessment (further mitigative work, including mitigative excavation), must be determined following Stage 2 Archaeological Assessment, if archaeological resources are identified during survey.	Negligible for stage 1 Archaeological Assessment	No requirement for monitoring has been identified as a result of Stage 1 Archaeological Assessment. Monitoring may be required, depending on the results of Stage 2 Archaeological Assessment.
B6	Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	Visual Effects	✓		✓	Entire Corridor	Introduction of transit may reduce visual aesthetics of road	Introduction of a comprehensive landscaping and streetscaping plan for the corridor. Lane width reductions and smaller turning radii in heritage districts to allow wider pedestrian zones. Relocate or bury hydro lines in areas where widening places overhead lines unacceptably close to existing culturally sensitive areas.	Narrow sections of ROW where property cannot be acquired may limit incorporation of streetscaping		Significant	Monitor redevelopment and acquire property through redevelopment applications
		Landscaping	✓		✓	Entire Corridor	Landscaping species may not survive in winter months	Choose appropriate species for both winter and other months to maintain greenery throughout corridor. Place landscaping in planters and incorporate buried irrigation systems.	Species may still not survive	Change species, irrigation patterns, etc	Insignificant	Monitor health of landscaping continuously

11.3.3 OBJECTIVE C: To protect and enhance the natural environment in the corridor

The protection and enhancement of the natural environment within the corridor has been entirely achieved. By definition, the undertaking along the Yonge Street right-of-way is set in a highly developed urban environment, where natural features have mostly been disturbed by previous development. Nevertheless, small river tributaries or creeks still cross Yonge Street and connect to the much larger Don watershed. Similarly, nearby urban green spaces still exist and must be protected. In terms of all valued environmental components to be considered, effects on aquatic and terrestrial ecosystems are either negligible or insignificant when built-in mitigation measures are implemented or sensitive construction and operation methods are respected. The potential need to re-align a short portion of the waterbody crossing the west end of the proposed Maintenance and Storage Facility site is an example of a mitigation measure that could result in an increase in aquatic habitat.

The Undertaking is considered to have insignificant environment effects on the Oak Ridges Moraine because the impacts have been avoided, minimized or mitigated.

Future air quality, except for PM, is expected to be better than currant air quality mainly due to improvements in engine technology and fuels but also with some contribution from the diversion of trips to rapid transit. The forecast increase in PM10 from 2001 to 2021 can be attributed to the increase in background traffic due to population and employment growth built into the traffic forecasting model, which will be partially offset with the expected increase in transit mode split as future trips move from autos to improved transit services. As noted in **Appendix K**, future 2021 air quality was forecasted both with and without the proposed rapid transit alternative. In the case of all pollutants assessed (PM_{10}, NO_x, SO_2, CO), implementation of rapid transit is expected to have a net positive effect in 2021 (refer to Tables 4.2, 4.3 and 4.4 in **Appendix K**). Greenhouse gas emission (CO_2) is also forecasted to be reduced due to the energy efficiency of the overall vehicle fleet plus the implementation of an improved public transit alternative. (Refer to Section 4.2 of **Appendix K**)

The analysis of environmental effects and mitigation under this objective is presented below in the continuation of **Table 11-3**.

Table 11-3
Assessment of Environmental Effects for Objective C – Natural Environment

GOAL	Environmental Value/ Criterion	Environmental Issue/ Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C1	**Minimize adverse effects on Aquatic Ecosystems**	Fuel spills, due to accidents during construction refueling and accidents during operation, entering the watercourses.		✓	✓	Entire Corridor	Fish kills due to chemical spills resulting in short term population decline.	No refueling within 10 m of a watercourse. Emergency Response Plan	Short term population decline. Some contaminants within storm water system.	None practical	Insignificant	None required
		Sediment laden storm water entering watercourses during construction.		✓		Entire Corridor	Fish kills and loss of aquatic habitat resulting in short term population decline.	Construction fencing at work areas near watercourses limiting area of disturbance. Erosion and Sediment Control Plan will be included.	Short term population decline.	None practical	Significant, only if erosion and sediment control measures fail due to an event during winter.	Monitor sediment accumulation after rain events during construction to ensure that the proposed mitigation measures in the ESCP have been satisfied.
		Sediment laden storm water entering watercourses during operation.			✓	Entire Corridor	Loss of aquatic habitat resulting in population decline.	Storm water management facilities such as grassed swales, oil and grit separators, storm water ponds. Opportunities to improve stormwater quality will be investigated.	Short term population decline.	Clean-out facilities as required.	Insignificant	Monitor sediment accumulation in storm water management facilities.
		Loss of site-specific habitat		✓		All watercourses within entire corridor	Potential loss of fish habitat as a result of culvert/bridge extension, repair or replacement and development of a vehicle maintenance and storage facility.	Design transitway cross-sections to avoid modifications at culverts/bridges. Avoid in-water work to the extent possible. Minimize the area of in-water alteration to the extent possible. Follow in-water construction timing restriction. Perform all in-water work in the dry using a temporary flow bypass system.	A harmful alteration of fish habitat may result from a culvert extension at Rouge River Tributary 2 and development of the vehicle maintenance and storage facility at Langstaff Road at Don River Tributary 3.	Negotiations with regulatory agencies during detail design. Compensate for the harmful alteration of fish habitat. Opportunity to enhance enclosed and degraded stream at vehicle maintenance and storage facility through stream daylighting, realignment and restoration.	Insignificant	On-site environmental inspection during in-water work. Post-construction monitoring of fish habitat compensation measures.

Table 11-3
Assessment of Environmental Effects for Objective C – Natural Environment

GOAL	Environmental Value/ Criterion	Environmental Issue/ Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
		Fish mortality		✓		All watercourses within entire corridor	Fish may be injured or killed by dewatering or physical harm.	Design transitway cross-sections to avoid modifications at culverts/bridges. Avoid in-water work to the extent possible. Perform all in-water work in the dry using a temporary flow bypass system. Capture fish trapped during dewatering of the work zone and safely release upstream. Prohibit the entry of heavy equipment into the watercourse.	None expected.	None	Negligible	On-site environmental inspection during in-water work.
C1	**Minimize adverse effects on Aquatic Ecosystems (continued)**	Barriers to fish movement		✓	✓	All watercourses within entire corridor.	Culvert/bridge extension, repair or replacement may create a barrier to fish movement.	Use open footing culverts or countersink closed culverts a minimum of 20% of culvert diameter. The culvert extension will be designed to maintain fish passage.	The culvert extension at Rouge River Tributary 2 will be designed to avoid the creation of a barrier to fish movement. No barrier to fish movement will be created at the vehicle maintenance and storage facility at Langstaff Road at Don River Tributary 3.	Negotiations with regulatory agencies during detail design.	Negligible	On-site environmental inspection during in-water work.
		Baseflow alterations		✓	✓	All watercourses within entire corridor.	New impervious surfaces can lead to changes in the frequency, magnitude and duration of flows.	Reduce the area of impervious surfaces to the extent possible. Use storm water management practices that encourage infiltration and recharge of groundwater.	None expected.	None	Negligible	Post-construction inspection of storm water management facilities to evaluate their effectiveness. On-going maintenance as required.
		Baseflow alterations – realignment of watercourse		✓	✓	Pomona Mills Creek at the proposed Maintenance and Storage Facility	Fish habitat may be destructed or disturbed.	▪ erosion and sedimentation control ▪ provide Level 1 stormwater treatment for vehicle storage and maintenance facility ▪ convey existing flow through the site during construction of the new watercourse ▪ create new channel using natural channel design ▪ construct new channel off-line in the dry ▪ stabilize new channel prior to diversion ▪ divert flow into new channel ▪ capture and safely release stranded fish ▪ in-water construction timing restriction Negotiations will occur with regulatory agencies during detail design to address the proposed realignment and naturalization of this watercourse.	▪ alteration of approximately 700 m^2 of highly degraded fish habitat anticipated ▪ opportunity to create and enhance approximately 900 m^2 of fish habitat through channel realignment ▪ therefore, net gain of 200 m^2 of fish habitat anticipated ▪ opportunity to enhance this highly degraded watercourse through natural channel design.	None required	Positive	Monitor the newly altered fish habitat
		Increased temperature		✓	✓	All watercourses within entire corridor.	Clearing of riparian vegetation and storm water management practices can impact temperature regimes.	Minimize the area of stream bank alteration to the extent possible. Use storm water management practices that encourage infiltration and recharge of groundwater.	Shading provided by culvert/bridge offsets shading lost through removal of riparian vegetation.	Restore riparian areas disturbed during construction with native vegetation.	Negligible	Post-construction inspection of storm water management facilities to evaluate their effectiveness. On-going maintenance as required. Post-construction inspection of riparian plantings to confirm survival.
		Disturbance to rare, threatened or endangered species		✓	✓	East Don River	Redside dace resident approximately 2 km upstream of Yonge Street. None known to be resident within zone of influence of the project.	No species-specific mitigation required.	None expected	None required	Negligible	None required.

Table 11-3
Assessment of Environmental Effects for Objective C – Natural Environment

GOAL	Environmental Value/ Criterion	Environmental Issue/ Concerns	Project Phase[1] P	C	O	Location	Potential Environment Effects	Proposed Mitigation Measures: Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C2	**Minimize adverse effects on Terrestrial Ecosystems**	Destruction/ Disturbance of wildlife habitat.		✓	✓	Entire corridor Rouge River Tributary 2	Construction of the transitway and associated facilities will result in the removal of vegetation and the wildlife habitat that it supports. Activities such as site grubbing, staging & stockpiling during construction could result in destruction or disturbance of migratory birds Extension of existing culvert may have potential adverse effects on migratory birds.	▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize grade changes to the extent possible. ▪ Use close cut clearing and trimming to minimize the number of trees to be removed. ▪ Delineate work zones using construction fencing/tree protection barrier. ▪ Protect trees within the clear zone using guide rail, curbs, etc. to prevent removal. No bird nesting was observed in this culvert.	Removal of 0.026 ha of cultural meadow vegetation community at the CN-Bala/GO Line and 0.013 ha of cultural meadow vegetation community at the hydro corridor south of Highway 407. Community has low habitat structure and diversity.	Restore natural areas disturbed during construction with native vegetation, where feasible. Replace ornamental vegetation as part of landscaping.	Negligible	Post-construction inspection of vegetation plantings to confirm survival.
		Wildlife mortality.		✓		Entire corridor	Removal of wildlife habitat may result in wildlife mortality.	▪ Perform vegetation removals outside of wildlife breeding seasons (typically April 1 to July 31). ▪ Perform bridge/culvert extension, repair and replacement outside of wildlife breeding seasons.	None expected	None required	Negligible	None required.
C2	**Minimize adverse effects on Terrestrial Ecosystems (continued)**	Barriers to wildlife movement.		✓	✓	Entire corridor Rouge River Tributary 2	Increase in the width of Yonge Street to accommodate transitway and associated facilities may create an additional impediment to wildlife movement. Culvert/bridge extension, repair or replacement may create a barrier to wildlife movement.	Enhance wildlife passage under transitway, where feasible through culvert/bridge modifications. Culvert extension at Rouge River Tributary 2 will not impede wildlife passage under Yonge Street. The function of this culvert, to provide wildlife passage by small mammals, will be maintained. Opportunities to enhance wildlife passage at vehicle maintenance and storage facility through stream daylighting, realignment and restoration.	Transitway represents an incremental increase in road width compared to existing barrier created by Yonge Street.	Use of existing culverts/bridges maintains wildlife passage under transitway and does not offer opportunities to enhance wildlife passage.	Negligible.	None required.
		Wildlife/vehicle conflicts.			✓	Entire corridor	Increase in the width of Yonge Street to accommodate transitway and associated facilities may increase the potential for wildlife/vehicle conflicts.	▪ Span bridges across the meander belt. ▪ Use oversized culverts to promote wildlife passage under the road. ▪ Stagger culvert inverts to create wet and dry culverts.	Transitway represents an incremental increase in road width compared to existing hazard to wildlife created by Yonge Street.	None required	Insignificant	None required.
		Disturbance to rare, threatened or endangered wildlife.		✓		Entire corridor	No rare, threatened or endangered wildlife identified within study area.	No species-specific mitigation required	None expected	None required	Negligible	None required.
		Disturbance to vegetation through edge effects, drainage modifications and road salt.		✓	✓	Entire corridor	▪ Clearing of new forest edges may result in sunscald, windthrow, and invasion by exotic species. ▪ Ditching, grading and other drainage modifications may alter local soil moisture regimes. ▪ Road salt may result in vegetation mortality and dieback.	▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize grade changes and cut/fill requirements to the extent possible. ▪ Use close cut clearing and trimming to minimize encroachment on remaining vegetation. ▪ Delineate work zones using construction fencing/tree protection barrier. ▪ Manage the application of road salt to the extent possible.	Vegetation communities within the study area are primarily cultural in origin and have been impacted by Yonge Street. Transitway represents an incremental encroachment into these already disturbed communities.	Landscape treatments	Insignificant	None required.

Table 11-3
Assessment of Environmental Effects for Objective C – Natural Environment

GOAL	Environmental Value/ Criterion	Environmental Issue/ Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
		Rare, threatened or endangered flora.		✓		Yonge Street and High Tech Road, Yonge Street at Railway Underpass	Three regionally rare tree species are located within the study limits including black walnut, juniper and red cedar. The significance of these trees is diminished since they have been planted.	▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize grade changes to the extent possible. ▪ Use close cut clearing and trimming to minimize the number of trees to be removed. ▪ Delineate work zones using construction fencing/tree protection barrier. ▪ Protect trees within the clear zone using guide rail, curbs, etc. to prevent removal.	Trees may be removed by the transitway and its associated facilities.	None required	Insignificant	None required.
C3	**Improve regional air quality and minimize adverse local effects**	Degradation of existing local and regional air quality when compared to MOE standards			✓	York Region	Situation expected to be unchanged or marginally better than 2001	The fleet average emissions will drop significantly due to technological improvements balancing the increase in traffic volumes. The proposed Rapid Transit will divert commuters from individual highly polluting sources (single passenger automobiles)	Forecast improvement in all pollutants assessed (PM_{10}, NO_x, SO_2, CO) when comparing 2021 forecasts with and without the proposed Rapid Transit (see Tables 4.3 and 4.4 of **Appendix K**, 1.6% decrease in PM_{10}, 2.0% decrease in NO_x, 1.9% decrease in SO_2, and 3.0% decrease in CO)	None required	Positive Effect	None required
		Increase in emissions of Greenhouse Gases (GhG)			✓	York Region	Fewer GhGs are expected to be emitted	Compared to the status quo (no additional transit) there will be far less GhGs emitted per commuting person	Reduced per capita emissions of GhGs (overall annual reduction of 54 kilotonnes of CO_2 forecast in 2021)	None required	Positive Effect	None required
		Degradation of air quality during construction		✓		Yonge Street Corridor	Some dust is expected during the construction period.	The law requires that all possible pollutant emission mitigation steps possible be taken during construction activities	Some PM emissions locally.	None required.	Negligible	None recommended
		Air quality impacts due to Rapid Transit vehicle maintenance and storage activity			✓	Langstaff Road	Vehicle maintenance emissions experienced by nearest sensitive receptors will/will not exceed ambient standards	All maintenance activities will improve the operation of the engines thereby emitting fewer pollutants.	Increased impact on some local receptors but applicable standards not expected to be exceeded.	None required	Negligible	None recommended.
C4	**Minimize adverse effects on corridor hydro-geological, geological and hydrological conditions**	Increased pavement; decreased infiltration			✓	Entire corridor Proposed Maintenance & Storage Facility	Minor increase in quantity of surface runoff. Minor decrease in quantity of groundwater. Lower quality of surface water.	Storm water management facilities such as grassed swales and storm water ponds. Stormwater Management Plan should comply with the applicable provisions of the Oak Ridges Moraine Conservation Plan. Water quality controls up to the MOE water quality guideline of Enhanced Level (i.e. 80% TSS removal) will be required for area where an increase in impervious surface is observed. Storm water management controls (quality, quantity and erosion) will also be required for the construction of the proposed Maintenance & Storage Facility (MSF).	Minor increase in peak streamflows. Minor decrease in groundwater.	None practical	Negligible	None required

11.3.4 OBJECTIVE D: To promote smart growth and economic development in the corridor

One of the main purposes of the Rapid Transit System is to support the smart growth policies in the Region and simultaneously encourage economic development. From this perspective, the Yonge Street Transitway strongly supports Regional and Municipal planning policies, such as the Centres and Corridors urban form. In many respects, the undertaking will contribute to the intensification of underutilized sites along and encourage transit-oriented development at infill locations and vacant land along the corridor. At the same time, several built-in design characteristics, such as minor retaining measures to minimize property impacts and U-turn to provide alternate access to properties, are aimed at reducing the potential for adverse effects on business or access to social and community facilities.

Sections of the Yonge Street Corridor are seen as appropriate for possible intensification area as described in the Provincial Government's draft *Growth Plan* which has a target density of 200 residents and jobs per hectare for intensification areas.

The analysis of environmental effects and mitigation under this objective is presented below in the continuation of **Table 11-4**.

Table 11-4
Assessment of Environmental Effects for Objective D – Economic Environment

GOAL	Environmental Value/ Criterion	Environmental Issue/ Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE D: To promote smart growth and economic development in the corridor												
D1	**Support Regional and Municipal Planning Policies and approved urban structure**	Need for pedestrian-friendly streets and walkways for access to stations		✓	✓	Entire corridor	Social and economic environment could be affected if Yonge St. is not attractive and safe for pedestrian traffic.	Signalized pedestrian crosswalks will be provided at all stations and intersections; Pedestrian safety will be considered in designs for station precincts and road signage will be highly visible to both pedestrians and automobiles.	Potential for jaywalking in vicinity of stations	Platform edge treatment will discourage illegal access	Insignificant and positive	Monitor traffic accidents involving pedestrians to establish whether cause is transit related.
		Locating higher density and transit-oriented development where it can be served by transitway			✓	New and redevelop-ment locations	Change in existing land use patterns along transit corridor may not be attainable	Regional/Municipal land use controls and approval processes to encourage transit-oriented development or re-development in support of OP objectives.	Redevelopment pressure on surrounding areas	Apply Municipal Site Plan approval process	Insignificant	Monitor re-development activity to control overall increase in development density
		Reflection of historical districts through urban design and built form.		✓	✓	Thornhill Heritage District/ Richmond Hill historical district	Station aesthetics may not be compatible with the character of heritage districts along the corridor.	Incorporate station designs and features that reflect the surrounding historical districts where further redevelopment is limited through consultation with community and heritage groups.	Rapid transit availability could encourage incompatible re-development	Apply Municipal Site plan approval process	Insignificant	Municipalities to monitor nature of re-development in sensitive districts
D2	**Provide convenient access to social and community facilities in corridor**	Potential barrier effects during construction and operation		✓	✓	Entire corridor	Transitway could be perceived as a barrier in access to future Town Hall, hospital, malls, parks, etc.	Construction Traffic and Pedestrian Management Plan will avoid wherever possible, barriers to entrances/exits to large attractors along Yonge Street. Transitway median design to incorporates frequent access paths during operations, particularly at community facilities	Alternative access routes to facilities may affect adjacent properties	Mark detours and alternative access points clearly	Insignificant	Monitor congestion levels during construction and traffic patterns during operations.
D3	**Minimize adverse effects on business activities in corridor**	The potential for an increase in business activity.	✓	✓	✓	Entire corridor	As Yonge Street is a highly developed corridor, increased activity could require a change in urban form.	Intensification of underutilized sites along with the development of infill locations and any vacant land can be pursued under municipal planning guidelines for transit-oriented development.	Increase in traffic; increase in workforce/ population.	Encourage intensification meeting urban form objectives.	Insignificant and positive	Monitor building applications/ permits, economic influences (employment rate, etc.)
		The potential for a decrease in business activity.		✓	✓	Entire corridor	Modification of road access could lead to displacement and/or business loss.	Implement procedures to address requests of affected businesses; Incorporate design solutions and construction methods to minimize number of businesses affected.	Decrease in traffic and work force population will be offset by increased activity due to improved transit service.	Encourage alternative compatible development	Insignificant and positive	Cooperative response to business loss concerns addressed to municipalities.
D4	**Protect provisions for goods movement in corridor**	Ease of Truck Movement			✓	Entire Corridor	Median transitway will restrict truck movement in corridor	Provided U-turns at major intersections to allow for truck access to side streets and properties. Traffic analysis at intersections indicated sufficient capacity for trucks using U-turns	Intersections with no station in median does not allow sufficient turning width for WB 17(articulated trucks)	Traffic signs prohibit large truck at stations with no stations in median. Designate truck routes	Insignificant	Monitor and widen Yonge with right turn tapers at side streets to allow for movement

Table 11-4
Assessment of Environmental Effects for Objective D – Economic Environment

GOAL	Environmental Value/ Criterion	Environmental Issue/ Concerns	Project Phase[1]			Location	Potential Environment Effects	Proposed Mitigation Measures			Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O			Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation		
OBJECTIVE D: To promote smart growth and economic development in the corridor												
		Ease of Truck Movement		✓		Entire Corridor	Construction may limit access for trucks	Traffic management plan to ensure truck access at all times	May not be possible in some areas	Designate alternative truck routes	Negligible	None required

Notes: **P** – Pre construction, **C** – Construction, **O** – Operation

11.4 ENVIRONMENTAL EFFECTS ASSESSED FOR CEAA REQUIREMENTS

11.4.1 Cumulative Effects

Cumulative environmental effects are defined as, *"… the effects on the environment caused by an action in combination with other past, present and future human actions"* (CEAA, 1999). They occur when two or more project-related environmental effects, or two or more independent projects, combine to produce a different effect. The effects may be positive or negative, and may have regional as well as site-specific implications. They can be assessed on the basis of their spatial and temporal boundaries.

11.4.1.1 Spatial Cumulative Effects

Spatial cumulative effects may be experienced by:

- crowding of more than one project or activity within a single space;
- compounding of effects from a localized activity with other activities or conditions over a broader (i.e., regional) area;
- indirect consequence of an activity's effect on a seemingly unrelated activity of condition; and
- fragmenting the value of a larger environmental component by small incremental changes (i.e., nibbling).

The facilities planned for the Yonge Street Corridor transitway have been sited in locations and designed in configurations such that there will be no spatial cumulative effects during the construction and operation of the rapid transit service.

During project implementation, staging of the construction of elements of the undertaking will ensure that temporary construction disruption does not present a risk of reaching an unacceptable level of adverse effect on community and business access and mobility. Traffic accommodation, noise and dust control measures will be planned and designed to mitigate the overall level of construction activity at any one time and location. Monitoring programs will be followed to verify that the level of construction activity is not accumulating to a level with potential for adverse effects on the social and natural environment.

Similarly, operation of the rapid transit service in the Yonge Street Corridor simultaneously with the proposed service in the Highway 7 Corridor will not produce any adverse cumulative effects. The services will use separate transitways and the size and configuration of the intermodal terminal at Richmond Hill Centre will accommodate both services. The commercial land uses surrounding the station are not sensitive to the noise levels projected for the combined operations in the future. If re-development of the lands around the facility takes place in the future, it will very likely remain commercial due to the proximity of the Hydro right-of-way and the role of the area as a transportation hub.

11.4.1.2 Temporal Cumulative Effects

Temporal cumulative effects may be experienced by:

- accumulation of repetitive yet insignificant effects, reaching a significant level (i.e., crossing a threshold) over a long period of time.

11.4.2 Timelags Whereby the Effects of Short-term Activities are not Experienced until the Future

The one potential temporal cumulative effect has been identified and discussed in **Chapter 5** under the evolution of technologies on the proposed rapid transit network. This relates to the potential loss of BRT service reliability on the Toronto portion of the corridor between Steeles Avenue and the Finch subway station. As indicated, this future condition may require extension of the TTC subway system or the introduction of an LRT based service to York Region. The growth in transit ridership and its effect on the frequency of BRT vehicles required in this portion of the corridor will be monitored during the first 10 years of operation of the system. Any adverse effects of the combination of an enhanced York Region service and Toronto's proposed improvements between Finch and Steeles Avenue will be addressed jointly by both municipalities through a subsequent EA in advance of the need for a change in technology.

11.4.3 Effects of a Project Malfunction or Accident

Rapid transit service will be operated mostly on dedicated lanes within the Yonge Street ROW. All transit vehicle movements will be subject to the Ontario Highway Traffic Act and general traffic will only be permitted to cross the dedicated lanes at signalized intersections. These measures will reduce the probability of a system malfunction due to collisions with other vehicles. In the event such as a collision occurs, rapid transit vehicle operators will be able to obtain instant assistance from the transit control centre. If required, the centre will request emergency response services that will be able to reach the site of the incident using the general traffic lanes and, when necessary, the median crossings for emergency vehicles provided at regular intervals along the routes. This will permit management of any environmental hazards at incidents by the appropriate emergency service.

The maintenance and storage of rapid transit vehicles will be carried out at the Region's maintenance facility proposed in the Langstaff industrial area of Markham. This facility will be designed to comply with all safety and environmental protection requirements of the Ontario Building Code Act and will only be constructed after a municipal building permit and all other agency permits have been obtained. This will minimize any adverse effects on the environment of malfunction of systems or equipment at the facility. Examples of measures to control the consequences of malfunctions at the facility include oil and grease separators in the drainage system to prevent contamination of adjacent watercourses, containment measures in areas where fuel is stored or dispensed and fire protection to avoid the release of toxic materials in the event of an accident.

11.4.4 Effects of the Environment on the Undertaking

All infrastructure required for the undertaking will be designed to function satisfactorily and safely in the range of environmental conditions stipulated in the applicable Ontario design codes and standards. Since the infrastructure and systems anticipated comprise typical road and rail transit facilities, proven in service in the transportation industry in Canadian urban environments, no adverse effects of normal environmental conditions are expected.

The service will be operated mostly in existing road rights-of-way where drainage systems and snow or ice clearing measures will mitigate the effects of severe weather conditions on operations in both summer and winter. Where exclusive rights-of-way are used for rapid transit, the Region will provide all necessary transitway maintenance services to enable safe operation in all normal weather conditions. In the event that extreme conditions (e.g. blizzards or hurricanes), make rapid transit operation unsafe, services will be halted and reinstated under direction from the Region's Transit System Control Centre.

11.4.5 Full Life-cycle Effects

The assessment described in Chapter 11 considers the potential environmental effects during both construction and operation of the undertaking. In accordance with the requirements of the CEAA, the effects during the remaining phase of the project life-cycle, the Decommissioning phase are discussed below.

York Region's rapid transit service is planned as a permanent public service with facilities designed for a service life of 30 – 50 years. Consequently, most of the infrastructure will be maintained or replaced to support the service for the foreseeable future. The only instance where a component may be decommissioned would be if the Region decided to replace all or part of the Maintenance Centre with another facility at another site. If this were to occur, the Region would decommission the facility in accordance with all requirements of the relevant.

12. IMPLEMENTATION PROCESS

12.1 CONTEXT

Chapter 1 of this report has described the Regional Municipality of York's commitment to put in place a comprehensive network of rapid transit services linking the four designated regional centres. The Plan has as its focus, the early provision of a viable alternative to increasing automobile dependence for mobility in the Region.

The Yonge Street Corridor undertaking, described in **Chapter 10**, is the primary north-south corridor in York Region's proposed four-corridor Rapid Transit Plan. In addition, travel demand modelling has indicated that rapid transit service on Yonge Street will attract the highest transit ridership on the network. Consequently, the Region's plans for the evolution of the network place a high priority on early implementation of facilities and service in this corridor.

This Environmental Assessment Study constitutes the first step in the implementation process which will include all the traditional phases of preliminary and detailed design, construction, testing and commissioning of systems and installations and finally operation of rapid transit service.

12.2 PROJECT IMPLEMENTATION PLAN

In support of the Environmental Assessment studies, the preferred transitway design has been developed to a Functional Planning level of detail including both horizontal and vertical alignment of the preferred transitway alternative. Also, preferred locations for the at-grade stations have been identified and conceptual layouts for insertion of prototypical station facilities developed at each station site.

12.2.1 The Design Phase

The infrastructure planning undertaken during the study is considered adequate to identify the effects of implementation and operation of the undertaking and establish whether any mitigation is needed and what form it should take. Following approval of the EA by both provincial and federal agencies, further preliminary design and subsequently, detailed design will constitute the first stage of the Region's implementation plan.

Selection of bus rapid transit (BRT) as the preferred initial technology allows the facilities to be constructed and the service to be operated in stages along the length of the corridor. The timing and extent of each stage implemented and operated will depend on the availability of funding and the period required for construction of each stage.

Once these factors have been determined, a work plan to carry out the detailed design will be developed. This plan must recognize that the Region has decided to implement rapid transit featured services with new buses in mixed traffic in the corridors prior to and during construction of the dedicated lanes which is not part of the undertaking. Consequently, the Maintenance and Storage Facility (MSF) at Langstaff will be the first component to be designed for early approval and construction as soon as land acquisition is complete.

It is likely that the design phase for transitway infrastructure will be completed sequentially in three segments along the route, each timed to allow sufficient time for post-EA approvals prior to the scheduled start of construction in each segment. Besides the MOE and CEAA approvals of the EA itself, examples of these approvals are:

- Municipal Building Permits, mainly for the MSF;
- TRCA permits;
- OWRA Section 53 approvals for the proposed storm sewers and end-of-pipe stormwater management facilities;
- Federal DFO authorization;
- If required, EPA approvals for waste disposal at the MSF;
- Permits under the Lakes and Rivers Improvement Act for alternations to the watercourses and/or stream crossings; and
- Any Ontario MNR approvals.

Potentially, the implementation segments would be Steeles Avenue to Highway 7, Highway 7 to Major Mackenzie Drive and finally all works further north to 19th Avenue. Component designs, in each segment, will incorporate and define in detail, all mitigation measures identified as necessary, for both construction and operation, in **Chapter 9** of this report. Also, on completion of the design activities, detailed construction staging plans including traffic management measures and all temporary works will be prepared.

12.2.2 The Construction Phase

12.2.2.1 The Maintenance and Storage Facility

As indicated above, the early introduction of BRT services in mixed traffic in the corridors, including Yonge Street, will require operational bus maintenance and storage facilities at the earliest practical time after approval of the EA and acquisition of the property. Hence, the initial phase of the proposed facility will be the first element of this undertaking to be constructed. This initial phase will comprise construction of:

- site grading and drainage systems;
- access and circulation roadways;
- administrative offices;
- the control centre;
- repair bays;
- bus storage concentrated in the northeast quadrant of the ultimate site;
- site fencing and security systems.

It is expected that construction of the initial phase will commence as soon as land acquisition is complete, expected to be late in 2006. Completion of the initial facility is scheduled for early 2007.

Realignment of the creek across the west side of the MSF site is not needed to construct this phase. Subsequent phases, to complete the ultimate facility, will be scheduled when required to support transit vehicle fleet expansion during the operating life of the undertaking. These will likely be completed during the first 10-12 years.

12.2.2.2 The Transitway and Stations

Implementation of the transitway by segment was introduced in the discussion on design approach above. Assuming continuity in the availability of funding for construction, it is anticipated that construction of the transitway and associated station facilities will commence in late 2006 in the southernmost segment between Steeles Avenue and Langstaff Road. Work in this 6 km segment will continue through the 2007 and 2008 construction seasons.

It is assumed that, if approved, construction of transit infrastructure improvements in the short Toronto section of Yonge Street between Steeles Avenue and Finch Subway Station will be carried out simultaneously. If a median transitway is not implemented south of Steeles Avenue, the necessary works to permit a transition from median lanes to existing curbside HOV lanes will be implemented north of Steeles Avenue.

In late 2007, preparatory works such as utility relocations, will commence in the 4 km central section between Highway 7 and Major Mackenzie Drive as well as the 2.7 km northern section between Crosby and 19th Avenues. Transitway and station construction, consisting of the activities described above, will be carried out during the 2008 and 2009 construction seasons. Construction of the curbside station in the Wright St./Crosby Ave. area of the mixed-traffic section in the Richmond Hill business district will be scheduled to coincide with completion of the transitway section south of Major Mackenzie Drive.

Prior to commencing construction in the Yonge Street right-of-way, a comprehensive, detailed Traffic Management Plan will be prepared in

consultation with regional and local municipal traffic operations staff, emergency services personnel and owners of businesses generating major traffic movements. The plan will include:

- traffic signal modifications to control left and U-turns;
- distribution of available roadway width for traffic lane diversions;
- sequencing of shifts of construction and traffic between sides of Yonge Street;
- measures to preserve vehicle and pedestrian access to adjacent properties;
- measures to maintain access for emergency vehicles;
- locations and details of signage and barriers; and
- methods to permit transit operations during construction.

Within each of the segments discussed above, road-widening works, to develop the median right-of-way for transit, will be staged to minimize the temporary disruption due to traffic lane diversions and narrowing.

12.3 ENVIRONMENTAL COMMITMENTS

The purpose of this section is to outline commitments made by York Region to undertake environmental mitigation measures to ensure compliance with the requirements of the government agencies responsible for the review of this Environmental Assessment.

Table 12-1
Summary of Environmental Concerns and Commitments

Environmental Issue/ Concern/ Effect			Environmental Commitments		
I.D. #	**Details**	**Potentially Interested Group/ Agency**	**I.D.#**	**Details**	**Comments**
1	Fisheries and Aquatic Habitat	EC, MNR, DFO, MOE, TRCA	1.1	Transitway design will comply with MTO's *Environmental Protection Requirements for Transportation Planning and Highway Design, Construction, Operation and Maintenance*, including the Oak Ridges Moraine Component, and the *Environmental Best Practices* and a copy of these documents to be obtained during the detailed design phase once they are finalized.	Appendix E
			1.2	A *Fisheries Act* authorization will be secured for Pomona Mills Creek realignments at the MSF site during the detailed design phase.	Appendix E
			1.3	Discussion with TRCA will be carried out during the detail design phase to determine if a HADD will occur at one culvert extension, and if so, to secure a Fisheries Act authorization.	
			1.4	*Natural Channel Design* principles to be followed in the construction of the realignment of the Pomona Mills Creek at the proposed MSF site. Consultations to be held with regulatory agencies during detail design to address the proposed realignment and naturalization of this watercourse.	Appendix E
			1.5	The MSF design will be coordinated with the *Pomona Mills Creek Environmental Rehabilitation Project*.	Appendices E & M
			1.6	Any proposed in-stream work and site-specific mitigation measures will be carried out as outlined in Table 8 of the Natural Science Report (**Appendix E**).	Appendix E
2	Wildlife Habitat	MNR, TRCA, DOE, EC	N/A	N/A	N/A
3	Vegetation and Wetlands	MNR, MOE, TRCA, DOE, EC	N/A	N/A	N/A
4	Groundwater Resources	MOE, TRCA	4.1	Well inspection will be conducted prior to construction to establish baseline conditions. In the event that wells are required to be closed, closure will proceed in accordance with O.Reg.903 of the *Ontario Water Resource Act*.	Appendix H
5	Surface Water Resources	MOE, MNR, DOE, TRCA	5.1	A detailed Storm Water Management Plan (SWMP) will be developed in accordance with the MOE's *Stormwater Management Planning and Design Manual (2003)* and comply with the objectives in Section 46(1) of the *Oak Ridges Moraine Conservation Plan* (ORMCP).	Section 10.6, Appendices E & M
			5.2	The project will use planning, design and construction practices included in Section 45(2) of ORMCP to protect water resources.	Appendix E
			5.3	In accordance with ORMCP Section 45(8), no new stormwater management ponds will be located in key natural heritage features or hydrologically sensitive features.	Appendices E & M
			5.4	Water quality controls up to the MOE water quality guideline of Enhanced Level (80% total suspended solids removal) will be required for areas where an increase in impervious surface is observed, also in Section 45(6) of ORMCP.	
			5.5	The SWMP will follow the approach, described in Section 46(2) of ORMCP, to stormwater management where applicable.	Appendices E & M
			5.6	The SWMP will be prepared in accordance with the *Rouge River Comprehensive Basin Management Study* (TRCA 1990) as required in Section 46(3) of ORMCP.	Appendices E & M
			5.7	The SWMP will not use new rapid infiltration basins and columns facilities within Plan Areas as required in Section 47(1) of ORMCP.	Appendices E & M
			5.8	Storm water management controls to be applied for the construction of the proposed MSF.	Section 11.4.3
			5.9	An Erosion and Sediment Control Plan will be developed to manage the flow of sediment into storm sewers and watercourses and to monitor erosion and sedimentation control measures during construction.	Section 10.6
6	Air Quality & Energy	MOE, EC	N/A	N/A	N/A
7	Contaminated Soil	MOE	7.1	In the event contaminated sites are identified after construction activities begin, a contingency plan will be prepared to outline the steps that will be taken to ensure that contaminant release will be minimized and appropriate clean-up will occur. The site clean-up procedure of the plan is subject to the *MOE's Brownfield's* legislation and the *Record of Site Condition Regulation* (O.Reg. 153/04)	Appendix I
8	Noise and Vibration	MOE	N/A	N/A	N/A
9	Effects on Businesses and Other Land Uses	MOE	9.1	A parking need assessment and management study to be performed.	Section 10.1.7
10	Level of Accessibility	Catholic Cemeteries	10.1	Catholic Cemeteries will continue to be advised of details of the intersection design at the Holy Cross cemetery entrance design.	Section 13.2
11	Archaeological Resources	MTCR, Municipal Agencies,	N/A	No commitments required at this time.	Appendix J

Table 12-1
Summary of Environmental Concerns and Commitments

Environmental Issue/ Concern/ Effect			Environmental Commitments		
I.D. #	**Details**	**Potentially Interested Group/ Agency**	**I.D.#**	**Details**	**Comments**

Table 12-1
Summary of Environmental Concerns and Commitments

Environmental Issue/ Concern/ Effect			Environmental Commitments		
I.D. #	Details	Potentially Interested Group/ Agency	I.D.#	Details	Comments
		Municipal Heritage Planners, LACAC, TRCA			
12	Heritage Resources/ Cultural Landscape	Vaughan	12.1	Continue to work with Thornhill Heritage Committee during the design phase with respect to the existing community settings.	Section 11.3.2
13	Operational	Toronto	13.1	City of Toronto and TTC staff will be consulted during the monitoring of the service as it relates to capacity and technology requirements and service integration.	Section 10.1
			13.2	City of Toronto staff will continue to be advised on the status of the Undertaking including consultation during the remainder of the EA phase, detailed design and construction to provide coordination between projects.	Section 10.1

12.4 MONITORING

The purpose of this section is to outline commitments made by York Region to monitor the project activities to ensure compliance with the requirements of the government agencies responsible for the review of this EA.

12.4.1 Construction Monitoring

During the construction of the transitway, the Region will carry out monitoring activities in accordance with a comprehensive **Monitoring Program** to be finalized during the detailed design phase. The plan will set out the purpose, method and frequency of all monitoring activities and provide the framework for recording and documenting their results.

The following outline of the plan documents York Region's commitment to measure the effects of transitway and maintenance facility construction activities on the elements of the environment listed.

Table 12-2
Construction Monitoring

Environment Element	Purpose of Monitoring	Monitoring Method	Monitoring Frequency
Effect of construction on water quality and quantity in watercourses	To confirm that water quality is not being adversely affected by construction activity	Monitor sediment accumulation after rain events during construction to ensure that the proposed mitigation measures in the Erosion and Sediment Control Plan have been satisfied.	After first significant rain event
Potential Loss of site-specific aquatic habitat due to structural work and development of a vehicle maintenance and storage facility.	To avoid or reduce the potential loss of site specific aquatic habitat	On-site environmental inspection during in-water work. Post-construction monitoring of fish habitat compensation measures.	As required by construction schedule for in-water work activities. As well as on completion of construction works on structures.
Fish may be injured or killed by dewatering or physical harm.	To avoid or reduce fish mortality.	On-site environmental inspection during in-water work.	As required by construction schedule for in-water work activities.
Culvert/bridge extension, repair or replacement may create a barrier to fish movement.	To maintain fish passage.	On-site environmental inspection during in-water work.	As required by construction schedule for in-water work activities.
Destruction/ Disturbance of wildlife habitat due to removal of vegetation during construction	To ensure minimum disturbance to wildlife habitat	Post-construction inspection of vegetation plantings to confirm survival.	On completion of construction works adjacent to vegetative areas.
Noise generated by construction activities	To ensure noise levels comply with Municipal by-laws	Site measurements of levels produced by representative equipment/activities	At time of introduction of equipment/ activities producing significant noise level with potential to disturb sensitive areas.
Effect of construction activities on air quality(dust, odour,)	To confirm that local air quality is not being adversely affected by construction activity	Regular inspections of site dust control measures and of construction vehicle exhaust emissions	Monthly during construction seasons.
Condition of heritage homes adjacent to transitway alignment	To determine if any damage/deterioration is due to construction activity	Pre-construction inspection to obtain baseline condition and monitoring during nearby construction	As required by construction schedule for work adjacent to heritage features.
Effect of construction on boulevard trees	To ensure the survival of boulevard trees	Inspection of protective measures and monitoring of work methods near trees	Prior to commencement of work and bi-weekly during work activities.
Potential barrier effects during	To avoid barriers to entrances/exits to large	Monitor congestion levels	After temporary

Table 12-2
Construction Monitoring

Environment Element	Purpose of Monitoring	Monitoring Method	Monitoring Frequency
construction and operation	attractors along Yonge Street and to ensure the effectiveness of the Construction Traffic and Pedestrian Management Plan	during construction and traffic patterns during operations.	access works have been installed and during on going inspection of construction works.

Environmental protection measures will be stipulated in all appropriate construction specifications that will form the contractual basis for carrying out the works. The **Monitoring Program** will include procedures for implementation of mitigation of any adverse effects identified as well as contingency measures to respond to unexpected adverse impacts. In addition, the plan will set out the responsibilities of inspection staff assigned to carry out the monitoring program described above. The staff will report to an independent Environmental Compliance Manager who will have overall responsibility for execution of the **Monitoring Program**.

12.4.2 Operations Monitoring

The **Monitoring Program**, described above, will also include a methodology and associated procedures to continue the necessary monitoring during revenue operations to confirm compliance with the commitments documented in the EA Report. The Program will include regular monitoring activities as well as the procedure to be adopted in the event that adverse effects are identified between regular inspections. Monitoring activities during rapid transit operations will encompass the following:

Table 12-3
Operations Monitoring

Environment Element	Purpose of Monitoring	Monitoring Method	Monitoring Frequency
Baseflow alterations	To ensure the frequency, magnitude and duration of flows is not adversely affected by new impervious surfaces	Post-construction inspection of storm water management facilities to evaluate their effectiveness. On-going maintenance as required.	After significant storm events following completion of construction facilities.
Fish habitat may be destructed or disturbed due to realignment of watercourse (Pomona Mills Creek at the	To ensure a health fish habitat after watercourse realignment	Monitor the newly altered fish habitat	Twice per year in spring and fall

Table 12-3
Operations Monitoring

Environment Element	Purpose of Monitoring	Monitoring Method	Monitoring Frequency
proposed MSF)			
Temperature increase due to clearing of riparian vegetation and storm water management practices	To ensure minimum change in temperature for aquatic habitat	Post-construction inspection of riparian plantings to confirm survival.	Twice per year in spring and fall
Effect of snow and ice removal on water quality in corridor watercourses	To confirm that water quality is not being adversely affected by transitway and vehicle maintenance activities	Monitor sediment accumulation in storm water management facilities.	During major storm events up to five times per year
Noise generated by operation and maintenance activities	To ensure noise levels comply with Municipal by-laws	Pass-by and idling measurements of levels produced by representative vehicles /activities	Initially after revenue service is introduced and in response to concerns or after any major increase in service frequency.
Effect of rapid transit operations on local air quality (pollutants, odour,)	To confirm that local air quality is not being adversely affected by transit vehicle activity at terminals/facilities	Regular inspections of measures and of transit vehicle exhaust emissions	Initially after facilities are placed into service and at five-year interval during vehicle life.
Condition of heritage homes adjacent to transitway alignment	To determine if any damage/deterioration is due to vibrations produced by transit vehicles	Post-construction inspection to obtain baseline condition and monitoring during pass-by operations	Initially after revenue service is introduced and in response to concerns or after any major increase in service frequency.
Effect of operations and maintenance on boulevard trees	To ensure the survival of boulevard trees	Inspection of protective measures and monitoring of work methods near trees	Annually
Potential effect of transit vehicle access to MSF on local traffic circulation	To ensure minimum interruption to local traffic circulation	Monitor signal operations	Initially after facility is placed into service and after any major expansion of facility activities.
Effect of operations of RT on intersection operation and access to minor side streets and properties along Yonge St. using U-turns	To ensure acceptable level of service at intersections and accessibility to minor side streets and properties along Yonge Street	Monitor intersection performance and conflict potentials. Prohibit Right Turns On Red movements from the side street at these locations if necessary	Initially after introduction of RT service and during the Region's regular assessment of intersection performance.
Provision of median crossing for Emergency Response Services vehicles only	To ensure the operation of the ERS vehicles	Obtain feedback from ERS staff on performance of access provisions.	Initially after completion of emergency access facilities and through regular transit authority consultation with the emergency services.

Table 12-3
Operations Monitoring

12.4.3 Vehicle Conversion from BRT to LRT

The **Monitoring Program** will involve a methodology for reviewing the timing for conversion in vehicle technology from BRT to LRT. Ridership will be monitored between 2007 and 2011, and by 2012 a major review of the YRTP project will be undertaken to determine if the underlying assumptions about growth (population, employment and other activities) in York Region have taken place. This review will determine if the ridership response to the YRTP service has also met expectations. The traffic operations within the Corridor and at intersections will be reviewed to determine the level of service (LOS). The advantages of technology conversion to LRT technology will be assessed before making a final decision on the timing of LRT implementation (improvement in overall traffic operations, travel time savings, impact to overall ridership, service reliability etc.).

During the monitoring, consultation with the City of Toronto and TTC staff will take place in relation to capacity and technology requirements and service integration. In addition, the consultations will review the TTC subway extension priorities at that time to establish if, and when an extension of the Yonge Subway to Highway 7 will be forthcoming. A report will be presented to Regional Council in open session, following the printing of newspaper notices advising the public of the proposed technology transfer from BRT to LRT.

12.5 MODIFYING THE PREFERRED DESIGN

In discussing the process to change the preferred design, it is important to distinguish between minor and major changes. A major design change would require completion of an amendment to this EA, while a minor change would not. For either kind of change, it is the responsibility of the Regional Municipality of York, as proponent, to ensure that all possible concerns of the public and affected agencies are addressed.

Minor design changes may be defined as those which do not appreciably change the expected net impacts associated with the project. For example, a design change in lighting treatment and landscaping as well as minor changes to median width, vehicle lane widths, design speed of roadway curbs in the North Section and underground infrastructure to be renewed. Such changes could likely be dealt with during the design phase and would remain the responsibility of York Region to ensure that all relevant issues are addressed.

Due to unforeseen circumstances, it may not be feasible to implement the project as described in this EA report. Accordingly, any significant modification to the project or change in the environmental setting for the project which occurs after the filing of this EA shall be reviewed by York Region and an addendum to the EA shall be prepared.

13. CONSULTATION AND AGENCY INVOLVEMENT

There are five features that are key to successful planning under the Environmental Assessment Act. These five features, described in the "Interim Guidelines on Environmental Assessment Planning and Approval, Ministry of Environment, 1989" are:

- Consultation with affected parties;
- Consideration of reasonable alternatives;
- Consideration of all aspects of the environment (i.e., natural, social, economic, cultural and technical);
- Systematic evaluation of net environmental effects; and
- Clear and complete documentation of the planning process.

The consultation process developed for this study contributes to the achievement of each of these key features. As such an extensive public involvement program was followed during the EA. The study was organized so that interested parties were:

- Informed throughout the study by the use of various communication channels and techniques;
- Involved throughout the study period and as well notified of appropriate milestones;
- Provided access to current information in an efficient manner;
- Provided sufficient time to respond to question and data request; and
- Encouraged to participate in an issue identification and resolution process.

The program ensured that concerns and issues were brought forward early and addressed appropriately in the course of the study. In addition, ***Public Consultation Centres*** were organized on several occasions for the general public to review and comment on the findings and progress of the study. These were advertised in local newspapers and mail-drop notices. A mailing list, carried over from the ToR preparation, was also maintained and updated during the course of the study.

When appropriate, meetings with specific interest groups were held to deal with localized issues and many formal meetings and presentations were organized with various stakeholders within the Study Area. As well, information regarding the status of the EA study was available on the Region's website throughout the study.

Since the preparation of the ToR, most of the Technical Advisory Committee (TAC) members have continued their involvement in the EA, although some members have decided not to participate since the limits of the EA Study were set outside of their jurisdiction. Others, even though representing agencies that were outside the reduced study limits, remained on the TAC as York Region still intends to introduce transit priority measures north of the current study limits (i.e., From 19th Avenue to Newmarket) within their jurisdiction.

Participating technical agencies have continued to be involved during the EA Study and were actively involved in scoping the issues, developing and assessing alternative alignments, and developing mitigating measures for unavoidable impacts. Consultation with agencies was held through formal TAC meetings, site visits, workshops and correspondence.

The public, including the general public, communities, interest groups and property owners (residential/business/other) were offered several opportunities to review the study findings and provide input.

The public had four formal opportunities to participate in the EA Study through Public Consultation Centres. In addition, representatives of key interest groups, community associations, business areas and heritage groups have been consulted through workshops, meetings and correspondence.

Technical Advisory Committee (TAC) and Technical Agencies

A Technical Advisory Committee was organized to facilitate the line of communication between the Project Team and relevant agencies, thereby ensuring a seamless integration of Rapid Transit into the Region. TAC representatives were given the opportunity at all critical milestones to express any concerns their agencies may have with regards to the project. In addition, member's input was sought at various stages throughout the study and their suggestions and comments integrated into the scope of work. Given the nature of the study, the location of the study area, the range of issues and the potential for a high level of community interest and concern, the TAC was comprised of senior staff from the following agencies:

- York Region (including York Region Transit);
- Town of Markham;
- Town of Richmond Hill;
- City of Vaughan;
- City of Toronto;
- TTC;
- GO Transit;
- Ministry of Natural Resources (MNR);
- Ministry of Transportation (MTO);
- Toronto Regional Conservation Authority (TRCA);
- Ministry of Culture.

The Environmental Assessment and Approvals Branch (EAAB) of the Ministry of the Environment (MOE) was asked to participate on the TAC but indicated that it was not their usual policy to participate in TAC meetings. Consequently, separate meetings were held with the MOE - EAAB to keep them informed of the study status and request comments. Meetings with MOE were also held to obtain input on noise and air quality protocols and methodologies.

Also, contact was initially established with CEAA to present the overall York Region Transit study on a program wide basis and to describe the three corridors through which implementation of the transit strategy was going to be undertaken. At this meeting a review the application of the Federal Environmental Assessment procedures, and requirements and procedures for the screening procedures of "Triggers" under the Canadian Environmental Assessment Act was conducted. Finally CEAA was contacted at the final stages of the preparation of the EA to plan for the review of the Report.

During the EA phase, the TAC met on seven occasions. Three of these meetings were held immediately prior to Public Consultation Centres to present to TAC members the material for the upcoming PCC's and obtain their feedback. The four other meetings were held to:

- inform the TAC committee of the evaluation methodology of the alternatives and seek input from them;
- present the preferred alternative and summarize the rationale for preferring the Yonge alignment route; and
- review the draft EA Report and obtain final feedback on the Report prior to submission to MOE.

Technical Agencies

Key technical agencies were asked to provide input through participation on the TAC. In addition, those technical agencies with a potential interest in the study, including provincial, municipal, and federal agencies, were contacted at key points during the study and requested to provide technical input and to comment on the study findings.

In particular, the Emergency Response Services including fire departments, medical service units and police departments were consulted to address the emergency response vehicle access after implementation of the median transitway and during operation of the rapid transit service.

The technical agencies that were contacted included the following (those shown with an asterisk (*) were also on the TAC):

• Ministry of Environment Environmental Assessment and Approval Branch Central Region	• Ministry of Natural Resources Aurora District* South Central Region
	• Ministry of the Solicitor General – OPP
• Ministry of Culture Heritage Operations Regional Services Branch	• Ministry of Transportation Urban Planning Office Transportation Planning Branch
• Ministry of Education York Region District School Board York Region Separate School Board CSD Centre Sud-Ouest CBD Catholique Centre Sud	• Ontario Realty Corporation
	• York Regional Fire Coordinator
	• York Region Police Chief
	• CN North America
	• GO Transit*
• Ministry of Health	• Rouge Park
• York Regional Health Unit	• Environment Canada
• Ministry of Municipal Affairs and Housing Office of the Greater Toronto Area Central Municipal services Office	• Canadian Environmental Assessment Agency – Ontario Region

The Government Review Team (GRT) for the EA was given an opportunity to provide comments on the Draft EA report. A summary of these comments and the responses to each are included in **Appendix N**.

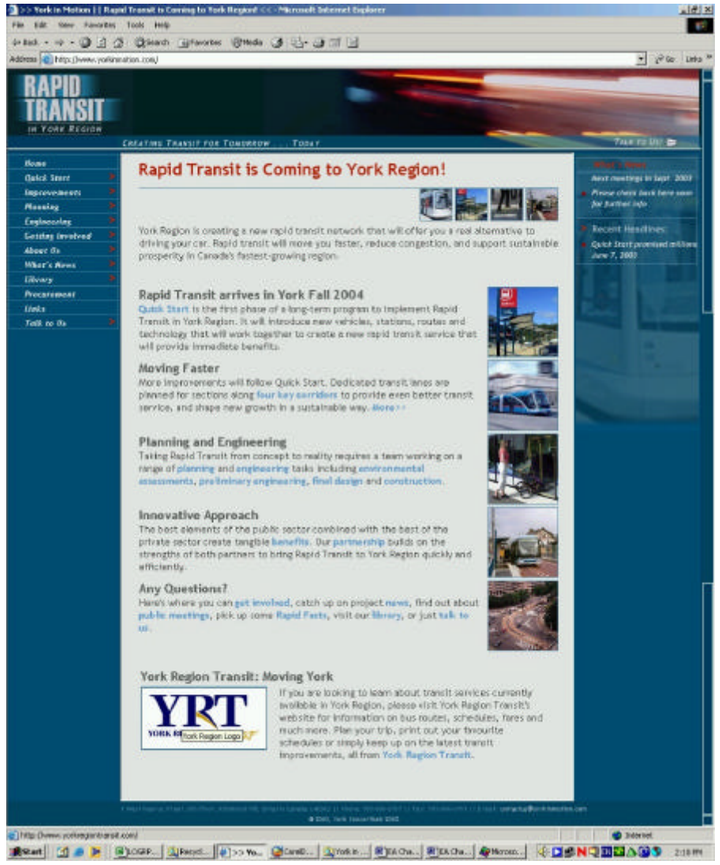
13.1 PUBLIC INVOLVEMENT PROGRAM

For the purpose of the Yonge Street EA, the public included the general public, community groups, interest groups and property owners. Input from the public was obtained in a variety of ways including:

Public Notices – Several public notices were published to introduce the study to the public, to invite interested members of the public to be placed on the mailing list and to provide any preliminary comments. Notices were placed in local newspapers, including the *Markham Economist & Sun*, the *Vaughan Citizen*, and the *Richmond Hill Liberal*, before each *Public Consultation Centre* (the local newspapers cover all households in the Study Area and are a standard avenue for the Region to publish notices and information about these types of project). In addition, for the third PCC, announcements and information material were mailed and delivered to interest groups and community associations at all addresses along Yonge Street from Steeles Avenue to 19th Avenue (13 km).

Public Consultation Centres (PCCs) – PCCs were held at four key stages during the study, including a final PCC after approval of the revised unscoped EA Terms of Reference. At each point, PCCs were held in two locations that provided geographic coverage for southern and northern parts of the Study Area along Yonge Street.

Project Website – The dedicated York Rapid Transit Website (www.yorkinmotion.com and subsequently www.vivayork.com) provided an ongoing opportunity for the public to acquire information about the project, contact the Region and the Consortium team, and provide comments.



Region's Website – During the length of the study, current and updated information about the project was available on the Region's website. The Website included information on all aspects of the three ongoing Rapid Transit EAs in the Region, as well as information pertaining to other related rapid transit initiatives.

13.1.1 Public Consultation Centres

Public Consultation Centres were an important feedback instrument throughout the study duration. Using the format of an Open House, they allowed the public to keep up-to-date on the proposed design alternatives and recommendations for each main phase of the Project. During each PCC, the public was invited to review a detailed series of display boards, ask questions to team members and provide written and verbal comments. The full Public Consultation Centre reports are presented in **Appendix B**. The main highlights of each round of Meetings were as follows:

- **First round of Public Consultation Centres**

The purpose of the first Public Consultation Centre was to familiarize the public with the YRTP program, to provide the public with an opportunity to review and provide input regarding the collection of background data and to summarize the findings of the previously completed Need and Justification Study. This study included the analysis and evaluation of alternative transportation solutions. In addition to other information, the two routes identified in the ToR were displayed and the public was asked to provide feedback on the relative opportunities/challenges that each of these routes would present as well as any specific concerns or preferences. The first round of Public Consultation Centres was held:

Where	When?
Hillcrest Mall, Town of Richmond Hill	Wednesday, November 7, 2002 (from 2:30 pm to 8:30 pm)
Centrepoint Mall, City of Vaughan	Thursday, November 28, 2002 (from 2:30 pm to 8:30 pm)

The material on display consisted of presentation boards, YRTP information banners, a continuous slide presentation and two project-specific fact sheets. Examples of this material are included in **Appendix B**.

A total of 77 people signed the visitor's "sign-in" sheet at Wednesday's PCC. Because the PCC was held in a shopping mall environment, where it is more difficult to control the signing process, it is estimated that there may have been up to 150 people who reviewed some or all of the material but did not sign in. On the Thursday, a total of 39 people signed the "sign-in" sheet. Because of similar shopping mall conditions, there were significantly more individuals who attended but did not sign in.

A “Comments” box was available at both venues for participants to submit their comments on the project and on the presentation material. In addition to numerous verbal comments, seven written comment sheets were completed and submitted (see **Appendix B**). Consultation with the public at this first round of PCCs indicated general agreement that a higher-order transit system is necessary along Yonge Street to cope with an increasingly growing vehicle congestion problem. Through verbal discussions and as documented in the comment sheets, the majority of participants support this initiative. However, some have expressed the opinion that a subway extension would be a better long-term solution to traffic and transit related problems in this corridor.

- **Second round of Public Consultation Centres**

The purpose of the second Public Consultation Centre was to review and provide input regarding the comparative assessment of the alternatives, the determination of the preferred undertaking, potential environmental effects, and proposed mitigating measures, and to obtain feedback on specific concerns or preferences. It should be noted that the PCC held on Friday at Hillcrest Mall was combined with the first Public Consultation Centre for the Highway 7 Corridor Public Transit Improvements EA. The second round of Public Consultation Centres was held:

Where	When?
Thornhill Community Centre, Town of Markham	Wednesday, February 5, 2003 (from 3:00 pm to 9:00 pm)
Hillcrest Mall, Town of Richmond Hill	Friday, February 7, 2003 (from 3:00 pm to 9:00 pm)

The material on display consisted of presentation boards, YRTP banners, a continuous slide presentation and two project-specific fact sheets. Examples are included in **Appendix B**.

A total of 32 people signed the “visitor’s sign-in” sheet at Wednesday’s PCC. Again, many more individuals attended the venue but did not sign in. At Friday’s PCC a total of 84 people signed in but it is estimated that there may have been at least 200 people who viewed some or all the material without signing in.

A “Comments” box was available at both venues for participants to submit their comments on the project and on the presentation material. In addition to verbal comments, seven written comment sheets were completed and submitted in the “Comment Sheet” box at the venue on Wednesday. Another twelve comment sheets were submitted at Friday’s session. In summary, responses to the comment sheet and other observations gathered by the team indicate that the Rapid Transit Program is a welcome solution to an increasingly growing traffic congestion problem along Yonge Street. The majority of participants supported the project and liked to see it implemented sooner rather than later. There were some concerns associated specifically with the Thornhill Heritage District, which were addressed prior to the next Public Consultation Centre meeting. The consultation record in **Appendix B** contains copies of the comment sheets submitted.

The most frequent comments/concerns expressed by the participants at the second Public Consultation Centre were:

- Support for a Rapid Transit system along Yonge Street;
- The opinion that fast travelling speeds, passenger comfort, overall convenience, fare affordability and general safety were the most important factors to a successful RT system;
- Park and Ride facilities should be provided in association with a proposed Rapid Transit program along Yonge Street;
- Concern that the proposed transitway will have a negative impact on the Thornhill Heritage District

- **Third round of Public Consultation Centres**

The purpose of this third Public Consultation Centre was to present to the public the preferred alignment for a median transitway and describe its’ main characteristics as the recommended undertaking. The third round of Public Consultation Centres was held:

Where	When?
Hillcrest Mall, Town of Richmond Hill	Friday, June 6, 2003(from 2:30 pm to 8:30 pm)
Yorkhill Elementary School	Monday, June 9, 2003 (from 6:00 pm to 9:00 pm)

The material on display consisted of presentation boards, YRTP banners, a continuous slide presentation and one project-specific fact sheet explaining the reasons for retaining the Yonge Street alignment and a general description of the transitway. The Region of York also used the opportunity offered by this PCC to present a series of Planning Policy boards that were in support for transit related development within the corridor. Upon arrival, attendees were asked to sign a visitor “sign-in” sheet. **Appendix B** contains a record of the material presented.

A total of 100 people signed in at both PCC’s, 61 people on the Friday and 39 at the Monday PCC. Given the congested “mall” environment at the Friday meeting, it was difficult to ensure that all the visitors signed in. For this reason, it is estimated that about 150 visitors actually attended the exhibits on that day. Most people signed-in on the Monday evening.

During this third round of PCCs, the proposed Yonge Street alternative was confirmed to be the preferred option for the participants. Concerns associated specifically with the Thornhill Heritage District were again brought to the attention of the consultant and the proposed mixed traffic operation in the Old Richmond Hill business district seemed to satisfy most objections brought forward at the second PCC.

Although, several residents had specific concerns with property issues, it was possible during the meetings to address all requests for detailed explanations at specific locations. The modified left turn movements, brought about by the median location of the transitway on Yonge Street, was brought to the attention of the public. In most cases, the participants were satisfied with the “U” turn option that would replace, in most cases, the current left turn situation. To the knowledge of the consultant, all the residents potentially affected by the project were satisfied with the answers to their questions. The most frequent comments/concerns expressed by the participants at this third round of Public Consultation Centres were:

- The retained option along Yonge Street was supported by a majority of the participants;
- Since this PCC dealt with a more specific alignment for the transitway, several landowners or area residents were concerned about potential land acquisition on their property or the property where their building is located;
- Several area residents expressed concerns that the transitway would increase local traffic within and along the Yonge Street Corridor; and
- Concern that the proposed transitway will have a negative impact on the Thornhill Heritage District was again expressed, as it was during the second PCC.

- **Fourth and final round of Public Consultation Centres**

A final series of Public Consultation Centres was convened after the July 2004 approval of the revised ToR for the EA study. These centres, held on the dates below provided an opportunity for the public to review the findings of all steps in the EA process including an overview of the findings of the analysis of both alternatives to the undertaking (alternative transportation solutions) and alternative methods of carrying out the undertaking (routes and technologies).

Where	When?
Hillcrest Mall, Town of Richmond Hill	Saturday, Sept 11, 2004 (from 12:30 pm to 6.00 pm)
Promenade Mall, City of Vaughan	Thursday, Sept 9, 2004 (from 3:00 pm to 9:00 pm)

Again, the material on display consisted of presentation boards, YRTP information banners, a continuous slide presentation and two project-

specific fact sheets explaining the components of the Yonge Street transitway design and the environmental benefits of rapid transit service. In addition, copies of the detailed transitway alignment plan and profile drawings shown in Chapter 8 were available for review by attendees. The consultation record in **Appendix B** contains examples of the material presented.

Attendance at these centres included both participants who were familiar with the project from previous PCC's and members of the public who were unaware of the project proposals. Some of the former attended to confirm that mitigation discussed at prior meetings was being incorporated in the recommended design. Representative comments made by attendees included the following:

- Rapid transit in the form of a Yonge Subway extension or light rail service to Richmond Hill should be pursued;
- Reduce volume of traffic on roads by providing a fast, frequent service with convenient stations;
- Consider visual impact of transit facilities on the streetscape, respect natural features, minimize impacts and avoid a "barrier effect" between adjacent communities;
- Include attractive public spaces to encourage pedestrians and transit use;
- Provide convenient links to other existing transit services and routes such as GO Rail; and
- Rapid transit is a good idea and much needed.

- **Record of Public Consultation Centres**

The record of the Public Consultation Centres described above is included in **Appendix B** and contains copies of comments received from the general public and examples of responses by the Region.

13.1.2 Facts Sheets

Over twenty different Facts Sheets were prepared as part of the YRTP's larger communications program. The Facts Sheets presented information on a wide range of topics including specific information about the Consortium, the proposed technologies, as well as more general information relating to the environmental, transportation and economic benefits of the Plan. The facts sheets produced during the project covered topics such as follows:

- What is Rapid Transit?;
- What is York Region's Rapid Transit Plan?;
- Bringing Rapid Transit to York Region: A Three-Phase Approach;
- Sustainability and Smart Growth;
- Mobility and Connectivity;
- Industry and Economy;
- Technology and Innovation;
- Integrated Family of Services Increases Convenience of Public Transit;
- Rapid Transit Corridors will Link Four Urban Centres within York Region;
- The Environmental Assessment Process;
- York Region's Rapid Transit Plan Technical Advisory Committee;
- York Region and York Consortium;
- Rapid Transit is Key to Smart Growth;
- Transportation Benefits of York Region's Rapid Transit Plan;
- Environmental Benefits of York Region's Rapid Transit Plan;
- Financial and Economic Benefits of York Region's Rapid Transit Plan;
- Innovation and Technology Benefits of York Region's Rapid Transit Plan;
- York Region is the Fastest Growing Municipality in the Greater Toronto Area;
- Transportation Gridlock Threatens Quality of Life;
- York Region's Rapid Transit Plan Improves Inter-Regional Connections;
- Measuring the Effectiveness of York Region's Rapid Transit Plan;
- Quick Start will Speed the Implementation of York Region's Rapid Transit Plan.

Other specific Facts Sheets, tailored to each of the Public Consultation Centres, were also produced during the study.

13.1.3 York Region Rapid Transit Program Website

A comprehensive Website was created for the purpose of informing the public on the project progress. This Website, www.yorkinmotion.com has now been replaced by the www.vivayork.com site which contains a link to a summary of the material presented on the original site. Under the general heading of *Creating Transit for Tomorrow…Today*, the original site offered an extensive list of topics to consult under a number of headings, including:

- An explanation of the ***Quick Start Project*** which will introduce new service improvements, roadways modifications, stations, vehicles and amenities that work together to bring rapid transit to York Region in the short term.

- A description of the ***Improvements*** that will be brought about by the transitway project through an explanation of the *Planning and Environmental Assessment process*, the *Family of services* that will be offered, the *Proposed routes*, the *Expected benefits* and the *Timing* for implementation of the various components of the project.

- A general section introducing the basic ***Planning*** considerations and documents supporting the Rapid Transit Program in York Region. Among those, a brief presentation of the Smart Growth approach with relevant links to the Ontario Smart Growth website, a section introducing and linking to the York Region's, Transportation Master Plan and current information pertaining to the EA processes for the proposed three main rapid transit corridors (Highway 7 and Vaughan North-South Link Transitway EA Study Markham North-South Link Transitway EA Study, Yonge Street Transitway EA Study).

- A section on all ***Engineering*** considerations including preliminary design, detailed design and construction general schedules. This section was designed to be easily accessible to the general public.

- An important section on ***Getting Involved*** inviting the public and community/interest groups to regularly consult *Public meeting notices*, *request presentations* or *book a speaker* in the context of the project.

- A general description of the ***Public-Private Partnership*** that was developed to create the *York Consortium*.

- A ***What's News*** section providing links and excerpts of recent headlines and Press releases pertaining to the project.

- A ***Library*** of Planning reports and other relevant documentation that could assist the public in better understanding the project and assessing its effect on the community.

- A ***Talk to us*** link provided visitors to the site a method to offer comments, request information and add there names to a master mailing list.

13.2 STAKEHOLDER CONSULTATION

First Nations Consultation

The Ontario Native Affairs Secretariat (ONAS) received a copy of the Draft EA as part of the Government Review Team for this study. Following a review of the Draft EA, ONAS noted that there does not appear to be any land claims in the vicinity of the project. In addition, ONAS noted that the EA may be of interest to the Mississaugas of the New Credit First Nation and recommended that contact be made with them.

ONAS recommended that contact be made with organizations that represent a number of First Nations to inquire whether there are any First Nations who may be interested in the project and wish to provide comments. The two organizations identified by ONAS are the Association of Iroquois and Allied Indians, and the Anishinabek Region/Union of Ontario Indians. The Association of Iroquois Indians recommended contacting the Six Nations of the Grand River. The First Nations that encompass the southeast region within the Anishinabek Region/Union of Ontario Indians were contacted to see if they have a potential interest in the study. These First Nations include Alderville First Nation, Beausoleil First Nation, Algonquins of Pikwakanagan First Nation, Chippewas of Georgina Island First Nation, Curve Lake First Nation, Mississauga's of Scugog Island First Nation and Moose Deer Point First Nation.

ONAS also suggested that Indian and Northern Affairs Canada (INAC) be contacted since the Government of Canada sometimes receives claims that Ontario does not. Three different branches of INAC were contacted, namely the Comprehensive Claims, Specific Claims and Litigation Management and Resolution Branches. Study Area maps were provided for review and information on any First Nations that may have an interest in the EA was requested.

The Comprehensive Claims Branch of INAC noted that there are currently no comprehensive claims within the Study Area.

The Specific Claims Branch of INAC noted that the Study Area is located within the area delineated by the Toronto Purchase specific claim which involves the Mississaugas of the New Credit First Nation.

The Litigation Management and Resolution Branch of INAC noted a case involving the 1923 Williams Treaties which is currently in litigation. The First Nations involved as part of these Treaties and that may have an interest in the EA are the following: Alderville First Nation, Beausoleil First Nation, Chippewas of Georgina Island First Nations, Mississaugas of Scugog Island First Nation, Chippewas of Mnjikaning First Nation, Hiawatha First Nation and Curve Lake First Nation. Some of the First Nations that fall within the 1923 William Treaties are part of the Anishinabek Region/Union of Ontario Indians organization.

The First Nations listed above have been contacted to determine their interest in this EA, if any. The status of this contact is listed in **Table 13-1**.

Table 13-1
First Nations Contacted

First Nation	Response to Contact
1. Mississaugas of the New Credit First Nation	Would like to receive a copy of the EA.
2. Curve Lake First Nation	Do not require a copy of the EA. A notice of submission will be sent.
3. Alderville First Nation	Would like to receive a copy of the EA.
4. Beausoleil First Nation	Would like to receive a copy of the EA.
5. Chippewas of Georgina Island First Nation	Do not require a copy of the EA. A notice of submission will be sent.
6. Mississauga's of Scugog Island First Nation	Would like to receive a copy of the EA.
7. Hiawatha First Nation	Do not require a copy of the EA. A notice of submission will be sent.
8. Six Nations of the Grand River	Would like to receive a copy of the EA.
9. Algonquins of Pikwakanagan First Nation	Would like to receive a copy of the EA.
10. Chippewas of Mnhikaning (Rama) First Nation	Response not available. A notice of submission will be sent.
11. Moose Deer Point First Nation	Response not available. A notice of submission will be sent.

Thornhill Yonge Street Study Project

The Town of Markham in conjunction with the City of Vaughan initiated the Thornhill Revitalization project. The purpose of this project was to undertake an Area Revitalization Master Planning and Streetscaping Study. During the development of alternatives, a concerted effort was made by the two project teams to better define effects on the heritage district because the introduction of transit within the study limits, as part of the Yonge Street Transitway EA, influenced the development of planning and streetscaping options. Both teams worked collaboratively to develop an overall streetscaping plan that would satisfy local heritage societies and the community at large. The Yonge Street Transitway alignment and station plans available at that time were displayed at the planning study's second public house where alternatives for the Thornhill Revitalization study were presented. This was to illustrate the integration of the two projects to the community.

Discussions between the two teams resulted in a limited compromise of design standards for both traffic and transit lane widths in order to maximize boulevard width for pedestrian facilities at pinch points and avoid adverse effects on heritage buildings.

Heritage Societies

Meetings with heritage societies were also undertaken during the course of the project. The meetings were held to describe to the societies how it was intended to integrate transit within Yonge Street, the effect it may have on heritage resources and to address their concerns. A meeting was held with each of the **Society for the Preservation of Old Thornhill (SPOT)** and the **Society for the Community of Old Richmond Hill (SCOR)**.

Concerns from SCOR were alleviated when it was made clear that rapid transit would operate in a mixed traffic arrangement through the Richmond Hill Central Business District (CBD) and a median transitway would not be constructed. Their concerns about disruption during construction were further alleviated when they were informed that the tunnel option had been rejected.

Concerns from SPOT were addressed through a continuous dialogue during the course of the Thornhill Yonge Street Study project carried out in parallel to the EA.

Other Stakeholder Consultations

Several meetings were convened to address specific concerns raised by stakeholder groups and property owners. These comprised;

- A presentation to approximately 50 residents from the area surrounding the intersection of Royal Orchard Boulevard and Yonge Street, held at the Thornhill Country Club. The purpose was to address concerns regarding the proximity of the roadway after incorporation of a median transitway to heritage buildings and impact on access to adjacent properties. This meeting included a period for review of the preferred design boards prior to a formal presentation. The presentation provided general information on the study findings and outlined the benefits of improved transit. It also addressed specifically how the design in the area of Royal Orchard Boulevard would mitigate concerns expressed during prior consultations. The presentation was followed by a question and answer session.

- A meeting with members of the executive of the Thornhill Country Club to discuss their concern with proposed arrangements for members to access the Club after implementation of the rapid transit facilities in the Yonge Street median. In subsequent correspondence, the Region agreed to add a signalized intersection in the vicinity of the Club to make access and egress to the Club and adjacent properties more convenient.

- Consultation (meetings and correspondence) with the Catholic Cemeteries Archdiocese of Toronto to address their concerns regarding access to the Holy Cross Cemetery in the Langstaff area. A signalized intersection was included to mitigate these concerns and improve access to the cemetery and adjacent properties.

- Correspondence with a Thornhill plaza owner to explain proposed modifications to traffic patterns and address concerns regarding access to the plaza.

- Correspondence with condominium owners to explain design concepts to mitigate the need for removal of mature trees along the frontage of their property.

- A presentation to a Thornhill condominium association meeting to describe the effects of rapid transit implementation adjacent to their property and outline mitigation measures.

General Presentations

The Region's general communications program included making presentations to a wide variety of stakeholders, opinion makers and community groups. While the EA study was not usually the focus of these presentations, it was included as a key element of the overall rapid transit initiative in most of the presentations. Among the groups to whom presentations were made during the EA consultation period were:

- Richmond Hill Chamber of Commerce (Government Affairs Committee and annual summer luncheon);
- Rotary Club of Richmond Hill;
- Toronto Board of Trade;
- Canadian Urban Transit Association;
- Federal GTA Caucus;
- GO Transit;
- Toronto Strategic Transportation Planning Committee;
- Regional Council and all nine (9) local municipal Councils;
- MPs and MPPs;
- MP Town Hall meeting;
- The "Taste of Asia" Festival.
- A senior citizen group at a Weldrick Road condominium

13.3 MUNICIPAL APPROVALS

At important decision points in the study, formal presentations were made to the Steering Committee and Regional Council to summarize the assessment of alternatives, the recommended designs and major recommendations of the study, including the final submission of this report. These presentations were also made to councils and committees of the City of Vaughan, the Town of Markham and Town of Richmond Hill.