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. 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 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.
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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.

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 TTO at this time.

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.

<table>
<thead>
<tr>
<th>System Element</th>
<th>Technology Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical system capacity (passengers per hour per direction)</td>
<td>Bus Rapid Transit (BRT)</td>
</tr>
<tr>
<td></td>
<td>2,000 to 12,000</td>
</tr>
<tr>
<td>Right-of-way required and staging flexibility</td>
<td>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.</td>
</tr>
<tr>
<td>Vehicle type and characteristics</td>
<td>Conventional buses or special purpose hybrid diesel-electric, rubber-tired rapid transit vehicles 12-25m long</td>
</tr>
<tr>
<td>Station characteristics</td>
<td>Platform length can vary from 18 - 90m with simple shelter or elaborate passenger facilities</td>
</tr>
<tr>
<td>Service planning options</td>
<td>A blend of line-haul and branched services is possible as rubber-tired vehicles can leave the transitway to reduce transfers.</td>
</tr>
<tr>
<td>Range of capital costs including vehicles</td>
<td>Varies from $10 to $40 million per km depending on degree of with transitway separation</td>
</tr>
</tbody>
</table>

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, Weldon 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.
- 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.

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.

![Figure E-4 Preferred Alignment and Station Locations](image)

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.

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:

<table>
<thead>
<tr>
<th>Segment</th>
<th>Bus Rapid Transit (BRT)</th>
<th>Light Rail Transit (LRT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North of Major Mackenzie Drive to 19th Avenue</td>
<td>60 articulated buses (18m length) per hour</td>
<td>16 two-car LRT trains per hour (58m length)</td>
</tr>
<tr>
<td>Major Mackenzie Drive to Langstaff</td>
<td>60 articulated buses (18m length) per hour or two buses per traffic signal cycle</td>
<td>16 two-car LRT trains per hour (58m length)</td>
</tr>
<tr>
<td>Langstaff to Steeles Avenue</td>
<td>65 articulated buses (18m length) per hour.</td>
<td>20 two-car LRT trains per hour (58m length)</td>
</tr>
<tr>
<td></td>
<td>Buses would operate in two-vehicle platoons with one or two platoon per traffic signal cycle.</td>
<td></td>
</tr>
</tbody>
</table>

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.

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.
- 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-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 fulfill 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 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.

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.

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

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 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
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 GOA 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 fulfills 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:

- Providing the high quality transit link between the Newmarket Regional Centre and the three southern Regional Centres located along the Highway 7 Corridor.
- Providing the central north-south public transit feed to the planned Richmond Hill Centre inter-modal terminal station at the junction of the Yonge Street and Highway 7 Corridors in the Bayview Glen area of Richmond Hill.
- Distributing trips from the Highway 7 Corridor to the north-south service at the Richmond Hill Centre terminal.
- 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.
- Providing rapid transit access to the GO Transit Richmond Hill commuter rail corridor at the Langstaff and Richmond Hill GO Stations.
- Providing rapid transit access to the proposed Highway 407 inter-regional bus rapid transit corridor at the Richmond Hill Centre terminal.

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 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 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.
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.

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 significant 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.
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 Carville 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 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 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.

<table>
<thead>
<tr>
<th>Location</th>
<th>AADT (Vehicles per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North of Steeles Avenue</td>
<td>49,510</td>
</tr>
<tr>
<td>North of Highway 7</td>
<td>38,330</td>
</tr>
<tr>
<td>North of Major Mackenzie</td>
<td>31,810</td>
</tr>
<tr>
<td>North of Elgin Mills Road</td>
<td>33,120</td>
</tr>
</tbody>
</table>

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 Bantyr Avenue to Wedlock 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.

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.
2.3.1.1 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.

2.3.1.2 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:

- 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;
- comparison of historical and future trends must be based on roadway groupings as present roadways are expanded or new parallel roadways are added.

**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 Carville 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:

![Screenlines for Demand vs Capacity Analysis](image-url)
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...
Evaluation
Objectives and Criteria

Do Nothing

Current Commitments including Priority Transit and Urban Sprawl Management

ALTERNATIVE TRANSPORTATION STRATEGIES

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;
- effects on archaeological resources and heritage or cultural features.

Residual road capacity shortfall in corridor will cause:
- a loss of community mobility;
- an increased traffic accident potential, and
- a degraded transit service making it less attractive as a travel option.

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 neighborhood 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.

Road widening will require more new or widened bridges at crossings and rivers.

Replace most of road capacity shortfall by greater transit use will:
- improve regional/municipal O.P. and development objectives;
- degrade employment/worker commutes to and from the Region;
- significantly increase time-related cost of travel in the Regional economy.

Continued reliance on auto use for growing travel demand will:
- increase overall vehicle trips and congestion resulting in increased vehicular emission and energy consumption.

Continued reliance on auto use for growing travel demand will:
- increase overall vehicle trips and congestion resulting in increased vehicular emission and energy consumption.

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.

A higher mode split for inter-regional travel will reduce total number of vehicle trips thereby reducing emissions and GHG effects.

Strategies discourages the use of committed transit services.

Strategies increases transit person trips only between 300 and 1,200 (depending on synchronies).

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 effects as compared to any other regional travel needs.

Evaluation of Alternatives to the Undertaking

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 neighborhood 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.

Road widening will require more new or widened bridges at crossings and rivers.

Replace most of road capacity shortfall by greater transit use will:
- reduce neighborhood 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
degree, still cause:
neighbourhood traffic infiltration;
some loss of community mobility and pressure on existing road rights-of-way;
the present low transit mode split to continue in the absence of an enhanced transit service.

Improvement such as a rapid transit network supports the present low transit mode split to continue in the absence of an enhanced transit service.

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.

Marginaly better than "Do Nothing" since added road capacity will reduce overall traffic congestion.

A higher mode split for inter-regional travel will reduce total number of vehicle trips thereby reducing emissions and GHG effects.

Strategies encourages the use of committed transit services.

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.

Longer term congestion related costs for goods and people movement will still increase for inter-regional travel.

Expansion of transit infrastructure in existing rail and freeway rights-of-way minimizes adverse effects on natural features.

Expansion of transit infrastructure in existing rail and freeway rights-of-way minimizes adverse effects on natural features.

Road widening will require more new or widened bridges at crossings and rivers.

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 effects as compared to any other regional travel needs.

Implementation such as an urban transit network supports Region's O.P. centers and corridors urban form and municipal development objectives.

Reduces land acquisition costs for transportation facilities by promoting greater use of high capacity roadways.

Reduces land acquisition costs for transportation facilities by promoting greater use of high capacity roadways.

Offers a lower unit travel cost option to the general public.

Improvement such as an urban transit network supports Region's O.P. centers and corridors urban form and municipal development objectives.

Reduces land acquisition costs for transportation facilities by promoting greater use of high capacity roadways.

Reduces land acquisition costs for transportation facilities by promoting greater use of high capacity roadways.

Expansion of transit infrastructure in existing rail and rail rights-of-way minimizes adverse effects on natural features.

Expert口径 on rail/road network infeasibility and cost of new rail rights-of-way.

Expert口径 on rail/road network infeasibility and cost of new rail rights-of-way.

Provides improved access and connectivity to inter-regional services operating in Region.

Offers long-term growth capacity for several origin-destination pairs.

Strategy discourages the use of committed transit services.

Strategy discourages the use of committed transit services.

A focus on inter-regional travel demand by increasing road capacity alone:
- does not promote regional/municipal O.P. urban form objectives and contributes to 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 for general public who will have no alternative to auto use on the enhanced road system.

Continuing corridor congestion without an effective non-automobile alternative will:
- slow business investment;
- not promote regional/municipal O.P. urban form and development objectives;
- degrade employment/worker commutes to and from the Region;
- Region’s TNP current commitments will require fairly significant on-going public sector capital spending.

Requires enhanced local transit service and large park-and-ride lots to attract ridership and reach employment centres.

Improved 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 convergence of goods movement;
- direct costs;
- travel time delay costs.

Continuing corridor congestion without an effective non-automobile alternative will:
- slow business investment;
- not promote regional/municipal O.P. urban form and development objectives;
- degrade employment/worker commutes to and from the Region;
- Region’s TNP current commitments will require fairly significant on-going public sector capital spending.

Improves goods movement by providing some reduction in auto volumes on arterial roads.

Relies primarily on auto use for connectivity to inter-regional transit services.

Continued reliance on auto use for growing travel demand will:
- increase overall vehicle trips and congestion resulting in increased vehicular emission and energy consumption.

Continued reliance on auto use for growing travel demand will:
- increase overall vehicle trips and congestion resulting in increased vehicular emission and energy consumption.

Provides improved access and connectivity to inter-regional services operating in Region.

Expanded bi-directional inter-regional rail and 400 series service offers long-term reserve capacity for some origin-destination pairs.

Expand long-term capacity for several origin-destination pairs.

Reduce travel time delays costs is considered less significant assuming reaload capacity increases can be achieved.

Increase in time related costs is considered less significant assuming reaload capacity increases can be achieved.

Increased 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 convergence of goods movement;
- direct costs;
- travel time delay costs.

Increased 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 convergence of goods movement;
- direct costs;
- travel time delay costs.

Air Effective Transportation Strategy to Impact 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 provide future demands;
- system operational performance will be severely degraded.

Forecast combining shortfall in corridor road capacity (7-13 traffic lanes each direction) indicates that:
- focus on auto-based system without TNP 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.

Forecast combining shortfall in corridor road capacity (7-13 traffic lanes each direction) indicates that:
- focus on auto-based system without TNP rapid transit initiative is not an effective strategy to provide future demands;
- system operational performance will be severely degraded;
- increase in transit person trips is only between 0 and 300.

Forecast combining shortfall in corridor road capacity (7-13 traffic lanes each direction) indicates that:
- focus on auto-based system without TNP rapid transit initiative is not an effective strategy to provide future demands;
- system operational performance will be severely degraded;
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Forecast combining shortfall in corridor road capacity (7-13 traffic lanes each direction) indicates that:
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Forecast combining shortfall in corridor road capacity (7-13 traffic lanes each direction) indicates that:
- focus on auto-based system without TNP rapid transit initiative is not an effective strategy to provide future demands;
- system operational performance will be severely degraded;
- increase in transit person trips is only between 0 and 300.

Forecast combining shortfall in corridor road capacity (7-13 traffic lanes each direction) indicates that:
- focus on auto-based system without TNP rapid transit initiative is not an effective strategy to provide future demands;
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

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Screenline</th>
<th>Direction</th>
<th>Existing</th>
<th>Do Nothing</th>
<th>Current Commitments + Priority Transit + TDM (Base Case)</th>
<th>Road Expansion</th>
<th>Enhanced RH Commuter Rail &amp; Inter-regional Bus Service</th>
<th>York Rapid Transit Corridor Initiatives</th>
<th>Rapid Transit Corridor Initiatives vs. Base Case (% change)</th>
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* 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 of 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 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.
Table 4-1

<table>
<thead>
<tr>
<th>REGION/MUNICIPALITY</th>
<th>POPULATION</th>
<th>EMPLOYMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1986</td>
<td>2001</td>
</tr>
<tr>
<td></td>
<td>Absolute</td>
<td>%</td>
</tr>
<tr>
<td>YORk REGION</td>
<td>353,300</td>
<td>772,000</td>
</tr>
<tr>
<td></td>
<td>418,700</td>
<td>119%</td>
</tr>
<tr>
<td>Aurora</td>
<td>20,900</td>
<td>43,000</td>
</tr>
<tr>
<td></td>
<td>22,100</td>
<td>106%</td>
</tr>
<tr>
<td>East Gwillimbury</td>
<td>14,600</td>
<td>23,000</td>
</tr>
<tr>
<td></td>
<td>8,400</td>
<td>58%</td>
</tr>
<tr>
<td>Georgina</td>
<td>22,600</td>
<td>39,000</td>
</tr>
<tr>
<td></td>
<td>8,400</td>
<td>38%</td>
</tr>
<tr>
<td>King</td>
<td>16,000</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>4,000</td>
<td>25%</td>
</tr>
<tr>
<td>Markham</td>
<td>115,100</td>
<td>218,000</td>
</tr>
<tr>
<td></td>
<td>22,900</td>
<td>101%</td>
</tr>
<tr>
<td>Newmarket</td>
<td>35,200</td>
<td>71,000</td>
</tr>
<tr>
<td></td>
<td>35,700</td>
<td>101%</td>
</tr>
<tr>
<td>Richmond Hill</td>
<td>47,200</td>
<td>140,000</td>
</tr>
<tr>
<td></td>
<td>35,700</td>
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<tr>
<td>Vaughan</td>
<td>66,500</td>
<td>194,000</td>
</tr>
<tr>
<td></td>
<td>102,900</td>
<td>133%</td>
</tr>
<tr>
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<td>15,100</td>
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<tr>
<td></td>
<td>8,900</td>
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</tr>
<tr>
<td>OTHER</td>
<td>3,826,600</td>
<td>4,792,100</td>
</tr>
<tr>
<td></td>
<td>965,500</td>
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<td>132,000</td>
<td>152,200</td>
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<tr>
<td></td>
<td>20,200</td>
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<td>Rest of Toronto</td>
<td>2,066,200</td>
<td>2,298,500</td>
</tr>
<tr>
<td></td>
<td>232,300</td>
<td>11%</td>
</tr>
<tr>
<td>Durham</td>
<td>300,000</td>
<td>502,000</td>
</tr>
<tr>
<td></td>
<td>230,000</td>
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<tr>
<td>Peel</td>
<td>1,066,400</td>
<td>1,937,000</td>
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<tr>
<td></td>
<td>884,400</td>
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<td>274,400</td>
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<td>477,400</td>
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<td>Hamilton</td>
<td>424,800</td>
<td>499,000</td>
</tr>
<tr>
<td></td>
<td>235,000</td>
<td>55%</td>
</tr>
<tr>
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<td>1,961,300</td>
<td>2,462,900</td>
</tr>
<tr>
<td></td>
<td>501,600</td>
<td>26%</td>
</tr>
<tr>
<td>PD1</td>
<td>410,100</td>
<td>423,000</td>
</tr>
<tr>
<td></td>
<td>12,900</td>
<td>3%</td>
</tr>
<tr>
<td>Rest of Toronto</td>
<td>868,200</td>
<td>1,030,600</td>
</tr>
<tr>
<td></td>
<td>162,400</td>
<td>19%</td>
</tr>
<tr>
<td>Durham</td>
<td>315,200</td>
<td>390,000</td>
</tr>
<tr>
<td></td>
<td>312,900</td>
<td>102%</td>
</tr>
<tr>
<td>Peel</td>
<td>260,800</td>
<td>488,300</td>
</tr>
<tr>
<td></td>
<td>207,300</td>
<td>79%</td>
</tr>
<tr>
<td>Halton</td>
<td>207,000</td>
<td>360,000</td>
</tr>
<tr>
<td></td>
<td>207,600</td>
<td>61%</td>
</tr>
<tr>
<td>Hamilton</td>
<td>377,000</td>
<td>487,000</td>
</tr>
<tr>
<td></td>
<td>235,000</td>
<td>62%</td>
</tr>
</tbody>
</table>

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 YRT 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
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, transit priority and other factors. Lower speeds are assumed on the Yonge Street Corridor south of Highway 7, given the high volume of buses, 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 4-3 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 4-4 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-Yonge to Steeles and Richmond Hill Centre intermodal Terminal, 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.

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.

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 approximately 5,850 in the Base Case to 11,300, an increase of 93%. 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.

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.

For the three Yonge Street rapid transit services combined, approximately 9,530 in 2001 to 22,610 in 2021.

Table 4-6 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.

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 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.

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-stop 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 transit signal priority at intersections and real-time passenger information at stations, on-board and at home. 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 15-55 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.

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.

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).
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 60,000 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 pp/hpd 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);
- 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 5-2  Option A-2 Subway to Finch
LRT to Yonge / 19th Ave,
BRT rest of system

Figure 5-3  Option A-3 Subway to Finch
LRT to Yonge / 19th Ave,
BRT rest of system

Figure 5-4  Option B-1 Subway to Langstaff
LRT to Yonge / 19th Ave,
BRT rest of system

Figure 5-5  Option B-2 Subway to Langstaff
LRT to Yonge / 19th Ave,
BRT rest of system

Figure 5-6  Option B-3 Subway to Langstaff
LRT to Yonge / 19th Ave,
BRT rest of system
The system in the Region will be an important catalyst in achieving the Region’s Centres and Corridors land use planning objective. It would create a high quality, high passenger volume transit node and 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.

### Evaluation Matrix (Quantitative)

<table>
<thead>
<tr>
<th>Evaluation Factor</th>
<th>Baseline</th>
<th>A-1</th>
<th>A-2</th>
<th>A-3</th>
<th>B-1</th>
<th>B-2</th>
<th>B-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Cost (millions)</td>
<td>$350</td>
<td>$310</td>
<td>$350</td>
<td>$300</td>
<td>$300</td>
<td>$330</td>
<td>$330</td>
</tr>
<tr>
<td>Capital Cost in Region (millions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual O &amp; M Cost (millions)</td>
<td>$72.5</td>
<td>$100</td>
<td>$95.5</td>
<td>$105</td>
<td>$105</td>
<td>$110</td>
<td>$110</td>
</tr>
<tr>
<td>Additional System Riders</td>
<td>16%</td>
<td>20%</td>
<td>18%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
</tbody>
</table>

### Evaluation Matrix (Qualitative)

<table>
<thead>
<tr>
<th>Evaluation Factor</th>
<th>Baseline</th>
<th>A-1</th>
<th>A-2</th>
<th>A-3</th>
<th>B-1</th>
<th>B-2</th>
<th>B-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Connectivity</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Quality of Service</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Land Use</td>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Environmental Factors</td>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Risk</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**QUALITY RATING:**

<table>
<thead>
<tr>
<th></th>
<th>Least desirable</th>
<th>More desirable</th>
<th>Most desirable</th>
</tr>
</thead>
</table>

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.

### Strategy for Technology Application on Yonge Street Transway

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...
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 infrastructure impacts. This is especially true for the Yonge Street route, as it is the preferred option from this point of view.

In terms of the natural environment impacts, the north end of all threePM1435 Yonge Street Corridor Public Transit Improvements Environmental Assessment 20/07/2005 routes is 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 5 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.

Overall, development of a segregated or partially exclusive right-of-way rapid transit facility within the Yonge Street Route 5 is preferred based on the following:

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

<table>
<thead>
<tr>
<th>FACTOR &amp; INDICATOR</th>
<th>ALTERNATIVE</th>
<th>EXPLANATION OF RANKING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exclusive Lanes in the Median</td>
<td>Exclusive Curb Lanes</td>
</tr>
<tr>
<td><strong>TRANSPORTATION QUALITY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transit Service Reliability</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• A two-way transitway on one side reduces interference to one side only but requires control of vehicular access to transitways to achieve reliability and safety.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect on Traffic Operations</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall level of safety right-of-way</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle Access to Adjacent Properties</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>• A one-way curb-side transitway must be shared by right-turning vehicles. If access to adjacent properties is to be protected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The median transitway option requires the provision of U-turns, either dedicated or at intersections to maintain access to adjacent properties.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HUMAN ENVIRONMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise &amp; Vibrate Impacts</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>• A median transitway places transit operations further from adjacent sensitive buildings and therefore has less impact on them.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• A two-way curb-side transitway will be closest to adjacent buildings on one side producing the most severe noise and vibration impacts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger Convenience and</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>• A one-way curb-side transitway permits a more familiar platform arrangement for transit users.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>FACTOR &amp; INDICATOR</th>
<th>ALTERNATIVE</th>
<th>EXPLANATION OF RANKING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exclusive Lanes in the Median</td>
<td>Exclusive Curb Lanes</td>
</tr>
<tr>
<td><strong>CONTRIBUTION TO TRANSPORTATION SERVICE QUALITY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comfort in accessing Transitway stations</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Median transitway station platforms require protective measures to overcome passenger discomfit due to road traffic passing behind a platform.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ECONOMIC ENVIRONMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital &amp; Operating Costs</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>• A medium transitway will have the highest capital costs due to the wider cross section required at intersections where left turn lanes are reinstated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Capital costs of curb-side transitways will be increased if service roads are required to permit mid-block access to adjacent properties.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• A one or two-way curb-side transitway provides opportunities for combining platforms with adjacent sidewalks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Acquisition Costs</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 7:35 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, Balf 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.

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Signalized</th>
<th>Unsignalized (stop sign on minor street)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steeles Avenue</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Highland Park Boulevard</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Woodpark Avenue</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Crestwood Road</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Grandview Avenue</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Doncaster Avenue</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Glen Cameron Road</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Morgan Avenue</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Clark Avenue</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Arnold Avenue/Elgin Street</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Thornridge Drive</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>John Street</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Jane Street</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Colbourne Street</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Thornhill Summit Drive/Centre Street</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Royal Orchard Boulevard</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Bay Thorn Drive/Thornhill Avenue</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

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

Table 6-1

<table>
<thead>
<tr>
<th>Arterials and Major Collectors</th>
<th>Through Lanes on Yonge Street</th>
<th>Through Lanes on Cross Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steeles Avenue</td>
<td>2N 2S</td>
<td>2E 2W</td>
</tr>
<tr>
<td>Doncaster Avenue</td>
<td>2N 2S</td>
<td>2E 1W</td>
</tr>
<tr>
<td>Clark Avenue</td>
<td>2N 2S</td>
<td>1E 1W</td>
</tr>
<tr>
<td>John Street</td>
<td>2N 2S</td>
<td>1E 1W</td>
</tr>
<tr>
<td>Centre Street</td>
<td>2N 2S</td>
<td>1E 1W</td>
</tr>
<tr>
<td>Royal Orchard Boulevard</td>
<td>2N 2S</td>
<td>1E 1W</td>
</tr>
<tr>
<td>Highway 7</td>
<td>3N 3S</td>
<td>3E 3W</td>
</tr>
<tr>
<td>High Tech Road</td>
<td>3N 2S</td>
<td>2E 2W</td>
</tr>
<tr>
<td>Bayley Avenue</td>
<td>2N 2S</td>
<td>2E 1W</td>
</tr>
<tr>
<td>Carnview Road/13th Avenue</td>
<td>2N 2S</td>
<td>2E 2W</td>
</tr>
<tr>
<td>Wedlock Road</td>
<td>2N 2S</td>
<td>2E 2W</td>
</tr>
<tr>
<td>Harding Boulevard</td>
<td>2N 2S</td>
<td>1E 1W</td>
</tr>
<tr>
<td>Major Mackenzie Drive</td>
<td>2N 2S</td>
<td>2E 2W</td>
</tr>
<tr>
<td>Crosby Avenue</td>
<td>2N 2S</td>
<td>1E 1W</td>
</tr>
<tr>
<td>Elgin Mills Road</td>
<td>2N 2S</td>
<td>2E 2W</td>
</tr>
<tr>
<td>Bernard Avenue</td>
<td>2N 2S</td>
<td>2E 1W</td>
</tr>
<tr>
<td>Silverwood Drive/Brickside Road</td>
<td>2N 2S</td>
<td>1E 1W</td>
</tr>
<tr>
<td>Devonsleigh Boulevard/Nottingham Drive</td>
<td>2N 2S</td>
<td>1E 1W</td>
</tr>
<tr>
<td>Gamble Road/13th Avenue</td>
<td>2N 2S</td>
<td>1E 1W</td>
</tr>
</tbody>
</table>

Table 6-2

Primary Intersections and their Type of Control
Table 6-2
Primary Intersections and their Type of Control

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Signalized</th>
<th>Unsignalized (stop sign on minor street)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helen Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uplands Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirk Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bantier Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longbridge Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Langstaff Road/Hwy 407 EB Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-E 407 On Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-E 407 On Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S/W 407 On Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE-NS 407 Off Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-W 407 Off Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yongehurst Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trinity Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centre Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arnold Crescent/Lorne Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Mackenzie Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Tech Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roosevelt Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beresford Drive/Withward Lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MacKay Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baytree Avenue/Scott Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dalemoun/Edgar Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Heights Drive/Oak Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spruce Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16th Avenue/Carville Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hillcrest Mall Entrance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observatory Lane/Ball Boulevard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetrick Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Claretta Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yongehurst Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May Avenue/Richmond Hill Shopping Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harding Boulevard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjenson Street/Elmwood Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Mackenzie Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arnold Crescent/Lome Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centre Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richmond Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wright Street/Dunlop Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedford Park Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crosby Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benson Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hunt Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Levendale Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trayhow Drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxford Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elgin Mills Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leonard Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Croydon Hill Avenue/Bernard Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Naughton Drive</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 AADTs

<table>
<thead>
<tr>
<th>Location</th>
<th>AADT (Vehicles Per Day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North of Steeles Avenue</td>
<td>49,510</td>
</tr>
<tr>
<td>North of Highway 7</td>
<td>38,330</td>
</tr>
<tr>
<td>North of Major Mackenzie</td>
<td>32,820</td>
</tr>
<tr>
<td>North of Elgin Mills Road</td>
<td>33,120</td>
</tr>
</tbody>
</table>

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 w/c of 1.0 and/or Level of Service (LOS) “E” or “F”.

Table 6-4
Existing AM Peak Intersection Operations

<table>
<thead>
<tr>
<th>Intersection Reference Yonge Street</th>
<th>Signalized Intersection Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Delay</td>
</tr>
<tr>
<td>Stelies Avenue</td>
<td>Delay</td>
</tr>
<tr>
<td>John Street</td>
<td>Delay</td>
</tr>
<tr>
<td>Centre St./Thornhill Summit Dr.</td>
<td>Delay</td>
</tr>
<tr>
<td>Royal Orchard Blvd.</td>
<td>Delay</td>
</tr>
<tr>
<td>Uplands Avenue</td>
<td>Delay</td>
</tr>
<tr>
<td>E-NS 407 Off Ramp</td>
<td>Delay</td>
</tr>
<tr>
<td>Hey 407 EB Ramp/Langstaff Road</td>
<td>Delay</td>
</tr>
<tr>
<td>NBL is operating at capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>NBR, EBL and SBT are approaching capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>Long SB queues</td>
<td>Delay</td>
</tr>
<tr>
<td>NBL and SBT are operating at capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>WBT and SBT are operating at capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>NBL, EBL and SBT are approaching capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>SBL and SBT are operating at capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>NBL and SBT are approaching capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>NBL and SBT are approaching capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>NBL and SBT are approaching capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>NBL and SBT are approaching capacity.</td>
<td>Delay</td>
</tr>
<tr>
<td>NBL and SBT are approaching capacity.</td>
<td>Delay</td>
</tr>
</tbody>
</table>
## Signalized Intersection Operations

### Existing AM Peak

#### Intersection Reference

<table>
<thead>
<tr>
<th>Intersection Reference</th>
<th>Yonge Street</th>
<th>Overall</th>
<th>Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delay</td>
<td>LOS</td>
<td>Delay</td>
</tr>
</tbody>
</table>

#### Table 5-6 Existing PM Peak Intersections

<table>
<thead>
<tr>
<th>Intersection Reference</th>
<th>Yonge Street</th>
<th>Overall</th>
<th>Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delay</td>
<td>LOS</td>
<td>Delay</td>
</tr>
</tbody>
</table>

### Signalized Intersection Operations

#### Existing PM Peak

<table>
<thead>
<tr>
<th>Intersection Reference</th>
<th>Yonge Street</th>
<th>Overall</th>
<th>Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delay</td>
<td>LOS</td>
<td>Delay</td>
</tr>
</tbody>
</table>

### Signalized Intersection Operations

#### Existing PM Peak

<table>
<thead>
<tr>
<th>Intersection Reference</th>
<th>Yonge Street</th>
<th>Overall</th>
<th>Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delay</td>
<td>LOS</td>
<td>Delay</td>
</tr>
</tbody>
</table>

### Comments

- 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 permissible 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/Balf Boulevard
  - May Avenue/Richmond Hill Shopping Centre
  - Harding Boulevard

### 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 permissible 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 permissible 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,

- 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
- Devonleigh Boulevard/Nottingham Drive
- 19th Avenue/Gamble Road
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
- Bail 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/Balf 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:

<table>
<thead>
<tr>
<th>Location</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yonge Street/Steeles Avenue</td>
<td>Key transit transfer area</td>
</tr>
<tr>
<td>intersection</td>
<td>Centrepoint Mall and specialty commercial</td>
</tr>
<tr>
<td>Yonge Street/Clark Avenue</td>
<td>High rise residential and specialty</td>
</tr>
<tr>
<td>intersection</td>
<td>commercial</td>
</tr>
<tr>
<td>Arnold Avenue to Centre Street</td>
<td>Residential, commercial and office/personal services</td>
</tr>
<tr>
<td>19th Avenue to Weldrick Road</td>
<td>Key transit transfer area</td>
</tr>
<tr>
<td>Traffic</td>
<td>Shopping centres</td>
</tr>
<tr>
<td>Richmond Hill Central Business</td>
<td>University of Toronto David Dunlap Observatory</td>
</tr>
<tr>
<td>District</td>
<td>Specially commercial, retail, personal services, and institutional uses.</td>
</tr>
</tbody>
</table>

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Yonge Street Corridor Public Transit Improvements Environmental Assessment

20070505
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 rivers. 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.

6.2.2 Geology/Hydrogeology

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 downslope 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 transit lanes would have greater susceptibility to quality effects. It is interpreted that horizontal groundwater movement would be more likely to result in quality effects than vertical groundwater movement, which is also termed, “upgradient”. 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 unrecorded in the MOE database.

<table>
<thead>
<tr>
<th>Section</th>
<th>Number of Historical Wells</th>
<th>West</th>
<th>East</th>
</tr>
</thead>
<tbody>
<tr>
<td>10+000 to 11+000</td>
<td>13</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>11+000 to 12+000</td>
<td>62</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>12+000 to 13+000</td>
<td>58</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>13+000 to 14+000</td>
<td>54</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>14+000 to 15+000</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>15+000 to 16+000</td>
<td>10</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>16+000 to 17+000</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>17+000 to 18+000</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>18+000 to 19+000</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>19+000 to 20+000</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>20+000 to 21+000</td>
<td>19</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>21+000 to 22+000</td>
<td>25</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>22+000 to 22+350</td>
<td>9</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
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 Carvill 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 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.

6.2.6.2 German Mills Creek

German Mills Creek, a cooler 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.

Table 6-7

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>Status</th>
<th>Main Branch of the East Don River</th>
<th>German Mills Creek</th>
<th>Tributary #2 of the Rouge River</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloostoma elongatum</td>
<td>Redside Dace</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cottus cognaticus</td>
<td>Brook Stickleback</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Etheostoma nigrosum</td>
<td>Johnny Darter</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lampetra anguilla</td>
<td>American Brook Lamprey</td>
<td>1987</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lampetra gilgoula</td>
<td>Pumpkin Lamprey</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lota lycophoros</td>
<td>Common Sucker</td>
<td>1987, 1994</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micropterus salmoides</td>
<td>Creek Chub</td>
<td>1997</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onchorhyncus mykiss</td>
<td>Rainbow Trout</td>
<td>1985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pisces galaxias</td>
<td>Bluntnose Minnow</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 characters 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 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.

Table 6-8

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juglans nigra</td>
<td>Black Walnut</td>
<td>Rare*</td>
</tr>
<tr>
<td>Juniperus communis</td>
<td>Common Juniper</td>
<td>Rare*</td>
</tr>
<tr>
<td>Juniperus virginiana</td>
<td>Red Cedar</td>
<td>Uncommon</td>
</tr>
<tr>
<td>Lonicera japonica</td>
<td>Tartarian Honeysuckle</td>
<td>Common</td>
</tr>
<tr>
<td>Lythrum salicaria</td>
<td>Purple Loosestrife</td>
<td>Common</td>
</tr>
<tr>
<td>Maianthemum stellatum</td>
<td>Fairy False Solomon’s-seal</td>
<td>Common</td>
</tr>
<tr>
<td>Melilotus alba</td>
<td>White Sweet Clover</td>
<td>Common</td>
</tr>
<tr>
<td>Myosotis laxa</td>
<td>Small Forget-me-not</td>
<td>Common</td>
</tr>
<tr>
<td>Phalaris arundinacea</td>
<td>Reed Canary Grass</td>
<td>Common</td>
</tr>
<tr>
<td>Picea abies</td>
<td>Norway Spruce</td>
<td>Common</td>
</tr>
<tr>
<td>Pinus nigra</td>
<td>Austrian Pine</td>
<td>Common</td>
</tr>
<tr>
<td>Pinus sylvestris</td>
<td>Scots Pine</td>
<td>Common</td>
</tr>
<tr>
<td>Poa compressa</td>
<td>Canada Bluegrass</td>
<td>Common</td>
</tr>
<tr>
<td>Poa pratensis ssp. pratensis</td>
<td>Kentucky Bluegrass</td>
<td>Common</td>
</tr>
<tr>
<td>Populus tremuloides</td>
<td>Trembling Aspen</td>
<td>Common</td>
</tr>
<tr>
<td>Potentilla recta</td>
<td>Rough-hued Cinquefoil</td>
<td>Common</td>
</tr>
<tr>
<td>Prunus virginiana ssp. virginiana</td>
<td>choke Cherry</td>
<td>Common</td>
</tr>
<tr>
<td>Quercus rubra</td>
<td>Red Oak</td>
<td>Common</td>
</tr>
<tr>
<td>Rhhamnus cathartica</td>
<td>Common Buckthorn</td>
<td>Common</td>
</tr>
<tr>
<td>Robinia pseudo-acacia</td>
<td>Black Locust</td>
<td>Common</td>
</tr>
<tr>
<td>Rubus idaeus ssp. idaeus</td>
<td>Wild Red Raspberry</td>
<td>Common</td>
</tr>
<tr>
<td>Salix fragilis</td>
<td>Crack Willow</td>
<td>Common</td>
</tr>
<tr>
<td>Salix purpurea</td>
<td>Basket Willow</td>
<td>Common</td>
</tr>
<tr>
<td>Salix × sepulcralis</td>
<td>Weeping Willow</td>
<td>Common</td>
</tr>
<tr>
<td>Solidago altissima</td>
<td>Tall Goldenrod</td>
<td>Common</td>
</tr>
<tr>
<td>Solidago canadensis</td>
<td>Canada Goldenrod</td>
<td>Common</td>
</tr>
<tr>
<td>Solidago nemoralis</td>
<td>Gray Goldenrod</td>
<td>Common</td>
</tr>
<tr>
<td>Sorbus aucuparia</td>
<td>European Mountain-ash</td>
<td>Common</td>
</tr>
<tr>
<td>Tanacetum vulgare</td>
<td>Garden Tansy</td>
<td>Common</td>
</tr>
<tr>
<td>Taraxacum officinale</td>
<td>Common Dandelion</td>
<td>Common</td>
</tr>
<tr>
<td>Thuja occidentalis</td>
<td>Eastern White Cedar</td>
<td>Common</td>
</tr>
<tr>
<td>Thalictrum pratense</td>
<td>Red Clover</td>
<td>Common</td>
</tr>
<tr>
<td>Ulmus americana</td>
<td>White Elm</td>
<td>Common</td>
</tr>
<tr>
<td>Ulmus pumila</td>
<td>Siberian Elm</td>
<td>Common</td>
</tr>
<tr>
<td>Urtica dioica ssp. dioica</td>
<td>Stinging Nettle</td>
<td>Common</td>
</tr>
<tr>
<td>Vicia cracca</td>
<td>Bird Vetch</td>
<td>Common</td>
</tr>
<tr>
<td>Vitis riparia</td>
<td>Riverbank Grape</td>
<td>Common</td>
</tr>
</tbody>
</table>

Notes: Introduced taxa.
*Rare in the GTA (after Varga et al. (2000)).
+Rare in the GTA (after Varga et al. (2000)).
\*Common 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

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeglaea phoebeae</td>
<td>Red-winged Blackbird</td>
<td>Common</td>
</tr>
<tr>
<td>Arenaria intermedia</td>
<td>Field Sparrow</td>
<td>Common</td>
</tr>
<tr>
<td>Arabidopsis thaliana</td>
<td>Little Greater Celandine</td>
<td>Rare</td>
</tr>
<tr>
<td>Aquilegia canadensis</td>
<td>Canada Goose</td>
<td>Common</td>
</tr>
<tr>
<td>Asclepias syriaca</td>
<td>Baltimore Oriole</td>
<td>Common</td>
</tr>
<tr>
<td>Aster novi-belgii</td>
<td>Northern Flicker</td>
<td>Common</td>
</tr>
<tr>
<td>Aster x frikartii</td>
<td>Baltimore Oriole</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Northern Flicker</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Baltimore Oriole</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Northern Flicker</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Baltimore Oriole</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Northern Flicker</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Baltimore Oriole</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Northern Flicker</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Baltimore Oriole</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Northern Flicker</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Baltimore Oriole</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Northern Flicker</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Baltimore Oriole</td>
<td>Common</td>
</tr>
<tr>
<td>Aster × frikartii</td>
<td>Northern Flicker</td>
<td>Common</td>
</tr>
</tbody>
</table>

*Appendix E*
6.2.7.1 Rare, Threatened or Endangered Wildlife Species

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamiasciurus hudsonicus</td>
<td>Eastern Chipmunk</td>
<td>Common</td>
</tr>
<tr>
<td>Sylvilagus floridanus</td>
<td>Eastern Cottontail</td>
<td>Common</td>
</tr>
<tr>
<td>Peromyscus sp.</td>
<td>White-footed (Deer) Mouse</td>
<td>Common</td>
</tr>
<tr>
<td>Perognathus polionotus</td>
<td>Raccoon</td>
<td>Common</td>
</tr>
<tr>
<td>Sciurus carolinensis</td>
<td>Gray Squirrel</td>
<td>Common</td>
</tr>
<tr>
<td>Caprimulgus satanas</td>
<td>Eastern Coot</td>
<td>Common</td>
</tr>
<tr>
<td>Tamias striatus</td>
<td>Eastern Chipmunk</td>
<td>Common</td>
</tr>
<tr>
<td>Tamiasciurus hudsonicus</td>
<td>Red Squirrel</td>
<td>Common</td>
</tr>
</tbody>
</table>

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.

6.2.8 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 Carville 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. Richmond Forest Life Science ANSI is situated on the east branch of the Don River south of Carville 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 forests 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.

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 watersheds 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 watersheds within the Rouge River watershed consist of two minor tributaries located within the headwaters area of the Rouge River watershed. All of the above waterscourses 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 watersheds 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 floodplain 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 waterscourses within the Study Area however these lines are currently in the early stage of updating the Regional Floodlines for the east Don River.

Fill regulation lines and their extension lines provide a planning tool for developers to avoid the floodplain area.

The TRCA regulates all activities within Regulatory floodplain 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 waterscourses 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 waterscourses – main branch of the East Don River and the Rouge River tributaries – are cold water fisheries.

The areas around these waterscourses are highly urbanized and many of the older storm drainage systems discharge directly to the waterscourses. Newer developments typically discharge to storm water management facilities that provide quantity and/or quality controls prior to storm runoff entering the waterscourses. 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 Weldon 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.
Table 6-11
Don River, Bayview Avenue & Steeles Avenue - Station # D 8503

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Monitoring Season</th>
<th>%Obs</th>
<th>Min</th>
<th>Max</th>
<th>Mean2</th>
<th>Median</th>
<th>Guideline</th>
<th>% Meet Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspended Solids (mg/L)</td>
<td>May - Oct</td>
<td>13</td>
<td>2.0</td>
<td>28.0</td>
<td>10.6</td>
<td>1.3</td>
<td>25.0</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td>Nov - Apr</td>
<td>10</td>
<td>2.0</td>
<td>22.5</td>
<td>7.1</td>
<td>1.3</td>
<td>15.0</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>23</td>
<td>1.2</td>
<td>28.0</td>
<td>9.1</td>
<td>1.0</td>
<td>25.0</td>
<td>98%</td>
</tr>
<tr>
<td>Chloride (mg/L)</td>
<td>May - Oct</td>
<td>13</td>
<td>8</td>
<td>241</td>
<td>97</td>
<td>94</td>
<td>250</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Nov - Apr</td>
<td>10</td>
<td>94</td>
<td>392</td>
<td>147</td>
<td>179</td>
<td>250</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>23</td>
<td>95</td>
<td>242</td>
<td>127</td>
<td>127</td>
<td>250</td>
<td>87%</td>
</tr>
<tr>
<td>E. Coli (counts/100 mL)</td>
<td>May - Oct</td>
<td>14</td>
<td>5</td>
<td>2500</td>
<td>179</td>
<td>100</td>
<td>250</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Nov - Apr</td>
<td>7</td>
<td>5</td>
<td>1800</td>
<td>88</td>
<td>100</td>
<td>250</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>21</td>
<td>5</td>
<td>1040</td>
<td>120</td>
<td>120</td>
<td>250</td>
<td>48%</td>
</tr>
<tr>
<td>Phosphorous (mg/L)</td>
<td>May - Oct</td>
<td>13</td>
<td>0.01</td>
<td>0.17</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
<td>31%</td>
</tr>
<tr>
<td></td>
<td>Nov - Apr</td>
<td>10</td>
<td>0.01</td>
<td>0.06</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>23</td>
<td>0.01</td>
<td>0.17</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
<td>36%</td>
</tr>
<tr>
<td>Ammonized Ammonia (mg/L)</td>
<td>May - Oct</td>
<td>6</td>
<td>0.005</td>
<td>0.031</td>
<td>0.008</td>
<td>0.003</td>
<td>0.02</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>Nov - Apr</td>
<td>8</td>
<td>0.005</td>
<td>0.033</td>
<td>0.001</td>
<td>0.000</td>
<td>0.01</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>17</td>
<td>0.005</td>
<td>0.031</td>
<td>0.004</td>
<td>0.004</td>
<td>0.004</td>
<td>88%</td>
</tr>
<tr>
<td>Nitrate (mg/L)</td>
<td>May - Oct</td>
<td>13</td>
<td>0.05</td>
<td>1.30</td>
<td>0.46</td>
<td>0.53</td>
<td>1.0</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>Nov - Apr</td>
<td>9</td>
<td>0.26</td>
<td>2.20</td>
<td>2.28</td>
<td>2.28</td>
<td>2.28</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>22</td>
<td>0.16</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>14%</td>
</tr>
<tr>
<td>Water Temp. (°C)</td>
<td>May - Oct</td>
<td>13</td>
<td>7.0</td>
<td>17.0</td>
<td>10.0</td>
<td>6.0</td>
<td>19.3</td>
<td>86%</td>
</tr>
<tr>
<td></td>
<td>Nov - Apr</td>
<td>9</td>
<td>-0.1</td>
<td>14.5</td>
<td>6.0</td>
<td>5.0</td>
<td>11.5</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>22</td>
<td>-0.1</td>
<td>20.3</td>
<td>12.2</td>
<td>12.2</td>
<td>12.2</td>
<td>88%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Monitoring Season</th>
<th>%Obs</th>
<th>Min</th>
<th>Max</th>
<th>Mean2</th>
<th>Median</th>
<th>Guideline</th>
<th>% Meet Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Coli (counts/100 mL)</td>
<td>May – Oct</td>
<td>5</td>
<td>10.6</td>
<td>20.4</td>
<td>14.3</td>
<td>13.0</td>
<td>213</td>
<td>100%</td>
</tr>
<tr>
<td>Water Temp. (°C)</td>
<td>May – Oct</td>
<td>5</td>
<td>10.6</td>
<td>20.4</td>
<td>14.3</td>
<td>13.0</td>
<td>213</td>
<td>100%</td>
</tr>
</tbody>
</table>

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/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, Hillview 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 uses 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 Carville 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.

Hilcrest 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, intensity 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 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, 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 Newkir- 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 Longstaff 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, 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 Penetangishene 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 Bergen 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 severe 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.

6.4.2 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 cultural 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/19 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 10286 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 Former Jefferson schoolhouse located at No. 9993 Yonge Street and the John Palmer Sr. residence located at No. 9993 Yonge Street are designated under Part IV of the Ontario Heritage Act.

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](image-url)
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 site records for registered archaeological sites (housed at the Ministry of Culture) and the inventory of archaeological resources in the vicinity of the study area: the Corridor, the Langstaff Road corridor, the Weldrick Road corridor, and the PM1435 Yonge Street Corridor Public Transit Improvements Environmental Assessment 20/07/2005.

The Study Area under review is located in Borden blocks. 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 AIgu and AKu.

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

<table>
<thead>
<tr>
<th>Borden No.</th>
<th>Site Name</th>
<th>Cultural/Temporal Affiliation</th>
<th>Site Type</th>
<th>Researcher(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIgu-34</td>
<td>Vanderburgh Historic Euro-Canadian</td>
<td>Farmstead</td>
<td>Archaeological Services Inc. 1997</td>
<td></td>
</tr>
<tr>
<td>AIgu-45</td>
<td>Oton</td>
<td>Iroquoian</td>
<td>Hamlet</td>
<td>Archaeological Services Inc. 1987, 1988, 1996</td>
</tr>
<tr>
<td>AIgu-94</td>
<td>Russell Historic Euro-Canadian</td>
<td>Farmstead</td>
<td>Archaeological Services Inc. 1988</td>
<td></td>
</tr>
<tr>
<td>AIgu-95</td>
<td>Langstaff Jail Farm Historic Euro-Canadian</td>
<td>Farmstead</td>
<td>Archaeological Services Inc. 1987, 1993</td>
<td></td>
</tr>
<tr>
<td>AIgu-108</td>
<td>Carros Undetermined Precontact</td>
<td>Isolated Find</td>
<td>Archaeological Services Inc. 1989</td>
<td></td>
</tr>
<tr>
<td>AIgu-109</td>
<td>Foreman Undetermined Precontact</td>
<td>Isolated Find</td>
<td>Archaeological Services Inc. 1899</td>
<td></td>
</tr>
<tr>
<td>AIgu-111</td>
<td>Borden-Langstaff-Aiken Historic Euro-Canadian</td>
<td>Farmstead</td>
<td>Archaeological Services Inc. 1990</td>
<td></td>
</tr>
<tr>
<td>AIgu-115</td>
<td>Elgin Yonge Centre Late Woodland</td>
<td>Isolated Find</td>
<td>R. Pearce 1990</td>
<td></td>
</tr>
<tr>
<td>AIgu-118</td>
<td>No name Arch</td>
<td>Early Archaic</td>
<td>Isolated Find</td>
<td>Ministry of Transportation 1991</td>
</tr>
<tr>
<td>AIgu-120</td>
<td>Over Late Woodland / Historic Euro-Canadian</td>
<td>Isolated Find</td>
<td>Ministry of Transportation 1991</td>
<td></td>
</tr>
<tr>
<td>AIgu-151</td>
<td>Royal Chapel Historic Euro-Canadian</td>
<td>Farmstead</td>
<td>Archaeological Services Inc. 1995</td>
<td></td>
</tr>
<tr>
<td>AIgu-223</td>
<td>Hamilton Historic Euro-Canadian</td>
<td>Farmstead</td>
<td>D.R. Poulton 1999</td>
<td></td>
</tr>
</tbody>
</table>

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 (AIgu-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 Foreman site (AIgu-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 (AIgu-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 (AIgu-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 (AIgu-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.

Of these 18 sites, 7 sites (the Soules’ Inn site [AIgu-61], the Langstaff Jail-Farm site [AIgu-65], the Vanderburgh site [AIgu-34], the Foreman site [AIgu-109], the Over site [AIgu-120], the Elgin Yonge Centre site [AIgu-115], and the Royal Chapin site [AIgu-151]) have been registered within approximately 50 metres of Yonge Street. The Vanderburgh site (AIgu-34) is also in close proximity to Weldrick Road.

The Soules’ Inn site (AIgu-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 (AIgu-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.
Based on the presence of these 7 sites within the Study Area, as well as on the presence of several watercourses, including Germers 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 levels 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.

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

<table>
<thead>
<tr>
<th>Receptor #</th>
<th>Address</th>
<th>Monitoring Date</th>
<th>Monitoring Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11 Meadowview Ave</td>
<td>25-28 April 2003</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>7 Clark Avenue</td>
<td>2-5 May 2003</td>
<td>63</td>
</tr>
<tr>
<td>3</td>
<td>15 Donan Place</td>
<td>2-5 May 2003</td>
<td>64</td>
</tr>
<tr>
<td>4</td>
<td>27 Baniti Crescent</td>
<td>25-29 April 2003</td>
<td>96</td>
</tr>
<tr>
<td>5</td>
<td>Mary Gapper Crescent (52 Addison Street)</td>
<td>2-5 May 2003</td>
<td>62</td>
</tr>
<tr>
<td>6</td>
<td>10057 Yonge Street</td>
<td>25-28 April 2003</td>
<td>67</td>
</tr>
<tr>
<td>7</td>
<td>6 Leonard Street</td>
<td>2-5 May 2003</td>
<td>63</td>
</tr>
<tr>
<td>8</td>
<td>3 Abbibi Street</td>
<td>25-28 April 2003</td>
<td>72</td>
</tr>
</tbody>
</table>

### 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 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

<table>
<thead>
<tr>
<th>Location</th>
<th>Address</th>
<th>Monitoring Date</th>
<th>Measured Equivalent Daytime (16 hr) and Nighttime (8 hr) L_{eq} Sound Level</th>
<th>Predicted L_{eq} Sound Levels from AADT Traffic Volumes</th>
<th>Closest Receptor Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(dB) Day</td>
<td>(dB) Night</td>
<td>(dB) Day</td>
</tr>
<tr>
<td>1</td>
<td>11 Meadowview Ave</td>
<td>Apr 25</td>
<td>NA</td>
<td>53</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apr 26</td>
<td>53</td>
<td>55</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apr 27</td>
<td>58</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>7 Clark Ave.</td>
<td>May 3</td>
<td>53</td>
<td>50</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May 4</td>
<td>54</td>
<td>50</td>
<td>49</td>
</tr>
<tr>
<td>3</td>
<td>15 Donan Pl.</td>
<td>May 3</td>
<td>54</td>
<td>50</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May 4</td>
<td>63</td>
<td>50</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apr 26</td>
<td>60</td>
<td>56</td>
<td>62</td>
</tr>
<tr>
<td>4</td>
<td>27 Vaniti Cres.</td>
<td>Apr 27</td>
<td>61</td>
<td>56</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apr 28</td>
<td>64</td>
<td>56</td>
<td>NA</td>
</tr>
<tr>
<td>5</td>
<td>Mary Gapper Cres.</td>
<td>May 3</td>
<td>60</td>
<td>50</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May 4</td>
<td>54</td>
<td>52</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>10057 Yonge St.</td>
<td>Apr 26</td>
<td>59</td>
<td>54</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apr 27</td>
<td>58</td>
<td>54</td>
<td>61</td>
</tr>
<tr>
<td>6</td>
<td>6 Leonard St.</td>
<td>May 3</td>
<td>60</td>
<td>57</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May 4</td>
<td>59</td>
<td>56</td>
<td>61</td>
</tr>
<tr>
<td>7</td>
<td>3 Abbibi Street</td>
<td>Apr 26</td>
<td>55</td>
<td>55</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apr 27</td>
<td>54</td>
<td>53</td>
<td>NA</td>
</tr>
</tbody>
</table>

### Table 6-18
Predicted Background Sound Levels at Closest Future Receptors

<table>
<thead>
<tr>
<th>Year</th>
<th>AADT Volumes Highway 407 Eastbound</th>
<th>Receiver Distance (m)</th>
<th>AADT Volumes Highway 407 Westbound</th>
<th>Receiver Distance (m)</th>
<th>Daytime Sound Level (dB)</th>
<th>Nighttime Sound Level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>56,257</td>
<td>105</td>
<td>53,983</td>
<td>145</td>
<td>73.91</td>
<td>67.38</td>
</tr>
<tr>
<td>2021</td>
<td>62,142</td>
<td>105</td>
<td>59,630</td>
<td>145</td>
<td>74.18</td>
<td>67.65</td>
</tr>
</tbody>
</table>

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:

- carbon dioxide (CO\textsubscript{2}): a gas formed by the complete combustion of carbon-based fuels, and is emitted from the exhaust pipes of all vehicles.
- sulphur dioxide (SO\textsubscript{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\textsubscript{2}): a gas formed when anything is burned in air. It is emitted in vehicle exhaust;
- O\textsubscript{3}:
- PM\textsubscript{10}: an index of total suspended particulate matter.
- PM\textsubscript{2.5}: the smaller the particle size, the more readily it can enter the lungs.
- 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\textsubscript{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;

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.
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 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/m³ averaged over 24 hours, and the annual geometric mean of the 24-hour samples is 60 µg/m³. The air quality criteria for TSP are summarized in Table 6-20.

Dustfall

In developing an Ambient Air Quality Criterion (AAQC) for dustfall of 7 g/m²/30 days, the MOE used soil data (e.g. surface build-up of dust) from various Ontario towns between 1951 and 1955, which indicated areas of relatively low soil falling (11 to 15 g/m²/30 days), relatively moderate soilating (17 to 24 g/m²/30 days) and relatively heavy soiling (26 to 34 g/m²/30 days) (WHO, 1961). The air quality criteria for dustfall are summarized in Table 6-22.

Table 6-19

| Stability Class Distribution 1996-2001 in Percent for Toronto Pearson International Airport |
|---------------------------------|------|------|------|------|------|------|
| A  | 0.72  | 0.73  | 0.65  | 0.31  | 0.36  | 0.34  | 0.52         |
| B  | 4.51  | 4.5  | 4.83  | 4.32  | 3.96  | 4.07  | 4.36         |
| C  | 9.57  | 10.26 | 11.35 | 11.54 | 10.47 | 10.42 | 10.60        |
| D  | 54.5  | 55.67 | 51.82 | 53.15 | 58.34 | 58.25 | 55.29        |
| F  | 17.21 | 15.61 | 16.86 | 16.15 | 13.21 | 13.23 | 15.38        |

Note: Class A – Least stable class
Class B – Neutral atmosphere
Class C – Most stable

Table 6-20

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>Ambient Air Quality Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSP</td>
<td>24 hours</td>
<td>120 µg/m³</td>
</tr>
<tr>
<td></td>
<td>1 year*</td>
<td>60 µg/m³</td>
</tr>
</tbody>
</table>

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/m³, the visibility would be about 40 km. At 150 µg/m³, a common urban concentration, the range would be reduced to about 8 km. The MOE 24-hour criterion of 120 µg/m³ is based on a visual range of about 10 km.

TSP was not assessed because the larger particles only affect visibility, while the PM₁₀ has been associated with health impacts.

Fine Particulate Matter PM₁₀ and PM₂.₅

Many studies over the past few years have indicated that fine particulate matter (PM₁₀ and PM₂.₅), 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

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>Guideline Level</th>
<th>Ambient Air Quality Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM₁₀</td>
<td>24 hours</td>
<td>Ontario Intern</td>
<td>50 µg/m³</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>24 hours</td>
<td>Proposed OWS</td>
<td>30 µg/m³</td>
</tr>
</tbody>
</table>
The MOE AAQCs for NO\(_x\) from the City of Toronto are due to transportation sources (RWDI, 2001).

A recent study shows that 21% and 58% of the SO\(_2\) pulmonary function changes, increased airway responsiveness and airway exposure cause greater effects. Short-term acute effects include reaction mechanisms. Ozone (O\(_3\)) is readily transformed to sulphuric acid mist. SO\(_2\) can be oxidized to sulphur trioxide, which, in the presence of water vapour, is used to describe the sum of NO, NO\(_x\), and the term NO\(_2\), 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\(_2\), CO and O\(_3\) are shown in Table 6-23.

---

### Table 6-23

**Provincial: Ontario Ministry of the Environment**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>Ambient Air Quality Criteria</th>
<th>Source: MOE (2001a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dustfall</td>
<td>1 year*</td>
<td>7.0 g/m³/30 days</td>
<td>Note: NS - No Standard</td>
</tr>
</tbody>
</table>

Criteria Air Contaminants (NO\(_x\), SO\(_2\), CO, O\(_3\))

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\(_2\) is a reddish brown, highly reactive gas that is formed in the atmosphere through the oxidation of nitric oxide (NO). NO\(_2\), 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\(_3\)).

**Table 6-22**

<table>
<thead>
<tr>
<th>Compound</th>
<th>CAS No.</th>
<th>Ambient Air Quality Criteria (AAQC)</th>
<th>Note: * Calculated equivalent standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Oxides</td>
<td>10012-44-0</td>
<td>NS 200 NS 400</td>
<td>ND = No Data</td>
</tr>
<tr>
<td>Sulphur Dioxide</td>
<td>7446-09-5</td>
<td>5 275 NS 690</td>
<td>ND = No Data</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>630-08-0</td>
<td>15,700 36,200 NS</td>
<td>ND = No Data</td>
</tr>
<tr>
<td>Ozone</td>
<td>10028-15-6</td>
<td>NS NS NS 165</td>
<td>ND = No Data</td>
</tr>
</tbody>
</table>

**Table 6-23**

**MOE Ambient Air Quality Criteria for Criteria Air Contaminations**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Sampling Period</th>
<th>MOE Criteria</th>
<th>Location #1 – Stouffville Works Yard</th>
<th>Location #2 – Yonge and Hendon</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO(_2)</td>
<td>24-hr (µg/m(^3))</td>
<td>1998-2000</td>
<td>100%</td>
<td>ND ND 8 46</td>
<td>ND ND 8 46</td>
</tr>
<tr>
<td>O(_3)</td>
<td>24-hr (µg/m(^3))</td>
<td>1998-2000</td>
<td>100%</td>
<td>17 161 100% 19 124%</td>
<td>100% 21% 19% 124%</td>
</tr>
<tr>
<td>SO(_2)</td>
<td>24-hr (µg/m(^3))</td>
<td>1998-2000</td>
<td>100%</td>
<td>200 7 258 14 377</td>
<td>100% 8% 100% 7% 189%</td>
</tr>
<tr>
<td>NO(_x) (as NO(_2))</td>
<td>24-hr (µg/m(^3))</td>
<td>1998-2000</td>
<td>100%</td>
<td>36,200 ND ND 0 7,615</td>
<td>100% 0% 100% 7% 189%</td>
</tr>
<tr>
<td>CO</td>
<td>1-hr (µg/m(^3))</td>
<td>1998-1999</td>
<td>100%</td>
<td>50 5 65 ND ND</td>
<td>100% 50% 100% 50% 100%</td>
</tr>
<tr>
<td>PM(_2.5)</td>
<td>24-hr (µg/m(^3))</td>
<td>1998-2000</td>
<td>100%</td>
<td>30 ND ND 6 56</td>
<td>100% 50% 100% 50% 100%</td>
</tr>
<tr>
<td>PM(_10)</td>
<td>24-hr (µg/m(^3))</td>
<td>1998-2000</td>
<td>100%</td>
<td>30 ND ND 6 56</td>
<td>100% 50% 100% 50% 100%</td>
</tr>
</tbody>
</table>

**Table 6-24**

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\(_2.5\) concentrations have been observed at values about 50% higher than the standard occasionally.

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\(_2.5\)). Measurements at this station will be representative of the air quality along the Yonge Street Corridor from Highway 400 to York/Durham Line.
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.

### 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.

### Summary of Project Air Quality Monitoring

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>NOE Criteria</th>
<th>Location #1 – Works Yard</th>
<th>Location #2 – Yonge and Hendon</th>
<th>Location #3 – 16th &amp; Kennedy</th>
<th>Location #4 – Woodbine Centre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stouffville (48002)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO$_2$</td>
<td>24-hr (µg/m$^3$)</td>
<td>75</td>
<td>Max. 12</td>
<td>Min. 7</td>
<td>Avg. 11</td>
<td>Max. 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30-hr (µg/m$^3$)</td>
<td>Max. 12</td>
<td>Min. 7</td>
<td>Avg. 4</td>
<td>Max. 4</td>
</tr>
<tr>
<td>NO$_x$</td>
<td>24-hr (µg/m$^3$)</td>
<td>15</td>
<td>Max. 5</td>
<td>Min. 4</td>
<td>Avg. 4</td>
<td>Max. 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30-hr (µg/m$^3$)</td>
<td>Max. 5</td>
<td>Min. 4</td>
<td>Avg. 3</td>
<td>Max. 3</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>24-hr (µg/m$^3$)</td>
<td>50</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30-hr (µg/m$^3$)</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Dustfall (inorganic fraction)</td>
<td>24-hr (µg/m$^3$)</td>
<td>10</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30-hr (µg/m$^3$)</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
</tbody>
</table>

Note: * Calculated equivalent standard
ND = No Data
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 service 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 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 at 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 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 overlaid and, where appropriate, services can be started or terminated off 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>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td></td>
</tr>
<tr>
<td>BRT and LRT horizontal and vertical alignment standards</td>
<td></td>
</tr>
<tr>
<td>Sight distance and visibility</td>
<td></td>
</tr>
<tr>
<td>General appearance</td>
<td></td>
</tr>
<tr>
<td>Passenger comfort</td>
<td></td>
</tr>
<tr>
<td>Impact on at-grade crossings</td>
<td></td>
</tr>
<tr>
<td>Intended operating and service plan</td>
<td></td>
</tr>
<tr>
<td>Adjacent roadways and railways</td>
<td></td>
</tr>
<tr>
<td>Vehicle performance</td>
<td></td>
</tr>
<tr>
<td>Impact on adjacent property</td>
<td></td>
</tr>
<tr>
<td>Underground and overhead utilities</td>
<td></td>
</tr>
<tr>
<td>Cost-effectiveness</td>
<td></td>
</tr>
<tr>
<td>BRT and LRT horizontal and vertical clearances</td>
<td></td>
</tr>
<tr>
<td>Type of construction</td>
<td></td>
</tr>
</tbody>
</table>
Table 7-1
Summary of BRT Running Way Geometric Design Criteria

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Preferred min./max.</th>
<th>Absolute min./max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Speed – Transitway between stations</td>
<td>90 kph</td>
<td>40 kph</td>
</tr>
<tr>
<td>Design Speed – Station and Business Dist. Areas</td>
<td></td>
<td>50 kph</td>
</tr>
<tr>
<td>Design Speed - Arterial Ramps and Access Roads</td>
<td></td>
<td>40 kph</td>
</tr>
<tr>
<td>Stopping Sight Distance: 90 kph design speed</td>
<td></td>
<td>236 m</td>
</tr>
<tr>
<td>60 kph design speed</td>
<td></td>
<td>84 m</td>
</tr>
<tr>
<td>Minimum Horizontal Curve Radius, Transitway</td>
<td>200m</td>
<td>50 m</td>
</tr>
<tr>
<td>Minimum Horizontal Curve Radius, Stations and CBD</td>
<td>120m</td>
<td>50 m</td>
</tr>
<tr>
<td>Minimum Horizontal Curve Radius, Access Ramps</td>
<td></td>
<td>45 m</td>
</tr>
<tr>
<td>Minimum Horizontal Curve Radius in Maintenance Facility</td>
<td>30m</td>
<td>15m</td>
</tr>
<tr>
<td>Minimum Turning Radii at intersections</td>
<td>25m</td>
<td>15 m</td>
</tr>
</tbody>
</table>

Maximum Transitway Super-elevation (above 50 kph) 7%

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

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
Summary of LRT Running Way Geometric Design Criteria

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Preferred Horizontal Alignment</th>
<th>Absolute Horizontal Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Radius of Circular Curves: On Running Line in Stations</td>
<td>250 m</td>
<td>100 m</td>
</tr>
<tr>
<td>Minimum Length of Circular Curves: On Running Line in Yards</td>
<td>50 m</td>
<td>35 m</td>
</tr>
<tr>
<td>Minimum Length of Spiral Curves, the greater of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- considering roll rate or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- considering vehicle torsion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- considering lateral acceleration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Length of Tangent between spiral curves</td>
<td>100 m</td>
<td>25 m</td>
</tr>
<tr>
<td>Minimum Length of tangent track preceding a point of switch</td>
<td>15 m</td>
<td>15 m</td>
</tr>
<tr>
<td>Minimum Length of tangent beyond the ends of platforms</td>
<td>20 m</td>
<td>15 m</td>
</tr>
</tbody>
</table>

VERTICAL ALIGNMENT

Maximum Gradient: On running line in Stations | 4.5% | 6.0% |

Minimum Grade on running line | 0.3% | 0.5% |

Minimum Length of vertical curves | 200 m | 200 m |

Maximum Applied Super-elevation on running track (E_a) | 110 mm | 130 mm |

Maximum Unbalanced Super-elevation (E_u): On running line in turnouts | 75 mm | 100 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 fulfill 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 fueling, 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 Highway 7/Langstaff 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/Langstaff 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
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 19th Avenue/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
- Carville Road/16th Avenue
- Weddrick 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 Banty 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.
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 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:

- 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
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.
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 & EVALUATION 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 Radcliffe 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.

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.
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.

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:

- 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 transit 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.

9.2.4 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.
FINAL LAYOUT FOR THE TRANSIT WAY SOUTH OF STEELES AVENUE WILL BE DEPENDENT ON THE CLASS CA CURRENTLY UNDERWAY BY THE CITY OF TORONTO. YRTP AND THE REGION WILL WORK WITH THE CITY TO ACHIEVE A COMPATIBLE DESIGN.
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 to 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 area is currently farmland used for market gardens and small fruit orchards that would have to be removed in order to accommodate the proposed facility. 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.

**c) Highway 7 Parkway Belt Land**

This site is located north of Highway 7 and west of Yonge Street approximately 1.5 km from the Yonge Street Corridor. Access to the site is available directly from Highway 7. 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.

**d) Yonge Street Corridor Parkway Belt Land**

This site is located along the Honey Street Corridor between Yonge Street and Highway 407 approximately 1 km from the Yonge Street Corridor. Access to the site is available directly from Yonge Street. 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.

**Figure 9-9**

Maintenance and Storage Facility Sites Considered
### 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

<table>
<thead>
<tr>
<th>Goals</th>
<th>Typical indicators measuring route's ability to achieve goals</th>
<th>Unit of measure</th>
<th>Yonge Street Only</th>
<th>Yonge Street/ Weldrick/ GO Line Option</th>
<th>GO Line Option</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A1</strong> Maximize inter-regional and local transit connectivity</td>
<td>Connections to inter-regional services and existing gateways, Compatibility with proposed network</td>
<td>No. of crossings services (GO, TTC, etc.), Relative measure</td>
<td>GO connection at Langstaff, Best connectivity with local transit, Good connectivity with local transit</td>
<td>GO connections at Richmond Hill and Langstaff, Worst connectivity with local transit</td>
<td></td>
</tr>
<tr>
<td><strong>A2</strong> Maintain flexibility to expand network?</td>
<td>Potential for additional stations</td>
<td>No. of stations</td>
<td>Smaller route length, Potential for additional station at Weldrick/CN, Longer route length</td>
<td>Mostly at grade, parking lots, etc., Many grade separations</td>
<td></td>
</tr>
<tr>
<td><strong>A3</strong> Alignment geometry that maximizes speed and ride comfort and minimizes safety risks and maintenance costs</td>
<td>% of route &gt; 3% grade, No. of running way sections &gt; 3.5%, No. of curves &lt; 100 metres, No. of curves &gt; 100 metres and &lt; 300 metres</td>
<td>%, F, F</td>
<td>8 % of route, 1 (420m in length), 0 curves, 2 curves</td>
<td>0.1 % of route, 1 (25m in length), 1 (10m in length), 2 curves, 2 curves</td>
<td></td>
</tr>
<tr>
<td><strong>A4</strong> Increase attractiveness of rapid transit service</td>
<td>Projected travel time along each alternative, Daily boardings (24 hours), Route features with potential to reduce service reliability</td>
<td>Travel time, Daily boardings, Constraints/ intersections,</td>
<td>Travel time, Daily boardings, Constraints/ intersections,</td>
<td>Travel time, Daily boardings, Constraints/ intersections,</td>
<td></td>
</tr>
<tr>
<td><strong>A5</strong> Station locations that maximize ridership potential of rapid transit service</td>
<td>Existing and future residents or residences within 500 m of the nearest station, Existing and future development within a 500 m walking distance of a station</td>
<td>No. of residents, No. of employment centres</td>
<td>Estimate from aerials at station locations, Estimate from aerials at station locations</td>
<td>Estimate from aerials at station locations, Estimate from aerials at station locations</td>
<td></td>
</tr>
<tr>
<td><strong>A6</strong> Maximize convenience of access to rapid transit system</td>
<td>Number of stations with bus transfer facilities, Number of stations with potential for park-and-ride facilities, Number of stations with potential for passenger pick-up/drop-off facilities, Number of stations with other travel modes (taxi/bike/Wheel Trans)</td>
<td>No. of stations, No. of stations, No. of stations, No. of stations</td>
<td>All stations have bus transfer facilities, Little potential outside of Gateway, No grade separations, Taxis, bikes, etc already on Yonge</td>
<td>All stations have bus transfer facilities, Little potential outside of Gateway, Some grade separations, Estimated from other two options, Grade separations are inconvenient</td>
<td></td>
</tr>
</tbody>
</table>

#### 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

**Preferred Option for Objective A:**

**Note:** The above indicators were presented to the public at Open House A2. 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>
<thead>
<tr>
<th>Goals</th>
<th>Typical indicators measuring mode's ability to achieve goals</th>
<th>Unit of measure</th>
<th>Yonge Street Only</th>
<th>Yonge Street/Weldrick/GO Line Option</th>
<th>GO Line Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1 Minimize adverse effects on and maximize benefits for communities in corridor</td>
<td>Potential for displacement/erosion of unique and distinctive community features</td>
<td>No. of unique &amp; distinctive community features disrupted</td>
<td>Some potential</td>
<td>Some potential</td>
<td>Little to no potential</td>
</tr>
<tr>
<td></td>
<td>Number of persons and residential units displaced by location</td>
<td>No. of residential units</td>
<td>None</td>
<td>6 units</td>
<td>6 units</td>
</tr>
<tr>
<td></td>
<td>Potential for change in interaction among community groups</td>
<td>Relative Change</td>
<td>Median barrier may restrict interaction</td>
<td>Estimated from other two options</td>
<td>Stations on one side may promote connectivity</td>
</tr>
<tr>
<td></td>
<td>Number, land area and type of community features/ services affected</td>
<td>No. of community features</td>
<td>Little to none</td>
<td>Little to none</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Construction effects</td>
<td>Constructability Review</td>
<td>4.7km on major arterial</td>
<td>9km on arterial, 1.3km on residential</td>
<td>Mostly on its own right of way</td>
</tr>
<tr>
<td>B2 Maintain or improve road traffic and pedestrian circulation</td>
<td>Number of intersections with restricted access</td>
<td>No. of intersections</td>
<td>10 intersections</td>
<td>7 intersections</td>
<td>5 intersections</td>
</tr>
<tr>
<td></td>
<td>Number of residential driveways with restricted access</td>
<td>No. of driveways</td>
<td>0 driveways</td>
<td>0 driveways</td>
<td>0 driveways</td>
</tr>
<tr>
<td></td>
<td>Potential for infiltration of neighborhoods by diverted traffic</td>
<td>Razing</td>
<td>Substantial level of diverted traffic</td>
<td>Significant level of diverted traffic</td>
<td>No diverted traffic</td>
</tr>
<tr>
<td></td>
<td>Loss of residential street parking</td>
<td>Length of resident street parking loss</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Change in level of pedestrian cross-movements</td>
<td>Razing</td>
<td>Transway on shorter route length</td>
<td>Transway on longer route length</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Number of pedestrian paths severed or made more indirect</td>
<td>No. of pedestrian paths severed</td>
<td>At least 5 severed</td>
<td>At least 7 severed</td>
<td>5 severed</td>
</tr>
<tr>
<td></td>
<td>Number of stations with the potential to increase traffic and parking on local streets</td>
<td>No. of stations</td>
<td>Side streets close to stations, etc.</td>
<td>Side streets close to stations, etc.</td>
<td>Side streets close to stations, etc.</td>
</tr>
<tr>
<td></td>
<td>Number of unique signalized intersections required</td>
<td>Razing (No. of signalized intersections)</td>
<td>2-along route</td>
<td>4-along route</td>
<td>4-along route</td>
</tr>
<tr>
<td></td>
<td>Number of signalized intersections affected - more complex demands</td>
<td>Razing (No. of signalized intersections)</td>
<td>13-along route</td>
<td>15-along route</td>
<td>15-along route</td>
</tr>
<tr>
<td></td>
<td>Number of unsignalized intersections affected</td>
<td>Razing (No. of unsignalized intersections)</td>
<td>0-along route</td>
<td>0-along route</td>
<td>0-along route</td>
</tr>
<tr>
<td></td>
<td>Length of road with temporary restricted capacity or blocked during construction</td>
<td>Length of road</td>
<td>4.7km - arterial</td>
<td>8km - arterial and 1.3km - residential</td>
<td>8km - side roads</td>
</tr>
<tr>
<td>B3 Maintain a high level of public safety and security in corridor</td>
<td>Number of locations with potential to decrease public safety</td>
<td>No. of location &amp; degree of safety</td>
<td>Motorists not used to u-turns, etc</td>
<td>Many unique intersections</td>
<td>Stations next to rail line is concern (running etc)</td>
</tr>
<tr>
<td></td>
<td>Effect of transitway insertion on emergency vehicle circulation</td>
<td>Razing</td>
<td>May use transway, minor restriction</td>
<td>Estimated from other two options</td>
<td>No-effect</td>
</tr>
<tr>
<td>B4 Minimize adverse noise and vibration effects</td>
<td>Sound - Minimize the number of residences impacted by operations</td>
<td>Number</td>
<td>Relative Evaluation</td>
<td>Relative Evaluation</td>
<td>Relative Evaluation</td>
</tr>
<tr>
<td></td>
<td>Vibration - Minimize number of residences impacted by operations</td>
<td>Number</td>
<td>Relative Evaluation</td>
<td>Relative Evaluation</td>
<td>Relative Evaluation</td>
</tr>
<tr>
<td></td>
<td>Construction - Minimize the number of residences impacted</td>
<td>Number</td>
<td>Relative Evaluation</td>
<td>Relative Evaluation</td>
<td>Relative Evaluation</td>
</tr>
<tr>
<td>B5 Minimize adverse effects on cultural resources</td>
<td>Number of features</td>
<td>CLU</td>
<td>0 - BHF</td>
<td>0 - CLU</td>
<td>0 - CLU</td>
</tr>
<tr>
<td></td>
<td>Number of features</td>
<td>CLU</td>
<td>Best potential for visual integration</td>
<td>Big impact on single unit homes</td>
<td>Difficult to integrate with surroundings</td>
</tr>
<tr>
<td>B6 Minimize disruption of community vittas and adverse effects on street and neighbourhood aesthetics</td>
<td>Visual impact on people living and working in and visiting the community</td>
<td>Razing</td>
<td>Potential blocking of businesses</td>
<td>Impact on single unit homes</td>
<td>Little degradation, need to tracks</td>
</tr>
</tbody>
</table>

**SYNOPSIS OF ALIGNMENT EVALUATION FINDINGS**

**Objectives And Goals:**
- Effects on communities.
- Public safety and security.
- Effects on cultural resources.
- Noise and vibration.
- Community noise and street aesthetics.
- Causes very few adverse community effects, provides good access and offers good urban design potential.
- Insertion in Yonge St. results in minimal 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 is useful for increased 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**

**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 (LANGSTAFF ROAD TO SOUTH OF ELGIN MILLS) - OBJECTIVE C: To promote a sustainable environment by protecting and enhancing the natural environment in the corridor

<table>
<thead>
<tr>
<th>Goals</th>
<th>Typical indicators measuring route’s ability to achieve goals</th>
<th>Yonge Street Only</th>
<th>Yonge Street/Weidrick/GO Line Option</th>
<th>GO Line Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Minimize adverse effects on Aquatic Ecosystems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of aquatic ecosystems displaced or disturbed within zone of potential facility effects</td>
<td>No. of aquatic ecosystems</td>
<td>2 Crossings</td>
<td>6 Crossings</td>
</tr>
<tr>
<td></td>
<td>Type of aquatic ecosystems displaced or disturbed within zone of potential facility effects</td>
<td>Type of aquatic ecosystems (lentic or lotic)</td>
<td>Estimated from LGL input</td>
<td>Estimated from LGL input</td>
</tr>
<tr>
<td></td>
<td>Area (ha) or length (m) of aquatic ecosystems displaced or disturbed within zone of potential facility effects</td>
<td>Significant area of aquatic ecosystems (habitat type, community type, presence of species at-risk, etc.)</td>
<td>Estimated from LGL input</td>
<td>Estimated from LGL input</td>
</tr>
<tr>
<td></td>
<td>Number of aquatic ecosystems displaced or disturbed within zone of potential facility effects</td>
<td>Area (ha) of aquatic ecosystems</td>
<td>Estimated from LGL input</td>
<td>Estimated from LGL input</td>
</tr>
<tr>
<td>C2</td>
<td>Minimize adverse effects on Terrestrial Ecosystems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of terrestrial ecosystems displaced or disturbed within zone of potential facility effects</td>
<td>No. of terrestrial ecosystems</td>
<td>4 terrestrial ecosystems</td>
<td>8 terrestrial ecosystems</td>
</tr>
<tr>
<td></td>
<td>Type of terrestrial ecosystems displaced or disturbed within zone of potential facility effects</td>
<td>Type of terrestrial ecosystems (woodlands, forests, thickets, fields, etc.)</td>
<td>Estimated from LGL input</td>
<td>Estimated from LGL input</td>
</tr>
<tr>
<td></td>
<td>Extent of terrestrial ecosystems displaced or disturbed within zone of potential facility effects</td>
<td>Area (ha) of terrestrial ecosystems</td>
<td>Estimated from # of ecosystems</td>
<td>Estimated from # of ecosystems</td>
</tr>
<tr>
<td></td>
<td>Significance of terrestrial ecosystems displaced or disturbed within zone of potential facility effects</td>
<td>Significance of terrestrial ecosystems (uncommon vegetation communities, significant concentration of animals, areas movement corridors, rare or specialized habitats, presence of species at-risk, etc.)</td>
<td>Estimated from LGL input</td>
<td>Estimated from LGL input</td>
</tr>
<tr>
<td>C3</td>
<td>Minimize adverse effects on corridor hydrogeological, geological and hydrological conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potential effects on municipal and private wells</td>
<td>No. and type of wells</td>
<td>Significant difference between alternatives: the road widening required to implement the transtsyway in all three alternatives does not encroach on the wells.</td>
<td>Significant difference between alternatives: the road widening required to implement the transtsyway in all three alternatives does not encroach on the wells.</td>
</tr>
<tr>
<td></td>
<td>Number of recharge/discharge areas affected</td>
<td>No. and area (ha) of recharge/discharge areas</td>
<td>Significant 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.</td>
<td>Significant 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.</td>
</tr>
<tr>
<td></td>
<td>Potential effects on aquifers</td>
<td>No. and depth of aquifers</td>
<td>Significant 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 have impact to the aquifer.</td>
<td>Significant 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.</td>
</tr>
<tr>
<td></td>
<td>Area within floodplain</td>
<td>Length of Transitway (km)</td>
<td>One floodplain crossing</td>
<td>1.3km German Mills Creek</td>
</tr>
<tr>
<td></td>
<td>Number of sites with issues of potential subsurface environmental concern</td>
<td>Number of sites</td>
<td>95 sites (from Golder)</td>
<td>67 sites (from Golder)</td>
</tr>
</tbody>
</table>

### SYNOPSIS OF ALIGNMENT EVALUATION FINDINGS

Objectives And Goals:
- Protect Natural Environment.
- Effect on aquatic ecosystems.
- Effect on terrestrial ecosystems.
- Effect on Hydro-geological conditions.

Preferred Option for Objective C

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

<table>
<thead>
<tr>
<th>Goals</th>
<th>Typical indicators measuring route’s ability to achieve goals</th>
<th>Yonge Street Only</th>
<th>Yonge Street/ Weldrick/ GO Line Option</th>
<th>GO Line Option</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D1 Support Regional and Municipal Planning Policies and approved urban structure</strong></td>
<td>Conformity with, and support for, policies of official plans and urban structures of Region, internal and adjacent municipalities, including GTA</td>
<td>Rating</td>
<td>Estimate from aerials, land use input</td>
<td>Estimate from aerials, land use input</td>
</tr>
<tr>
<td></td>
<td>Conformity with land use designations, including compatibility with existing development</td>
<td>Rating</td>
<td>Estimate from land use input</td>
<td>Estimate from land use input</td>
</tr>
<tr>
<td><strong>D2 Provide convenient access to social and community facilities in corridor</strong></td>
<td>Service to planned centres, major and minor</td>
<td>Rating</td>
<td>Town Hall, York Gen. Hospital, etc.</td>
<td>Estimated from other two options</td>
</tr>
<tr>
<td></td>
<td>Proximity to community facilities, hospitals, educational institutions, community centres, local government offices etc.</td>
<td>Rating</td>
<td>Close to above</td>
<td>Not close to Hospital or Town Hall</td>
</tr>
<tr>
<td><strong>D3 Minimize adverse effects on business activities in corridor</strong></td>
<td>Number, land area and type of industrial uses displaced</td>
<td>Rating</td>
<td>Estimate from aerials, land use input</td>
<td>Estimate from aerials, land use input</td>
</tr>
<tr>
<td></td>
<td>Number, land area and type of retail, office and service, commercial businesses displaced</td>
<td>Rating</td>
<td>Estimate from aerials, land use input</td>
<td>Estimate from aerials, land use input</td>
</tr>
<tr>
<td></td>
<td>Length of route with potential for an increase in business activity</td>
<td>Rating</td>
<td>Already a mature route</td>
<td>Greater potential</td>
</tr>
<tr>
<td></td>
<td>Number of business entrances/exits affected by transitway insertion</td>
<td>Rating</td>
<td>52 driveways</td>
<td>0 driveways</td>
</tr>
<tr>
<td></td>
<td>Percentage of total parking potential lost</td>
<td>Rating</td>
<td>Some parking may be lost</td>
<td>None</td>
</tr>
<tr>
<td><strong>D4 Protect provisions for goods movement in corridor</strong></td>
<td>Inventory of major truck routes, delivery and loading areas, manufacturing operations affected by transitway insertion</td>
<td>Rating</td>
<td>Lots of businesses and delivery routes on Yonge St.</td>
<td>Estimated from other two options</td>
</tr>
<tr>
<td><strong>D5 Promote transit-oriented development</strong></td>
<td>Opportunities for re-development</td>
<td>Rating</td>
<td>Designated vacant sites</td>
<td>More opportunity</td>
</tr>
<tr>
<td></td>
<td>Potential opportunities for development and higher order uses, at stations, terminals, and along the corridor</td>
<td>Rating</td>
<td>No significant difference</td>
<td>No significant difference</td>
</tr>
</tbody>
</table>

#### 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.

**Preferred Option for Objective D**

- **D**

**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.

**Legend:** Least Responsive ◣ ◢ ◔ ◐ ◑ Most Responsive
### Table 9-5
Evaluation of Alignment Alternatives for Objective E

<table>
<thead>
<tr>
<th>Goals</th>
<th>Typical indicators measuring route’s ability to achieve goals</th>
<th>Unit of measure</th>
<th>Yonge Street Only</th>
<th>Yonge Street/ Weldrick/ GO Line Option</th>
<th>GO Line Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Minimize capital cost of vehicles, facilities and systems required</td>
<td>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</td>
<td>$</td>
<td>Estimate (higher staging costs, shorter length)</td>
<td>Estimated (low staging costs, longer route, bridge)</td>
</tr>
<tr>
<td></td>
<td>Estimated vehicle fleet cost</td>
<td>$ (No. of fleet to be required, Frequency of the service, Length of service)</td>
<td>●</td>
<td>Slightly shorter route</td>
<td>Slightly longer route</td>
</tr>
<tr>
<td>E2</td>
<td>Minimize cost effects on adjacent properties to implement facilities</td>
<td>Estimated value of residential land to be acquired</td>
<td>Nature of residential land to be acquired</td>
<td>●</td>
<td>Minor widening of existing right-of-way</td>
</tr>
<tr>
<td></td>
<td>Estimated value of industrial land to be acquired</td>
<td>Nature of industrial land to be acquired</td>
<td>●</td>
<td>At least 16 units and some property</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Estimated value of commercial land to be acquired</td>
<td>Nature of commercial land to be acquired</td>
<td>●</td>
<td>At least one property</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Potential for costs associated with management of contaminated soils or ground water</td>
<td>Relative assessed cost-risk</td>
<td>95 sites (from assessment)</td>
<td>●</td>
<td>67 sites (from assessment)</td>
</tr>
<tr>
<td>E3</td>
<td>Minimize adverse effects of alignment characteristics on operating and maintenance costs</td>
<td>Influence of route length on O &amp; M costs</td>
<td>$ (route length)</td>
<td>●</td>
<td>4.7km route</td>
</tr>
<tr>
<td></td>
<td>Influence of alignment characteristics on O &amp; M costs</td>
<td>$ (no. of stations, ease of access to maintenance vehicles)</td>
<td>●</td>
<td>5 stations, good horizontal, moderate vertical</td>
<td>●</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>PREFERRED OPTION FOR OBJECTIVE E</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
</tr>
</tbody>
</table>
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.

From this evaluation, the following key conclusions were reached:

- 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 Avenue.
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 10-25 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 engagement process.
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 transway with the reduced lane width will require a local speed reduction.

**Streetscaping:** A streetscaping plan was adopted for the Yonge Street EA transway. 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 district. Streetscaping:

The short section of transitway with the reduced lane width will require a local speed reduction.

**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 Transway 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 transway. Within the mixed-traffic section, LRT vehicles will remain in the median, sharing the median lanes with general traffic.

**Network:** The transway 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 transway 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”.

PM1435 Yonge Street Corridor Public Transit Improvements Environmental Assessment 21/07/2005 10-3
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 maneuver, 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.

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 50 m 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.

![Streetscaping plan for Yonge Transitway](image-url)
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.

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.

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 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.

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.
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 Transit-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 this 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 corridor.

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;
- “Str. 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.
2016 Scenario

For 2016, the same services as for 2011 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 10-3
Peak-hour Vehicle Volumes and Frequencies – 2016

<table>
<thead>
<tr>
<th>Branch</th>
<th>Frequency (m:s)</th>
<th>Vehicles/Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newmarket (express)</td>
<td>2:45</td>
<td>57</td>
</tr>
<tr>
<td>Bermint</td>
<td>2:00</td>
<td>35</td>
</tr>
<tr>
<td>Major Mackenzie</td>
<td>3:45</td>
<td>65</td>
</tr>
<tr>
<td>Richmond Hill</td>
<td>4:00</td>
<td>55</td>
</tr>
<tr>
<td>Steeles</td>
<td>2:44</td>
<td>50</td>
</tr>
</tbody>
</table>

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 10-4
Total Peak-hour Vehicle Volumes and Frequencies – 2016

<table>
<thead>
<tr>
<th>North of:</th>
<th>Passengers</th>
<th>Min. Freq. (m:s)</th>
<th>Vehicles/Hour</th>
<th>Pass./Veh.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bermint</td>
<td>1000</td>
<td>3:45</td>
<td>16</td>
<td>62</td>
</tr>
<tr>
<td>Major Mackenzie</td>
<td>1400</td>
<td>6:00</td>
<td>26</td>
<td>54</td>
</tr>
<tr>
<td>Richmond Hill</td>
<td>1800</td>
<td>3:45</td>
<td>32</td>
<td>56</td>
</tr>
<tr>
<td>Steeles</td>
<td>2400</td>
<td>2:44</td>
<td>36</td>
<td>64</td>
</tr>
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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, Pomonah 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.

Table 10-5
Peak-hour Vehicle Volumes and Frequencies – 2021

<table>
<thead>
<tr>
<th>Branch</th>
<th>Frequency (m:s)</th>
<th>Vehicles/Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newmarket (express)</td>
<td>2:15</td>
<td>40</td>
</tr>
<tr>
<td>Bermint</td>
<td>2:00</td>
<td>30</td>
</tr>
<tr>
<td>Major Mackenzie Branch(es)</td>
<td>10:00</td>
<td>6</td>
</tr>
<tr>
<td>Highway 7 Branch(es)</td>
<td>5:00</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 10-6
Total Peak-hour Vehicle Volumes and Frequencies – 2021

<table>
<thead>
<tr>
<th>North of:</th>
<th>Passengers</th>
<th>Min. Freq. (m:s)</th>
<th>Vehicles/Hour</th>
<th>Pass./Veh.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bermint</td>
<td>1000</td>
<td>2:15</td>
<td>49</td>
<td>62</td>
</tr>
<tr>
<td>Major Mackenzie</td>
<td>4400</td>
<td>2:00</td>
<td>79</td>
<td>47</td>
</tr>
<tr>
<td>Richmond Hill</td>
<td>4800</td>
<td>1:40</td>
<td>84</td>
<td>50</td>
</tr>
<tr>
<td>Steeles</td>
<td>6100</td>
<td>1:15</td>
<td>96</td>
<td>65</td>
</tr>
</tbody>
</table>
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 m²). The length of the realignment is approximately 450 m (900 m²). There is an opportunity to create at least 200 m² 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.
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 weekdays 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 fuelling and cleaning. After fuelling 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 fuelling 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 as 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 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 Section 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.

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 environment 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 individuals at a localized area or 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

<table>
<thead>
<tr>
<th>Goal</th>
<th>Environmental Value Criterion</th>
<th>Environmental Issues/Concerns</th>
<th>Project Phases</th>
<th>Location</th>
<th>Potential Environment Effects</th>
<th>Proposed Mitigation Measures</th>
<th>Potential Residual Effects</th>
<th>Further Mitigation</th>
<th>Level of Significance after Mitigation</th>
<th>Monitoring and Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Maximize inter-regional and local transit connectivity</td>
<td>Connections to inter-regional services and future gateways</td>
<td>✓</td>
<td>Hey 7 and Hey 407 crossing</td>
<td>Better connection to GO Stations and future provincial inter-regional transit station will improve ridership on all transit services</td>
<td>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.</td>
<td>Increased potential for infill development around Langstaff Station.</td>
<td>R.O.W protection along the GO Line corridor to achieve an additional connection</td>
<td>Positive effect</td>
<td>Monitor ridership and the need to develop connection to GO Richmond Hill Station</td>
</tr>
<tr>
<td>A</td>
<td>Compatibility with proposed local network</td>
<td>✓</td>
<td>Entire Corridor</td>
<td>Incorvient transfer between local transit and Yonge Rapid Transit may discourage transit ridership</td>
<td>Stations generally located on east-west local transit routes ensuring convenient transfers between services. Integrated fare system proposed.</td>
<td>Project may change the configuration of local transit.</td>
<td>Local services will be configured as a grid where practical, providing community coverage and feeder roles</td>
<td>Positive effect</td>
<td>Regular review of effectiveness of local service plans.</td>
<td></td>
</tr>
</tbody>
</table>

**Goal A:** To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service

**Built-in Positive Attributes and/or Mitigations:**

- Positive effect
- Monitor ridership and the need to develop connection to GO Richmond Hill Station

**Potential Residual Effects:**

- Increased potential for infill development around Langstaff Station.

**Further Mitigation:**

- R.O.W protection along the GO Line corridor to achieve an additional connection

**Level of Significance after Mitigation:**

- Positive effect

**Monitoring and Recommendation:**

- Regular review of effectiveness of local service plans.

**Objective A:**

To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service.

**Built-in Positive Attributes and/or Mitigations:**

- Positive effect
- Monitor ridership and the need to develop connection to GO Richmond Hill Station

**Potential Residual Effects:**

- Increased potential for infill development around Langstaff Station.

**Further Mitigation:**

- R.O.W protection along the GO Line corridor to achieve an additional connection

**Level of Significance after Mitigation:**

- Positive effect

**Monitoring and Recommendation:**

- Regular review of effectiveness of local service plans.
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, Buriker 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.
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**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Environmental Value/ Criterion</th>
<th>Environmental Issues/ Concerns</th>
<th>Project Phase</th>
<th>Location</th>
<th>Potential Environment Effects</th>
<th>Proposed Mitigation Measures</th>
<th>Level of Significance after Mitigation</th>
<th>Monitoring and Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B1</strong></td>
<td>Minimize adverse effects on and maximum benefits for communities in corridor</td>
<td>Potential displacement of community features</td>
<td>✓✓✓</td>
<td>Entire Corridor</td>
<td>Potential displacement or loss of unique features.</td>
<td>Avoided known locations of distinct features to minimize impact; Incorporated streetscaping and road furniture to enhance corridor and community environment.</td>
<td>None expected</td>
<td>None expected</td>
</tr>
<tr>
<td></td>
<td>Effect on Community Cohesion</td>
<td></td>
<td>✓✓✓</td>
<td>Entire Corridor</td>
<td>Median transitway in widened Yonge Street may be perceived as a barrier between east and west communities.</td>
<td>Provided safe crosswalks with median refuge. Improved streetscaping in order to create a more pedestrian-friendly environment.</td>
<td>None expected</td>
<td>None necessary</td>
</tr>
<tr>
<td></td>
<td>Community facility utilization</td>
<td></td>
<td>✓✓✓</td>
<td>Entire Corridor</td>
<td>Improved transit access increases demand on facilities and services within the corridor.</td>
<td>Municipality can expand services and facilities through the increased development charge revenue.</td>
<td>Community facility expansion could impact existing communities.</td>
<td>Include mitigation measures in community facility expansion.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.)</td>
<td></td>
<td>Intersection Yonge/Steeles Avenue</td>
<td>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.</td>
<td>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.</td>
<td>None expected</td>
<td>None necessary</td>
</tr>
</tbody>
</table>

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**References:**

PM1435 Yonge Street Corridor Public Transit Improvements Environmental Assessment 2007/05
### Table 11-2
Assessment of Environmental Effects for Objective B - Social Environment

<table>
<thead>
<tr>
<th>Goal</th>
<th>Objective B: To protect and enhance the social environment in the corridor</th>
<th>Project Phase</th>
<th>Location</th>
<th>Potential Environment Effects</th>
<th>Proposed Mitigation Measures</th>
<th>Potential Residual Effects</th>
<th>Further Mitigation</th>
<th>Level of Significance after Mitigation</th>
<th>Monitoring and Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to minor side streets and properties along Yonge Street.</td>
<td>Entire Corridor</td>
<td></td>
<td></td>
<td></td>
<td>U-turns provided at major intersections for safe maneuvers into side streets and properties. Random permissive left turns eliminated thus increasing safety. Develop traffic management plans for construction.</td>
<td>Conflict with U-Turns and Right Turns on Red from side streets at Meadowview Ave., Uplands Ave., Langstaff Road East, Weldon Rd, Devorsleigh Blvd may decrease safety.</td>
<td>None necessary</td>
<td>Moderately significant</td>
<td>Monitor traffic and prohibit Right Turns On Red movements from the side street at these locations if necessary</td>
</tr>
<tr>
<td>North-south vehicular and RT capacity on Yonge Street.</td>
<td>Glen Cameron Road and Arnold Avenue/Elgin Street</td>
<td></td>
<td></td>
<td></td>
<td>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.</td>
<td>None necessary</td>
<td>Negligible</td>
<td>The decision to implement these special provisions should be deferred until post-operation conditions are monitored and the need is identified.</td>
<td></td>
</tr>
<tr>
<td>Maintain or improve road traffic and pedestrian circulation</td>
<td>Thornhill Drive Jane Street/ Colborne Street/ Meadow Avenue/ Spruce Avenue</td>
<td></td>
<td></td>
<td></td>
<td>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.</td>
<td>Modernly Significant</td>
<td></td>
<td></td>
<td>Undertake “before” and “after” traffic volume observations on affected roads to determine any changes in traffic infiltration levels.</td>
</tr>
<tr>
<td>Potential for Traffic Infiltration</td>
<td>Woodward Avenue/ Grandview Avenue/ Highland Park</td>
<td></td>
<td></td>
<td></td>
<td>Traffic management measures such as turn restrictions could be implemented during detail design.</td>
<td>Infiltration may remain. Traffic management measures or alternative access arrangements would be undertaken, as required.</td>
<td>Moderately Significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parking Prohibitions in Richmond Hill Commercial District.</td>
<td>Richmond Hill CBD</td>
<td></td>
<td></td>
<td></td>
<td>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.</td>
<td>None expected</td>
<td>None necessary</td>
<td>Insignificant</td>
<td>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.</td>
</tr>
<tr>
<td>NBSTU U-turn movements and the corresponding side street right-turn-on-red (RTOR) movements</td>
<td>Meadowview Avenue Uplands Avenue Langstaff Road East Weldon Rd Devorsleigh Blvd</td>
<td></td>
<td></td>
<td></td>
<td>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.</td>
<td>None required</td>
<td>None expected</td>
<td>None necessary</td>
<td>Significant</td>
</tr>
<tr>
<td>Maintain a high level of public safety and security in corridor</td>
<td>Yonge Street</td>
<td></td>
<td></td>
<td></td>
<td>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. U-Turns at signalised intersections.</td>
<td>Some risk may remain as access method will change after implementation of mitigation.</td>
<td>Address during detail design in consultation with ERS staff.</td>
<td>Insignificant</td>
<td>Obtain feedback from ERS staff on performance of access provisions.</td>
</tr>
<tr>
<td>Minimize adverse noise and vibration effects</td>
<td>Entire corridor in proximity of residential uses</td>
<td></td>
<td></td>
<td></td>
<td>Combining effect of median Transway 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.</td>
<td>None expected</td>
<td>None necessary</td>
<td>Negligible</td>
<td>Conduct audit measurements to confirm compliance once the Transway is fully operational.</td>
</tr>
<tr>
<td>Vibration effect for BRT and LRT due to Widening of Yonge Street</td>
<td>Entire corridor in proximity of residential uses</td>
<td></td>
<td></td>
<td></td>
<td>Combining effect of median Transway 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 m/s^2 for LRT. BRT vibration levels are expected to be negligible.</td>
<td>None expected</td>
<td>None necessary</td>
<td>Negligible</td>
<td>Conduct audit measurements to confirm compliance once the Transway is fully operational.</td>
</tr>
</tbody>
</table>
Table 11-2
Assessment of Environmental Effects for Objective B - Social Environment

<table>
<thead>
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<th>Goal</th>
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</thead>
<tbody>
<tr>
<td>B4</td>
<td>Minimize adverse noise and vibration effects (continued)</td>
<td>Noise due to BRT vehicle idling within the Maintenance Facility</td>
<td>✓</td>
<td>Langstaff Road</td>
<td>Vehicle idling noise levels experienced by nearest sensitive receptors will potentially exceed ambient limits by more than acceptable limits.</td>
<td>4.6 m high enclosure wall will be constructed along the east property line of the Maintenance Facility.</td>
<td>None expected</td>
<td>None necessary</td>
<td>Negligible</td>
<td>Conduct audit measurements to confirm compliance once the facility is fully operational.</td>
</tr>
<tr>
<td>B5</td>
<td>Minimize adverse effects on cultural resources</td>
<td>Displacement of Built Heritage Features (BHF) Displacement of Cultural Landscape Units (CLU)</td>
<td>✓</td>
<td>Langstaff Road, Markham</td>
<td>The potential development of intermodal bus and admin. facility will occur with the likely removal of the two BHF’s - 75 &amp; 77 Langstaff Road East, Markham</td>
<td>Although these buildings are old they are not designated heritage buildings.</td>
<td>None expected</td>
<td>None required</td>
<td>Negligible</td>
<td>Conduct audit measurements to confirm compliance once the facility is fully operational.</td>
</tr>
<tr>
<td>B6</td>
<td>Disruption of Built Heritage Features (BHF) Displacement of Cultural Landscape Units (CLU)</td>
<td>Thornhill Heritage District Conservation, Vaughan &amp; Markham</td>
<td>✓</td>
<td>75 &amp; 77 Langstaff Road East, Markham</td>
<td>There is potential for disruption from changes in the visual, audible and atmospheric environment to cultural heritage features within the heritage district areas.</td>
<td>Considerable community and municipal kudos 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 minimize impacts. Relocated station platforms to more desirable locations. Adjusted madtrans alignment to balance impacts on either side.</td>
<td>No significant effect is anticipated after mitigation.</td>
<td>No significant effect is anticipated after mitigation.</td>
<td>Monitoring may be undertaken in response to certain specific complaints relating to noise and vibration. However, on-going or continuous monitoring is not recommended.</td>
<td></td>
</tr>
<tr>
<td>B7</td>
<td>Disruption of Built Heritage Features (BHF) Displacement of Cultural Landscape Units (CLU)</td>
<td>Richmond Hill CBD area.</td>
<td>✓</td>
<td></td>
<td>There is potential for disruption from changes in the visual, audible and atmospheric environment to cultural heritage features within the Central Business District areas.</td>
<td>Median transway eliminated as an option through the CBD. A mixed traffic option has been chosen. Stations limited in the area.</td>
<td>None expected</td>
<td>None required</td>
<td>Negligible</td>
<td>None required</td>
</tr>
<tr>
<td>GOAL</td>
<td>Environmental Value/ Criterion</td>
<td>Environmental Issues/ Concerns</td>
<td>Project Phase</td>
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<td>Potential Environment Effects</td>
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<td>Further Mitigation</td>
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<tr>
<td>11</td>
<td>OBJECTIVE B: To protect and enhance the social environment in the corridor</td>
<td>Possible impacts to areas with potential for identification of archaeological sites.</td>
<td>✔️</td>
<td>Entire Corridor</td>
<td>There is potential for identification of archaeological sites within the project impact area.</td>
<td>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.</td>
<td>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 mitigation excavation), must be determined following Stage 2 Archaeological Assessment, if archaeological resources are identified during survey.</td>
<td>Negligible for stage 1 Archaeological Assessment</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>B6</td>
<td>Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics</td>
<td>Visual Effects</td>
<td>✔️</td>
<td>Entire Corridor</td>
<td>Introduction of transit may reduce visual aesthetics of road</td>
<td>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.</td>
<td>Narrow sections of ROW where property cannot be acquired may limit incorporation of streetscaping</td>
<td>Significant</td>
<td>Monitor redevelopment and acquire property through redevelopment applications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landscaping</td>
<td>✔️</td>
<td>Entire Corridor</td>
<td>Landscaping species may not survive in winter months</td>
<td>Choose appropriate species for both winter and other months to maintain greenery throughout corridor. Place landscaping in planters and incorporate buried irrigation systems.</td>
<td>Species may still not survive</td>
<td>Change species, irrigation patterns, etc</td>
<td>Insignificant</td>
<td>Monitor health of landscaping continuously</td>
<td></td>
</tr>
</tbody>
</table>
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 current 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 (PM10, NOx, SO2, 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 (CO2) 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>
<thead>
<tr>
<th>Goal</th>
<th>Environmental Value/ Criterion</th>
<th>Environmental Issues/ Concerns</th>
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<th>Monitoring and Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Minimize adverse effects on Aquatic Ecosystems</td>
<td>Fuel spills, due to accidents during construction and accidents during operation, entering the watercourses.</td>
<td>✓ ✓</td>
<td>Entire Corridor</td>
<td>Fish kills due to chemical spills resulting in short term population decline.</td>
<td>No refueling within 10 m of a watercourse. Emergency Response Plan</td>
<td>Short term population decline. Some contaminants within storm water system.</td>
<td>None practical</td>
<td>Insignificant</td>
<td>None required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sediment laden storm water entering watercourses during construction.</td>
<td>✓ ✓</td>
<td>Entire Corridor</td>
<td>Fish kills and loss of aquatic habitat resulting in short term population decline.</td>
<td>Construction fencing at work areas near watercourses limiting area of disturbance. Erosion and Sediment Control Plan will be included.</td>
<td>Short term population decline.</td>
<td>None practical</td>
<td>Significant, only if erosion and sediment control measures fail due to an event during winter.</td>
<td>Monitor sediment accumulation after rain events during construction to ensure that the proposed mitigation measures in the ESCP have been satisfied.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sediment laden storm water entering watercourses during operation.</td>
<td>✓ ✓</td>
<td>Entire Corridor</td>
<td>Loss of aquatic habitat resulting in population decline.</td>
<td>Storm water management facilities such as grassed swales, oil and grit separators, storm water ponds. Opportunities to improve stormwater quality will be investigated.</td>
<td>Short term population decline.</td>
<td>Clean-out facilities as required</td>
<td>Insignificant</td>
<td>Monitor sediment accumulation in storm water management facilities.</td>
</tr>
<tr>
<td></td>
<td>Loss of site-specific habitat</td>
<td>All watercourses within entire corridor</td>
<td>✓ ✓</td>
<td>All watercourses within entire corridor</td>
<td>Potential loss of fish habitat as a result of culvert/floodway extension, repair or replacement and development of a vehicle maintenance and storage facility.</td>
<td>Design transway 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.</td>
<td>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.</td>
<td>A harmful alteration of fish habitat. Opportunity to enhance enclosed degraded stream at vehicle maintenance and storage facility through stream daylighting, realignment and restoration.</td>
<td>Insignificant</td>
<td>On-site environmental inspection during in-water work. Post-construction monitoring of fish habitat compensation measures.</td>
</tr>
<tr>
<td>Project Phase</td>
<td>Potential Environment Effects</td>
<td>Proposed Mitigation Measures</td>
<td>Level of Significance after Mitigation</td>
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<tr>
<td></td>
<td>Fish mortality</td>
<td>Design transverse cross-sections to avoid modifications at culverts/bridges. 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.</td>
<td>None expected. None Expected</td>
<td>Negligible On-site environmental inspection during in-water work.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Barriers to fish movement</td>
<td>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.</td>
<td>None expected. None Expected</td>
<td>Negligible On-site environmental inspection during in-water work.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baseflow alterations</td>
<td>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.</td>
<td>None expected. None Expected</td>
<td>Negligible Post-construction inspection of storm water management facilities to evaluate their effectiveness. On-going maintenance as required.</td>
<td></td>
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<tr>
<td></td>
<td>Baseflow alterations – realignment of watercourse</td>
<td>Fish habitat may be destroyed or disturbed.</td>
<td>None required. Positive</td>
<td>Monitor the newly altered fish habitat</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Increased temperature</td>
<td>Clearing of riparian vegetation and storm water management practices can impact temperature regimes. Clear the riparian area to allow the river to function free of artificial constraints.</td>
<td>None expected. None Expected</td>
<td>Negligible Post-construction inspection of storm water management facilities to evaluate their effectiveness. On-going maintenance as required.</td>
<td></td>
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<tr>
<td></td>
<td>Disturbance to rare, threatened or endangered species</td>
<td>Redside dace resident approximately 2 km upstream of Yonge Street. None known to be resident within zone of influence of the project.</td>
<td>None expected. None Expected</td>
<td>None required. None required.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Goal</td>
<td>Environmental Value/ Criterion</td>
<td>Environmental Issue/ Concerns</td>
<td>Project Phase</td>
<td>Location</td>
<td>Potential Environment Effects</td>
<td>Proposed Mitigation Measures</td>
<td>Level of Significance after Mitigation</td>
<td>Monitoring and Recommendation</td>
<td></td>
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</tr>
<tr>
<td>C2</td>
<td>Minimize adverse effects on Terrestrial Ecosystems</td>
<td>Destruction/ Disturbance of wildlife habitat.</td>
<td>Entire corridor</td>
<td>Construction of the transitway and associated facilities will result in the removal of vegetation and the wildlife habitat it supports. Activities such as site grubbing, grading &amp; stockpiling during construction could result in destruction or disturbance of migratory birds.</td>
<td>- 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.</td>
<td>- 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.</td>
<td>Negligible</td>
<td>Post-construction inspection of vegetation plantings to confirm survival.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>Minimize adverse effects on Terrestrial Ecosystems (continued)</td>
<td>Wildlife mortality.</td>
<td>Entire corridor</td>
<td>- Removal of wildlife habitat may result in wildlife mortality.</td>
<td>- 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.</td>
<td>None expected</td>
<td>None required</td>
<td>Negligible</td>
<td>None required.</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>Minimize adverse effects on Terrestrial Ecosystems (continued)</td>
<td>Wildlife/vehicle conflicts.</td>
<td>Entire corridor</td>
<td>- Increase in the width of Yonge Street to accommodate transitway and associated facilities may create an additional impediment to wildlife movement.</td>
<td>- 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.</td>
<td>None expected</td>
<td>None required</td>
<td>Negligible</td>
<td>None required.</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>Minimize adverse effects on Terrestrial Ecosystems (continued)</td>
<td>Disturbance to rare, threatened or endangered wildlife.</td>
<td>Entire corridor</td>
<td>- Increase in the width of Yonge Street to accommodate transitway and associated facilities may increase the potential for wildlife/vehicle conflicts.</td>
<td>- 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.</td>
<td>None expected</td>
<td>None required</td>
<td>Negligible</td>
<td>None required.</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>Minimize adverse effects on Terrestrial Ecosystems (continued)</td>
<td>Disturbance to vegetation through edge effects, drainage modifications and road salt.</td>
<td>Entire corridor</td>
<td>- Cleaning of new forest edges may result in sunscald, windthrow, and invasion by exotic species. - Disturbing, grading and other drainage modifications may alter local soil moisture regimes. - Road salt may result in vegetation mortality and dieback.</td>
<td>- Minimize the area of vegetation removals to the extent possible. - Minimize grade changes and culvert 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.</td>
<td>None expected</td>
<td>None required</td>
<td>Negligible</td>
<td>None required.</td>
<td></td>
</tr>
</tbody>
</table>
## Table 11-3
Assessment of Environmental Effects for Objective C – Natural Environment

<table>
<thead>
<tr>
<th>GOAL</th>
<th>Environmental Value/ Criterion</th>
<th>Environmental Issue/ Concerns</th>
<th>Project Phase</th>
<th>Location</th>
<th>Potential Environment Effects</th>
<th>Proposed Mitigation Measures</th>
<th>Level of Significance after Mitigation</th>
<th>Monitoring and Recommendation</th>
</tr>
</thead>
</table>
| C3   | Improve regional air quality and minimize adverse local effects | 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 removal 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. | None required | Magnificent | 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<sub>10</sub>, NO<sub>x</sub>, SO<sub>2</sub>, CO) when comparing 2023 forecasts with and without the proposed Rapid Transit (see Tables 4.3 and 4.4 of Appendix K). 1.6% decrease in PM<sub>10</sub>, 2.0% decrease in NO<sub>x</sub>, 1.9% decrease in SO<sub>2</sub>, and 3.0% decrease in CO. | None required | Positive Effect | None required |
| C3   | Improve regional air quality and minimize adverse local effects | 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<sub>2</sub> forecast in 2021) | None required | Positive Effect | None required |
| C3   | Improve regional air quality and minimize adverse local effects | 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 |
| C3   | Improve regional air quality and minimize adverse local effects | Air quality impacts due to Rapid Transit vehicle maintenance and storage activity | ✓ | Langstaff Road | Vehicle maintenance emissions experienced by nearest sensitive receptors 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. Storm water 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>
<thead>
<tr>
<th>OBJECTIVE D: To promote smart growth and economic development in the corridor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
</tr>
<tr>
<td><strong>D1</strong> Support Regional and Municipal Planning Policies and approved urban structure</td>
</tr>
<tr>
<td>Locating higher density and transit-oriented development where it can be served by transitway</td>
</tr>
<tr>
<td>Reflection of historical districts through urban design and built form</td>
</tr>
<tr>
<td><strong>D2</strong> Provide convenient access to social and community facilities in corridor</td>
</tr>
<tr>
<td><strong>D3</strong> Minimize adverse effects on business activities in corridor</td>
</tr>
<tr>
<td>The potential for a decrease in business activity</td>
</tr>
</tbody>
</table>
| **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 stations in median does not allow sufficient turning width for VBR (particulated trucks) | Traffic signs prohibit large truck at stations with no stations in median. Designate truck routes | Insufficient | Monitor and widen Yonge with right turn tapers at side streets to allow for movement.
<table>
<thead>
<tr>
<th>GOAL</th>
<th>Environmental Value/ Criterion</th>
<th>Environmental Issue/ Concerns</th>
<th>Project Phase P C O</th>
<th>Location</th>
<th>Potential Environment Effects</th>
<th>Proposed Mitigation Measures</th>
<th>Built-In Positive Attributes and/or Mitigations</th>
<th>Potential Residual Effects</th>
<th>Further Mitigation</th>
<th>Level of Significance after Mitigation</th>
<th>Monitoring and Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBJECTIVE D: To promote smart growth and economic development in the corridor</td>
<td></td>
<td></td>
<td></td>
<td>Entire Corridor</td>
<td>Construction may limit access for trucks</td>
<td>Traffic management plan to ensure truck access at all times</td>
<td>May not be possible in some areas</td>
<td>Designate alternative truck routes</td>
<td>Negligible</td>
<td>None required</td>
<td></td>
</tr>
</tbody>
</table>

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 will be accommodated by 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 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 dependency 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

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

<table>
<thead>
<tr>
<th>Environmental Issue/Concern Effect</th>
<th>LD. #</th>
<th>Environmentally Interested Group/Agency</th>
<th>L.D. #</th>
<th>Details</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Signal Modifications to Control Left and U-turns</td>
<td>1</td>
<td>Fisheries and Aquatic Habitat</td>
<td>1</td>
<td>EC, MNR, TRCA, DOE, EC</td>
<td>Appendix E</td>
</tr>
<tr>
<td>Traffic Signal Modifications to Control Left and U-turns</td>
<td>1.1</td>
<td>Traffic Signal Modifications to Control Left and U-turns</td>
<td>1.1</td>
<td>Traffic Signal Modifications to Control Left and U-turns</td>
<td>Appendix E</td>
</tr>
<tr>
<td>Traffic Signal Modifications to Control Left and U-turns</td>
<td>1.2</td>
<td>A Fishes Act Authorization Will Be Secured for Pomona Mills Creek Realignment at the MSF Site During the Detailed Design Phase</td>
<td>1.2</td>
<td>A Fishes Act Authorization Will Be Secured for Pomona Mills Creek Realignment at the MSF Site During the Detailed Design Phase</td>
<td>Appendix E</td>
</tr>
<tr>
<td>Traffic Signal Modifications to Control Left and U-turns</td>
<td>1.3</td>
<td>Discussion with TRCA Will Be Carried Out During the Detailed Design Phase</td>
<td>1.3</td>
<td>Discussion with TRCA Will Be Carried Out During the Detailed Design Phase</td>
<td>Appendix E</td>
</tr>
<tr>
<td>Traffic Signal Modifications to Control Left and U-turns</td>
<td>1.4</td>
<td>Natural Channel Design Principles to Be Followed in the Construction of the Realignment of the Pomona Mills Creek at the Proposed MSF Site</td>
<td>1.4</td>
<td>Natural Channel Design Principles to Be Followed in the Construction of the Realignment of the Pomona Mills Creek at the Proposed MSF Site</td>
<td>Appendix E</td>
</tr>
<tr>
<td>Traffic Signal Modifications to Control Left and U-turns</td>
<td>1.5</td>
<td>The MSF Design Will Be Coordinated with the Pomona Mills Creek Environmental Rehabilitation Project</td>
<td>1.5</td>
<td>The MSF Design Will Be Coordinated with the Pomona Mills Creek Environmental Rehabilitation Project</td>
<td>Appendix E &amp; M</td>
</tr>
<tr>
<td>Traffic Signal Modifications to Control Left and U-turns</td>
<td>1.6</td>
<td>Any Proposed In-stream Work and Site-Specific Mitigation Measures Will Be Carried Out as Outlined in Table II of the Natural Science Report</td>
<td>1.6</td>
<td>Any Proposed In-stream Work and Site-Specific Mitigation Measures Will Be Carried Out as Outlined in Table II of the Natural Science Report</td>
<td>Appendix E</td>
</tr>
</tbody>
</table>
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>
<thead>
<tr>
<th>Environment Element</th>
<th>Purpose of Monitoring</th>
<th>Monitoring Method</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of construction on water quality and quantity in watercourses</td>
<td>To confirm that water quality is not being adversely affected by construction activity</td>
<td>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.</td>
<td>After first significant rain event</td>
</tr>
<tr>
<td>Potential Loss of site-specific aquatic habitat due to structural work and development of a vehicular maintenance and storage facility.</td>
<td>To avoid or reduce the potential loss of site-specific aquatic habitat</td>
<td>On-site environmental monitoring during in-water work. Post-construction monitoring of fish habitat compensation measures.</td>
<td>As required by construction schedule for in-water work activities.</td>
</tr>
<tr>
<td>Fish may be injured or killed by dewatering or physical harm.</td>
<td>To avoid or reduce fish mortality.</td>
<td>On-site environmental inspection during in-water work.</td>
<td>As required by construction schedule for in-water work activities.</td>
</tr>
<tr>
<td>Culvert/bridge extension, repair or replacement may create a barrier to fish movement.</td>
<td>To maintain fish passage.</td>
<td>On-site environmental inspection during in-water work.</td>
<td>As required by construction schedule for in-water work activities.</td>
</tr>
<tr>
<td>Destruction/ Disturbance of wildlife habitat due to removal of vegetation during construction</td>
<td>To ensure minimum disturbance to wildlife habitat</td>
<td>Post-construction inspection of vegetation plantings to confirm survival.</td>
<td>On completion of construction works adjacent to vegetative areas.</td>
</tr>
<tr>
<td>Noise generated by construction activities</td>
<td>To ensure noise levels comply with Municipal by-laws</td>
<td>Site measurements of levels produced by representative equipment/activities</td>
<td>At time of introduction of equipment/activities producing significant noise levels with potential to disturb sensitive areas.</td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Environment Element</th>
<th>Purpose of Monitoring</th>
<th>Monitoring Method</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish habitat may be destroyed or disturbed due to realignment of watercourse (Pomona Mills Creek at the</td>
<td>To ensure a health fish habitat after watercourse realignment</td>
<td>Monitor the newly altered fish habitat</td>
<td>Twice per year in spring and fall</td>
</tr>
</tbody>
</table>

Table 12-2 Operations Monitoring

<table>
<thead>
<tr>
<th>Environment Element</th>
<th>Purpose of Monitoring</th>
<th>Monitoring Method</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basflow alterations</td>
<td>To ensure the frequency, magnitude and duration of flows is not adversely affected by new impervious surfaces</td>
<td>Post-construction inspection of storm water management facilities to evaluate their effectiveness. On-going maintenance as required.</td>
<td>After significant storm events following completion of construction facilities.</td>
</tr>
<tr>
<td>Condition of heritage homes adjacent to transoay alignment</td>
<td>To determine if any damage/deterioration is due to construction activity</td>
<td>Pre-construction inspection to obtain baseline condition and monitoring during nearly construction</td>
<td>As required by construction schedule for work adjacent to heritage features.</td>
</tr>
<tr>
<td>Effect of construction on boulevard trees</td>
<td>To ensure the survival of boulevard trees</td>
<td>Inspection of protective measures and monitoring of work methods near trees</td>
<td>Prior to commencement of work and bi-weekly during work activities.</td>
</tr>
<tr>
<td>Fish habitat may be destroyed or disturbed due to realignment of watercourse (Pomona Mills Creek at the</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Table 12-3 Operations Monitoring

<table>
<thead>
<tr>
<th>Environment Element</th>
<th>Purpose of Monitoring</th>
<th>Monitoring Method</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basflow alterations</td>
<td>To ensure the frequency, magnitude and duration of flows is not adversely affected by new impervious surfaces</td>
<td>Post-construction inspection of storm water management facilities to evaluate their effectiveness. On-going maintenance as required.</td>
<td>After significant storm events following completion of construction facilities.</td>
</tr>
<tr>
<td>Condition of heritage homes adjacent to transoay alignment</td>
<td>To determine if any damage/deterioration is due to construction activity</td>
<td>Pre-construction inspection to obtain baseline condition and monitoring during nearly construction</td>
<td>As required by construction schedule for work adjacent to heritage features.</td>
</tr>
<tr>
<td>Effect of construction on boulevard trees</td>
<td>To ensure the survival of boulevard trees</td>
<td>Inspection of protective measures and monitoring of work methods near trees</td>
<td>Prior to commencement of work and bi-weekly during work activities.</td>
</tr>
<tr>
<td>Potential barrier effects during construction</td>
<td>To avoid barriers to entrances/exit to large</td>
<td>Monitor congestion levels</td>
<td></td>
</tr>
</tbody>
</table>
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.

### Table 12-3 Operations Monitoring

<table>
<thead>
<tr>
<th>Environment Element</th>
<th>Purpose of Monitoring</th>
<th>Monitoring Method</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed MSF</td>
<td>To ensure minimum change in temperature for aquatic habitat</td>
<td>Post-construction inspection of riparian plantings to confirm survival</td>
<td>Twice per year in spring and fall</td>
</tr>
<tr>
<td>Effect of snow and ice removal on water quality in corridor watersheds</td>
<td>To confirm that water quality is not being adversely affected by transway and vehicle maintenance activities</td>
<td>Monitor sediment accumulation in storm water management facilities</td>
<td>During major storm events up to five times per year</td>
</tr>
<tr>
<td>Noise generated by operation and maintenance activities</td>
<td>To ensure noise levels comply with Municipal by-laws</td>
<td>Pass-by and riding measurements of levels produced by representative vehicles</td>
<td>Initially after revenue service is introduced and in response to concerns or after any major increase in service frequency</td>
</tr>
<tr>
<td>Effect of rapid transit operations on local air quality (pollutants, odour)</td>
<td>To confirm that local air quality is not being adversely affected by transit vehicle activity at terminals/facilities</td>
<td>Regular inspections of measures and of transit vehicle exhaust emissions</td>
<td>Initially after facilities are placed into service and at five-year interval during vehicle life</td>
</tr>
<tr>
<td>Condition of heritage homes adjacent to transway alignment</td>
<td>To determine if any damage/deterioration is due to vibrations produced by transit vehicles</td>
<td>Post-construction inspection to obtain baseline condition and monitoring during pass-by operations</td>
<td>Initially after revenue service is introduced and in response to concerns or after any major increase in service frequency</td>
</tr>
<tr>
<td>Effect of operations and maintenance on boulevard trees</td>
<td>To ensure the survival of boulevard trees</td>
<td>Inspection of protective measures and monitoring of work methods near trees</td>
<td>Annually</td>
</tr>
<tr>
<td>Potential effect of transit vehicle access to MSF on local traffic circulation</td>
<td>To ensure minimum interruption to local traffic</td>
<td>Monitor signal operations</td>
<td>Initially after facility is placed into service and after any major expansion of facility activities</td>
</tr>
<tr>
<td>Effect of operations of RT on intersection operation and access to minor side streets and properties along Yonge St. using U-turns</td>
<td>To ensure acceptable level of service at intersections and accessibility to minor side streets and properties along Yonge Street</td>
<td>Monitor intersection performance and conflict potentials</td>
<td>Initially after introduction of RT service and during the region’s regular assessment of intersection performance</td>
</tr>
</tbody>
</table>

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 underpass 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 CEEA 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 CEEA 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 Culture
  - Heritage Operations
  - Regional Services Branch
- Ministry of Education
  - York Region District School Board
  - York Region Separate School Board
  - CSD Centre Sud-Ouest
  - CBD Catholique Centre Sud
- Ministry of Health
- York Regional Health Unit
- Ministry of Municipal Affairs and Housing
  - Office of the Greater Toronto Area
  - Central Municipal services Office
- Ministry of Natural Resources
  - Aurora District*
  - South Central Region
- Ministry of the Solicitor General – OPP
- Ministry of Transportation
  - Urban Planning Office*
  - Transportation Planning Branch
- Ontario Realty Corporation
- York Regional Fire Coordinator
- York Region Police Chief
- CN North America
- GO Transit*
- Ottawa Valley Canada
- Environment Canada
- Canadian Environmental Assessment Agency – Ontario Region
- York Regional Health Unit
- York Regional Health Unit
- 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 Transportation
  - Urban Planning Office*
  - Transportation Planning Branch
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  - Transportation Planning Branch
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- Ministry of Natural Resources
  - Aurora District*
  - South Central Region
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- Ministry of Transportation
  - Urban Planning Office*
  - Transportation Planning Branch
- Ontario Realty Corporation
- York Regional Fire Coordinator
- York Region Police Chief
- CN North America
- GO Transit*
- Ottawa Valley Canada
- Environment Canada
- Canadian Environmental Assessment Agency – Ontario Region
- York Regional Health Unit
- York Regional Health Unit

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:

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 7, 2002</td>
<td>Centrepoint Mall, City of Vaughan</td>
<td>2:30 pm to 8:30 pm</td>
</tr>
<tr>
<td>November 28, 2002</td>
<td>Hillcrest Mall, Town of Richmond Hill</td>
<td>2:30 pm to 8:30 pm</td>
</tr>
</tbody>
</table>

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.
Hillcrest Mall was combined with the first Public Consultation Centre for the concerns or preferences. It should be noted that the PCC held on Friday at provide input regarding the comparative assessment of the alternatives, the purpose of the second Public Consultation Centre was to review and 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:

<table>
<thead>
<tr>
<th>Where</th>
<th>When?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thornhill Community Centre, Town of Markham</td>
<td>Wednesday, February 5, 2003 (from 3:00 pm to 9:00 pm)</td>
</tr>
<tr>
<td>Hillcrest Mall, Town of Richmond Hill</td>
<td>Friday, February 7, 2003 (from 3:00 pm to 9:00 pm)</td>
</tr>
</tbody>
</table>

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 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.

#### 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:

<table>
<thead>
<tr>
<th>Where</th>
<th>When?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillcrest Mall, Town of Richmond Hill</td>
<td>Friday, June 6, 2003 (from 2:30 pm to 8:30 pm)</td>
</tr>
<tr>
<td>Thornhill Elementary School</td>
<td>Monday, June 9, 2003 (from 6:00 pm to 9:00 pm)</td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Where</th>
<th>When?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillcrest Mall, Town of Richmond Hill</td>
<td>Saturday, Sept 11, 2004 (from 12:30 pm to 6:00 pm)</td>
</tr>
<tr>
<td>Promenade Mall, City of Vaughan</td>
<td>Thursday, Sept 9, 2004 (from 3:00 pm to 9:00 pm)</td>
</tr>
</tbody>
</table>

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.

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 Pikwakagan First Nation, Chippewas of Georgina Island First Nation, Mississaugas of Scugog Island First Nation, Wiwahatha First Nation and Curve Lake First Nation. Some of the First Nations that fall within 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 Mnikanning First Nation, Hiawatha First Nation and Curve Lake First Nation.

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>
<thead>
<tr>
<th>First Nation</th>
<th>Response to Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mississaugas of the New Credit First Nation</td>
<td>Would like to receive a copy of the EA.</td>
</tr>
<tr>
<td>2. Curve Lake First Nation</td>
<td>Do not require a copy of the EA. A notice of submission will be sent.</td>
</tr>
<tr>
<td>3. Alderville First Nation</td>
<td>Would like to receive a copy of the EA.</td>
</tr>
<tr>
<td>4. Beausoleil First Nation</td>
<td>Would like to receive a copy of the EA.</td>
</tr>
<tr>
<td>5. Chippewas of Georgina Island First Nation</td>
<td>Do not require a copy of the EA. A notice of submission will be sent.</td>
</tr>
<tr>
<td>6. Mississaugas of Scugog Island First Nation</td>
<td>Would like to receive a copy of the EA.</td>
</tr>
<tr>
<td>7. Hiawatha First Nation</td>
<td>Do not require a copy of the EA. A notice of submission will be sent.</td>
</tr>
<tr>
<td>8. Six Nations of the Grand River</td>
<td>Would like to receive a copy of the EA.</td>
</tr>
<tr>
<td>9. Algonquins of Pikwakagan First Nation</td>
<td>Would like to receive a copy of the EA.</td>
</tr>
</tbody>
</table>

**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.