

12. VAUGHAN N-S LINK ULTIMATE CONVERSION TO SUBWAY TECHNOLOGY

12.1 BACKGROUND

12.1.1 Regional Context

The study's Terms of Reference included an assessment of a potential extension of the TTC's Spadina Subway from the York Region boundary north of York University to Vaughan's planned Corporate Centre at Highways 400 and 7 in response to both a request by the City of Vaughan and the Region's Centres and Corridors Strategy initiatives.

The Regional Centres and Corridors Strategy is a multi-faceted program of policy, financial tools, infrastructure and supportive programs. The objective of the strategy is to facilitate the development of both the Regional Centres and Corridors with more intensive development supporting transit ridership and with a mix of higher-density uses creating a more vibrant, city-type environment. The Vaughan Corporate Centre (VCC) is the western Regional Centre which is intended to focus on higher order development needed as the Region increases the emphasis on the growth priority of city-building within the urban boundary.

The Regional Official Plan Amendment 43 was approved on January 5, 2005 to further enhance the Regional Centre policies to promote mix-use intensification supported by rapid transit with high quality urban design in the Vaughan Corporate Centre. The overall purpose of ROPA 43 is to advance the city-building model of development based on a network of Regional Centres and Regional Corridors, served by rapid transit. The long-term sustainability of York Region's urban structure requires a diverse, mixed-use development form that is compact, transit-supportive, pedestrian-friendly and well-designed. City-building is a vital part of achieving the Region's Urban Structure through:

- Managing rapid growth;
- Providing housing for a diversifying population;
- Keeping the economy strong – providing for business and workforce;
- Supportive and efficient infrastructure;
- Providing human services;
- Quality of life; and
- Need long term sustainability.

Regional initiatives including Vision 2026, Transportation Master Plan, York Region Rapid Transit Plan (YRTP), and the "York Region Centres + Corridors Strategy: "Making it Happen!" have all reaffirmed the need for and benefits of more compact and concentrated development patterns as a

means of supporting infrastructure investment and improving the overall quality of our communities.

A focus on centres and corridors also forms the basis for growth management across the entire GTA region, as endorsed by Regional Planning Commissioners of Ontario – GTA Caucus in their December 2003 report, "Centres & Corridors – Growth Management in the GTA." This growth management model is further reinforced by the release of the Provincial Draft Growth Plan for the greater Golden Horseshoe which defines the VCC as an "Urban Growth Centre" intended to become one of the primary areas for growth with transit supportive densities. The Draft Growth Plan calls for a compact, "inward" pattern of growth supported by transit as an alternative to continued auto-oriented "outward" growth.

12.1.2 Local Context

The objective of the City of Vaughan is to ensure the link between the VCC and the existing and planning rapid transit facilities established through the broader Regional policies and the local Official Plan is confirmed and protected for, and if necessary refined. Vaughan has actively been pursuing the realization of the VCC and its linkage to the broader framework through:

- The adoption of OPA 500 – Vaughan Corporate Centre Secondary Plan
- The ongoing Vaughan's Highway 7 Futures Study - Defining intensification opportunities along the Regional Corridor
- The ongoing Vaughan Corporate Centre Streetscape and Open Space Master Plan Study – to update and enhance OPA 500
- Current consideration of higher density development applications in response to these planning initiatives

All of these planning initiatives are supportive of the broader Regional goals for city-building via a centres and corridors urban structure.

Reflecting the Regional Official Plan policies, the City of Vaughan Official Plan Amendment 529 protects for a rapid transit alignment between the Vaughan Corporate Centre and the City of Toronto. The alignment shown in OPA 529 is based on the Higher Order Transit Corridor Protection Study – Vaughan Corporate Centre, which was completed in 2001. It is the basis for the alignment under consideration in this Environmental Assessment.

The Higher Order Transit Corridor Protection Study was informed by the TTC's concurrent Rapid Transit Expansion Study – August 2001, which was considered by the Commission on August 29, 2001. The study recommended that the Spadina Subway Extension to Steeles Avenue be adopted as one of its two priorities for rapid transit expansion, should funding come available. The Commission adopted this recommendation.

The conceptual alignment for the Spadina subway extension that was carried forward for future evaluation in the Rapid Transit Expansion Study is consistent with the alignment adopted in OPA 529.

OPA NO. 529 identifies and incorporates the alignment into the City of Vaughan Official Plan and its policies allow for the application of Section 41(7)(d) of the Planning Act, which permits the municipality to require conveyance of public transit rights of way, at the time of site plan approval proved that the rights of way are shown or described in an official plan. The Ontario Municipal Board approved OPA 529 on July 11, 2001. The York Region Official Plan Amendment 43 reflects this alignment as a Regional Rapid Transit Corridor.

12.1.3 Updating of Background Studies

Ridership forecasting for the analysis of transit technology options for York Region's rapid transit network assumed that the Spadina Subway would be extended to York University before 2021. This analysis, described in **Chapter 5**, also indicated that bus rapid transit would be appropriate as the initial technology for the Vaughan North-South Link between York University and the VCC during the study planning period to 2021.

Notwithstanding this conclusion, there is a high probability that the Toronto subway system will serve York University on the regional boundary during the planning period. Given the University's proximity to a major regional node, Vaughan's planned Corporate Centre on Highway 7, consideration of the short subway extension along the Vaughan North-South Link as the ultimate technology is a logical component of the Highway 7 Corridor Public Transit Improvements undertaking. When the regional centre develops as a primary node along the Highway 7 route, the maximum transportation benefits and efficiencies will be achieved by linking subway technology to surface rapid transit at this node. Consequently, this Chapter describes and updates the recommendations of the *Higher Order Transit Corridor Protection Study – Vaughan Corporate Centre to York University*¹ carried out for the City in 2000-2001. This study assessed and compared a range of alignments for possible future subway extensions to provide the basis for selection of a preferred alignment for which right-of-way could be protected.

Subsequent to this study, the City undertook a Property Protection Study for Steeles Rapid Transit Terminal Facilities to establish the property requirements for the preferred arrangement of facilities to support an initial subway terminal on Steeles Avenue north of York University. On the basis of this study's recommendations, York Region acquired property on the

¹ *Higher Order Transit Corridor Protection Study – Vaughan Corporate Centre to York University*. Prepared by Cansult Limited in association with Tranplan Associates, January 2001.

north side of Steeles Avenue opposite the Northwest Gate entrance to the University campus. This site and associated rights-of-way for new east-west road access from Jane and Keele Streets and north-south access from Steeles Avenue will provide for a bus terminal.

12.2 RELATIONSHIP TO THE TTC'S SPADINA SUBWAY EXTENSION ENVIRONMENTAL ASSESSMENT

In October 2004, the TTC initiated an Individual Environmental Assessment for an extension of the Spadina Subway from Downsview Station to Steeles Avenue via York University. While the study area for this EA extends across the Regional boundary and up to the planned VCC, the study's Terms of Reference limits the assessment of subway alignment alternatives to the corridor between the existing Downsview Subway Station and the York Region transit terminal site north of the University on Steeles Avenue.

The TTC expects to complete their EA by the end of 2005 and obtain approval of the recommendations during 2006. At the time of completion of the Region's Highway 7 and Vaughan North-South Link EA, the on-going TTC study had identified a preferred route (Route 1 in their study) and a series of alignment alternatives for the subway extension up to the area of the Steeles Avenue terminal site. These alternatives were presented to the public in May 2005 as candidate alignments for evaluation in subsequent phases of the EA study.

These alignments approach the site from either an east-west orientation along the north boundary of the campus or a diagonal southeast to northwest direction across the station terminal site. Alignment alternatives for an extension of the subway into Vaughan will have to be compatible with any of these candidate alignments from the south.

12.3 IDENTIFICATION OF ALTERNATIVE ROUTES – YORK UNIVERSITY TO VCC

12.3.1 Vaughan Corporate Centre Station Location

The previous VCC study (*Vaughan Corporate Centre Transportation/Transit Planning and Functional Design Study*) identified three alternative alignments north of Highway 407 within which the higher order transit service could be provided, as illustrated in **Figure 12.3-1** (the scope of the study was limited by the VCC area and thus did not address alignments south of Highway 407). The three alignments were: Jane Street alignment, Edgeley Boulevard alignment and Millway Avenue alignment (recognizing that as part of the VCC road plan, Millway Avenue will be extended

southerly from its current terminus at Highway 7). An assessment of each alternative was conducted based on elements pertaining to design, services and operation, environmental impacts, land use, implementation and cost.

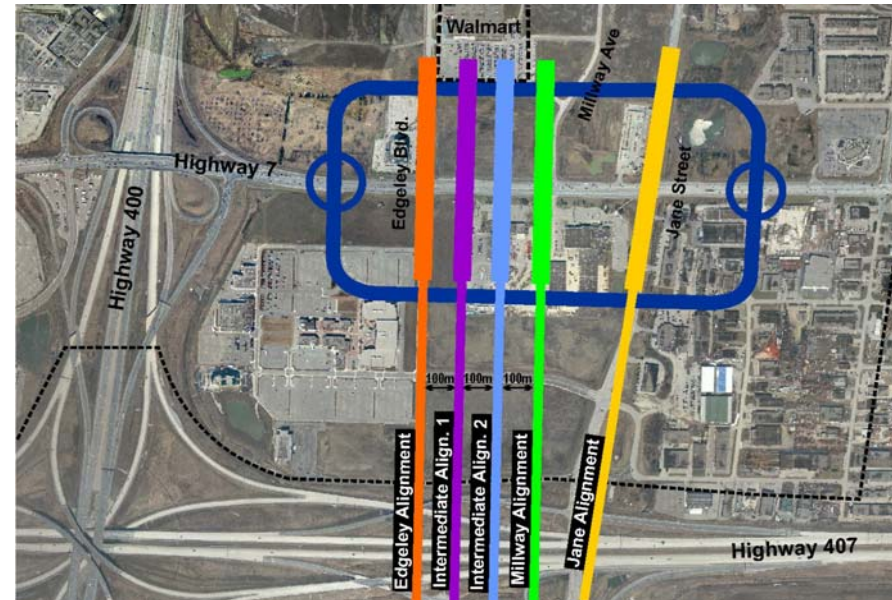


Figure 12.3-1
Vaughan Corporate Centre Station Location Alternatives

This assessment of alternatives identified the Millway alignment as the preferred alignment. Its merits include flexibility of transit technologies and excellent coverage of the VCC node. This option terminates centrally in the node at the signalized intersection of Millway Avenue and Highway 7, the intersection that has the greatest potential to accommodate transit priority signalization for at-grade transit service. It allows for acceptable inter-connection of transit service going to and from the west along Highway 7 connecting to north-south transit service and elevated, underground, and at-grade elevations can be acceptably integrated within the Millway Avenue right-of-way. Overall, Millway Avenue provided the greatest amount of flexibility to accommodate a rapid transit service that could be progressively upgraded from buses operating at-grade in exclusive lanes and with signal priority to fully grade-separated subway technology.

Following the selection of the preferred route to York University, the alignment through the VCC was revisited at the request of the adjacent landowners who were seeking to minimize the land impacts associated with the future Millway extension and the rapid transit service. The landowners' preference was to limit the southerly extension of Millway Avenue thereby allowing the development parcel to remain, intact (it would otherwise be bisected by Millway Avenue). As such, additional alternative alignments through the Corporate Centre were considered. These alignments are listed below and illustrated in **Figure 12.3-1**.

- Millway Avenue (corresponding to the future roadway extension);
- 100 metres west of Millway Avenue (corresponding to a future local

road);

- 100 metres east of Edgeley Boulevard (corresponding to a future local road); and
- Edgeley Boulevard.

The alternatives were evaluated in the context of the VCC and the future 407 Transitway. Only the horizontal alignments were evaluated as the vertical alignments were considered comparable at that stage. In particular, each alignment was assessed with respect to the following:

- service to the VCC, future 407 Transitway and Highway 407 commuter parking lot;
- impacts on existing and future developments;
- integration with the planned Highway 7 transit mall;
- feasibility of a northerly extension beyond the Corporate Centre;
- short-term implementation;
- length of crossing required at Highway 407; and
- the effect on the overall route length.

The results of this evaluation are summarized below.

Service to the VCC

Within the Vaughan Corporate Centre, the VCC node is to be developed as a high density area, accommodating approximately 40% of the office employment positions (7275 out of 17,740) and 100% of the residential population (5000 residents). As such, the level of service that each alternative provides to the Corporate Centre was based on the extent to which the node area is located within the 500 metre catchment area of the VCC station (the most likely users will be those within the 300 metre catchment area). It was noted that although significant development outside of the node will also fall within the 500 metre catchment area, this development was expected to be more of the big-box and/or industrial nature and thus not necessarily highly oriented towards transit use.

Overall, the Millway Avenue alignment was expected to provide the greatest level of service as 100% of the node was located within 500 metres of the station. As the alignment is shifted to the west, the extent to which the node area was located within the 500 metre is reduced. The Edgeley Boulevard alignment contains only approximately 70% of the node within its catchment area.

Service to the Future 407 Transitway and Commuter Parking

With respect to the service level provided to the future 407 Transitway, all four alignments provided comparable levels given that the transitway station and the subway station will likely be integrated, regardless of

location. However, with respect to service to the commuter parking, the alignments to the west are favoured in that they would provide for a greater number of parking stalls within the station catchment area (Jane Street limits parking availability east of the station).

Impacts on Existing and Future Developments

Both the Millway Avenue alignment and the alignment 100 metres west of Millway Avenue impacted the existing Toromont property, as indicated in **Figure 12.3-1**. However, this land use does not conform with the envisioned development of the VCC (and the node area in particular) and thus its redevelopment is foreseen (the question of when remains unanswered). No impacts to existing development would occur with either the Edgeley Boulevard alignment or the alignment 100 metres west of Edgeley; the former coincided with an existing road right-of-way whereas the latter bisects undeveloped parcels.

With respect to future VCC developments, the Edgeley Boulevard alignment did not have any impacts, as the alignment in its entirety, including the provision for station tail track north of Avenue Seven, was located within the existing road right-of-way (which extends southerly to Peelar Road/Highway 407). The only impacts associated with the Millway Avenue alignment were related to the provision for the tail track given the skewed alignment of Millway north of Highway 7. However, should Millway Avenue not be fully extended to the south, additional impacts would result. Both of the remaining alignments impacted the development parcels between the ring road and Peelar Road (the future road rights-of-way terminate at the ring road) in addition to some impacts to the WalMart site to accommodate the tail track (see **Figure 12.3-1**).

Integration with Highway 7 Transit Mall

Again, the Millway alignment offered the best opportunity to integrate services with those planned for the Highway 7 transit mall given its central location within the node area and the corresponding signalized intersection. The Edgeley Boulevard alignment also provided a good opportunity given that the transit mall would be accessible through the signalized intersection at Edgeley Boulevard. With the intermediate alignments, additional signalized intersections would be required on Highway 7 to allow the integration of transit services. These additional signals are undesirable given the resulting impacts to the operations of the transit mall (by increasing the number of intersections, both delays and travel times are increased and level of service is decreased). In addition, the resulting signal spacing would not comply with Regional standards (minimum spacing of 250 metres whereas only 100 and 200 metres would be provided).

Feasibility of Northerly Extension beyond VCC

Through the VCC, a northerly extension of the alignment would be most readily accommodated at Edgeley Boulevard as the alignment would simply follow the right-of-way. However, Edgeley Boulevard currently terminates south of Rutherford Road and thus an extension beyond this point would have further ramifications. The two intermediate alignments would both likely be extended via Edgeley Boulevard (given their proximity) and in doing so would be subject to the potential impacts noted above in addition to further impacting the current WalMart development. The Millway alignment would be best suited to follow Jane Street given its proximity and northerly limits (Highway 9 in Newmarket). However, in doing so, there could be some impacts to future VCC development as the alignment is reconfigured to Jane Street.

Short-Term Implementation

In the short-term, both the Edgeley Boulevard and the alignment 100 metres east of Edgeley could be readily implemented (the latter would require the acquisition of some vacant lands south of Interchange Way/ring road). The remaining two alignments required the availability of the Toromont lands.

Length of Highway 407 Crossing and Overall Route

The lengths of crossing at Highway 407 were comparable, ranging from approximately 270 metres (Edgeley alignment) to 315 metres (Millway alignment). Overall, the alternatives west of Millway Avenue increased the route length by distances of approximately 100 metres, 200 metres and 300 metres respectively. At an approximate construction cost of \$100 million per kilometre, these increases translate to \$10, \$20 and \$30 million respectively. Property acquisition costs were considered site specific and thus could not be gauged at that time.

Preferred Alignment

To best serve the VCC, the Millway alignment was preferred given its central location, increased potential for surface transit integration with the Highway 7 transit mall and the potential for interim development of a Millway busway. Although this alignment depended upon the acquisition of a portion of the property occupied by Toromont, this shortcoming was not considered serious since other short-term alternatives are available for transit improvements (i.e. the recommended exclusive bus lanes on Jane Street). Furthermore, the Corporate Centre will not develop as envisaged without the redevelopment of the Toromont lands and, because of the site's large size, it is questionable whether sufficient transit demand would exist for an exclusive right-of-way without redevelopment of this site.

Although the Edgeley Boulevard alignment was more favourable in the short-term, (the land is available and there will be minimal impacts), the overall quality of access to rapid transit provided to the Corporate Centre in the long-term would not be as great. This could have further ramifications to the long-term VCC development potential in that significant transit services are required to support the ultimate development levels.

12.3.2 Routes linking Vaughan Corporate Centre to York University

The Higher Order Transit Corridor Protection Study identified the following existing rights-of-way as opportunities for a rapid transit route to the planned VCC, (the use of public rights-of-way rather than private rights-of-way is preferred to minimize property acquisition costs and to expedite implementation):

East-West Rights-of-way:

- Steeles Avenue
- Steeles Hydro Corridor
- Highway 407
- Future 407 Transitway
- Highway 7

North-South Rights-of-way:

- Edgeley Boulevard (north of Highway 407)
- Millway Avenue (north of Highway 407)
- Jane Street
- CN McMillan Rail yard
- Keele Street

The combination of the various east-west and north-south rights-of-way resulted in the development of the following alternatives:

- | | |
|-------------|---|
| ➤ Route A | Steeles Avenue/Jane Street/Millway Avenue |
| ➤ Route B | Steeles Hydro Corridor/Jane Street/Millway Avenue |
| ➤ Route C-1 | Rail Yard/Highway 407/Millway Avenue |
| ➤ Route C-2 | Rail Yard/Highway 407/Edgeley Boulevard |
| ➤ Route D | Rail Yard/Highway 7 |
| ➤ Route E-1 | Keele Street/Highway 407/Millway Avenue |
| ➤ Route E-2 | Keele Street/Highway 407/Edgeley Boulevard |
| ➤ Route F | Keele Street/Highway 7 |

The above alternatives are illustrated in **Figure 12-2** and described briefly below. Common to all alternatives was the assumption that the existing

Spadina subway will be extended to York University using the preferred route recommended in the TTC's *Yonge-Spadina Subway Loop Environmental Assessment Report* and that the University Station would be the point of origin for the extension into Vaughan where the point of destination will be the VCC node.

12.3.2.1 Route A

From York University, Route A extended north to Steeles Avenue turning west into the arterial road right-of-way to a point approximately 400 metres east of Jane Street where it deviated to continue in a northerly direction. The route was then located adjacent to Jane Street as it crossed the CN York Subdivision and Highway 407 and continued into the VCC node via the future Millway Avenue south of Highway 7.

12.3.2.2 Route B

Route B was similar to Route A except the east-west portion was contained within the existing Hydro Corridor approximately 200 metres north of Steeles Avenue while the alignment into the Corporate Centre node remained unchanged.

12.3.2.3 Route C

Route C extended northerly from the York University station site towards Highway 407, crossing the Hydro Corridor and the existing CN rail leads en route. It was then located parallel to and south of Highway 407, primarily within the future 407 Transitway corridor, to Jane Street where again a change to the north-south direction was required for the alignment into the Corporate Centre node. Two slight deviations were developed as a result of geometric constraints in the vicinity of Jane Street. The first, Route C-1, aligned with Edgeley Boulevard, whereas the second, Route C-2, aligned with Millway Avenue.

12.3.2.4 Route D

Route D was similar to Route C from York University to Highway 407. Beyond Highway 407, it remained along the west edge of the CN rail property to Highway 7. The approach to the Corporate Centre node was then achieved in the east-west direction via Highway 7.

12.3.2.5 Route E

Route E extended northeasterly from the university toward Highway 407 via the Keele Street right-of-way. It subsequently followed the alignment of Highway 407 in the east-west direction to Jane Street and then on to the Corporate Centre node. As with Route C, two slight variations (Route E-1

and E-2) were developed to accommodate the change of direction and use of Edgeley Boulevard versus Millway Avenue.

12.3.2.6 Corridor F

Route F was primarily located within the Keele Street and Highway 7 rights-of-way and thus closely followed their alignments from the university to the Corporate Centre node. As with Route D, it approached the Corporate Centre node via Highway 7 from the east, as opposed to the south.

12.3.3 Evaluation of Alternative Routes

The above alternative subway routes were evaluated against the comprehensive set of criteria, consisting of factors and sub-factors presented in **Table 12.3-1**. The evaluation was general in nature for the purposes of assessing the broad effects and benefits of the various functionally different route alternatives and to present arguments justifying the selection of the preferred route.

Table 12.3-1 Evaluation Criteria

Factor	Sub-factors
Transportation Design	<ol style="list-style-type: none"> Horizontal alignment <ul style="list-style-type: none"> maximum design speed minimum design speed number of curves total curve length substandard curves (radius < 350 metres) percent of corridor on curves quality of alignment Vertical alignment
Transportation Service	<ol style="list-style-type: none"> Connection to future 407 Transitway at Jane Street/Keele Street/other locations. Service to the Vaughan Corporate Centre. Overall accessibility and station location at the VCC/York Transit Terminal/intermediate stations. Travel time Commuter parking opportunities Possible extension of service beyond the Corporate Centre Integration with street bus service at the VCC/York University/intermediate stations.
Social Environment	<ol style="list-style-type: none"> Impacts to existing residents Displacement of jobs/homes/businesses Noise and vibration Impacts to the Beechwood Cemetery

Table 12.3-1 Evaluation Criteria

Factor	Sub-factors
Natural Environment	<ol style="list-style-type: none"> Loss of natural environment <ul style="list-style-type: none"> Aquatic ecosystems Terrestrial ecosystems Air quality Hydrogeological, geological and hydrological conditions Restriction of access to conservation and recreation lands
Land Use	<ol style="list-style-type: none"> Potential for development at stations at the VCC/York Transit terminal/intermediate stations. Impacts on development plans
Implementation	<ol style="list-style-type: none"> Use of railway lands Use of hydro lands Possibility of expropriation of private lands
Cost	<ol style="list-style-type: none"> Length of corridor Length of curves Number of structures Number of stations Portion of corridor buried and/or elevated Impacts on existing buildings

12.3.3.1 Summary of Evaluation

Based on the criteria tabulated above, the Study recommended that both **Routes A and B** be considered further given their commonality and proximity (in fact, they can be considered route options within the same overall corridor). Not only did they both provide the most direct link between the VCC and the Spadina subway (via York University), but they also provided a high level of service to the future 407 Transitway and the associated commuter parking facility. In addition, they would both serve future adjacent developments well and have good potential for further expansion in a northerly direction beyond the Corporate Centre (possibly to serve Canada's Wonderland, the Vaughan Mills Centre, the community of Maple and the future Urban Village 1).

The key rationale in selecting Routes A and B is itemized below; with instances where alternative routes were evaluated as being better or equal to routes A and B noted.

Transportation Design

- shortest and most direct link between the Corporate Centre and York University;
- least number of curves, none of which are substantial or substandard; and
- shortest segment on curvilinear alignment.

Transportation Services

- The proposed station at Jane Street/future 407 Transitway would

provide an excellent opportunity for integration of services (rapid transit with future 407 Transitway) and good commuter parking and kiss-and-ride opportunities.

- Route A provided the most optimal station spacing (the stations are approximately equally spaced and well located in areas that are either developed or developable).
- Both had good potential for a northerly extension beyond the Vaughan Corporate Centre to serve Paramount Canada's Wonderland, the Vaughan Mills Centre, the community of Maple and the future Urban Village 1.
- Route F was comparable to both A and B from this perspective, although an extension beyond the Corporate Centre would likely be towards the west.

Social Environment

- no residential areas are affected as the routes avoid such areas;
- minimal displacement of jobs and businesses;
- no impacts on the cemetery; and
- overall, the impacts of Route C-1 and D on the social environment are comparable.

Natural Environment

- Routes A and B had the potential to impact Black Creek; from the perspective of natural environment, the other alternatives are preferable

Land Use

- There was good potential for development at all four stations (Route A is slightly better given the more optimal station spacing).
- The station on Steeles Avenue was expected to promote further intensification of the adjacent land uses, including those lands within the university campus.
- There would be minimal impacts on future development plans at the VCC, York University and at the intermediate station locations.
- Route F was comparable from this perspective.

Implementation

- For Route A, railway and hydro lands are not required; a large percentage of the corridor would be in public ownership.
- Also with Route A, there is only a minimal possibility of expropriation of private property.
- Route B is not as favourable as approximately 40% would be located in the Hydro Corridor, the use of which would be subject to operational requirements of Hydro One (such an arrangement involving a 500 KV line is unprecedented in Ontario) and approval by the landowners, the Ontario Realty Board.

Cost

- Routes A and B represented the shortest routes with the fewest curves and structures; as such the related construction and maintenance costs were expected to be lower than the longer, more curvilinear routes.
- Route B offered the potential for an at-grade section within the Hydro Corridor, thereby reducing costs further.
- Route D was considered comparable from a cost perspective (although it was somewhat longer and had more curves, it too had the potential for an at-grade section).

12.4 FUTURE SUBWAY ELEMENTS OF THE UNDERTAKING: YORK TRANSIT TERMINAL TO VCC

Having established that the most appropriate routes for a rapid transit service connecting the VCC to York University were Routes A and B, the Study then developed specific alignments along each route. The alignment alternatives had to satisfy a range of criteria including operational efficiency, convenient station access points, future extension opportunities and minimal impacts on existing and future developments in addition to the social and natural environments. Design criteria used were presented in Chapter 7 and a description of the routes and evaluation criteria follows.

Routes A and B are primarily located within public rights-of-way currently being used for either roadway (i.e. Steeles Avenue) or hydro services (i.e. Hydro Corridor north of Steeles Avenue), or will be used in the future for the same (i.e. Millway Avenue and future 407 Transitway). As such, the opportunities for an at-grade rapid transit alignment are limited. Also, the proposed extension to York University is being planned as below-grade, further limiting at-grade opportunities.

12.4.1 Analysis of Alternative Alignments

A total of five alignment alternatives were assessed in the Higher Order Transit Corridor Protection Study. As shown in **Figure 12.4-1**, Alignments A-1 and A-2 were located along Steeles Avenue/Jane Street/Millway Avenue, (i.e. along Route A) whereas Alignments B-1, B-2 and B-3 were located along the north edge of Steeles Hydro Corridor/Jane Street/Millway Avenue (i.e. along Route B).

The sections of Alignments B-1, B-2 and B-3 within the Hydro Corridor were developed recognizing the existing hydro towers and transmission lines; one 230 kV line (closest to Steeles Avenue) and two 500 kV lines currently exist. As instructed by Hydro One at the time of the study, the rapid transit alternatives cannot be located directly under the transmission lines (except in crossing the corridor) regardless of whether the facility is at-grade or in

tunnel, and as such the alignment followed the north boundary of the Hydro Corridor. Although a fourth transmission line (230 kV) is planned along the north boundary, both it and the rapid transit route could be accommodated provided the former is buried as opposed to elevated by towers, and off-set from the rapid transit alignment. Discussions with Hydro One indicated that 230 kV underground cable is a proven technology currently employed by Hydro One and thus would have applications in this instance.

Immediately north of the Hydro Corridor is a second utility corridor that houses a high-pressure gas main and sewer lines. These locations were noted on the respective figures and avoided, where possible, by the alternative routes. It was recognized that while a crossing of the utility corridor will be required; this could be accomplished provided that the rapid transit alignment maintains a sufficient vertical clearance.

12.4.1.1 Alignments A-1 and A-2

From the university, Alignments A-1 and A-2 curved under Steeles Avenue approximately 800 metres east of Jane Street at the Region's terminal site and then proceeds to Jane Street, where, via a 360 metre curve, it turned north towards Highway 407 where a 60 metre long, 2000 metre radius curve was provided to connect with Millway Avenue and its ultimate destination at the intersection of Avenue Seven and Millway Avenue. As this represented the terminal station, sufficient geometrics were provided for both tail track and crossover track. As illustrated, alignment A-2 was identical to Alignment A-1 apart from its origin, which coincided with the station location as identified in the *Yonge-Spadina Subway Loop EA*. The alignment geometrics and remaining station locations were otherwise identical.

In addition to the proposed stations on Steeles Avenue at York Region's terminal and the VCC, one additional intermediate station was identified to serve the future Jane Street/407 Transitway/commuter parking facility. As the construction of this facility will likely occur in stages, the station on Steeles Avenue was located not only to maximize the catchment area but also to serve as an interim terminal facility. Hence, sufficient geometrics for tail track and crossover track (as indicated in **Figure 12.4-1**) were considered.

These alignments would be located entirely below ground and hence possible constraints introduced by the existing developments (within York University and the VCC), utilities (gas main and 900 mm diameter sanitary sewer) and the crossing of Highway 407 and future transitway can be circumvented.

12.4.1.2 Alignments B-1 and B-2

Alignment B-1 originated from the 1993 TTC EA study's westerly York University alignment and proceeds north, crossing under Steeles Avenue at the York transit terminal site, to the existing Hydro Corridor (see **Figure 12.4-1**). Alignment B-2 was identical to A-1 except that it originated at the 1993 EA approved station further east. Both alignments then turned to the west, surfacing and continuing at-grade along the south boundary of the Hydro Corridor for approximately 750 metres. As per the instruction of Ontario Hydro, the crossing of the existing transmission lines was below-grade. Approximately 450 metres east of Jane Street, the alignment will return to below-grade and proceed to the future 407 Transitway station. This station was common to all alignments and the remainder of the alignment to the VCC remained unchanged. To minimize land use impacts and the length of crossing required through the Hydro Corridor, horizontal curves of 320 metres were adopted in both instances. Although larger radii could promote higher speeds (and hence shorter travel times), the proximity of the curves to adjacent stations minimized the increase in travel times introduced by the curves. Therefore, the impacts of reduced curve radii were not significant.

Given the use of the Hydro Corridor, the range of locations for a successful intermediate station were somewhat limited; the proposed location was immediately south of Steeles Avenue to serve development along Steeles Avenue while taking advantage of potential commuter parking within the Hydro Corridor. As it would likely be an intermediate terminal station during staged construction, trail track and crossover facilities would be required. Given its proximity to the curve, the tail track would be required outside of the curve and thus would be used on a temporary basis only (resulting in inflated construction costs with only limited use).

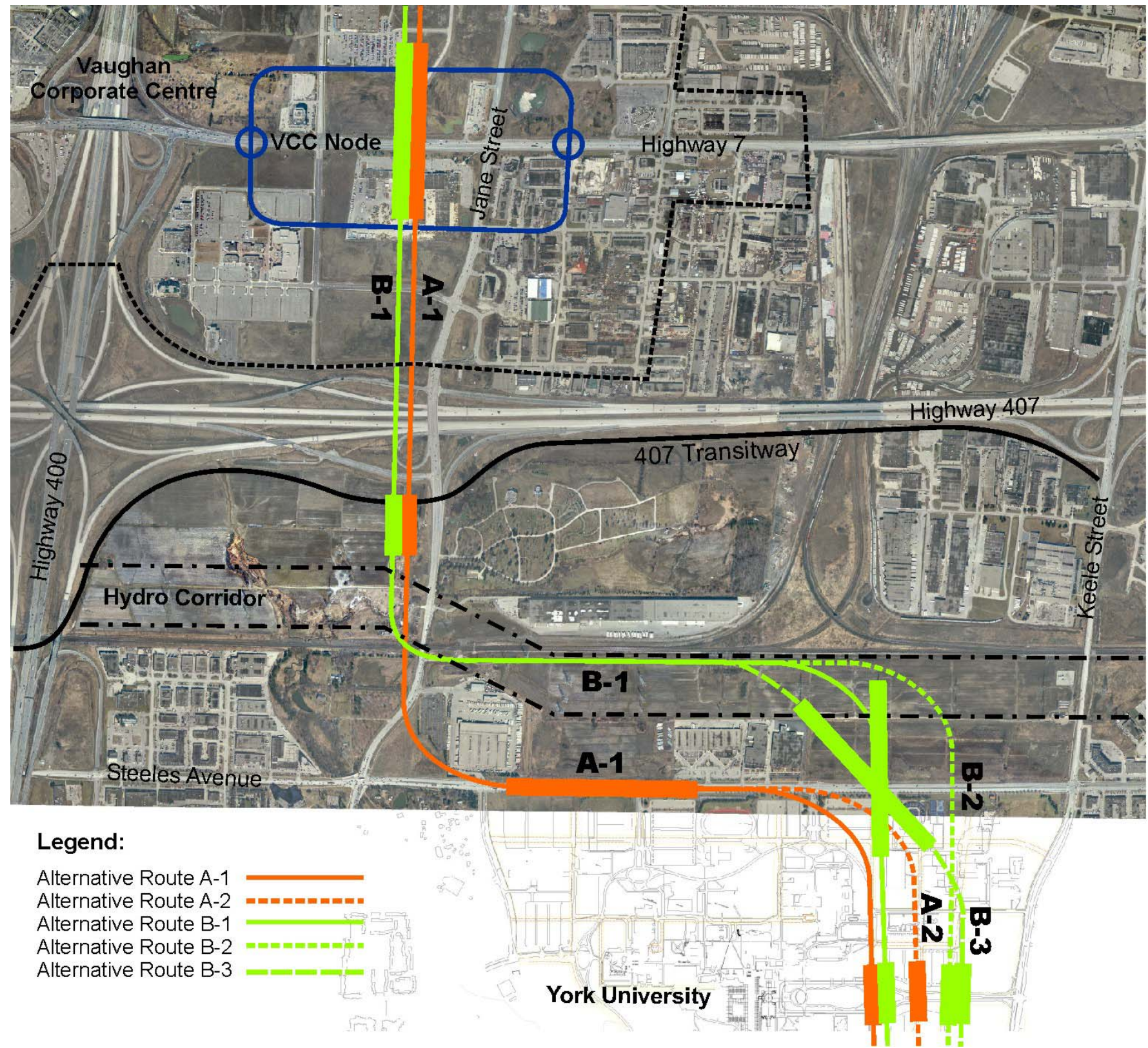


Figure 12.4-1
Alignment Alternatives between VCC and York University

12.4.1.3 Alignment B-3

The fifth alternative, B-3 built on both Alignments B-1 and B-2 in that it provided for a station at Steeles Avenue while minimizing the resulting impacts and eliminating any duplication of track. Originating at the EA approved university station, it continued northerly crossing the Hydro Corridor on an approximate 45-degree angle. The crossing itself was on a tangent section thereby accommodating the requirements for a terminal station (again, it was assumed that this interim station would serve as an intermediate end point during staged construction). The corresponding distance from the university station to the Steeles Avenue station was approximately 850 metres. The remaining alignment through the Hydro Corridor and onto the Corporate Centre was identical to the previous two routes. Overall, approximately 550 metres of this alignment would be at-grade.

12.4.2 Evaluation of Alternative Alignments

The evaluation of the alternatives was conducted in two stages. The first stage evaluated the individual alternatives within each of the two corridors (i.e. Route A: Steeles Avenue/Jane Street/Millway Avenue and Route B: Hydro Corridor/Jane Street/Millway Avenue) and identified the single preferred route within each. The second stage evaluated the preferred alternative within Route A as compared to that in Route B.

The alternative alignments were evaluated based on criteria pertaining to transportation design, transportation service, social environment, natural environment, land use, implementation and costs (refer to **Table 12.4-2**). As part of a consistent approach, this set of criteria is similar to that used in the evaluation of the alternative rapid transit routes. However, the different scope, alternatives and levels of detail involved at each of the different stages of the analysis and evaluation required using the criteria in a slightly different manner for each. In addition, many of the sub-factors are not differentiable across the route alternatives and thus do not have any consequence in the evaluations. As such, the evaluation was based only on the key criteria as highlighted in **Table 12.4-2**.

Table 12.4-2 Evaluation Criteria

Factor	Sub-factors
Transportation Design	<ol style="list-style-type: none"> Horizontal alignment <ul style="list-style-type: none"> minimum & maximum design speed number of curves & total curve length substandard curves (radius < 320 metres) percent of corridor on curves quality of alignment Vertical alignment Potential to relocate station at York University
Transportation Services	<ol style="list-style-type: none"> Connection to future 407 Transitway <ul style="list-style-type: none"> quality of alignment Jane Street & Transitway Keele Street & Transitway other Service to the Vaughan Corporate Centre Overall accessibility and station location <ul style="list-style-type: none"> station at VCC station at York University intermediate station to serve future 407 Transitway intermediate station to serve Steeles Avenue Travel time Commuter parking opportunities Possible extension of service beyond the Corporate Centre Integration with street bus service <ul style="list-style-type: none"> at VCC at York University
Social Environment	<ol style="list-style-type: none"> Impacts to existing residents Displacement of jobs/homes/businesses Noise and vibration Impacts to the Beechwood Cemetery
Natural Environment	<ol style="list-style-type: none"> Loss of/disruption to the natural environment Restriction of access to conservation and recreation lands
Land Use	<ol style="list-style-type: none"> Potential for development at stations <ul style="list-style-type: none"> at VCC at York University at future 407 Transitway at other intermediate stations Impacts on development plans
Implementation	<ol style="list-style-type: none"> Use of railway lands Use of hydro lands Possibility of expropriation of private lands
Cost	<ol style="list-style-type: none"> Length of alignment (measured from York Transit Terminal Station to VCC station) “Throw-away” track Length of curves Number of structures Number of stations Portion of route at-grade Impacts on existing buildings

Subfactors shown **bold** indicate key criteria to be considered in the evaluation of the alternative routes

12.4.2.1 Stage 1 Evaluation

The Stage 1 evaluation assessed the various alternatives within the two identified travel routes to identify a preferred alignment within each, based on the key criteria previously presented. Given the commonality between alignments on Route A and Route B, a number of the evaluation criteria did not yield significantly different results.

Route A (Alignments A-1 and A-2)

As the only difference between Alignments A-1 and A-2 was their point of origin within York University and approach to Steeles Avenue, the evaluation focussed on the corresponding route segments. Beyond Steeles Avenue, the routes were identical and thus a corresponding analysis would not have yielded any further distinction at this stage. Also, given that the current update of the TTC's Spadina Subway Extension EA is revisiting alignments and station locations in the University, it is not necessary to present the details of the comparison between Alignments A-1 and A-2 made in the City of Vaughan's Study.

It suffices to record that Alignment A-1 was the preferred Route A alignment given that it better served the university (a primary travel origin/destination and purpose of the station), had less impact on existing and future university development, and was estimated to be less costly.

Route B (Alignment B-1 vs B-2 vs B-3)

Route B alignments differed only in the location of the York University station, the location of the Steeles Avenue station and the approach alignment to the Hydro Corridor. As such, the evaluation only addressed these differences. The points of origin at the university were the same as adopted by Alignments A-1 and A-2, and thus the evaluation as it pertained to this station remained unchanged (Alignments A-1 and B-1 adopted the westerly York University station whereas A-2, B-2 and B-3 adopted the easterly station).

Transportation Services

As was the case for A-1, Alignment B-1 provided better accessibility to the university campus (i.e. more of the campus would be within an acceptable walking distance of 500 metres) as compared to Alignments B-2 and B-3. With respect to the Steeles Avenue station, B-2 will provide better accessibility (although both B-1 and B-3 will also provide good accessibility) as they were closest to the major intersection of Steeles Avenue and Keele Street and contained a greater amount of undeveloped land within the station's 500 metre catchment area.

Commuter parking facilities were proposed within the Hydro Corridor north of Steeles Avenue in proximity to the corresponding stations (i.e. within 750-1000 metre walking distance). Given the proximity of the Hydro Corridor routes and the station at Steeles Avenue, comparable parking facilities, in terms of both size and accessibility, were foreseen.

Land Use

Potential for development adjacent to the York University station did not differ significantly for the three routes. However, the potential for development at the Steeles Avenue station was expected to differ between routes despite their close proximity. Alignment B-2 had the highest potential for development at the Steeles Avenue station as it contained the greatest amount of currently undeveloped land within the 500-metre catchment area. Some lands north of Steeles Avenue within the 500 metre catchment areas for the B-1 and B-3 stations are currently developed as industrial uses and thus would not foster transit ridership. South of Steeles Avenue, the B-3 alignment and Steeles Avenue station location would provide a slightly better potential for redevelopment of the York University lands given the University's desire to redevelop the north precinct.

In the long term, the City of Vaughan envisions a complete redevelopment along the north side of Steeles Avenue coupled with a redevelopment of the university's north precinct south of Steeles Avenue, with a focus on the ensuing subway station location. As such, the benefits of one station location over another become somewhat diminished in the long term (i.e. irregardless of where the station is located, the level of development is expected to be comparable).

Despite the improved service to the large (approximately 200 metres x 850 metres) developable parcel located in the northwest corner of Steeles Avenue and Keele Street, the B-2 alignment was located prominently in the centre of it and thus, from a developer's perspective, may not be as appealing given the resulting limitations on development. Although both B-1 and B-3 also bisected the same property, they both provided a higher level of flexibility for development given the relatively large parcel that remains (600 metres x 200 metres). In addition, there is an inherent potential for high-density development at the corner of the Steeles Avenue and Keele Street given the high visibility and auto accessibility resulting from frontage on two key arterial roadways. As such, a more westerly subway alignment (eg. B-1 or B-3) would improve accessibility to the remaining mid-block parcels (while not impacting the corner parcels) and further promote high-density development.

With respect to impacts on existing development and future development plans, Alignment B-1 had the fewest impacts. Through the university campus, B-1 would be located within the right-of-way of a future road

extending to Steeles Avenue (unlike B-2 and B-3 that will impact existing campus buildings and future university development). A simple perpendicular crossing of the vacant lands north of Steeles Avenue minimized impacts on future development - the corresponding easement could be used as a local access road to the development sites and commuter parking.

Implementation

Again, as with the Route A alignments, there was no significant differences with respect to implementation of the three routes for the segments within the university campus and Hydro Corridor. Alignment B-2 has the longest section within the Hydro Corridor and therefore the highest potential of conflicts with existing transmission towers. However, it was expected that any such conflicts could be relatively easily resolved through minor modifications to the horizontal and vertical alignment.

Cost

Of the three Route B alignments, B-3 was the shortest (5320 metres) followed by B-1 and B-2 (5630 and 5850 metres respectively) as measured from the centre of the Keele/Finch station to the terminating point in the Vaughan Corporate Centre. Included in the lengths for both B-1 and B-2 was a 260-metre section of tail track that would be required at the Steeles Avenue station should construction of the subway be staged and the Steeles Avenue station is an interim terminal station (refer to Figure 12.4-1). Upon further extension of the subway to the Vaughan Corporate Centre, the need for the tail track would be diminished although it could still be used for storage of trains and for short-turning trains. In essence, the tail track would be constructed for short-term use only and therefore represents an additional cost that would not otherwise be incurred if the construction was not staged or if Alignment B-3 was selected.

The primary benefit for locating the rapid transit alignment within the Hydro Corridor was the ability to provide a segment of the alignment at-grade or within a cut section and thereby reduce the overall cost of construction. Based on the alignments illustrated and assuming that the crossings of the hydro transmission lines (particularly the 500kV lines) must be accomplished below grade, Alignment B-1 provided for an approximate 750 metre at-grade section, B-2 a 1000 metre at-grade section and B-3 a 550 metre section resulting in potential savings of \$27.5 to \$50 million dollars to the cost of the overall project.

Similar to Alignment A-2, additional costs would be incurred by B-2 and B-3 associated with mitigating measures to reduce the impacts to existing development. There was the possible need to relocate and/or demolish 2-3 buildings (or tunnel under them) with both B-2 and B-3 while B-1 had no

impacts on existing buildings.

Preferred Alignment

The preferred alignment was found to be **Alignment B-1** as it better served the university, had less impact on existing university development and less impact on future proposed development (both north and south of Steeles Avenue). Although the development potential north of Steeles Avenue may be slightly higher for B-2 as there is more undeveloped land in close proximity to the Steeles Avenue station, B-1 provided for greater flexibility in the development of these lands. Even though both alignments bisected the parcel, B-1 resulted in more favourable parcel sizes from a developer's perspective.

Alignment B-3 was the least preferred given its skewed alignment and significant impacts on future development north of Steeles Avenue. Although it was shorter in overall length, the increased potential for at-grade sections with both B-1 and B-2 partially offsets this benefit. Alignments B-1 and/or B-2 were deemed equal to or better than B-3 for all of the key criteria investigated.

12.4.2.2 Stage 2 Evaluation

The Stage 2 evaluation compared the preferred alignments within the two Routes (Alignments A-1 and B-1) and identified a single preferred route to connect the Vaughan Corporate Centre to York University with intermediate stations to serve Steeles Avenue and the future 407 Transitway. South of Highway 407, Alignment A-1 differed considerably from B-1 and thus the evaluation was based on the full range of criteria detailed in Table 12-x, as opposed to select sub-factors. The results of the evaluation are summarized below.

Transportation Design

There was no appreciable difference between Alignments A-1 and B-1 from a design perspective, apart from the fact that a section of B-1 (approximately 500-750m) would be located at-grade within the Hydro Corridor. The horizontal and vertical alignments of both could be accommodated equally well with acceptable geometry.

Transportation Services

Given the common station locations, both alignments provided equal levels of service to the stations located at the University, future 407 Transitway and the Vaughan Corporate Centre. With respect to the station located at Steeles Avenue, A-1 provided an improved level of service in that the station spacing was more optimal. With B-1 the 1750 metre spacing

resulted in a significant level of development along Steeles Avenue (including future University development and the Black Creek Pioneer Village) well beyond the 500-metre catchment area (the farthest distance would be approximately 1000 metres).

Both alignments offered the opportunity for commuter parking within the Hydro Corridor. Given the configuration of the proposed Steeles Avenue station along B-1 (i.e. north-south), the overall walking distance from the parking area to the station was slightly less than that resulting from A-1. However, under each alignment, the majority of the Hydro Corridor parking would be within the 500-metre catchment area and thus the expected walking distance was acceptable.

With respect to integration with surface transit, both alignments offered comparable services at their common stations. Integration with the Steeles Avenue bus services were also considered comparable in that both provided opportunities for additional surface facilities (e.g. bus terminals, kiss-and-ride, etc.).

Social Environment

Few impacts to the social environment were expected given that there are no local residents within the immediate areas and no displacement of existing jobs/homes/businesses expected. The noise and vibration impacts of Alignment A-1 were judged to be somewhat greater than B-1 given its alignment underneath Steeles Avenue and the proximity of development on both sides of Steeles Avenue. Under Alignment B-1, this section would be within the Hydro Corridor and thus removed from the development activity along Steeles Avenue.

Natural Environment

Overall, there would be no loss of natural lands under either alignment. If the alignment were not underground (100% with Alignment A-1), it would be located within the Hydro Corridor, which is not considered a natural area. Despite Alignment A-1 being underground, it still had the potential to impact the Toronto Region Conservation Authority (TRCA) Lands located west of Jane Street adjacent to the existing CN rail line, as does B-1 (although a shorter section of its alignment passed through (under) TRCA lands).

Land Use

Again, Alignments A-1 and B-1 differed only with respect to the section extending from York University to the future 407 Transitway station. At the Steeles Avenue station, there was undeveloped lands in close proximity to either station location; for alignment A-1, the vacant parcel is approximately 450 metres by 200 metres whereas for B-1 the parcel is 850 metres by 200

metres. Both of these parcels could be developed in a manner to further support the development of the subway extension. The remaining lands within the respective catchment areas were seen as primarily limited to industrial or university uses; the former of which was not very conducive to the on-going development of a subway service. However, for both routes, it was envisioned that re-development along Steeles Avenue would likely occur in light of the future subway and that the development would be focused on the station location. As such, in the long term, there would be little difference between the alignments in that both offered the opportunity for further development. Alignment A-1 was considered to have a slight advantage in that the station would be more centrally located along Steeles Avenue and configured parallel to it as opposed to perpendicular.

With respect to impacts on future development plans, Alignment A-1 would have some impacts on development within the university campus (along the section that would not be within the road ROW) and some impacts on the parcels at the intersection of Jane Street and Steeles Avenue. B-1 would not impact university development in that it would be located completely within a road ROW but it would impact development immediately north, in the Steeles-Keele Investments Inc. property given the need for an easement.

Implementation

In constructing Alignment A-1, below ground easements would be required through a portion of York University (along the section that would not otherwise be located within a future road right-of-way), through the UPS site (under their existing parking lot) and through Phase 2 of the Columbarium site at the north-east corner of Jane Street and Steeles Avenue (under a proposed parking lot). Alignment B-1 would require an easement north of Steeles Avenue through the vacant development parcel (Steeles-Keele Investments Inc. property). In accordance with TTC requirements, the easements (23 metres) must be free and clear of all obstructions; buildings and structures must be set back and no structure of any depth could be constructed within the easement. Surface uses such as roads, sidewalks, shallow utilities, surface parking and landscaping would be permitted above the alignment.

Approximately 30% (1750 metres) of Alignment B-1 would be located within the Hydro Corridor (both underground and at-grade) and thus could potentially be impacted by the transmission lines (one 230 kV line and two 500 kV lines) and the transmission towers (relocation of towers was not considered feasible given the high costs). Although Hydro One stated that a subway alignment within the Hydro Corridor may be feasible, a significant amount of additional studies would be required to fully investigate potential impacts and necessary mitigating measures. In addition, it was noted that as Hydro One is only the registered easement holder and not the owner of

the lands within the Hydro Corridor, additional agreements with the landowner (Ontario Realty) would be required.

Both alignments would also require access to the Hydro Corridor parking facilities and an adequate area for supporting facilities (e.g. bus terminal, kiss-and-ride, etc.).

Cost

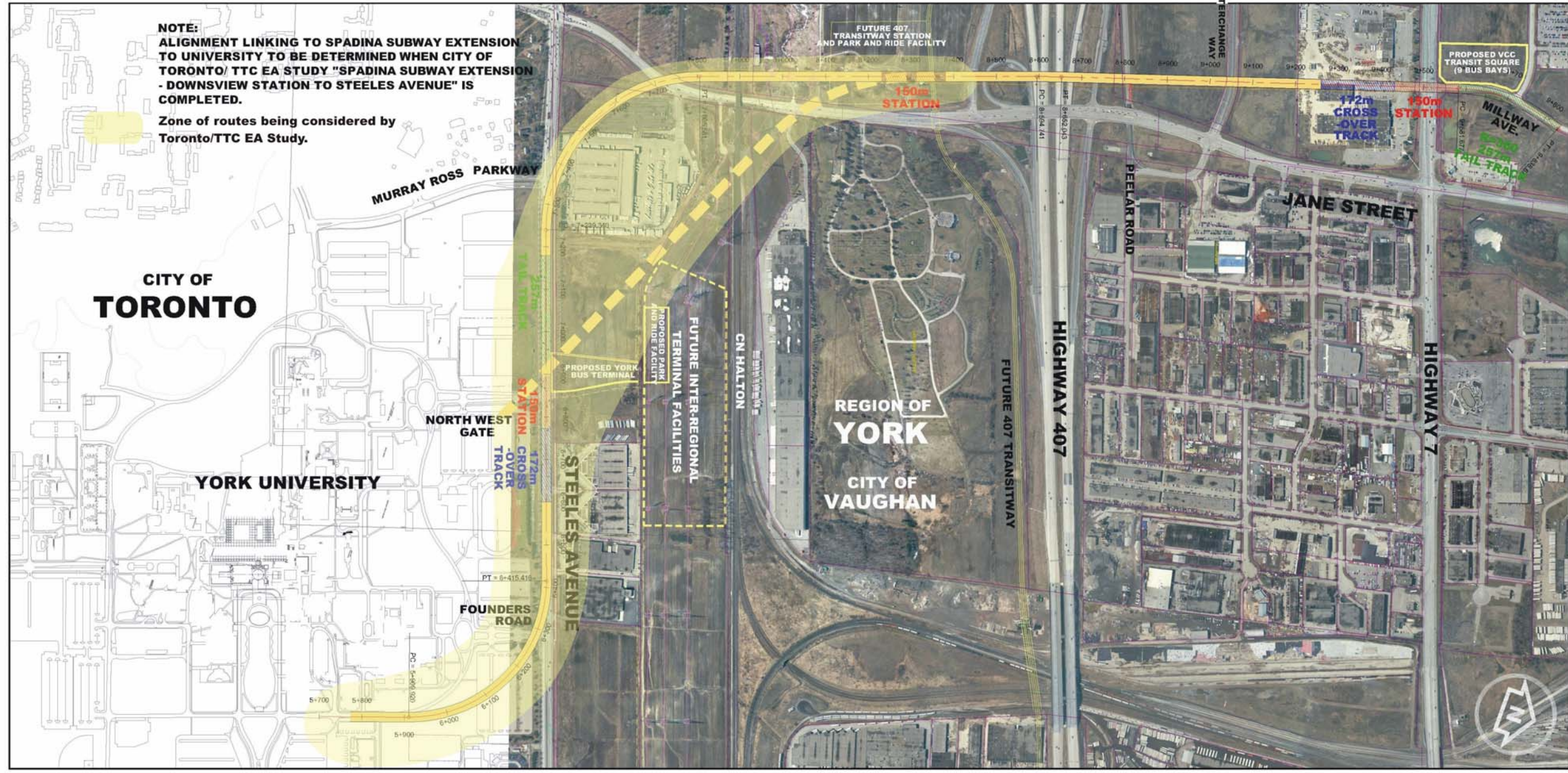
The overall length of Alignment A-1 (extending from the 1993 EA Study's Keele/Finch station to the VCC station) is approximately 5320 metres - 320 metres shorter than Alignment B-1. At an approximate construction cost of \$100 million per kilometre, this translates to a saving of \$32 million. Alignment B-1 will also incorporate a short section of tail track (260 metres) at the Steeles Avenue station that would not be necessary upon fully extending the line to the VCC (this assumes the construction is staged and the Steeles station serves as an interim terminal). As such, the costs incurred to construct this section of "throw-away" track (\$26 million) would only yield short-term benefits.

The purpose of investigating the use of the Hydro Corridor for B-1 was to minimize construction costs (at-grade construction being approximately half the cost of tunneling - \$50 million per kilometre). As such, the at-grade section would result in a saving of approximately \$30 million based on an at-grade length of 600 metres. Additional costs would be incurred in using the Hydro Corridor given the need to then bury the planned 230 kV transmission line. Estimates from Ontario Hydro indicate that this would cost approximately \$1 million per kilometre per circuit. Additional costs would also be incurred in the construction of the tunnel portals. Otherwise, there were no other significant differences from a cost perspective.

Preferred Alignment

Based on the evaluation and the summaries provided above **Alignment A-1** is recommended for a subway extension extending from York University to the Vaughan Corporate Centre.

Although Alignment B-1 was preferred from the perspective of impacts to the natural and social environments (slightly better than A-1 in both cases), Alignment A-1 provided an increased level of service and was preferred from an implementation perspective. Given the importance of the latter two elements and the significant differences between the two options in the respective comparisons, Alignment A-1 was considered to be the preferred route.

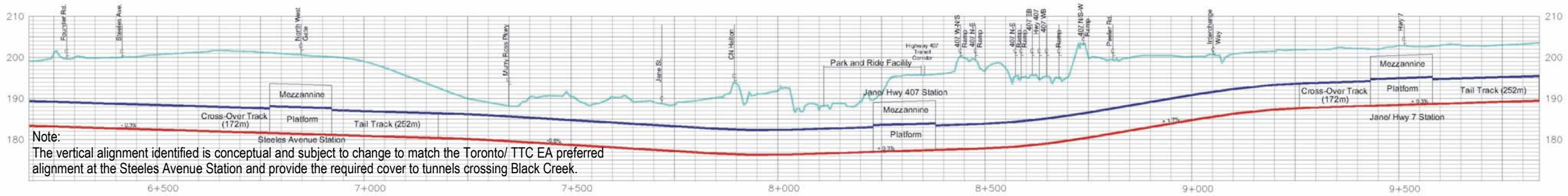


NOTE:
ALIGNMENT LINKING TO SPADINA SUBWAY EXTENSION TO UNIVERSITY TO BE DETERMINED WHEN CITY OF TORONTO/ TTC EA STUDY "SPADINA SUBWAY EXTENSION - DOWNSVIEW STATION TO STEELES AVENUE" IS COMPLETED.
Zone of routes being considered by Toronto/TTC EA Study.

CITY OF TORONTO

YORK UNIVERSITY

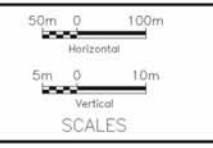
REGION OF YORK
CITY OF VAUGHAN



Note:
The vertical alignment identified is conceptual and subject to change to match the Toronto/ TTC EA preferred alignment at the Steeles Avenue Station and provide the required cover to tunnels crossing Black Creek.

12

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PREFERRED ALIGNMENT FOR SPADINA SUBWAY EXTENSION

12-4
FIGURE

12.5 SUBWAY FACILITIES INCLUDED IN THE UNDERTAKING

The scope of the *Higher Order Transit Corridor Protection Study*, described above, did not allow for the detailed station planning necessary to define property requirements for ancillary rapid transit terminal station facilities. Consequently, the City of Vaughan carried out a separate *Property Protection Study* in 2001 to identify the property requirements to support the Steeles Avenue Station location recommended for the preferred subway alignment A-1.

Following an analysis of the available alternatives, this study identified the preferred configuration and property requirements for facilities at the proposed interim terminal station. These facilities comprised the following components:

- The rapid transit station itself located below grade within the Steeles Avenue right of way and centred on the North West Gate intersection;
- A commuter parking lot with approximately 3,000 spaces located in the Hydro Corridor portion of the Parkway Belt north of Steeles Avenue;
- An off-street transit terminal with capacity for 19 bus bays on the northwest corner of the Steeles Avenue and North West gate intersection;
- A passenger pick-up and drop-off facility on the southeast corner of Steeles Avenue and North West Gate; and
- Two new municipal roads to provide access to the above facilities as well as to support higher intensity, transit-oriented development.

Based on the conclusions of both City of Vaughan studies, Vaughan Council adopted *OPA 529* which defined the location and width of the transit right-of-way and station locations. This amendment was subsequently approved by York Region and the Regional Council authorized the acquisition of the properties required for the transit terminal and associated access roads off Steeles Avenue and Jane Street in 2002. Most of the land required for the transit terminal has been acquired by the Region and acquisition of the remaining parcels including those required for the east-west access road is in progress.

Consequently, the site has been identified by the TTC as the end point of their routes and alignments to be studied in their on-going EA for the extension of the Spadina Subway. At the time of completion of this Highway 7 Corridor EA the TTC/City of Toronto EA study had not yet identified the preferred alignment for the subway south of this end-point. Hence it is not possible to confirm that the preferred subway alignment A-1 selected in the City of Vaughan studies and shown in **Figure 12-4** will be compatible with the alignment south of Steeles Avenue selected through

the TTC/City of Toronto EA.

Planning to date by the TTC's study has identified three potential alignments on which the subway could reach the Region's terminal site. The TTC work to date indicates that the preferred horizontal and vertical alignment of the Toronto subway extension will fall within the shaded zone shown on **Figure 12-4** between Highway 407 and Steeles Avenue.

Therefore this EA is seeking approval of the underground Alignment A-1 with the option of amending, where necessary, the portion south of Highway 407 to tie into the approved TTC station and tail track alignment at the York Region transit terminal site. The proposed amendment will include:

- analysis and evaluation of tunnel horizontal and vertical alignment options through the approximately 800m tie-in zone,
- identification of a preferred location for the future 407 Transitway station on the subway alignment and integration of surface facilities associated with this station based on the approved design from an EA for the 407 Transitway.
- assessment of the effects of construction of the above works and operation of subway service on the surrounding environment and description of proposed mitigation and monitoring measures..
- finalization of the preferred functional design for the Highway 7 terminal station and associated surface facilities including relocation of the surface rapid transit station on Highway 7 at Jane Street, and
- assessment of the effects of construction and operation of Highway 7 station facilities on the surrounding environment.

The Region proposes to carry out the additional studies and submit the amendment report at a future date and when preferred designs for the inter-related works have received EA approval.

In addition to the recommendation and assessment of a preferred subway alignment at the Region's transit terminal site, the TTC/City of Toronto EA will be developing and evaluating alternative locations and configurations for ancillary inter-regional transit terminal facilities serving the initial subway terminus at Steeles Avenue. These facilities, which are not part of the undertaking for the York Region's EA, will include:

- Bus terminal(s) for use by York Region, Viva, GO Transit and TTC bus services. These bus terminal facilities will use, in part, the lands immediately north of North West Gate acquired by Vaughan for a future bus terminal;
- a passenger pick-up and drop-off facility; and
- a commuter parking lot to be located in the Hydro Corridor north of Steeles Avenue.

The above facilities will be included in the works constituting the TTC/City of Toronto EA undertaking and consequently are excluded from this undertaking.

In summary, this York Region EA undertaking includes the following components of the ultimate phase of rapid transit in the Vaughan North-South Link, subway technology by extension of the TTC subway system to Highway 7:

- the alignment for subway right-of-way from the northern limit of the tail track at the Highway 7 Station to the north end of the interim terminal tail track at the Steeles West Station (defined by the TTC/City of Toronto EA).
- Stations at Highway 7 and Highway 407.
- Development of transit terminal facilities on York Region's site at the northwest corner of Steeles Avenue and North West Gate/Street 'C', in a facility of the type shown conceptually in **Chapter 9, Figure 9-25**.
- An initial phase of the proposed park-and-ride lot within the Hydro Corridor north of Steeles Avenue (500parking spots).
- Transit terminal facility at the northwest corner of Highway 7 and Millway Avenue.

12.6 ASSESSMENT OF THE PREFERRED SUBWAY DESIGN

12.6.1 Assessment Methodology

An impact analysis was undertaken to identify and mitigate the potential effects, both positive and negative of the pre-construction, construction and operational activities required for project implementation. Generally, the evaluation criteria and indicators established during the alternatives evaluation process for the undertaking's surface rapid transit components were used as the basis for assessing the environmental effects of the preferred design.

- As in the previous assessment professional experience, analysis, simulation and judgement formed the basis for identifying environmental effects and mitigation measures. The analysis was based primarily on comparing the existing environment condition with

the anticipated future environment, prior to, during, and after construction.

12.6.2 Project Related Effects and Mitigation

Using the methodology described in **Chapter 10**, 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 in 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.

12.6.3 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. **Section 12.6.4** describes these project activities for the surface rapid transit components of the undertaking 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

12.6.4 Analysis of Environmental Effects and Mitigation

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

The analysis for Objective A is tabulated in **Table 12.6-1**. Generally, a subway extension from York University, the ultimate form of the undertaking for the Vaughan N-S Link, has the ability to significantly improve mobility within the western portion of the corridor and provide good connectivity with all intra-regional transit services. It provides connections to the City of Toronto subway network via York University and is also capable of connecting to future Highway 407 rapid transit services near Jane Street. From this point of view, the subway technology 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 all respects. Station locations will support medium-long term development in the Vaughan Corporate Centre and York University area where high residential density, high employment numbers or a mixture of the two will capitalize on the effectiveness of implementing a subway system extension. The strategic locations of stations generally achieve the goal of increasing the attractiveness of the rapid transit service and make a positive contribution to maximizing ridership. In order for all members of society to have access to the system, all stations, ancillary facilities and the transit system itself will be accessible for the mobility impaired providing ramps, elevators, etc. Attractiveness of the rapid transit service is implicit in the design of this ultimate phase of the undertaking, by achieving the desired transit speed and providing a key link between a planned major Regional Centre and the future expanded GTA transit network.

Table 12.6-1
Effects and Mitigation for Improved Mobility

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service												
A1	Maximize Inter-regional and local transit connectivity	Connections to inter-regional services and future gateways	✓		✓	Highway 407 crossing	Opportunity to connect to MTO's future rapid transit plans on the 407 highway to improve the inter-regional transit network.	Vaughan N-S Link subway will include a station for transfers from a future 407 inter-regional service to the subway.	Some potential for infill commercial development around this transfer point.	Development approvals must recognize proximity to Black Creek	Positive effect	Monitor the ridership and land use to size park-and-ride facility as warranted by the Provincial future rapid transit plans.
		Connections to inter-regional services and future gateways	✓		✓	York University	Opportunity to connect to the City of Toronto and improve ridership on these transit services.	Vaughan North-South Link will provide a direct connection to the York University and to the TTC rapid transit system via the Spadina subway extension.	High potential for infill mixed-use development around this transfer point.	None	Positive effect	Monitor the ridership and the performance of the connection to Toronto.
		Compatibility with proposed local network	✓		✓	Entire Corridor	Inconvenient transfer between local transit and Highway 7 Rapid Transit may discourage growth in transit ridership.	Steeles Avenue and Hwy 7 Stations will be served by local YRT and TTC transit routes ensuring convenient transfers between services. Integrated fare system proposed.	Project will require a change to the configuration of local transit.	Local services configured as grid where practical, to provide both community coverage and feeder roles	Positive effect	Regular review of effectiveness of local service plans.
A2	Maximize speed and ride comfort and minimize safety risks and maintenance costs	Alignment geometry	✓		✓	Entire Corridor	Minimum geometric standards would limit service speed, increase travel time and reduce ride comfort and system safety.	Alignment for subway extension includes only one curve and with greater than minimum radius avoiding speed restriction, reduced ride comfort, increased safety risks and maintenance costs.	Improved travel time will attract ridership.	None	Positive effect	None required.
A5	Locate stations to maximize ridership potential and convenience of access for all users	Residents/Employees within walking distance of station locations. Accessibility of stations/transit system.			✓	Entire Corridor	Stations at locations with automobile-oriented land use could discourage rapid transit use.	Station locations will serve supportive land use. Facilities and access can be designed with weather protection, direct barrier-free access and attractive streetscapes within surrounding mixed-use neighbourhoods.	Continued dependence on automobile if land use objectives not achieved	Greater emphasis on supportive land use particularly in VCC.	Positive effect	Regular review of land use and new or infill development potential during detailed design phases for subway extension.

Notes:

P – Pre construction, C – Construction, O – Operation

12.6.4.2 OBJECTIVE B: To protect and enhance the social environment in the corridor

Overall, the various goals set to protect and enhance the social environment can be 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 existing and future communities served by the route can be maximized. The assessment for Objective B is tabulated in **Table 12.6-2**.

In particular, the subway phase of the undertaking will improve community mobility, in particular, access to commercial and community facilities planned for each end of the extension, the VCC and York University and environs. In general, overall intersection capacity for vehicular traffic in the station areas will be maintained due to the planned road system changes to accommodate traffic accessing station park-and-ride facilities. Also, a reduction in north-south vehicular demand is anticipated when the subway extension is placed into service. As a result, the intersections in the station areas can continue to serve a high volume of vehicular traffic, the needs of a broad range of pedestrians, and adjacent businesses with the implementation of rapid transit in subway form.

Preserving and improving public safety and security along the route was an important consideration in development of the design concept. While fulfilling its role as a major transit interchange node in VCC, the features of the Highway 7 station precinct design will create a pedestrian-friendly environment as planned in the recently-completed VCC Streetscaping Study. It will not only allow frequent access across the median transitway for Emergency Response Vehicles, but also provide pedestrians with a safer environment. In addition, noise and vibration studies at representative sensitive receptors have demonstrated that the use of the TTC's standard floating slab track support system will mitigate any noticeable increase in noise or vibration levels for residents of future developments that may be implemented along the route.

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 subway extension. Finally, the conversion to a subway, even in a highly developed urban context, will have no effect on the visual aesthetics of the route. In consultation with the municipalities and the public, a concerted effort will be made to incorporate landscaping and streetscaping principles developed for the VCC in station area design in the Avenue 7 right-of-way, offering the potential for a significantly enhanced street environment at a major transit interchange node.

**Table 12.6-2
Effects and Mitigation for Social Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B1	Minimize adverse effects on, and maximize benefits for, communities in corridor	Potential displacement of community features.		✓	✓	Entire route	Potential displacement or loss of unique features.	Avoids known distinct community features to minimize impact; incorporate landscaping and furniture into streetscape to enhance corridor and community environment.	None expected	None expected	Negligible	Future municipality and VCC community consultation
		Effect on community cohesion			✓	Entire route	Subway extension may be perceived as a north-south barrier between communities on each side of the route	Underground alignment design will facilitate convenient, safe vehicle and pedestrian crossings. Improved streetscaping at stations will create a friendlier pedestrian environment.	During initial operation, vehicle/pedestrian incidents may occur due to the introduction of new station support facilities.	Emphasis on information programs, effective signage, and traffic by-law enforcement.	Negligible	Monitor traffic behaviour and cause of incidents involving pedestrians in station areas at VCC and Steeles Ave.
		Community facility utilization			✓	VCC area	Improved transit access could increase demand on facilities and services within the VCC.	Municipality can expand services and facilities through the increased development charge revenue.	None expected	None expected	Positive effect	Monitoring of activity levels at the various facilities.
B2	Maintain or improve road traffic and pedestrian circulation	Reduction in overall intersection capacity			✓	Entire route	The overall intersection capacity for vehicular traffic in the station areas could be reduced due to the required operational changes and access related traffic redistribution.	The implementation of improved rapid transit will reduce the general vehicular demands on the corridor. Improved road infrastructure at VCC and the Steeles Avenue node will make traffic operation acceptable.	None expected	None expected	Insignificant	Continue to monitor intersections to confirm assumptions.
					✓	Proposed East-West Road (Jane Street)	Under 2021 considerations, SBL will operate at capacity and NBT will approach capacity during the AM peak hour. The opposing WBR will approach capacity during the PM peak hour.	Traffic volume will be monitored to determine if a SB dual left turn lane to access park-and-ride will be required to facilitate the heavy volume during the morning period.	Intersection will continue to operate at capacity.	None expected	Moderately Significant	Monitoring required for SB dual left turn lane.

**Table 12.6-2
Effects and Mitigation for Social Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE B: To protect and enhance the social environment in the corridor												
					✓	Northwest Gate (Steeles Avenue)	Under 2021 Considerations, the intersection will operate at capacity during the AM peak hour.	None required.	Intersection will continue to operate at capacity.	None expected	Moderately Significant	None required.
		Pedestrian Crossings			✓	Jane St./ Hwy 7;	Due to the width of the main street at intersection, pedestrians may not be able to cross the intersection in one signal phasing based on the standard pedestrian crossing times of 7 seconds.	These intersections may require two-stage crossing in the future to accommodate heavy main street traffic. The decision to implement these special provisions should be deferred until post-operation conditions are monitored and the need is identified.	None Expected	None Expected	Moderately Significant	Monitoring is required to determine if the implementation of two-stage is a necessity.
B3	Maintain a high level of public safety and security in corridor	Access for emergency vehicles	✓	✓	✓	Highway 7, Jane Street,	Incorporation of median and construction activity could have adverse effects on Emergency Response Services (ERS) access and time	U-Turns permitted at intersections. Consultation with emergency response representatives resulted in median breaks being provided to allow access to Emergency Response Vehicles only.	Some risk may remain as access procedure will change after implementation of mitigation	Address during detail design in conjunction with ERS	Insignificant	Obtain feedback from ERS
B4	Minimize adverse noise and vibration effects	Noise effects due to construction and operation of subway extension from Steeles Avenue station to Highway 7			✓	Portions of route where alignment is in the proximity of future residential land uses	Subway operations and general traffic on the widened Highway 7 corridor roadways may result in increased noise levels for residents.	Ambient noise level increase due to future subway operations will not exceed the 5dB threshold with TTC floating slab track support system. Sound level increases in future adjacent developments can be limited to acceptable levels by conditions during site plan approvals.	None expected	None necessary	Insignificant	Undertake confirmation monitoring to verify compliance once the subway extension is fully operational.
		Vibration effects due to construction and operation of subway extension			✓	Portions of route where alignment is in the proximity of future residential land uses	Subway operations may result in increased vibration levels for residents.	Modeling of future subway operations indicates that expected vibration increases will not exceed the protocol limit of 0.1 mm/sec.	None expected	None necessary	Negligible	Undertake confirmation monitoring to verify compliance once the subway extension is fully operational.
B5	Minimize adverse effects on cultural resources	Disruption of Built Heritage Features (BHF)		✓			The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around built heritage features.	None required – Subway facilities will be integrated with existing streetscape and VCC road network.	None expected	None necessary	Insignificant	None required
B5	Minimize adverse effects on cultural resources	Disruption of Cultural Landscape Units (CLU)		✓			The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural heritage features in the Cultural Landscape.	None required – Subway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
B6	Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	Visual Effects	✓		✓	VCC Station precinct	Introduction of surface transit facilities serving the VCC station may reduce visual aesthetics of Avenue 7.	Transit intermodal facilities will be developed in consultation with Vaughan Municipality as part of the introduction of a comprehensive landscaping and streetscaping plan for the VCC and station precinct.	None expected	None necessary	Insignificant	Monitor VCC planning and development applications and acquire property for facilities and streetscape enhancement through redevelopment applications
		Landscaping	✓		✓	Station precincts	Landscaping species may not survive in winter months.	Choose appropriate species for both winter and other months to maintain greenery throughout corridor. Place landscaping in planters and incorporate buried irrigation systems.	Species may still not survive	Change species', irrigation patterns, etc.	Insignificant	Monitor health of landscaping continuously
		Encroachment on sites of existing buildings		✓	✓			Subway alignment is required to avoid the south building.	Alignment		None	Insignificant

Notes:
P – Pre construction, C – Construction, O – Operation

12.6.4.3 OBJECTIVE C: To protect and enhance the natural environment in the corridor

The limited natural environment along the subway extension route of the can be protected and enhanced in a small way. Most of the preferred subway extension alignment is set in a developed urban environment where natural features have already been disturbed by previous development. Nevertheless, within the Don watershed, the Black Creek watercourse crosses Highway 7 east of the proposed subway terminal station at Millway Avenue and the proposed subway alignment south of Highway 407. At the Highway 7 crossing, the subway tunnel, station and surface works will be remote from the watercourse and outside the floodplain while at the crossing south of Highway 407 the tunnel profile can be designed to allow the subway to pass under the creek leaving the station and associated surface works as the components with potential to effect the watercourse and related vegetation.

As noted in **Section 12.5**, the precise location of the alignment south of Highway 407 through the Black Creek floodplain cannot be established until the preferred alignment for the subway across Steeles Avenue is identified and approved in the City of Toronto/TTC EA Study. The options under consideration in this study comprise the north-south alignment (Alignment A1) possible with a 90 degree curve from an east-west orientation of the Steeles Avenue Station or an alignment curving northward from a diagonal station orientation at Steeles Avenue. The former allows an interchange station either south or north of the Highway 407 rapid transit right-of-way while the latter's curvature restricts the station location to the north side of the right-of-way. Consequently, if the diagonal Steeles Station is selected by the Toronto/TTC study, all underground Highway 407 station works would be constructed under the Highway 407 ramps without directly impacting the Black Creek meander belt. On the other hand, to get the benefits of a more southerly station possible with Alignment A1, approximately 50 metres o the north-south portion of Black Creek would have to be realigned eastward towards Jane Street. While the northern station option eliminates the need for the creek realignment, it requires that all access to the station be at the north edge, instead of being distributed from two points in the station park-and-ride area.

The discussion of options above indicates that the extent of effects on the Black Creek watercourse cannot be identified and mitigation measures developed until after the Toronto/TTC's Spadina Subway Extension EA is approved in 2006 when further study of the connection to the preferred alignment in Toronto and an addendum to this EA Report is completed. This addendum will include a recommendation for the subway alignment between Highway 407 and the approved Steeles Avenue Station tail track as well as an update of the environmental effects of the recommended alignment in the form of analysis documentation and additions to **Table 12.6-3**.

In terms of all other 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 lengthening of existing culverts or installation of new culverts along the subway extension will incorporate mitigation measures where required to preserve or enhance the aquatic habitat. Future air quality, except for PM, is expected to be better than currant air quality mainly due to improvements in engine technology and fuels but also with some contribution from the diversion of trips to rapid transit. While PM levels can be expected to increase as traffic increases, rapid transit will slow the rate of increase. Green house gas emissions will be reduced due to the energy efficiency of an improved public transit alternative.

The assessment for Objective C is tabulated in **Table 12.6-3**

**Table 12.6-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C1	Minimize adverse effects on Aquatic Ecosystems	Fuel spills entering the watercourses, due to accidents during construction refuelling and accidents at bus terminals during operation.		✓	✓	Entire Route	Fish kills due to chemical spills resulting in short term population decline.	<ul style="list-style-type: none"> No refuelling within 10 m of a watercourse. Emergency Response Plan. 	<ul style="list-style-type: none"> Short term population decline. Some contaminants within storm-water system. 	None practical	Insignificant	None required
		Sediment laden stormwater entering watercourses during construction		✓		Entire Route	Fish kills and loss of aquatic habitat resulting in short term population decline.	<ul style="list-style-type: none"> Construction fencing at work areas near watercourses limiting area of disturbance. Erosion and Sedimentation Control Plan. 	Short term population decline.	None practical	Insignificant	None required
		Sediment laden stormwater entering watercourses during operation			✓	Entire Route	Loss of aquatic habitat resulting in population decline.	<ul style="list-style-type: none"> Stormwater management facilities such as grassed swales, oil and grit separators, stormwater ponds. 	Short term population decline.	Clean-out facilities as required.	Insignificant	Monitor sediment accumulation in stormwater management facilities.

**Table 12.6-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C1 Cont'd	Minimize adverse effects on Aquatic Ecosystems (cont'd)	Loss of site-specific habitat.		✓		Black Creek and tributary watercourses within route.	Potential loss of fish habitat as a result of watercourse realignment, new culverts/bridges, culvert/bridge extensions and/or culvert/bridge replacements or repairs.	<ul style="list-style-type: none"> Design subway works to avoid modifications at culverts/bridges. Span the watercourse, meander belt or floodplain with new structures where warranted by site conditions. 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. 	An improvement to fish habitat may result from channel modifications at Black Creek watercourses that support fish habitat.	Consultations with regulatory agencies during detail design to confirm no harmful alteration of fish habitat.	Insignificant	On-site environmental inspection during in-water work. Post-construction monitoring of fish habitat recovery measures.
		Fish mortality		✓		Black Creek and tributary watercourses within route.	Fish may be injured or killed by dewatering.	<ul style="list-style-type: none"> Design subway works to avoid modification of water quantity and quality in watercourses. Avoid in-water work to the extent possible. Perform all in-water work in the dry using a temporary flow bypass system. Capture fish trapped during dewatering of the work zone and safely release upstream. Prohibit the entry of heavy equipment into the watercourse. 	None expected.	None	Negligible	On-site environmental inspection during in-water work.
		Barriers to fish movement.		✓	✓	Black Creek and tributary watercourses within route.	Subway and station works may create a barrier to fish movement.	<ul style="list-style-type: none"> Use open footing culverts or countersink closed culverts a minimum of 20% of culvert diameter. Span the watercourse, meander belt or floodplain with new structures where warranted by site conditions. 	New bridges or culverts and culvert modifications will be designed to avoid the creation of a barrier to fish movement.	Negotiations with regulatory agencies during detail design.	Negligible	On-site environmental inspection during in-water work.
		Baseflow alterations		✓	✓	Black Creek and tributary watercourses within route.	New impervious surfaces at stations can lead to changes in the frequency, magnitude and duration of flows.	<ul style="list-style-type: none"> Reduce the area of impervious surfaces to the extent possible. Use stormwater management practices that encourage infiltration and recharge of groundwater. 	None expected.	None	Negligible	<ul style="list-style-type: none"> Post-construction inspection of stormwater management facilities to evaluate their effectiveness. On-going maintenance as required.
		Increased temperature		✓	✓	Black Creek and tributary watercourses within route.	Clearing of riparian vegetation and stormwater management practices can impact temperature regimes.	<ul style="list-style-type: none"> Minimize the area of stream bank alteration to the extent possible. Use stormwater management practices that encourage infiltration and recharge of groundwater. 	Shading provided by culvert/bridge offsets shading lost through removal of riparian vegetation.	Restore riparian areas disturbed during construction with native vegetation.	Negligible	<ul style="list-style-type: none"> Post-construction inspection of stormwater management facilities to evaluate their effectiveness. On-going maintenance as required. Post-construction inspection of riparian plantings to confirm survival.
		Disturbance to rare, threatened or endangered species		✓	✓	Black Creek and tributary watercourses within route.	<ul style="list-style-type: none"> Don River watershed known to support redbreast dace and American brook lamprey. 	<ul style="list-style-type: none"> Design subway works to avoid modifications at culverts/bridges. Avoid in-water work to the extent possible. Perform all in-water work in the dry using a temporary flow bypass system. Capture fish trapped during dewatering of the work zone and safely release upstream. Prohibit the entry of heavy equipment into the watercourse. 	None expected.	None required.	Negligible	None required.

**Table 12.6-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C2	Minimize adverse effects on Terrestrial Ecosystems	Loss of wildlife habitat		✓	✓	Black Creek and tributary watercourses within route.	Construction of the subway and station facilities may result in the removal of vegetation and the wildlife habitat it supports.	<ul style="list-style-type: none"> 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 guiderail, curbs, etc. to prevent removal. 	None expected.	Restore natural areas disturbed using construction with native vegetation, where feasible.	Negligible	None required.
		Wildlife mortality		✓	✓	Black Creek and tributary watercourses within route.	Removal of wildlife habitat may result in wildlife mortality.	<ul style="list-style-type: none"> Perform vegetation removals outside of wildlife breeding seasons (typically April 1 to July 31). Perform any channel realignment and culvert/bridge extension, repair and replacement outside of wildlife breeding season. 	None expected.	None required.	Negligible	None required.
		Barriers to wildlife movement and wildlife/vehicle conflicts		✓	✓	Black Creek and tributary watercourses within route.	<ul style="list-style-type: none"> Channel realignment or culvert/bridge extension, repair or replacement may create a barrier to wildlife movement. Insertion of subway station surface facilities may create an additional impediment to wildlife movement and increase the potential for wildlife/vehicle conflicts. 	Enhance wildlife passage around facilities, where feasible through culvert/bridge modifications and re-vegetation along boundaries.	Design of new bridges or culvert extensions to provide access to station facilities will not impede wildlife passage.	None required	Negligible	None required.
		Disturbance to rare, threatened, or endangered wildlife		✓	✓	Entire route.	Three rare species were identified within the Hwy. 7 corridor study area: rough-legged hawk (non-breeding migrant/vagrant, extremely rare breeding occurrence by MNR); northern shrike (non-breeding migrant/vagrant, very rare to uncommon breeding occurrence by MNR); and, milk snake ('special concern' by COSEWIC, and 'rare to uncommon' by MNR)	<ul style="list-style-type: none"> Prevent the harassment of eastern milk snake if encountered during construction. Perform vegetation removals outside of wildlife breeding seasons (typically April 1 to July 31). Perform culvert/bridge extension, repair and replacement outside of wildlife breeding season. 	None expected.	None required.	Negligible	None required.
		Disturbance to vegetation through edge effects, drainage modifications and road salt		✓	✓	Station surface facilities.	<ul style="list-style-type: none"> Clearing of new forest edges may result in sunscald, windthrow, and invasion of exotic species. Ditching, grading and other drainage modifications may alter local soil moisture regimes. Road salt may result in vegetation mortality and die back. 	<ul style="list-style-type: none"> Minimize the area of vegetation removals to the extent possible. Minimize the grade changes and cut/fill requirements to the extent possible. Use close cut clearing and trimming to minimize encroachment on remaining vegetation. Delineate work zones using construction fencing/ tree protection barrier. Manage the application of road salt to the extent possible. 	<ul style="list-style-type: none"> Vegetation communities within the study area are primarily cultural in origin and have been impacted by Highways 7 and 407. Subway stations represent a minor incremental encroachment into these already disturbed communities. 	Re-vegetation along watercourses and landscape treatments.	Insignificant	None required.

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**Table 12.6-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C2 cont'd	Minimize adverse effects on Terrestrial Ecosystems (cont'd)	Disturbance to rare, threatened or endangered flora		✓		Entire Route.	<ul style="list-style-type: none"> Some regionally rare or uncommon species may be located within the subway route limits. 	<ul style="list-style-type: none"> 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 guiderail, curbs, etc. to prevent removal. Transplant rare species to safe areas prior to construction. 	Trees may be removed by the construction of the subway and its associated facilities.	None required.	Insignificant	Monitor clearing activities to ensure that minimum work zones are used to avoid any unnecessary tree removal.
C3	Improve regional air quality and minimize adverse local effects	Degradation of existing local and regional air quality when compared to MOE standards			✓	VCC, Hwy 407 and Steeles Avenue Station areas	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 subway extension will divert commuters from individual highly polluting sources (single passenger automobiles).	Improvement of about 4% in all pollutants except PM. Subway availability will slow the rate of increase of PM.	None required	Positive Effect	None recommended
		Increase in emissions of Greenhouse Gases (GhG)			✓	Entire route	GhGs emitted may not be improved	Compared to the status quo (no rapid transit) there will be far less GhGs emitted per commuting person.	Net decrease in CO ₂ -equivalent emissions of 4-5 kilotonnes	None required	Positive Effect	None recommended
		Degradation of air quality during construction			✓	Entire route	Some dust may be created 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
C4	Minimize adverse effects on corridor hydro-geological, geological and hydrological conditions	Water quality in shallow groundwater that can affect quality in surface watercourses			✓	Areas located hydraulically down gradient of transit alignment, where receiving surface watercourses are present.	Subway park-and-ride lots and bus loops will require de-icing salt and also will accumulate various chemical substances that can impact water quality of runoff. Impacted runoff that infiltrates can increase concentrations in shallow groundwater. Potential to affect shallow groundwater that discharges to surface watercourses.	Dilution and other natural processes will attenuate elevated parameters in groundwater.	<ul style="list-style-type: none"> Potential effects to water quality of surface water courses. Groundwater quality effects are anticipated to be detectable. 	Reduce application of road salt, where possible. Curbs and gutters to convey impacted runoff away from permeable soil areas.	Moderately Significant	None required. Water quality effects are anticipated to remain acceptable.
		Baseflow in surface water courses		✓	✓	Recharge areas within proposed alignment, particularly in areas of Newmarket Till and sand textured glacial lake deposits.	Increase of paved area at stations decreases the pervious area that existed prior to construction, resulting in proportionally decreased recharge to shallow groundwater.	N/A	<ul style="list-style-type: none"> Decreases in recharge can decrease baseflow in surface water course(s). Reduced baseflow in surface watercourses. 	Construction of pervious surfaces where practical, including grassed areas and permeable pavements.	Negligible	None required. The degree of impact is anticipated to be undetectable.
		Increased pavement; decreased infiltration			✓	Stations along route	Minor increase in quantity of surface runoff. Minor decrease in quantity of groundwater.	Storm water management facilities such as grassed swales and storm water ponds.	<ul style="list-style-type: none"> Minor increase in peak streamflows. Minor decrease in groundwater. 	None practical	Negligible	None required

**Table 12.6-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C4 Cont'd	Minimize adverse effects on corridor hydro-geological, geological and hydrological conditions (Cont'd)	Groundwater resources and aquifers		✓		Black Creek crossing	Construction of subway tunnels and the planned Hwy 407 station could affect groundwater resources if significant dewatering is required.	The extent of dewatering and any aquifer depressurization to permit tunnel and station construction will be minimized by the use of earth pressure balancing tunnel boring equipment in areas where groundwater resources could be affected. Local dewatering and recharge will likely be required around the station which must be constructed by the cut-and-cover method. Measures to mitigate any potential effects will be identified during the amendment to this EA covering the connection of the subway at Hwy 407 to the approved alignment for the Toronto/TTC Spadina Subway Extension to York University.	<ul style="list-style-type: none"> ▪ None anticipated. ▪ (Detailed analysis of construction methods during the EA Amendment will confirm the likelihood of residual effects and identify any further mitigation required.) 	None anticipated	Insignificant	An on-going program to monitor groundwater and creek flow conditions will be conducted during construction

Notes:
P – Pre construction, C – Construction, O – Operation

12.6.5 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 conversion of the Vaughan N-S link to subway technology 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 are aimed at reducing the potential for adverse effects on business or access to social and community facilities.

The transit system should support the overall structure of the Region’s Planning Policies to ensure that form follows function. The transit system must create a sustainable environment that will increase development leading to increased business activity along the corridor. Through the increase in business activity, infill locations and vacant land could be developed, maximizing the density of development and leading to a more viable alternative of rapid transit in York Region. The assessment for Objective D is tabulated in **Table 12.6-4**.

**Table 12.6-4
Effects and Mitigation for Smart Growth and Economic Development**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE D: To promote smart growth and economic development in the corridor												
D1	Support Regional and Municipal Planning Policies and approved urban structure	Need for pedestrian-friendly streets and walkways for access to stations		✓	✓	VCC and Steeles Ave. Stations	Pedestrian access to the proposed subway stations could be degraded by increased vehicular traffic generated by development around the planned stations.	<ul style="list-style-type: none"> The VCC Streetscaping Study recommendations and York Region’s streetscaping policies applied to the Steeles Avenue precinct will create a pedestrian-friendly station environment. Signalized pedestrian crosswalks will be provided at all station locations and an appropriate number of intersections; Pedestrian safety will be considered in the design of station precincts and road signage will be highly visible to both pedestrians and automobiles. 	Potential for jaywalking in vicinity of stations, which could lead to increased in number of vehicle/pedestrian incidents.	Streetscaping treatment will discourage illegal access by defining pedestrian paths to signalized intersections	Negligible	Monitor traffic accidents involving pedestrians to establish whether cause is transit related.
		Locating higher density and transit-oriented development where it can be served by transitway			✓	New and redevelopment/infill locations	Current landowners could object to implementation of changes to existing land use pattern around subway stations.	<ul style="list-style-type: none"> Regional/Municipal land use controls and approval processes to encourage transit-oriented development or re-development in support of OP objectives. 	Redevelopment pressure on surrounding areas	Apply Municipal Site Plan approval process	Insignificant	Monitor re-development activity to control overall increase in development density
D2	Provide convenient access to social and community facilities in corridor	Potential barrier effects during construction and operation		✓	✓	VCC and York University station precincts	Subway construction works could be perceived as a barrier in access to future community centres, hospital(s), malls, parks, etc.	<ul style="list-style-type: none"> Construction Traffic and Pedestrian Management Plan will avoid wherever possible, barriers to entrances/exits to large attractors along Highway 7. 	Alternative access routes to facilities may affect adjacent properties	Mark detours and alternative access points clearly	Insignificant	Monitor congestion levels during construction and traffic patterns during operations.
D3	Minimize adverse effects on business activities in corridor	The potential for an increase in business activity.	✓	✓	✓	Entire route	Increased pedestrian traffic via the implementation of a rapid transit system will increase the potential for business activity.	<ul style="list-style-type: none"> A higher density of development on underutilized sites, infill locations and on vacant land should increase the market for some business activity. 	Increase in vehicular traffic; increase in workforce/ population.	Encourage intensification meeting urban form objectives.	Insignificant and positive	Monitor building applications/ permits, economic influences (employment rate, etc.)
		The potential for a decrease in business activity.		✓	✓	Entire route	Modification of road access could lead to displacement and/or business loss.	<ul style="list-style-type: none"> Implement procedures to address requests of affected businesses; incorporate design solutions and construction methods to minimize number of businesses affected. 	Decrease in traffic; decrease in workforce/population	Encourage alternative compatible development	Moderately significant	Cooperative response to business loss concerns addressed to municipalities.
D4	Protect provisions for goods movement in corridor	Ease of Truck Movement			✓	Entire route	Median transitway will restrict truck movement in corridor	<ul style="list-style-type: none"> 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. 	In areas of 4-lane cross-section, intersections with no station or landscaping in median do not allow sufficient turning width for WB 17(articulated trucks).	Traffic signs prohibit large truck at these intersections (see next entries). Designate truck routes.	Insignificant	Monitor and widen Highway 7 with right turn tapers at side streets to allow for movement
				✓		Entire route	Construction may limit access for trucks	<ul style="list-style-type: none"> Traffic management plan to ensure truck access at all times 	May not be possible in some areas	Designate alternative truck routes	Negligible	None required

Notes:
P – Pre construction, C – Construction, O – Operation