Ontario

407 TRANSITWAY

From East of Highway 400 to Kennedy Road

Environmental Project Report

Section 7: Impact Assessment, Mitigation, and Monitoring

Delcan IBI GROUP

in association with

LGL

7. IMPACT ASSESSMENT, MITIGATION, AND MONITORING

7.1 Introduction

The *Transit Projects and Greater Toronto Transportation Authority Undertakings Regulation*, Ontario Regulation 231/08 under the *Environmental Assessment Act,* Section 9 (2) requires the proponent to prepare an Environmental Project Report that contains the following information, among other requirements:

- "Description of the environment that will be affected or might reasonably be affected;
- Anticipated potential impacts;
- Proposed mitigation measures to minimize, manage, prevent and avoid environmental effects; and,
- Proposed monitoring and contingency measures, if required".

An impact assessment was undertaken to identify the positive and negative footprint, construction and operations impacts associated with the implementation of the 407 Transitway.

The impact assessment involved the application of the following steps:

1. Identify and analyze activities where the project, as described in **Section 6**, may interact with the existing environmental conditions described in **Section 4.**
2. Propose mitigation measures that can be implemented during construction or operations of the project.
3. Identify the residual environmental effects and their significance, if any.
4. Recommend monitoring activities during the construction and operations of the project.

The environmental effects of the undertaking can be classified under three categories:

- **Footprint Impacts –** Long term impacts on the existing environmental features located within the study area that will potentially be displaced or lost through the introduction of the transitway;
- **Construction Impacts –** These are potential short-term disruption effects resulting from construction of the transitway; and,
- **Operations and Maintenance Impacts –** These are potential long-term disruption effects resulting from the operations and maintenance of the transitway.

7.1.1 Studies Prepared in Support of the 407 Transitway

Potential impacts, mitigation measures and monitoring and contingency plans were derived from environment technical studies prepared based on the preliminary design of the 407 Transitway. The following is a list of studies conducted:

- **Property Waste and Contamination Assessment** – This study identified potential property contamination and/or waste materials that could interfere with the construction of the 407 Transitway within the study area. Fill placement was also noted at interchanges along the Highway 407 corridor. At the Preliminary Design Stage, it is concluded that the identified properties are outside the ROW. It concluded that if any of the properties are impacted, further studies be carried out during the Detailed Design Stage of this project.

- **Drainage, Hydrology, SWM and Floodplain Hydraulics** – A comprehensive assessment of the impact of the proposed transitway on existing drainage and watercourses has been completed. The study area crosses three major watersheds: Humber River, Don River (West and East Don River) and Rouge River resulting in 16 water crossings along the proposed alignment. A hydraulic analysis was undertaken for each crossing. A drainage and SWM plan was prepared for the transitway and five stations, parking lots and work yards at Jane Station, GO Barrie (Concord) Station, Bathurst Station, Leslie Station and Woodbine/Rodick Station that minimizes impact on the existing watercourses and drainage system. The remaining two stations, Yonge Station and Kennedy Station, will be planned and designed by others due to their integrated nature with other transit agencies. It concluded with a few recommendations for future study during the Detailed Design Stage of this project.

- **Fluvial Geomorphology** – An assessment of existing conditions at proposed water crossings for box culverts or bridge spans, including existing erosion problems, sedimentation problems in existing culverts, and meandering analysis was conducted to identify potential impacts and mitigation measures. The study concluded that based on Preliminary Design, no major concerns related to meander belt width or erosion limits have been found. During the Detailed Design Stage of this project, detail investigation on the potential risk to fluvial processes (as well as potential risk to the transitway structures) will be carried out.

- **Secondary Source Groundwater Investigation** – Existing groundwater resources and hydrogeology in the study area were investigated to identify potential constraints to the implementation of the 407 Transitway. It provided an overview of the geology and hydrogeology within and adjacent to the study area and identified areas where dewatering may be required. It identified areas where the groundwater table is likely to be high. It concluded that further investigation and monitoring is necessary to assess the impacts to the groundwater regime at the Detailed Design Stage of this project of the 407 Transitway.

- **Natural Heritage** – An assessment of the potential effects of the transitway on the existing natural heritage conditions was carried out for vegetation, wildlife, fisheries and designated natural areas within the study area. It concluded that the 407 Transitway will displace previously disturbed vegetation communities and wildlife habitat characterized as urban and no in-water work is anticipated. No designated natural areas will be affected by the 407 Transitway.

- **Aesthetics, Landscape Planting** – This study provided an inventory and general evaluation of the existing tree communities and the aesthetic/visual conditions associated with the proposed 407 Transitway corridor and station sites. It noted that most of the corridor is cleared from any woody vegetation as it travels along a hydro corridor, highway corridor or open space area. It recommended a landscape planning design that will mitigate the visual impacts and impacts to the existing vegetation communities. A preliminary landscape planting plan was developed as part of this study.

- **Noise and Vibration Impact Assessment** – A project-specific noise and vibration impact assessment was conducted for this undertaking. The assessment covered three scenarios: Existing Conditions (2008), Future without the 407 Transitway 10 years after the assumed date of implementation (2041) and Future with the 407 Transitway 10 years after the assumed date of implementation (2041). It concluded that the 407 Transitway alone will not increase noise levels equal to or higher than the 5dBA. However, it is predicted that overall ambient sound levels will be greater than 65 db(A). MTO will investigate the feasibility for mitigation control installation during the Detailed Design Stage of this project.

- **Air Quality Impact Assessment** – A project-specific air quality impact assessment was conducted to establish the air quality effects that may arise due to the implementation of the 407 Transitway. The assessment focused on the impacts of the common contaminants released from vehicular traffic and construction activities. The assessment covered three scenarios: Existing Conditions (2008), Future without the 407 Transitway (2031) and Future with the 407 Transitway (2031). It presented that there is a negligible difference in gaseous pollutant concentrations between the future with and future without the 407 Transitway scenarios. The study predicted that implementation of the 407 Transitway will result in an increase in particulate matter concentrations, however, when recommended mitigation measures are considered it is expected that particulate matter concentrations at sensitive receptor locations will be within standards.

- **Land Use Factors** – A secondary source information review was undertaken to identify existing land uses, designated land uses by municipalities and future planned land uses in the study area. The review concluded that the 407 Transitway reinforces the land uses of the Regional Centres, Vaughan Metropolitan Centre, Richmond Hill Regional-Langstaff Gateway Centre and Markham Centre by connecting passengers to these areas and providing opportunities for a seamless transit connection.

- **Cultural Heritage Assessment** – Built heritage resources and cultural heritage landscapes located in and adjacent to the study area in excess of 40 years of age were identified. It concluded that the 407 Transitway will result in displacement of two and disruption of one cultural heritage resources that mitigation measures will be carried out or further developed during the Detailed Design Stage of this project.

- **Stage 1 Archaeological Assessment** – A Stage 1 Archaeological Assessment was carried out in accordance with the 1993 Archaeological Assessment Technical Guidelines. A Stage 2 Archaeological Assessment was recommended for all undisturbed lands considered to have archaeological site potential and one site that may be disturbed by the proposed 407 Transitway construction.

- **Traffic Impact Assessment** - Project-specific Traffic Impact Assessments were conducted to determine future traffic impacts that may occur due to the construction and operations of the 407 Transitway. The assessment of 407 Transitway construction staging traffic impacts examined various construction stages and their impacts to arterial roadway traffic operations. The assessment covered three scenarios: without construction; with construction; and, with construction and a reversible traffic lane and two time periods - a.m. peak hour and p.m. peak hour. It concluded that most arterial roadways are projected to operate with reduced traffic capacities and worsening levels of service, particularly in the p.m. peak hour during construction. Where possible, the primary mitigation measure consisted of providing a reversible traffic lane during most construction stages, which is projected to help increase traffic capacity and improve levels of service at most arterial roadways.

The assessment of 407 Transitway operations traffic impacts focused on the proposed location of 407 Transitway Stations and study area traffic operations. Station area traffic impacts were assessed for five proposed 407 Transitway Stations: GO Barrie (Concord), Bathurst, Leslie, Woodbine/Rodick and Kennedy. The assessment covered three analysis scenarios: (2010) Existing Condition, (2031) Background Condition and (2031) Future Total Condition and two time periods: a.m. peak hour and p.m. peak hour. The analysis examined traffic impacts at signalized and un-signalized intersections and driveways around proposed station locations based on background traffic growth, other proposed area developments, increases in transit and vehicular traffic from the new 407 Transitway Station and proposed changes and reconfigurations to area roadways and intersections. With the 407 Transitway operational, some station area intersections are projected to operate with reduced traffic capacities and worsening levels of service, particularly in the peak directions. However, it is projected that various mitigation measures such as altering existing traffic signal time, providing transit priority measures and adding through and turn lanes will help increase traffic capacity and improve levels of service at poorly operating station area intersections.

Further studies will be required during the Detail Design Stage of the 407 Transitway to provide detailed impacts, mitigation measures, monitoring and contingency plans.

In this assessment, “residual” environmental impacts are defined as changes to the environment caused by the project, and vice versa, when compared to existing conditions and taking into account all built-in mitigation measures. Potential residual environmental impacts were assessed as to their significance, including spatial and temporal considerations.

7.2 Footprint Impacts

This section discusses the permanent displacement or loss of the existing environmental features resulting from the placement of the 407 Transitway. The 407 Transitway will be built mostly within the PBWP area except for certain sections where it will divert to the urban regional centres in the Town of Richmond Hill and the Town of Markham. The 407 Transitway is a new transit facility in the study area consisting of new runningway, structures such as new bridges, underpasses, bus stations, and maintenance and storage yard.

Impacts that are temporary and occur only during construction are discussed in **Section 7.3.** Impacts from the operations and maintenance of the 407 Transitway are discussed in **Section 7.4.**

The natural environment subsection will discuss footprint impacts to the natural environment. The impacts relate to the removal of vegetation and disturbance to fish and wildlife habitat. The construction of the transitway and associated facilities (i.e. Operations and Maintenance Facility, stations, bridges, culverts, and SWMF) have the potential to impact surface water quality and quantity and groundwater recharge.

The subsection that follows is the footprint impacts to the socio-economic and cultural environment and transportation functioning. The socio-economic and cultural environment footprint impact issues relate to two built heritage features found within the study area and need for further archaeological investigation in specific areas. For

the transportation footprint impacts, the main environmental value/criterion is to minimize the adverse effects on and maximize the benefits for communities within the entire corridor. The environmental issue/concern with respect to the environmental value/criterion is how the 407 transitway itself will affect lands adjacent to the corridor. The mitigation measures proposed aim to decrease the encroachment of the transitway property frontage and to minimize additional property acquisition as a whole.

The final section discussed under the heading of footprint impacts is the potential for conflicts between the 407 Transitway and utilities. Potential project effects on the utilities were identified and categorized as: conflict anticipated, potential conflict, and no conflict anticipated. Where conflicts were anticipated, mitigation measures were recommended and include utility relocation, taking test pits for further analysis, burying cables, safeguarding utilities during the construction stage, and extension of concrete culverts.

7.2.1 Natural Environment

In general, the footprint impacts of the 407 Transitway to the natural environment features are the removal of vegetation and the temporary disturbance to fish and wildlife activities and increase of impervious surface having effects on surface water and groundwater quality and quantity.

Physiography and Soils

The 407 Transitway will have minimum impact to the terrain and soils located within the study area as it will be located primarily within the PBWP area where Highway 407, municipal roads and hydro lines have already altered the terrain.

Surface Water, Drainage and Stormwater

As a result of the introduction of impervious areas within the ROW, volumes of runoff and local pack flows will likely increase. There may also be water quality impacts as well in the form of increased erosion and contaminants such as rubber and oil. A drainage and SWM plan has been prepared to address these potential impacts. Run-off generated by the 407 Transitway will be collected and treated using approved Stormwater Management Practices (SWMP) including detention ponds and enhanced grass swales, where possible. The enhanced grass swales will be part of a treatment approach comprised of: sheet flow off the runningway surface; flow through grassed filter strips (runningway embankment); and enhanced grass swales.

Groundwater

A reduction in groundwater recharge to the subsurface will occur as a result of the construction of impermeable surfaces. Based on the relatively large regional areas from which the local watersheds and aquifers derive recharge, the potential reduction in overall groundwater recharge is not expected to be significant. It is unlikely that the potential reduction in recharge would result in a measurable impact on groundwater recharge and discharge functions including baseflow in streams and water well supply quantity.

Profile lowering and drainage improvements have the potential to dewater or lower the local water table if the water table is intercepted and preferentially drained by ditches, swales or culverts. The effect of construction activities on the high water table areas and the associated potential discharge will be re-assessed during the Detailed Design Stage of this project. An investigation on foundations for all new bridges planned for the 407 Transitway will also be conducted during the Detailed Design Stage of this project.

The presence of municipal water supply servicing within the study area will result in many water wells identified in the well records being inactive, decommissioned, or demolished. Normally, the most susceptible wells to either quantity or quality interference related to transitway construction are the shallow overburden wells. A pre-construction survey will be followed by monitoring of water levels in the selected wells during positive dewatering activities.

Fish and Aquatic Habitat

There are 16 watercourses in total along the 407 Transitway alignment that will need to be crossed. New structures are proposed at most of these crossings as part of the proposed works associated with the 407 Transitway, while several watercourses will be crossed using existing structures. In general terms, any project that involves a new runningway or new structures over a watercourse, drainage modifications or generation of stormwater runoff has the potential to result in a harmful alteration, disruption or destruction (HADD) of fish habitat due to the following effects:

- displacement of fish or fish habitat;
- disruption to fish and fish habitat through changes to water quality and quantity, alterations to base flow, changes in water temperature and barriers to fish passage; and,
- displacement of fish species at risk or critical fish habitat.

The new structures proposed will consist of a 6 metres x 3.5 metres x 33.9 metres open bottom culvert at Tributary 1 of Black Creek and a 60 metres three-span bridge at Black Creek. The relatively large size of the proposed structures and the low sensitivity of the fish communities at each of these watercourses should not result in a HADD. The transitway will cross over Tributary 2 of Black Creek using the existing culvert; therefore, no modifications to this structure will occur. Black Creek and its tributaries have been classified as warmwater systems with a low sensitivity.

The crossings at Tributary 1 of the West Don River, West Don River and Westminster Creek will consist of new bridges with span lengths of 34 metres, 40 metres and 14.6 metres respectively. The new structures will likely not result in a HADD due to their minimal impact to the existing channel. Some additional mitigation/restoration measures may be required to enhance the local aquatic/riparian habitat conditions. The West Don River and the tributaries are warmwater systems that generally support a tolerant fish community and are considered of low sensitivity.

The transitway will cross over Tributary 1 of the East Don River located west of Bathurst Street using the existing culvert; therefore, no modifications to this structure will occur. The new structures proposed at the East Don River and Tributary 2 of East Don River east of Bathurst Street will consist of a 56.4 metres and 90 metres span bridge respectively. Given the length of the span at these two locations, no in-water work is anticipated. The East Don River and its tributaries are coldwater systems that support a wide variety of fish species, including migratory salmonids that are generally highly sensitive to impacts. Tributaries 1 and 2 of East Don River and the East Don River have also been identified by the DFO/TRCA Aquatic Species at Risk Mapping as Redside Dace habitat. Redside Dace typically inhabit coolwater systems with relatively clean and clear flow conditions. This species requires a high level of mitigation and protection measure as it is highly sensitive to impacts. Given the presence of Redside Dace at these locations, a permit may be required under the ESA.

No new structures are proposed at Pomona Mills Creek as the proposed transitway alignment will be elevated at this location. The Pomona Mills Creek is a coldwater system that supports a wide variety of fish species that are generally highly sensitive to impacts.

New structures are required at German Mills Creek and at Tributary 1 of German Mills Creek. The structures proposed are bridges with spans of 40 metres and 30 metres respectively. German Mills Creek is a coldwater system and therefore has a high sensitivity. Tributary 1 of German Mills Creek is a warmwater system of low sensitivity. The bridge structures proposed at these two locations will likely negate any possibility of a HADD occurring. No new structure is required at Tributary 2 of German Mills Creek as the transitway will travel over the existing culvert. Tributary 2 of German Mills Creek is a warmwater system of low sensitivity.

A new 30 metres span bridge is proposed at the Tributary of Beaver Creek. Given the length of this bridge, no in-water work is anticipated at this location. This watercourse is a warmwater system and is of moderate sensitivity.

A new 17.1 metres span open bottom culvert is proposed at the Markham Centre Tributary of the Rouge River. Given the size of this culvert opening, no in-water work is anticipated at this location. The Markham Centre Tributary is a warmwater system with moderate sensitivity.

The transitway will travel under Kennedy Road and the Kennedy Road Tributary of the Rouge River. Depending on construction method at this location (tunnelling vs. cut-and-cover), in-water work may or may not be required. The Kennedy Road Tributary is a warmwater system with moderate sensitivity.

The transitway to the west of the proposed Woodbine/Rodick Station will require a new structure to accommodate the crossing of a small intermittent watercourse. This watercourse flows in a northerly direction into a poorly defined swale within the woodland swamp adjacent to Highway 407. The swale eventually flows into the Tributary of Beaver Creek (R8) and as such likely supports a seasonal warmwater fish community. The new crossing structure will likely not constitute a HADD, due to the seasonal nature of the warmwater fish community in this channel which makes this a low sensitivity system. The new transitway route just east and west of Rodick Road will be directly adjacent to the woodland swale identified above. Further analysis of the watercourse/drainage features within the Woodbine/Rodick Station area and the design of the crossing structure will be addressed at the Detailed Design Stage of this project. The grading for the transitway and a proposed SWMF just west of Rodick Road may require the channel to be realigned which may constitute a HADD and negotiations with DFO on design, mitigation and compensation issues. A detailed analysis of this scenario and potential options to prevent channel realignment will be dealt with during the Detailed Design Stage of this project.

The watercourse crossings will be screened for a HADD/no HADD during Detail Design in accordance with the MTO/DFO/MNR Fisheries Protocol. In areas where it is determined that a HADD will occur, a Fish Habitat Compensation Agreement will be negotiated with regulatory agencies and a *Fisheries Act* Authorization will be secured prior to construction.

One aquatic species, Redside Dace *(Clinostomus elongatus)* is designated as Endangered both provincially and federally and is regulated by ESA. This species has been reported in the East Don River and its tributaries within the study area. The Redside Dace is a coolwater species that is highly sensitive to impacts. However, no in-water work is anticipated at these watercourse crossings. During Detail Design, MTO will consult with MNR to determine the requirement for a permit under the ESA at all watercourse crossings containing Redside Dace. An ESA permit will be secured from MNR, if required, prior to construction.

Vegetation and Vegetation Communities

The proposed 407 Transitway from Jane Street to Kennedy Road will affect 12 vegetation communities as shown on the plans in **Section 4.** Collectively, this will result in impacts to both terrestrial and wetland habitat. This loss of habitat could result in impacts to the TRCA's Natural Heritage System. The TRCA has identified all of the natural cover in its region. The Natural Heritage System represents natural features that have been evaluated and assessed based on habitat quality as well as species presence. This work has been undertaken, in part, to help direct land use policy, strategic planning and environmental decision-making. Subsequently, an evaluation of any additional impacts to the TRCA Natural Heritage System will be undertaken during the Detailed Design Stage.

Over 86% of the vegetated lands are cultural vegetation communities. Cultural vegetation communities include cultural meadow, cultural thicket, cultural savannah, and cultural woodland. Overall, these communities are a result of previous disturbance activities. Most of the disturbance to these vegetation communities will be along the community edges.

The FOD7 vegetation community located east of the GO Barrie Line, is a young to mid-aged succession community which is dominated by invasive Manitoba maple and black locust trees. This is a relatively natural vegetation community. The CUM1-1, CUT1, CUS1 and CUW1 are vegetation communities dominated by non-native plant species. These disturbed vegetation communities have low plant diversity likely related to the disturbances caused by the presence of a hydro corridor and the surrounding industrial land uses. However, locally rare and uncommon plant species including swamp rose, hairy aster, ninebark, white spruce and red cedar will be affected in the CUM1-1 communities near Jane Street, Keele Street, Dufferin Street, southwest of Centre Street, Bayview Avenue, and Kennedy Road. Similarly, hairy aster and ninebark and narrow-leaved meadow-sweet will be affected in CUT1 communities near Leslie Street, southwest of Centre Street. Swamp rose, ninebark and white spruce will be affected in the CUS1 communities near Keele Street and Leslie Street. The locally rare and uncommon species including red pine, swamp rose, ninebark and red cedar will be affected in CUW1 communities located near Centre Street and Yonge Street, and near the Don River.

Impacts to wetland communities within the study area will primarily be to wetlands which have developed due to the construction of drainage facilities, have been created due to concentrated development which has resulted in increased runoff in localized areas, as well as wetlands in low grade areas along the hydro corridors. These wetland vegetation communities include meadow and shallow marshes, swamp thickets, and mixed and deciduous swamps. However, these wetlands still provide a valuable function that includes flood mitigation, and habitat for more sensitive wildlife species.

Wetland communities including SWT2, SWD22-2, MAM2-10, MAS2 and MAS2-1 are mostly associated with watercourse or culvert based drainage. These wetland vegetation communities are narrow and disturbed due to the surrounding land uses including agriculture, industry, highway and hydro corridors. Locally rare and uncommon plant species including eastern buttonbush, ninebark and tall cord grass will be affected in the MAS2 and MAS2-1 communities near Jane Street and Warden Avenue. The SWD2-2 vegetation community located east of Woodbine Avenue is the best quality forest/swamp in the study area, dominated by red ash trees. This young to mid-aged

succession community is significant for wildlife due to its relatively large forest cover and a high water table. The proposed transitway station in the SWD2-2 community will result in fragmentation and displacement of native wetland species present in this community. The potential impact to the SWD2-2 community by the proposed transitway station in the southeast quadrant of Highway 407/Woodbine Avenue will be given consideration when evaluating the location and design of the station during the Detailed Design Stage of this project.

There are several wetland communities that will be impacted, including the complete loss of several small wetlands, and the removal of community edges of several other wetlands including the deciduous swamp (SWD2-2).

The loss of wetland plant species within these vegetation communities is expected to be minor as all of the plants species identified have populations that are abundant and secure within Ontario, and populations of those plants will still persist in the remaining portions of habitat. The small impact to the deciduous forest communities will likely result in the removal of portions of an edge, which generally tend to be dominated by non-native plant species.

No plant species that are regulated under the ESA or the SARA were encountered during botanical investigations. However, a review of the plant species data revealed that twelve regionally and/or locally rare plant species within the York Region and TRCA jurisdictions were identified within the study area. These species include: red pine, swamp rose, hairy aster, eastern buttonbush, ninebark, white spruce, tall cord grass, Virginia stickweed, one-seeded bur-cucumber, black walnut, and red cedar. All of these plant species have populations that are “apparently secure” or “secure” (S4 or S5) within Ontario.

Several regionally and/or locally significant plants will be removed, these species include swamp rose, hairy aster, tall cord grass, eastern buttonbush, ninebark, white spruce and red cedar. Opportunities to transplant these species will be investigated further during the Detailed Design Stage of this project.

Wildlife and Wildlife Habitat

Most of the available wildlife habitat affected by the 407 Transitway can be characterized as being of poor quality, low structural diversity and low habitat diversity. The exception would be the valley systems associated with the West and East Don rivers. Secondary source records report nine wildlife species that are regulated under ESA and SARA. The presence of these species is based on a review of secondary source data and available habitats within the study area.

The Milk Snake and Snapping Turtle are listed as Special Concern under both acts. The Canada Warbler and Golden-winged Warbler are listed as Special Concern under ESA and Threatened under SARA. The Chimney Swift is listed as Threatened under both acts. The Bobolink is listed as Threatened under the ESA. Blanding’s Turtle and Musk Turtle are listed as Threatened under ESA and SARA and Jefferson X Blue-spotted Salamander, Jefferson genome dominates is listed as Endangered under ESA and Threatened under SARA.

A Blanding’s Turtle individual was documented in the West Don River in 2010 by a local resident. This recent occurrence was in the vicinity of the West Don River. However, this area does not contain habitat considered suitable or this species. However, approximately 1.2 kilometres upstream, the Keffer Marsh provides habitat suitable for the species.

Field investigations during the Detailed Design Stage of this project phase should place an emphasis on confirming presence/absence and distribution of the nine species regulated under the ESA and SARA within the study area. If species at risk are confirmed to be present, the MNR will be consulted to determine the requirements for a permit under the ESA.

Numerous birds located within the project limits are listed under the MBCA. The MBCA prohibits the killing, capturing, injuring, taking or disturbing of migratory birds (including eggs) or the damaging, destroying, removing or disturbing of nests.

The overall poor quality, low structural diversity and low habitat diversity of the wildlife habitat and the type of species supported by these isolated patches of vegetation, reduces the level of significance attributable to the loss. Wildlife species present in these areas are represented primarily by small mammals and small, migratory and resident passerine birds; species that are more tolerant of human disturbance.

Mitigation measures following best management practices will be implemented to prevent and/or minimize the impacts to the natural environment. All necessary permits under the ESA and SARA will be obtained, as required. The impacts and mitigation measures identified in **Table 7-1** are based on the Preliminary Design Stage of the 407 Transitway.

Table 7-1: Footprint Impacts: Potential Impacts, Mitigation and Monitoring for Natural Environment

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
Physiography and Soils	Management of excess soil	A large volume of soil will be displaced by excavation activities. Excess soil may be generated that cannot be reused within the study area. The excess soil may be stained, odorous, containing debris or found to be contaminated. These excess soils will require management as waste.	Regulatory requirements in place at the time of construction and excess materials management guidelines and specifications (i.e. Ontario Provincial Standard Specification 180 – General Specification for the Management of Excess Materials) will be used when developing an excess materials management plan.	If excavation is required in areas identified to be 'highly likely' to have waste or contamination, intrusive environmental investigations (i.e. Phase II Environmental Site Assessment) will be conducted. The investigations will be conducted in accordance with provincial regulatory requirements to assess the environmental site conditions, disposal requirements for soil as well as health and safety requirements.
Surface Water, Drainage and Stormwater	Impact to quality and quantity of surface water	Increase in water runoff and local pack flows from the introduction of impervious areas such as the runningway, stations and the operations and maintenance facility. Proposed transitway structures have none to minimal impacts to upstream and downstream of the water crossings and to regional storm water levels. Three 407 ETR ponds that are in the way of the proposed 407 Transitway will need to be redesign and reconstructed.	SWMF will be designed for quality and quantity control. The design will include several enhanced swales for quality treatment of runoff generated by the transitway for drainage areas less than 5 hectares. Where the transitway drainage contributes to an existing SWM pond either directly or via a grass swale with or without quantity storage, quality treatment will continue to be provided by the existing SWM pond. Where the runoff does not contribute to a SWM pond, water quality treatment will be provided by the enhanced grass swales. The SWMF will control up to and including the 100 year post-development peak flows. The redesign and reconstruction of the three exiting ponds will be further assessed during the Detailed Design Stage.	SWM in consultation with TRCA and MOE will be developed during the Detailed Design Stage of this project. The intent and targets of the "Black Creek Stormwater Optimization Master Plan Class Environmental Assessment", when available, will be included in the design of the SWM at the Detailed Design Stage. A stormwater monitoring plan will be developed during the Detailed Design Stage of this project. The monitoring plan will include measures to determine the effectiveness of SWMF.
Groundwater	Impact to groundwater recharge and water table	There is potential for impacts to be associated with the construction of structures near valley corridors. A reduction in groundwater recharge to the subsurface will occur as a result of the construction of impermeable surfaces.	If profile lowering is expected from ditch relocations, embankments and drainage improvements intersecting the water table, soil and groundwater conditions in these areas will be assessed along with a water well survey to identify wells, if any, that may be impacted. Groundwater recharge lost to impermeable surface can be mitigated by direction of runoff to ground surfaces. Further hydrogeology studies will be conducted at locations where deep cuts are proposed and areas requiring dewatering to estimate discharge rates, predict impacts and evaluate treatment/discharge options. These studies are also needed to support the MOE's Permit to Take Water applications. An investigation on foundations for all new bridges planned for the 407 Transitway will also be conducted during the Detailed Design Stage of this project.	An Environmental Management Plan will be prepared during the Detailed Design Stage of the project where dewatering has potential to negatively impact fish habitat, wetlands or forests.
Fish and Fish Habitat	Harmful alteration, disruption or destruction (HADD) of fish habitat from changes to water quality and quantity, alterations to base flow, changes in water temperature and barriers to fish passage	The potential for the harmful alteration, disruption or destruction of fish habitat at most watercourse crossings is anticipated to be low. The grading for the transitway and a proposed SWMF just west of Rodick Road may require the intermittent channel to be realigned which may constitute a HADD and negotiations with TRCA and DFO on design, mitigation and compensation issues. No fluvial geomorphology issues have been identified at this stage.	To reduce the potential for alteration of fish habitat, best management practises and other mitigation measures proposed during the construction phase of this project will be implemented. Further analysis of the intermittent watercourse and drainage features at Woodbine/Rodick Station and the design of the crossing structure will be addressed at the Detailed Design Stage of this project. If any HADD is determined, a HADD permit will be obtained prior to construction and mitigation measures will be included in the construction package.	An Environmental Management Plan will be prepared during the Detailed Design Stage of the project where dewatering has potential to negatively impact fish habitat, wetlands or forests.

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
		Some of the watercourse crossings (East Don River and Tributaries 1 and 2) are likely to support Redside Dace which is regulated under the provincial ESA. As such, permits for the proposed activities may be required from the MNR.	Additional fluvial geomorphology studies will be conducted in the Detailed Design Stage to determine the meander belt and 100 year erosion limit.	
Vegetation and Vegetation Communities	Loss of vegetation and vegetation communities	The cumulative loss of vegetation along the transitway and stations is 73.06 hectares. This accounts for 19.8% of the total of natural areas (370.22 hectares) delineated within the study area. The majority of land that will be impacted consists of cultural communities including cultural meadow, cultural thicket, cultural savannah, and cultural woodland. Overall, these communities are a result of previous disturbance activities. Most of the disturbance to these vegetation communities will be along the community edges. There are several wetland communities that will be impacted, including the complete loss of several small wetlands, and the removal of community edges of several other wetlands including the deciduous swamp (SWD2-2). Several regionally and/or locally significant plants will be removed, these species include swamp rose, hairy aster, tall cord grass, eastern buttonbush, ninebark, white spruce and red cedar. Overall, it is reasonable to state that the quantity of vegetation loss at any one specific location is expected to be minor.	Regionally and locally significant plants should be transplanted from vegetation communities that will be impacted due to the proposed 407 Transitway and associated stations. Where possible, these plants should be transplanted into the newly created edges of those impacted communities, but outside the limit of disturbance. Transplants of naturally occurring plant species can include white spruce and red cedar trees that are less than 5 cm diameter at breast height (DBH), and buttonbush and ninebark shrubs, swamp rose, tall cord grass, and hairy aster. Additional plantings of other native tree, shrub, and herb species should also be used to help manage newly created edges. Newly exposed vegetation community edges provide pathways for non-native species dispersal, and provide better conditions for non-native species to out-compete those native species that still persist along those newly exposed edges. Where trees and/or shrubs are too large to be transplanted, compensation should be provided to replace those displaced species. A common practice for replacement is to provide 1.5 times replacement for each 10 cm DBH of tree lost, and a ratio of 2:1 for shrub species. A higher replacement value is to compensate for the potential loss of seedlings. Transplants and compensation plantings should be planted in habitat similar to the conditions in which those species currently exist. Compensation for loss of wetland habitat will consist of plantings of native wetland species within areas where drainage alterations will result in seasonally flooded area. Any proposed stormwater ponds will be planted only with native trees, shrubs and ground flora. During the Detailed Design Stage of this project a qualified landscape architect should be consulted to provide detailed plans which should be implemented by a qualified native landscape company. A narrow portion of the Green Ash Mineral Deciduous Swamp (SWD2-2), at the southeast corner of Highway 407 and Woodbine Avenue, will be impacted due to the construction of the transitway and Woodbine/Rodick Road Station. Red ash is the dominant tree both in the canopy and understorey, and the ground cover is dominated by broad-leaved cattail (*Typha latifolia*). Efforts will be made to minimize any impacts to this swamp, and to this end, erosion control fencing should be erected along its southern, western and eastern boundaries to provide protection from sediment transport during construction. Elevations of adjacent lands should be such that the local hydrology, post-construction, still maintains this area as a deciduous swamp. Edge management, post-construction should be undertaken to mitigate the spread of invasive species along the newly created edges. Non-native invasive plants can establish in natural areas displacing native plant species over time. Efforts to control non-native species that have become established, as well as prevent the establishment of new non-native plants is important to maintain the health and diversity of natural ecological systems. Recommended mitigation measures include: · the restoration of disturbed areas post-construction using only native plant species that once established can help to mitigate the	An evaluation of any additional impacts to the TRCA Natural Heritage System will be undertaken during the Detailed Design Phase. An Environmental Management Plan will be prepared during the Detailed Design Stage of the project where dewatering has potential to negatively impact fish habitat, wetlands or forests. Arborist reports, tree protection plans, edge management plans, and restoration plans, where required, will be prepared in consultation with regulatory agencies.

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
			establishment of non-native plant species; · where there are dense patches of common buckthorn *(Rhamnus cathartica),* swallow-wort *(Cynanchum rossicum)* or garlic mustard *(Alliaria petiolata),* the appropriate removal and control of these species by a qualified specialist, would benefit the ecological integrity of the surrounding natural features; and, · no invasive, non-native ornamentals plants should be used for landscaping (e.g., Norway maple, purple loosestrife, Japanese knotweed, Japanese honeysuckle, etc.).	
Wildlife and Wildlife Habitat	The 407 Transitway project has the potential to result in displacement of and disturbance to wildlife and wildlife habitat. Effects on wildlife can be described as follow: · displacement of wildlife and wildlife habitat; · barrier effects on wildlife passage; · displacement of wildlife species at risk.	The transitway runningway will displace approximately 48 hectares and the stations, 25 hectares of potential habitat. There is potential for impacts to wildlife species regulated by ESA and SARA. MBCA prohibits the killing, capturing, injuring, taking or disturbing of migratory birds (including eggs) or the damaging, destroying, removing or disturbing of nests. Numerous birds located within the project limits are listed under the MBCA. Given the urban nature of the study area, the 407 Transitway is not expected to have a major impact on wildlife passage.	Field investigations during the Detailed Design Stage of this project will place an emphasis on confirming presence/absence and distribution of the regulated wildlife species under ESA and SARA. Consultation with TRCA and MNR regarding the presence/absence and distribution of the regulated wildlife species and associated mitigation measures will continue during the Detailed Design Stage of this project. Permits required will be obtained during the Detailed Design Stage. The requirements of the MBCA will be met to ensure no significant adverse effects on avian wildlife occur. During the Detailed Design Stage of this project, habitat creation or enhancement to off-set any loses will be investigated.	
Designated Natural Areas	Impacts to designated natural areas in and adjacent to the study area.	The 407 Transitway will not impact any designated natural areas found in the study area. The 407 Transitway will be located away from these areas.		

7.2.2 Socio-Economic and Cultural Environment

The following section discusses the footprint impacts to the socio-economic, cultural environment and transportation within the study area. In general, the land uses adjacent to the 407 Transitway support the urban and regional transportation, highways, hydro corridors and open space. The majority of the 407 Transitway stations will serve as opportunities for transportation transfer points with other transit and transportation systems, thereby providing greater transit options. Two built heritage features have been identified as potentially affected by the placement of the 407 Transitway, however, their original appearance and value has been considerably altered. Further archaeological investigation will be needed at some areas within the footprint of the 407 Transitway. This will be conducted during the Detailed Design Stage.

Socio-Economic:

Land Use

Provincial planning documents and municipal Official Plans support the implementation of the 407 Transitway within the study area. The study area is predominantly located within the PBWP, which was implemented for the purposes of creating a multi-purpose corridor to accommodate utility and inter-urban transit. The 407 Transitway was designed to minimize the encroachment on property frontage and minimize property acquisition. Its purpose is to link urban areas with each other by providing space for the movement of people, goods, energy, and information, without disrupting community integrity and function. Presently the 407 Transitway will directly travel through the Richmond Hill-Langstaff Gateway Centre and the Markham Centre, which are envisioned to be transit-oriented communities with a mix of land uses and opportunity to transfer to other transit services such as the GO Transit, TTC and YRT. Consultation with the municipalities will continue during the Detailed Design Stage of this project regarding the integration of the 407 Transitway within the urban centres.

Cultural Environment:

Built Heritage Features and Cultural Heritage Landscapes

New transportation infrastructure may potentially affect built heritage resources and cultural heritage landscapes in a number of ways. The effects may include displacement through removal or demolition and/or disruption by the introduction of physical, visual, audible or atmospheric elements that are not in keeping with the character of the cultural heritage resources and/or their setting. Two built heritage resources associated with the former community of Concord, formerly used as residences will be impacted by the 407 Transitway (1841 and 1889 Highway 7 residential buildings). Currently they are in commercial use and the original appearance has been considerably altered. The two built heritage resources will be displaced by the implementation of the GO Barrie (Concord) Station of the 407 Transitway. Cultural Heritage Evaluations will be conducted for the two built heritage resources prior to construction.

Archaeological Features

A Stage 1 Archaeological Assessment has concluded that most registered archaeological sites are cleared of archaeological concerns. The majority of the identified registered archaeological sites are far from the 407 Transitway alignment except one. The J.J. Lunau Site 1 AlGt-219 which is a Euro-Canadian homestead is likely to be impacted by the 407 Transitway.

A Stage 2 Archaeological Assessment study will be conducted during the Detailed Design Stage of this project on the identified registered archaeological site and on undisturbed lands within the 407 Transitway footprint, if it is determined to be impacted by the project.

7.2.3 Transportation

The main aspect of footprint impacts, as they pertain to transportation factors, is with respect to property acquisition. During previous studies for the 407 Transitway, for which the project was deemed to be a prominent transportation development within the Greater Toronto Golden Horseshoe, ROW land protection was established. The *Need & Justification Study for the Projection of Highway 407/Parkway Belt West Transit Corridor (1992)* in particular, found that a ROW for a separate fully grade separated transitway should be protected within the Highway 407 corridor. Through those land protection studies and subsequent planning efforts, the footprint impacts anticipated for the transitway were able to be studied and minimized. Efforts to decrease the associated effects through the implementation of mitigation measures included actual refinement of the design to limit unnecessary property acquisition, where possible.

The following **Table 7-2** Footprint Impacts: Potential Impacts, Mitigation and Monitoring for Socio-Economic, Cultural Environment, and Transportation, describes the environmental value/criterion and associated potential environmental effects, mitigation measures, and applicable recommendations and monitoring suggestions.

Table 7-2: Footprint Impacts: Potential Impacts, Mitigation and Monitoring for Socio-Economic, Cultural Environment, and Transportation

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
Land Use	Conflict with existing and designated land uses in the study area.	Most of the 407 Transitway will be located within the PBWP. Only 4% of the transitway footprint will affect private property. **Appendix O** of this Report includes drawings illustrating approximate property requirements by the 407 Transitway ROW. Private effects are described below: · West and east of the Keele Street crossing. –Strip of north edge of industrial development effected by runningway. · East of the GO Barrie track. Two parcels affected by access road to the station and part of the park and ride facility. · Richmond Hill Centre area, underground easement permanent easement will be required. · Planned development east of German Mills Creek. Northwest corner of Leitchcroft parcel affected by runningway. · Markham Centre future development (Remington lands) west of GO Stoufville. · Future development (potential sport facility) east of the GO Stoufville track.	Detail design will ensure that access and circulation will not be affected by footprint of the transitway. Discussions and negotiations with property owners will take place and be concluded before detailed alignment is defined. · Negotiation to acquire partial or total parcel will take place during detailed design. · Negotiation to acquire parcel will take place during detailed design. · Preliminary discussions with developers took place during the Planning Stage. Final negotiations with developers will occur during Detailed Design Stage. · Adjusted alignment avoids effects to the planned access road and land use development of the property. Alignment modification was done following discussions with developers. · Alignment was refined to minimize intrusion in private property and conceptual development plans. In the affected strip, the runningway is underground. The development plans are at conceptual level. During detailed design, when development plans are defined, property impact assessment will need to be revised, discussed and negotiated with the Town and the developers. · Runningway is underground, requiring permanent underground easement. A sport facility is currently being discussed to be built at this location. During detail design, when development plans are defined, property impact assessment will need to be revised, discussed and negotiated with the Town and the developers.	Monitoring will depend on the final effect and mitigation measures (if applicable), defined at the detailed design stage, when development plans are defined, property impact assessment will need to be revised, discussed and negotiated with the Town and the developers.
Minimize adverse effects on and maximize benefits for communities within the entire corridor	Effect on adjacent properties	No major impacts to adjacent private properties are anticipated as the proposed 407 Transitway is to utilize lands within the PBWP to minimize additional property acquisition.	At locations where transitway facilities are adjacent to residential neighbourhoods, the detailed design will incorporate landscaping, noise attenuation, visual screening and access control to mitigate potential adverse effects on neighbouring communities.	
Built Heritage and Cultural Heritage Landscapes	Displacement of Built Heritage and Cultural Heritage Landscapes	Two built heritage buildings will be affected by the implementation of the GO Barrie (Concord) Station.	Cultural Heritage Resource Documentation Reports will be prepared for the two built heritage buildings, including a history of Concord during the Detailed Design Stage of this project.	
Archaeological Features	Potential loss/displacement of archaeological resources within the study area.	One of the archaeological sites may be impacted by the transitway.	A Stage 2 Archaeological Assessment study will be conducted during the Detailed Design Stage of this project on the identified registered archaeological site and on undisturbed lands within the 407 Transitway footprint, if it is determined to be impacted by the project. Stage 3 and 4 Archaeological Assessments will be conducted, as warranted.	
Minimize adverse effects on and maximize benefits for communities within the entire corridor	Effect on adjacent properties	Potential encroachment on property frontage. Potential loss of parking. Need to acquire property and displace business and/or residents.	The corridor's protected property has been utilized wherever practical to minimize additional and unavoidable property acquisition. Alignment and facilities have been designed to minimize encroachment on property frontage and partial or full property acquisition. Where acquisition of subsurface easements is necessary, negotiation and/or expropriation to establish fair market value with property owners will be used to mitigate effects. The transitway design will also minimize loss of parking along the corridor, particularly in the Regional Centres.	

7.2.4 Utilities

As Indicated in **Section 6,** effects to utilities and municipal services by the construction and operations of the transitway occur mostly at the grade separated crossings of the transitway with regional and local roads. The utilities and municipal services located within the transitway footprint are identified in **Section 4.4** "Existing Study Area Conditions".

Meetings were conducted with all utility Agencies and Municipalities to discuss relocation strategy of affected plants. It was concluded that in of the majority of cases, the relocation of affected utilities is feasible and conventional, and details will be defined during the design phase in consultation with the utility owner.

There are some cases however, where due mostly to the size of the plant, its relocation may not be feasible. These cases listed and described in **Table 7-3,** will require special construction procedures in order to avoid effects to the plants. During the Detail Design Stage further field investigation and consultations with the plant owner will be carried out before defining or confirming the type of solution. The Detailed Design Stage will also assess loading capacity where utilities and Municipal services are located under high embankments, to define protection measures and/or special construction techniques to assure these plants are not damaged during construction or operations of the transitway.

Hydro One expressed concerns related with clearances to their transmission towers at locations where the runningway footprint may be closer than their 15 metres desirable lateral clearance, mainly required for maintenance accessibility. An agreement exists between Hydro One, Markham and MTO covering the transitway design parallel to the Hydro corridor between Bayview Avenue and Warden Avenue. Lateral clearance in this section gets as close as 6 metres to the poles (mono), which was agreed to by Hydro One West of Bayview Avenue, there are two isolated locations where the lateral clearance to one corner of each tower is between 10 and 15 metres. During detailed design MTO will ensure the transitway design makes provisions for a feasible and safe access to the towers in these two isolated cases.

Table 7-3: Utility Conflicts and Observations, Recommendations, and/or Mitigation Measures

Station	Location	Utility/Service	Owner	Potential effect	Recommendation/Mitigation Measure
12+125	Yonge Street area	750 mm. watermain	York Region	Bridge pier close to watermain	Detailed structural design of bridge should assure pier foundation does not affect watermain.
12+130	Yonge Street area	CSP culvert	York Region	Bridge pier close to culvert	Detailed structural design of bridge should assure pier foundation does not affect culvert.
12+280	Yonge Street area	600 mm. sanitary sewer	York Region	Bridge abutment close to sewer	Detailed structural design of bridge should assure abutment foundation does not affect sewer.
12+290	Yonge Street area	1050 mm. watermain	York Region	Bridge abutment close to sewer	Detailed structural design of bridge should assure abutment foundation does not affect watermain.
12+830	Yonge Street area	(2) 2400X1800 storm sewer box. Outlet to storm water management pond	York Region	Would be affected by construction of runningway	The Yonge Subway Extension approved TPAP proposes a permanent siffon solution for this outlet facility that will also eliminate the effect to the transitway. Detailed Design Stage will review this proposed solution.
17+805	Highway 404 S-W ramp	2100 mm. storm sewer	York Region	Bridge foundation close to sewer	Detailed structural design of bridge should assure foundation does not affect watermain.
17 +600	Woodbine Av. area	2400 mm. conc. Sanitary sewer	York Region	Bridge foundation close to sewer	Detailed structural design of bridge should assure foundation does not affect watermain.

7.3 Construction Impacts

This section discusses the temporary impacts from construction activities to the existing environmental features found within the 407 Transitway corridor. The 407 Transitway is a new transit facility in the study area consisting of new structures such as a runningway, bridges, underpasses, bus stations, and a maintenance and storage yard. The following are the major construction activities or components that the assessment of construction impacts focused on:

- Surface Excavation;
- Clearing and Grubbing;
- Utility Relocation;
- Roadwork;
- Soil Removal and Disposal;
- Dewatering;
- Erosion and Sedimentation Control;
- Heavy Equipment Operations and Maintenance;
- Traffic Management;
- Material Import/Stockpiling; and,
- Concrete Forming.

7.3.1 Natural Environment

Construction impacts to the natural environment relate to the temporary disturbance to natural heritage features during construction, which are generally typical to transitway construction activities.

Physiography and Soils

A large volume of soil will be displaced in areas where the transitway will travel below grade. This may generate excess soil that cannot be reused within the project. Excess soil that is stained, odorous, contains debris or has been analysed and found to be contaminated will require management as a waste.

Contaminated Properties and Waste

The origin and quality of fill noted at interchanges along the study area is not known at this stage and will be investigated during the Detailed Design Stage of this project. If areas containing fill are to be disturbed during construction, the quality of the fill should be confirmed through available background information or by completing subsurface environmental investigations to determine appropriate management and disposal options. No other specific indications of issues of potential environmental concern were observed within the study area.

Railway ballast can contain slag and cinder material. This can be found at the CN Rail corridor located between Keele Street and Dufferin Street and at the three GO Transit lines located between Keele Street and Dufferin Street, Yonge Street and Bayview Avenue and Warden Avenue and Kennedy Road.

There is potential that the subsurface of the properties that are 'highly likely' to have waste materials/contamination will be disturbed by construction activities. The following are a list of properties where further environmental site assessments are warranted prior to construction:

- SW Aggregates and other industries – south of Highway 407 from east of the CN Rail corridor to Keele Street. The 407 Transitway crosses over the CN Rail corridor and under Keele Street;
- Keele Street and Snidercroft Road, 150 metres south of Highway, an oil spill occurred in June 21, 2009. The 407 Transitway travels under Keele Street;
- Sunoco Service Station and a transformer station – north of Highway 7 between Silver Linden Drive and Bayview Avenue. The 407 Transitway is south of Highway 7 and travels below grade;
- Miller Waste (formerly Direct Waste Systems) - south of Highway 407, west of Woodbine Avenue. The 407 Transitway is at or above grade;
- Miller Asphalt/Aggregates/Offices/Maintenance Yard – south of Highway 407, east of Woodbine Avenue. The 407 Transitway crosses at grade;
- Town of Markham Works Yard – west of Rodick Road. The 407 Transitway crosses below grade;
- Transformer Station – south of Highway 407 between Rodick Road and Warden Avenue. Two stormwater ponds are being proposed just south of Highway 407 (north of the transformer station); and,
- BMW Sales and Service Centre – northeast quadrant of Kennedy Road and Helen Avenue. The 407 Transitway crosses Kennedy Road below grade.

Phase 1 Environmental Site Assessments and Phase 2 Environmental Soil and Groundwater Investigations will be conducted in areas where excavation and other soil disturbing construction activities will take place and are 'highly likely' to have waste materials/contamination. This is to meet provincial regulatory requirements to assess the environmental site conditions, disposal requirements for soil as well as health and safety guidelines. Any soil contamination related impacts encountered during construction will be managed in consultation with a qualified professional.

As per MTO objectives, this project will strive for zero waste generation. Where recommendations for re-use of materials are made, geotechnical and structural implications of the re-use materials will be reviewed by qualified professional. The wastes which will be generated by the project will generally consist of:

- Reclaimed asphalt pavement (RAP) from milling of existing asphalt surfaces;
- Concrete, likely reinforced, from the removal of bridge or pavement structures;
- Manufactured wood waste from guide rails and the like removals; and,
- Scrap metal such as wire, corrugated steel pipe, and bridge guide rails.

RAP can be re-used on site for a variety of purposes as part of the construction activities, including, but not necessarily limited to, shoulder treatments, general fill and sub-grade fill. Non-reinforced concrete can be broken up and re-used within the project limits. Manufactures wood waste will require off-site disposal at licensed receiving facilities. Natural wood waste may be left on site within the ROW. Scrap metal should be collected for recycling at an off-site receiving facility.

Surface Water, Drainage and Stormwater

Construction activities could result in increased rates of erosion and sedimentation within and adjacent to the construction site and watercourses. The potential environmental impacts from increase erosion and sedimentation include: degradation of water quality, destruction of fish habitat, and increased flooding potential. Any in-water construction activity will be assessed and erosion and sediment control measures will be developed during the Detailed Design Stage. All stormwater runoff generated by the transitway will be treated using conventional SWMP including stormwater detention ponds and enhanced grassed swales. Level 1 enhanced treatment will be provided for all stormwater discharged to receiving watercourses.

Groundwater

The study area is serviced by municipal water supply and groundwater is unlikely used for potable water. Therefore impacts to potable water are not anticipated. A water well study will be conducted during the Detailed Design Stage of this project to assess any impacts to water wells. Affected well owners will continue to have water supplies of appropriate quality and in adequate quantities.

Any work done on affected wells or any replacement wells will be done pursuant to O. Reg. 903, Wells (pursuant to the *Ontario Water Resources Act)*.

Bridge construction, extension or widening over watercourses may cause temporary impact to the groundwater regime. Foundations investigations will occur for all new bridges located along the 407 Transitway during the Detailed Design Stage of this project. A strategy for mitigating potential impacts to groundwater will be developed at that time, where warranted. Temporary alteration of the groundwater regime may occur as a result of any positive dewatering that is implemented during construction. The measured impacts and effective radius of influence from the dewatering will be dependent on the hydrogeologic conditions. The impacts associated with the dewatering activities are expected to be temporary only. The effect of construction activities on the high water table areas and the associated potential discharge will be reassessed prior to construction.

It is unlikely that construction vehicles will present a risk of impact to local wells as a result of accidental releases of fuel with the best management practices implemented during construction stage.

Fish and Aquatic Habitat

Black Creek, the West Don River and its tributaries including Westminster Creek, Tributaries 1 and 2 of German Mills Creek the tributary of Beaver Creek and the Markham Centre and Kennedy tributaries of the Rouge River are warmwater systems of low to moderate sensitivity and support tolerant communities of warmwater fish species

posing a low constraint/sensitivity. The East Don River and its tributaries, Pomona Mills Creek and German Mills Creek support a coldwater fish community that is highly sensitive to impacts. Protection measures to be employed during construction, such as in-water construction timing restrictions, erosion and sedimentation control, best management practices, etc. will greatly reduce the potential for adverse effects to fish and fish habitat located along the 407 Transitway corridor. Site-specific environmental protection measures to be employed during construction will be developed in consultation with regulatory agencies during the Detail Design Stage.

Vegetation and Vegetation Communities

Effects on vegetation such as the displacement or loss of vegetation and vegetation communities will occur from the construction of the transitway and transitway stations including grading, the construction of bridges, and the installation of culverts.

Vegetation impacts from construction may be associated with equipment operating in areas designated for protection. Therefore, areas designated for protection will be clearly shown on all construction plans and construction fencing will be used in the field to limit access. Efforts will be taken during construction to minimize impacts to existing wetland vegetation communities including swamps, meadow marsh and shallow marsh communities located within the study area. Wherever possible, locally rare and uncommon species will be avoided or transplanted. Mitigation measures such as transplanting locally rare and uncommon plant species in adjacent communities will be further developed during the Detailed Design Stage of this project. Siltation of natural vegetation arising from soil erosion of exposed soils can arise if appropriate sediment control is not undertaken. An approved sediment control plan will be in place prior to the start of construction.

Non-native invasive plants can establish in natural areas displacing native plant species over time. An effort to control non-native species that have become established, as well as prevent the establishment of new non-native plants is important to maintain the health and diversity of natural ecological systems.

Arborist reports, tree protection plans, edge management plans, restoration plans and suitable compensation for vegetation losses will be prepared during the Detailed Design Stage of this project in consultation with the TRCA.

Wildlife and Wildlife Habitat

Secondary source records identified nine wildlife species that are regulated under the ESA and SARA to be present within the study area. Field investigations during the Detailed Design Stage of this project should place an emphasis on confirming presence/absence and distribution of these nine species within the study area. Mitigation measures and permitting will be developed in consultation with MNR.

Numerous birds located within the project limits are listed under the MBCA. The MBCA prohibits the killing, capturing, injuring, taking or disturbing of migratory birds (including eggs) or the damaging, destroying, removing or disturbing of nests. No vegetation removals will occur during the nesting season to meet the requirements of the MBCA. The nesting season for the majority of the species is from April 1 to July 31. This timing restriction will also protect the birds found within the study are and listed under the FWCA.

In general, construction activities will pose temporary impacts to the natural environment that can be mitigated and/or protected by existing best management practices. Mitigation measures and monitoring recommendations are presented in more detail in **Table 7-4.**

Noise and Vibration

Noise and vibration impacts will be temporary and will occur within time and place restrictions outlined in the various applicable municipal noise by-laws, or an exemption will be sought prior to commencement of construction. The impact of construction noise and vibration on nearby sensitive receptors will be monitored. Provincial guidelines with regard to construction sound levels that place specific restrictions on source sound levels will be followed. The guidelines are written to restrict maximum allowable sound levels for equipment used in certain construction activities.

Air Quality

The construction of the 407 Transitway has the potential to affect the air quality in the vicinity of the site during the construction phase. As with any construction site, these emissions will be of relatively short duration and are unlikely to have any long-lasting effect on the surrounding area. Dust impacts should be mitigated through the use of proper controls. Night time construction activities should also be considered in order to reduce emissions from vehicles that are slowed down by any reduced road capacity during the day.

Best management practices will be implemented to mitigate air quality impacts during construction.

Table 7-4: Construction Impacts: Potential Impacts, Mitigation and Monitoring for Natural Environment

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
Physiography and Soils	Change in the local terrain Management of excess soil.	Excess soil will be generated and there is potential for the encounter of contaminated soils during construction.	Excess soil will require waste classification in accordance with regulatory requirements. Regulatory requirements in place at the time of construction and excess materials management guidelines and specifications (e.g. OPSS 180) will be used when developing an excess materials management plan. The disposal of contaminated soils will be directed to an MOE approved soil treatment site or waste disposal site. The monitoring of these facilities is the jurisdiction of the MOE.	
Contaminated Waste and Property	Potential for disturbance and/or disposal of contaminated waste and/or soils during construction.	Disturbance of contaminated waste and/or soils during construction.	Phase 1 Environmental Site Assessments and Phase 2 Environmental Soil & Groundwater Investigations will be conducted in areas where excavation and other soil disturbing construction activities will take place and are 'highly likely' to have waste materials/contamination.	Monitoring plan will be undertaken in accordance with the Ontario *Environmental Protection Act*. The disposal of contaminated materials will be directed to an MOE approved soil treatment site or waste disposal site.
Surface Water, Drainage and Stormwater	Impact to quality and quantity of water.	Erosion and sedimentation impacts from construction. Three 407 ETR ponds that are in the way of the proposed 407 Transitway will need to be redesigned and reconstructed.	Measures will be put in place during construction to minimize disturbance to watercourses from inputs of soil, concrete dust/washwater and other materials. Measures will be included in the final design process to ensure that stormwater impacts will be minimal and that water features are protected as part of the proposed construction. Any in-water construction activity will be assessed during the Detailed Design Stage of this project. In areas where construction sites are located in proximity to watercourses, the use of minor grading to direct surface runoff away from aquatic habitats will be implemented. This generally consists of the slope leading to a very shallow swale created by a low ridge of topsoil. In order to prevent and minimize the release of sediment to watercourses, various sediment and erosion control measures will be implemented during construction, such as: · Environmental protection measures will be installed in areas adjacent to watercourses. Erosion and sediment control measures will be prepared to MTO standards; · During the final design, a sediment and erosion control plan will be developed utilizing Best Management Practices; · Any effluent derived from concrete cutting/forming will be collected and managed in accordance with provincial standard specifications; · Following the completion of final site grading and topsoil application, a roadside seed mixture (OPSS 572) and perennial rye grass nurse crop seed will be applied to all exposed soils. For exposed soils located adjacent to watercourse, immediately following seed application, a straw erosion control blanket (OPSS 572) will be installed along the embankment slopes; · No stockpiles of excess material will be located closer than 30 metres from water features in accordance to OPSS 180; and, · To prevent surface water contamination during construction, care will be taken to avoid accidental spillage or discharge of chemical contaminants (i.e. gasoline, oils, and lubricants). Refuelling will take place no closer than 30 metres from water features. Furthermore, proper containment, clean up and reporting, in accordance with provincial requirements will be completed in the event of a spill.	Environmental inspections of the construction site will be conducted to assess the performance of erosion and sedimentation control measures and identify any required maintenance. The inspections will permit the identification of localized erosion and sedimentation control issues that require site specific attention. A detail erosion and sedimentation control plan will be prepared during the final design. During Detailed Design Stage a protocol for SWM surface and groundwater monitoring and emergency spill prevention and reporting will be developed. During the course of construction, there is a risk of spills or discharges of pollutants or contaminants by the Contractor. The following contingency plan will be put in place: · Names and telephone numbers of persons in local municipalities and MOE to be notified forthwith of a spill; · Names and telephone numbers of representatives of fire, police and health departments of local municipalities who are responsible to respond to emergency situations; · Names and telephone numbers of companies experienced in control and clean up of hazardous materials that will be called in an emergency involving a spill; · Contingency plan shall include provisions for hazardous or unknown materials (e.g. puncturing a drain during excavation); · Containment and control of spill and clean up procedures are to be initiated immediately to mitigate environmental damage, while awaiting additional assistance; and, · Ensure materials and products are on site with which temporary repairs can be made to broken pipelines or other services so emissions of pollutants can be controlled and stopped.

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
Groundwater	Impact to groundwater recharge	Temporary impact to groundwater regime as a result of dewatering activities during construction.	If positive dewatering is required, a water well survey within 500 metres from the location will be conducted. A Permit to Take Water application will be submitted to the MOE to undertake any dewatering that is over 50,000 L/day. Contaminated groundwater will be managed in accordance with provincial legislation and regulations including the MOE's Guidelines for Use at Contaminated Sites in Ontario (MOE, 1997). Re-fuelling of construction vehicles will occur in designated areas, preferably on paved and impermeable surface to prevent groundwater contamination. An emergency spill response plan will be designed prior to construction.	A water well study will be conducted during the Detailed Design Stage of this project to assess any impacts to water wells. Affected well owners will continue to have water supplies of appropriate quality and in adequate quantities. Any work done on affected wells or any replacement wells will be done pursuant to O. Reg. 903, Wells (pursuant to the *Ontario Water Resources Act*). Monitoring of water levels in selected wells during positive dewatering activities will be conducted. An Environmental Management Plan will be prepared during the Detailed Design Stage of the project where dewatering has potential to negatively impact fish habitat, wetlands or forests. During Detailed Design a protocol for SWM surface and groundwater monitoring and emergency spill prevention and reporting will be developed.
Fish and Fish Habitat	Construction activities near watercourses have the potential to result in a harmful alteration, disruption or destruction (HADD) of fish habitat due to the following effects: · displacement of fish or fish habitat; · disruption to fish and fish habitat through changes to water quality and quantity, alterations to base flow, changes in water temperature and barriers to fish passage; and, · displacement of fish species at risk or critical fish habitat.	There is potential effect to fish and fish habitat during construction at watercourse crossings.	During the Detailed Design Stage, efforts to prevent a HADD will be made. If a HADD is confirmed during the Detailed Design Stage of this project, a *Fisheries Act* Authorization will be obtained prior to construction and mitigation measures will be included in the construction package. Mitigation measures pre-, during and post-construction should prevent any deleterious impacts to these systems. To reduce the potential for alteration of fish habitat, the following environmental mitigation measures will be implemented: · delineate work areas with construction fencing to minimize the area of disturbance; · restrict the use of heavy equipment on watercourse banks; · prohibit the use of heavy equipment in the watercourse; · place silt fence along margins in areas of soil disturbance; · monitor and maintain erosion and sedimentation control measures during construction to ensure their effectiveness; · apply seed and mulch, tackifier and/or erosion control blanket in areas of soil disturbance to provide adequate slope protection and long-term slope stabilization; and, · implement good housekeeping practices related to materials storage/stockpiling, equipment fuelling/maintenance, etc. during construction. Any required permits under ESA will be sought during the Detailed Design Stage. The East Don River, German Mills Creek and Pomona Mills Creek support a coldwater fish community that is highly sensitive to impacts. Coldwater systems require a construction timing window from July 1 – September 15 (work allowed) to protect the local fish communities. SWMF proposed to outlet to these systems should explore opportunities to reduce thermal impacts during the summer period. This could include enhanced infiltration measures, shading of outfalls and ponds, drawing water from deep portions of the ponds or other treatment options (bio-retention units, oil and grit separators, grassed swales, etc.). These mitigation measures should also be considered at the three watercourses where Redside Dace are present (East Don River and Tributaries 1 and 2 of the East Don River).	During construction, an environmental inspector will make frequent random site visits for the duration of work at the water crossing locations. The environmental inspector will be responsible for delineating work areas, ensuring that erosion and sedimentation control measures are functional and that the provisions related to fisheries and watercourse protection are met.

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
			The remaining watercourses are warmwater systems of low sensitivity that support tolerant communities of warmwater fish species posing a low constraint/sensitivity. The general construction timing window for these watercourses for in-water work is from July 1 – March 31 (work allowed).	
Vegetation and Vegetation Communities	Loss and disturbance of vegetation and vegetation communities	Impacts may be associated with equipment operating in areas designated for protection such as existing wetland vegetation communities including swamps, meadow marsh and shallow marsh communities and riparian habitat. Siltation of natural vegetation arising from soil erosion of exposed soils can arise if appropriate sediment control is not undertaken	The following environmental protection measures, designed to reduce or minimize impacts vegetation communities and vegetation, should be taken into consideration. · timing of construction will be planned to avoid excessive impacts to natural features (i.e., avoid periods of heavy rainfall or snow melt in early spring); · grading will be reduced to the minimum extent possible; · on steep slopes (e.g., greater than 3:1) erosion blankets will be used to stabilize the soils and to encourage the establishment of vegetative cover; · soil disturbance and disturbance of the existing vegetation on-site will be limited to only those areas requiring grading or excavation; · natural features designated for protection will be clearly identified (including individual trees where applicable) and fenced (one metre outside the canopy edge) to ensure no construction traffic, equipment or materials storage intrude on these areas, or cause compaction of the soils; · stockpiling of soil will be done away from protected natural areas particularly watercourses and wetlands and additional silt fencing used to prevent sediment transport; · any portion of riparian habitat adjacent to watercourses or any portion of wetlands that are not to be impacted but are inadvertently damaged or removed as a result of construction, will be immediately replaced with comparable native plant material; · perimeter silt fencing of a size and type capable of containing runoff will be installed down slope of all construction areas to slow down and filter surface water runoff; · exposed soils will be re-vegetated as soon as possible and re-vegetation will be completed prior to the onset of winter with native plant species; · prepare restoration and enhancement plans that will meet or exceed TRCA standards that will offset vegetation losses and achieve a net gain in vegetation area, attributes and functions; · prepare edge management plans for areas where encroachment on vegetation communities will occur; and, · prepare planting plans to include the use of native and salt-tolerant vegetation species. Recommended mitigation measures to control non-native species include: · the restoration of disturbed areas post-construction using only native plant species that once established can help to mitigate the establishment of non-native plant species; · where there are dense patches of common buckthorn (Rhamnus cathartica), swallow-wort (Cynanchum rossicum) or garlic mustard (Alliaria petiolata), the appropriate removal and control of these species by a qualified specialist, would benefit the ecological integrity of the surrounding natural features; and, · no invasive, non-native ornamentals plants should be used for landscaping (e.g., Norway maple, purple loosestrife, Japanese knotweed, Japanese honeysuckle, etc.).	The proposed erosion control measures will be implemented prior to the commencement of construction activities, they will be monitored regularly (more frequently during periods of rainfall or snow melt in early spring), and fencing will be repaired or replaced in a timely manner where damage has occurred due to construction activities or where they have become ineffective due to silt build-up. Monitoring of the health of the trees and overall state of the existing vegetation communities will be conducted during construction. Once construction is complete, monitoring will continue into the following growing season. Arborist reports, tree protection plans, edge management plans, restoration plans and suitable compensation for vegetation losses will be prepared during design in consultation with the TRCA. **Contingency** If it is determined that tree health or vegetation community restoration is failing or has failed, then trees or shrubs will be replaced with the identical species or girth, and a modified restoration plan will be determined.

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
Wildlife and Wildlife Habitat	The 407 Transitway project has the potential to result in displacement of and disturbance to wildlife and wildlife habitat. Effects on wildlife can be described as follow: · displacement of wildlife and wildlife habitat; · barrier effects on wildlife passage; · displacement of wildlife species at risk.	Temporary disturbance to wildlife species. Potential for encountering species regulated under ESA and SARA.	To meet the requirements of the MBCA, no vegetation removals will occur during the nesting season. . The nesting season for the majority of the species is from April 1 to July 31. This timing restriction will also protect the birds found within the study are and listed under the FWCA. A Special Provision will be placed in the contract package to inform the contractor of the need to protect the species from any harm. Any permits required under ESA or SARA will be obtained during the Detailed Design Stage.	During construction, an environmental inspector will make frequent random site visits for the duration of work at the water crossing locations. The environmental inspector will be responsible for delineating work areas, ensuring that erosion and sedimentation control measures are functional and that the provisions related to fisheries and watercourse protection are met. **Contingency** If active nests are found, a site-specific mitigation plan in consultation with the Canadian Wildlife Services will be prepared.
Noise and Vibration	Potential noise and vibration impacts to nearby residents during construction.	Temporary noise and vibration impacts.	Ÿ All construction equipment will be properly maintained to limit noise emissions and comply with the noise limits outlined in the MOE's Noise Pollution Control Publication (NPC) NPC-115 'Construction Equipment' and NPC-118 'Motorized Conveyance' guidelines. Ÿ Provincial guidelines with regard to construction sound levels that place specific restrictions on source sound levels will be followed. Ÿ If construction activities outside the prohibited times are required, an application of municipal noise by-law exemptions will be submitted. Ÿ Vibration levels will be monitored throughout the construction phase.	The public will be provided with contact information on how to raise issues/concerns regarding noise and vibration. Any complaints will be investigated and resolved in an effective and efficient manner.
Air Quality	There is potential for air quality impacts to occur during construction.	Dust emissions and exhaust emission from construction equipment will impact air quality of the area.	Best management practices will be implemented to prevent the potential release of dust and other airborne pollutants off site, such as: Ÿ Periodic watering of unpaved construction areas; Ÿ Period watering of stockpiles; Ÿ Use of water sprays during the loading of materials; and, Ÿ Sweeping and/or water flushing of the entrances to the construction zones. These types of control aid in minimizing impacts to the environment during the construction phase. Night time construction activities should also be considered in order to reduce emissions from vehicles that are slowed down by any reduced road capacity during the day.	The public will be provided with contact information on how to raise issues/concerns regarding air emissions. Any complaints will be investigated and resolved in an effective and efficient manner.

7.3.2 Socio-Economic and Cultural Environment

Land Use

Construction activities are not anticipated to impact land uses within the study area as most of the transitway is located within the PBWP lands.

Built Heritage and Cultural Heritage Landscapes

There is potential for disruption impacts due to the construction of the 407 Transitway to the Rives-Wolfe Residence located at 99 YMCA Boulevard, now used as a meeting centre for the YMCA. This building is a municipally designated property under the Part IV of the *Ontario Heritage Act* and protected by a municipal heritage conservation easement. Access to the building may be impacted during construction activities for the 407 Transitway resulting in isolation of the property. Consultation with the Town of Markham will be conducted to discuss options in mitigation impacts to the heritage building.

Archaeological Features

No registered archaeological site is anticipated to be impacted by the 407 Transitway except for one site, which is pending information from the Ministry of Culture. A Stage 2 Archaeological Assessment will be conducted on undisturbed lands within the zone of construction for the 407 Transitway prior to construction.

In general, residents and businesses may be inconvenienced by construction activities but the impacts will be relatively temporary and localized. Details of the mitigation measures identified to address impacts related to construction are discussed in **Table 7-5.**

Table 7-5: Construction Impacts: Potential Impacts, Mitigation and Monitoring for Socio-Economic Environment

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Environmental Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
Land Use	Land uses within the study area impacted by construction activities.	Construction activities are not anticipated to impact land uses within the study area as most of the transitway is located within the PBWP lands.		
Built Heritage and Cultural Heritage Landscapes	Potential impacts to built heritage and/or cultural heritage landscapes from construction activities.	Access to the Rives-Wolfe Residence located at 99 YMCA Boulevard may be disrupted due to the construction of the 407 Transitway.	Access to this building will be maintained. The building will be protected from construction activities and potential vibration effects resulting from the project. The Town of Markham will be consulted on the need and preparation of a Heritage Impact Assessment as part of the site plan approval process for the Kennedy Road – Kennedy Station.	A pre-construction survey of the building will be carried out to document its structural integrity. Monitoring will be carried out during construction to record and correct any damage that may result.
Archaeological Features	Potential loss/displacement of archaeological resources within the study area.	There is a potential impact to one identified archaeological registered site with unconfirmed status.	The Ministry of Culture has been contacted to determine if there are any outstanding concerns for the registered archaeological site. Information has not yet been released.	A Stage 2 Archaeological Assessment study will be conducted prior to construction on undisturbed areas located within the zone of construction. The following monitoring and contingency measures are recommended by the Ministry of Culture: Ÿ Should previously unknown or unassessed deeply buried archaeological resources be uncovered during development, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act.* The office of the Heritage Operations Unit, Ministry of Culture (416-314-7146) should be contacted immediately. Ÿ Any person discovering human remains must immediately notify the office of the Heritage Operations Unite, Ministry of Culture (416-314-7146), the police or coroner, and the Registrar of Cemeteries, Cemeteries Regulation Unit, Ministry of Government Services (416-326-8404). Consultation with stakeholders, including First Nations, will be initiated in the event that archaeological resources or human remains are discovered in accordance with Ministry of Culture practices.

7.3.3 Transportation

During the construction of the 407 Transitway, the potential for transportation related impacts to arise exists. These specific potential transportation issues and/or concerns include traffic management and pedestrian circulation as well as construction activities triggering traffic congestion and delays and the traffic accidents potential.

The management of traffic during the construction of the transitway will be a particular challenge during the construction of the project's underpasses. During the construction of the underpasses, the general purpose traffic of several Regional arterial roads and directional ramps between these roads and Highway 407 have the potential to be affected. The mitigation or minimization of any interferences to traffic during the periods of construction, will involve increasing the number of lanes available for traffic flow for the peak flow direction. Specifically, the construction staging sequence of the arterial road underpasses will ensure opening of three lanes of the road in peak direction. As an additional mitigation measure, temporary detours of the existing Highway 407 ramps will be built to allow construction of the crossings under the ramps, thereby minimizing disruptions to traffic.

The proposed mitigation measures for the environmental issues/concerns presented in **Table 7-6** will be carried out during the Detailed Design Stage of the study. During this future stage, a Traffic Management Plan will be developed to address the congestion and delays in which the 407 Transitway construction activities could potentially cause. Also, during the Detailed Design Stage, consultation with the corresponding Municipal and Provincial Authorities (York Region, local Municipalities and MTO), as well as other stakeholders (407 ETR) will be sought to determine the requirements to maintain safe operations of traffic on the road network affected by the construction of the 407 Transitway.

Table 7-6: Construction Impacts: Transportation System Effects and Mitigation

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Environment Effects	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigation Measures and Significance of any Potential Residual Effects	Monitoring and Recommendation
Maintain or improve road traffic and pedestrian circulation during construction on all arterial roads where new underpasses are proposed to allow the 407 Transitway to cross the road ROW.	Construction activities could cause congestion or delays and increase the potential for accidents.	Vehicle and pedestrian traffic on existing arterial roads could be delayed or potentially involved in an accident due to the need for temporary diversion or lane closure to allow construction of transitway works under arterial roads crossing the transitway ROW.	During the Detailed Design Stage, a Traffic Management Plan will be developed to define all temporary works and procedures necessary to accommodate vehicular and pedestrian traffic on the following arterials during construction of the transitway underpasses: - Jane Street - Bayview Avenue - Keele Street - Leslie Street - Dufferin Street - Rodick Road - Bathurst Street - Warden Avenue - Highway 7 The plan will describe all measures to allow safe passage of three lanes of traffic in the peak direction as well as two lanes available in the off-peak direction. In addition to temporary pedestrian circulation measures, the plan will detail all barriers, lane marking and signing for the temporary roadwork. While traffic capacity will be maintained, minor delays will occur due to the need to reduce speed during construction zones to ensure public and worker safety.	On a regular basis during construction, traffic conditions will be monitored and safety audits performed to verify that all temporary traffic accommodation measures are maintaining safe traffic operations at reasonable speed through the work sites.
The vicinity of the proposed south-north and north-south crossings of the 407 ETR by the transitway. The vicinity of the proposed east-west crossing of Highway 404.	Construction activities could cause congestion or delays and increase the potential for accidents.	Vehicle traffic on the 407 ETR and Highway 404 could be required to reduce speed or diverted for short periods to make shoulders available for equipment during erection of steel box-girders for the three bridges carrying the transitway over the highway.	During detailed design, the requirements to maintain safe operations of traffic on the ETR and Highway 404 without reduction in capacity during transitway bridge construction will be developed in consultation with the Highway Authorities. When approved, the permissible construction methods, associated clearances to traffic lanes and protection and other safety measures will be mandatory requirements within the Construction Contract documents for the ETR and Highway 404 bridge construction.	

7.4 Operations and Maintenance Impacts

The impacts resulting from the operations and maintenance of the 407 Transitway are similar to those of roadways. These impacts are anticipated to be minor since the 407 Transitway will be located within a corridor consisting of two major highways and previously disturbed open areas.

The 407 Transitway will contribute to the further integration of the transit systems of the area. It will support urban centres within the study area to be more vibrant by ensuring that transit is a more attractive travel option by improving travel times, comfort, and reliability of service; providing alternative travel choices for non-drivers; and, ensuring the long-term economic stability and environmental sustainability by reducing climate changing emissions.

7.4.1 Natural Environment

In general, the operations and maintenance activities associated with the 407 Transitway will not significantly impact the natural environment provided best management practices are implemented.

Physiography and Soils

Soils will be not disturbed by the operations and maintenance activities of the 407 Transitway.

Surface Water, Drainage and Stormwater

Future maintenance activities are not expected to involve any in-water works. The intent and targets of the "Black Creek Stormwater Optimization Master Plan Class Environmental Assessment" will be included during the preparation of the detail design of the 407 Transitway.

Road salt application for the safe operations of the 407 Transitway may pose impacts to the surface water and groundwater quality of the study area. To mitigate this impact MTO's Code of Practice and Salt Management Plan will be followed.

Groundwater

Water table conditions are not expected to be impacted once conditions equilibrate around the new structures. If required, enhanced infiltration techniques will be considered to mitigate against any measurable recharge. If required, site-specific testing to assess the need for and the suitability of the areas for enhanced techniques will be further conducted during the Detailed Design Stage of this project.

Fish and Aquatic Habitat

During detail design, opportunities to reduce thermal impacts to watercourses during the summer period will be explored when developing SWMF. This could include enhanced infiltration measures, shading of outfalls and ponds, drawing water from deep portions of the ponds or other treatment options (bio-retention units, grassed swales, etc.).

Vegetation and Vegetation Communities

All impacts to vegetation are transient and relate to the footprint and construction impacts. It is expected that post-construction, new wetland areas will be created due to changes in drainage related to the construction of the transitway and its related components. Detailed site-specific mitigation measures will be developed at the Detailed Design Stage of the project.

Wildlife and Wildlife Habitat

Barriers to wildlife passage will be created as a result of the 407 Transitway; however, given the urban nature of the study area including the existence of two major highway corridors, the 407 Transitway is not expected to have a major impact on wildlife passage. Existing wildlife corridors located at watercourse crossings and along rail line corridors will be maintained and restrictions to wildlife movement through these areas will not occur.

The addition of approximately 12 metres of pavement for the runningway will introduce a travel surface that will result in an increased risk of mortality for selected wildlife species that may elect to cross the transitway. While the introduction of a paved runningway will not prohibit crossing of the transitway by small and large animals, it poses a hazard to some of these species by introducing an exposure to vehicle conflicts. The increase in wildlife mortality resulting in the construction and operations of the transitway is expected to be minor given that most wildlife species found in the study area are tolerant of human disturbance and existing migration pathways will be maintained.

Noise, light and visual intrusion may alter wildlife activities, patterns and behaviours. In urban settings, wildlife is generally acclimatized to the urban conditions and only those species that are tolerant of human activities remain. Given the extent of urbanization in the study area, the tolerance of the wildlife to human activities and the limited zone of influence of the 407 Transitway, disturbance to wildlife from noise, light and visual intrusion is expected to be minor.

Noise and Vibration

The future noise levels without the transitway within the study area are expected to be greater than 65 dBA at two locations. The noise levels from the operations of the 407 Transitway will not exceed 5 dBA. However, a feasibility study for the installation of noise control measures will be conducted during the Detailed Design Stage of this project.

As the buses to be operated on the 407 Transitway will be rubber-tire vehicles travelling on a smooth surface, it is not anticipated that their operations will contribute significantly to existing vibration levels in the study area.

Air Quality

In the future, when the 407 Transitway is built, air quality will slightly improve for most gaseous pollutants (e.g. CO, NO_x) due to newer engine technologies and fuels, despite predicted increases in traffic due to population growth. The pollutant burden of carbon dioxide (CO_2) is expected to increase in the future due to increased traffic volumes from population growth. Without mitigation, air quality is predicted to degrade for particulate based compounds (i.e. $PM_{2.5}$, PM_{10} and TSP) due to increased traffic flow on Highway 407 resulting from population growth in the future.

The air quality study predicts a negligible increase in gaseous pollutant concentrations resulting from the operations activities of the 407 Transitway. The study also predicts that implementation of the 407 Transitway will result in an increase in particulate matter concentrations, however, when recommended mitigation measures (planting of vegetation or where planned for safety and/or noise issues solid barriers) are considered, it is expected that particulate matter concentrations at sensitive receptor locations will be within MOE standards.

Table 7-7 presents in more detail the mitigation measures proposed for the impacts associated with the operations and maintenance of the 407 Transitway.

Table 7-7: Operations and Maintenance Impacts: Potential Impacts, Mitigation and Monitoring for Natural Environment

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Environmental Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
Surface Water, Drainage and Stormwater	Potential for impacts to surface water quality and quantity within the study area.	Impacts to surface water quality from increased impervious areas; erosion and sedimentation at water crossings; stormwater runoff quality and quantity including thermal impacts to coldwater streams; road salt applications on the 407 Transitway. It is unlikely that the potential reduction in groundwater recharge would produce a measurable effect on baseflow of surface water.	During detail design, the design of SWMF will further address the treatment of water quantity and quality of stormwater runoff. Opportunities to reduce thermal impacts to watercourses during the summer period will be explored when developing SWMF. This could include enhanced infiltration measures, shading of outfalls and ponds, drawing water from deep portions of the ponds or other treatment options (bio-retention units, grassed swales, etc.). SWMF will receive proper maintenance to function properly as treatment systems of both water quality and quantity control. Salt applications are conducted by MTO or its agent. Road salt has been listed as a deleterious substance under the *Canadian Environmental Protection Act* due to its effect on surface water, groundwater, soils and organisms in high concentrations. MTO was a member of the Road Salts Working Group and participated in the preparation of the Code of Practice for the Environmental Management of Road Salts (Environment Canada, 2004) (see **Appendix N**). As a result, MTO has adopted the Code of Practice and prepared a Salt Management Plan including: · careful monitoring of weather conditions, judicious use of road salt; · use of alternatives to sodium chloride; · stationary automated anti-icing systems that control the application of road salt; and, · electronic control equipment for spreading salt and sand to ensure the correct amount is distributed; and, restricted use of road salt in environmentally sensitive areas. Due to the mobility of road salt constituents, mitigation of road salt impacts is difficult. However, road salt application within the ROW will be at the minimum levels allowed within the MTO's standard road salt application procedures. See below for recommended groundwater recharge mitigation measure to be further studied during the Detailed Design Stage of this project if measurable effect on surface water baseflow is perceived.	A pre-construction and post-construction surface water quality assessment will be developed during the Detailed Design Stage to document the environmental impacts/changes caused by the road widening, road salt application, assess the effectiveness of the proposed mitigation measures, identify existing SWM and identify further measures for improvement. Provision of monitoring of SWMF at Jane Station, GO Barrie (Concord) Station, Bathurst Station, Leslie Station, Woodbine/Rodick Station will developed during the Detailed Design Stage. Parameters of monitoring will include TSS, BOD5, Oil/grease and heavy metals.
Groundwater	Potential impact to water table and contamination of groundwater from operations.	New bridge structures, extension or widening over watercourses is not expected to impact the water table once water table conditions equilibrate around the new structures.	If required, enhanced infiltration techniques will be considered to mitigate against any measurable loss of recharge. Due to the mobility of road salt constituents, mitigation of road salt impacts is difficult. However, road salt application within the ROW will be at the minimum levels allowed within the MTO's standard road salt application procedures	If required, a site-specific testing to assess the need for and the suitability of the areas for enhanced techniques will be further conducted during the Detailed Design Stage of this project.
Fish and Aquatic Habitat	Potential to result in a harmful alteration, disruption or destruction of fish and fish habitat through changes to eater quality and quantity, alterations to base flow and changes in water temperature.	Impacts to fish and fish habitat post construction of the transitway.	SWMF proposed to outlet to these systems should explore opportunities to reduce thermal impacts during the summer period. This could include enhanced infiltration measures, shading of outfalls and ponds, drawing water from deep portions of the ponds or other treatment options (bio-retention units, grassed swales, etc.).	
Wildlife and Wildlife Habitat	Barriers to wildlife passage. Increased risk of mortality for selected wildlife species crossing the 407 Transitway. Noise, light and visual intrusion may alter	Given the urban nature of the study area, the 407 Transitway is not expected to have a major impact on wildlife passage. Existing wildlife corridors located at watercourse crossings and along rail line corridors will be maintained and restrictions to wildlife movement through	Most of the existing wildlife corridors located at watercourse crossings and along rail line corridors will be maintained and restrictions to wildlife movement through these areas will not occur.	

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Environmental Impact	Proposed Mitigation Measures Built-In Positive Attributes and/or Mitigations and Significance of any Potential Residual Effects	Monitoring and Recommendation
	wildlife activities, patterns and behaviours.	these areas will not occur. The addition of approximately 12 metres of pavement for the runningway will introduce a travel surface that will result in an increased risk of mortality for selected wildlife species that may elect to cross the transitway. While the introduction of a paved runningway will not prohibit crossing of the transitway by small and large animals, it poses a hazard to some of these species by introducing an exposure to vehicle conflicts. The increase in wildlife mortality resulting in the construction and operations of the transitway is expected to be minor. Given the extent of urbanization in the study area, the tolerance of the wildlife to human activities and the limited zone of influence of the 407 Transitway, disturbance to wildlife from noise, light and visual intrusion is expected to be minor.		
Noise and Vibration	Potential increase of noise levels from the operation of the 407 Transitway.	Although the operations of the 407 Transitway is not forecasted to contribute perceivable levels of noise (less than 5 dBA), the future conditions without the 407 Transitway is expected to be greater than 65 dBA at two locations within the study area. As the buses to be operated on the 407 Transitway will be rubberized-tire vehicles travelling on a smooth surface, it is not anticipated that their operation will contribute significantly to existing vibration levels in the study area.	Feasibility study for the installation of noise control measures will be conducted during the Detailed Design Stage of this project.	Should a Certificate of Approval be required for this facility is required, it will be obtained during the Detailed Design Stage.
Air Quality	Potential for the deterioration of air quality within the study area from operation activities of the 407 Transitway.	The air quality study predicts a negligible difference in gaseous pollutant concentrations between the future with and future without the 407 Transitway scenarios. The study does predict that implementation of the 407 Transitway will result in an increase in particulate matter concentrations, however, when recommended mitigation measures (planting of vegetation or where planned for safety and/or noise issues solid barriers) are considered it is expected that particulate matter concentrations at sensitive receptor locations will be within MOE standards.	Mitigation measures are recommended to reduce future particulate based (TSP and PM10) air quality impacts from the 407 Transitway which includes increased tree planting or constructing other solid barriers for noise and/or safety purposes adjacent to the Transitway which are at least 2 metres tall where possible. Trees/shrubs or solid barriers for noise and/or safety purposes located along the Transitway will act as screens and significantly reduce the particulate matter emission rate for material flowing horizontally from the roadways. In particular, it is recommended that trees be planted (or a solid barriers for noise and/or safety purposes be constructed) adjacent to the Transitway near St. Robert Catholic High School and existing/planned residential areas anticipated to be impacted.	

7.4.2 Socio-Economic and Cultural Environment

Adverse impacts to the land uses within the study area are not anticipated from the operation activities of the 407 Transitway. No impacts to archaeological and built heritage features are anticipated to be impacted by the operation of the 407 Transitway at this stage of the project.

7.4.3 Transportation

In general, the proposed 407 Transitway will have an overall positive effect on transit ridership in the corridor. As the 407 Transitway will be fully grade-separated when the construction is complete, the BRT or LRT operations on the transitway will have no interference with general traffic on arterial roads. However, there is potential for transportation impacts to traffic at the 407 Transitway stations.

The analysis of environmental effects and mitigation for each transitway station is presented in **Table 7-8,** while the detailed traffic analysis reports are included in **Appendix B.** The transportation systems effects and mitigation table illustrates the operations and maintenance impacts per station. The environmental issues and/or concerns are provided for all the stations with a station specific environmental issues/concerns focus. The following describes the seven environmental issues/concerns:

1. Connections to inter-regional transit services: addressing one of the objectives of the 407 Transit System itself, this environmental issue/concern illustrates the potential impacts that may arise in providing connectivity among the different transportation modes. Connectivity to other transit systems (TTC, Viva, YRT, Metrolinx and GO Transit) may be either hindered or facilitated at the station. The ultimate effect of this environmental issue/concern is the ability to aid or inhibit the movement of people rapidly and conveniently.
2. Compatibility with local transit services: this compatibility is related to how the transfers between the transitway and other transit systems are facilitated. The amount of convenience achieved will either positively or negatively affect ridership on the transitway.
3. Location of station and transit access: the potential effect of transit vehicle access to station in mixed traffic is an environmental issue/concern.
4. Travel time and service reliability for on-street-stop transit services: this environmental issue/concern speaks to the effect of bus operations when in mixed traffic. The potential for adverse effects to occur is present.
5. Station access by walking distance: as part of the integration of various transportation modes as part of the 407 Transitway's transit system, the provision of station access by means of walking is noted. If such convenient walking access to stations is not available, the potential for discouraged use of the transitway is possible.
6. Emergency/maintenance vehicles access: in order to be able to response to emergency situations that may occur at stations, a potential may exist where emergency access to the station may be hindered and time to reach the station may be lengthened.
7. Reduction in main street intersection capacities due to rapid transit operations: for the 2031 conditions, the overall level of service (LOS) of the intersection will approach capacity in both a.m. and p.m. peak hours. The a.m. westbound lanes (WBL) and p.m. eastbound lanes (EBL) will operate at capacity during these peak hours.

Table 7-8: Operations and Maintenance Impacts: Transportation System Effects and Mitigation

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Environmental Effects	Proposed Mitigation Measures, Built-In Positive Attributes and/or Mitigations Potential Residual Effects	Monitoring and Recommendation
Jane Station	Connections to inter-regional transit services	Opportunity to connect to TTC Spadina subway extension, YRT, and Viva Purple services to improve inter-regional and local transit system connectivity.	Ÿ 407 Transitway will provide a direct connection from southern York Region to Spadina Subway. Ÿ Increased potential for TOD development around Jane/407 Station. Ÿ Protection of vacant land for TOD.	Ridership monitoring and performance measure of connection to Toronto
	Compatibility with local transit services	Inconvenient transfer may adversely affect ridership.	Ÿ On-site local bus platforms ensure fast and convenient transfers between services. Integrated fare system is proposed. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular review of effectiveness of transferring.
	Location of station and transit access (Jane / Station Access road)	Potential effect of transit vehicle access to station in mixed traffic.	Ÿ No proposed mitigation measures. Ÿ Delay expected for buses. Ÿ Transit signal priority required.	Monitor signal operations.
	Travel time and service reliability for on-street-stop transit services	Adverse effect of bus operations in mixed traffic.	Ÿ No proposed mitigation measures. Ÿ Delays due to extensive traffic queuing at downstream intersection. Ÿ Transit signal priority required.	Regular on-going intersection performance monitoring program
Jane Station (cont'd)	Station access by walking distance	Lack of direct and convenient access could discourage transit use.	Ÿ Station location was selected to serve potential on-site TOD. Weather-protected station facilities are provided with pedestrian/cyclist pathway and attractive streetscaping along access road and adjacent arterial/collector roads. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Continuous monitor of pedestrian/cyclist activities
	Emergency/maintenance vehicles access	Potential adverse effects on emergency access and time to station.	Ÿ In addition to the main access shared with other traffic, an alternative access is provided at 407 eastbound off-ramp. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Feedback from ERS and O&M
	Reduction in main street intersection capacities due to rapid transit operations (Jane / Station Access road)	Three eastbound outbound lanes (one left-turn lane, one through and one right-turn lane) will not provide sufficient capacity for peak period demands in 2031.	Ÿ Potential widening of access road bridge from four lanes to six lanes in both directions. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Continuous monitor of intersection operations
GO Barrie (Concord) Station	Connections to inter-regional transit services	New, improved connections to GO Barrie Line, YRT, and Viva Purple services to enhance overall transit ridership.	Ÿ 407 Transitway will provide a direct, seamless connection from southern York Region to GO Transit's Barrie Line. Ÿ Increased opportunity of TOD development at this transfer point. Ÿ Protection of vacant land for TOD.	Monitor the ridership and performance of connection to Toronto
	Compatibility with local transit services	Inconvenient transfer may adversely affect ridership.	Ÿ On-street local bus platforms are to be located close the 407 Transitway Station and GO Barrie Line Station to ensure fast and convenient transfers between services. Integrated fare system is proposed. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular review of effectiveness of transferring.
	Location of station and transit access (Highway 7 / Station Access road)	Potential effect of transit vehicle access to station in mixed traffic.	Ÿ Preferred station design allows buses to utilize transit-exclusive lane to leave the station. In addition, transit signal priority is to be implemented at the intersection to minimize delays for buses. Ÿ Minor delay expected for general traffic. Ÿ Traffic signal timing plans need to be adjusted based on operation conditions of the time.	Monitor signal operations.
	Travel time and service reliability for on-street-stop transit services	Adverse effect of bus operations in mixed traffic.	Ÿ Transit signal priority. Ÿ Minor delays remain. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular on-going intersection performance monitoring program
	Reduce level of services for vehicular traffic (Highway7 / Station Access)	The required green times for the outbound station generated traffic reduce the green time allocated to the east-west traffic flows on Highway 7.	Ÿ Two outbound left turn lanes will decrease the required north-south phase time. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor intersection operations.

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Environmental Effects	Proposed Mitigation Measures, Built-In Positive Attributes and/or Mitigations Potential Residual Effects	Monitoring and Recommendation
GO Barrie (Concord) Station (cont'd)	Station access by walking distance	Lack of direct and convenient access could discourage transit use.	Ÿ Station location was selected to serve potential on-site TOD. Weather-protected station facilities are provided with pedestrian/cyclist pathway and attractive streetscaping along access road and adjacent arterial/collector roads. A pedestrian bridge over Highway 7 will provide commuters from Concorde Centre with direct and convenient access to both GO Barrie Line and 407 Transitway. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Continuous monitor of pedestrian/cyclist activities
	Emergency/maintenance vehicles access	Potential adverse effects on emergency access and time to station.	Ÿ Consultation with emergency representative with respect to the potential effects associated with the main access shared with other traffic. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Feedback from ERS and O&M
	Reduction in main street intersection capacities due to rapid transit operations (Bowes Road / Highway 7)	Under the 2031 conditions, the overall LOS of the intersection will approach capacity in both a.m. and p.m. peak hours. The a.m. WBT and p.m. EBT will operate at capacity.	Ÿ Improvements are not feasible due to land constraints or would not improve operating conditions due to excessively high traffic volumes on Highway 7. Ÿ The intersection will continue to operate approaching capacity. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor intersection performance
	(Centre Street / Highway 7)	Under 2031 conditions, the overall LOS of the intersection will approach capacity in both a.m. and p.m. peak hours. Both a.m. SBT and p.m. NBT will operate at capacity.	Ÿ Improvements are not feasible due to land constraints or would not improve operating conditions due to excessively high traffic volumes on Highway 7 and Centre Street. Ÿ The intersection will continue to operate approaching capacity. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor intersection performance
	(Station Access Road / Highway 7)	Under the 2031 conditions, the overall LOS of the intersection will approach capacity in both a.m. and p.m. peak hours. The a.m. WBT and p.m. EBT will operate at capacity.	Ÿ Dual northbound left-turn lanes will be provided to reduce green time for the south approach. Ÿ The green time for east-west movements on Highway 7 will be increased. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor intersection performance
Bathurst Station	Connections to inter-regional transit services	Provision of direct transfer between 407 Transitway and YRT and Viva Purple services to improve the accessibility of transit system.	Ÿ 407 Transitway will provide a convenient connection for commuters from local community to other rapid transit services. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor the ridership and performance of connection to other transit services
	Compatibility with local transit services	Inconvenient transfer may adversely affect ridership.	Ÿ On-site local bus platforms ensure fast and convenient transfers between services. Integrated fare system is proposed. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular review of effectiveness of transferring.
	Location of station and transit access (Bathurst Ramp / Station Access road)	Potential effect of transit vehicle access to station in mixed traffic.	Ÿ Preferred station design allows buses to utilize transit-exclusive lane to leave the station. In addition, transit signal priority is to be implemented to minimize delays for buses. Ÿ Minor delay expected for general traffic. Ÿ Traffic signal timing plans need to be adjusted based on operation conditions of the time.	Monitor signal operations.
	Travel time and service reliability for on-street-stop transit services	Adverse effect of bus operations in mixed traffic.	Ÿ Transit signal priority. Ÿ Minor delays remain. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular on-going intersection performance monitoring program
	Station access by walking distance	Lack of direct and convenient access could discourage transit use.	Ÿ Station location was selected to serve potential on-site TOD. Weather-protected station facilities are provided with pedestrian/cyclist pathway and attractive streetscaping along access road and adjacent arterial/collector roads. A pedestrian bridge over Highway 7 will provide commuters with direct and convenient access between parking-and-ride/bus terminals to 407 Transitway platforms. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Continuous monitor of pedestrian/cyclist activities

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Environmental Effects	Proposed Mitigation Measures, Built-In Positive Attributes and/or Mitigations Potential Residual Effects	Monitoring and Recommendation
Bathurst Station (cont'd)	Emergency/maintenance vehicles access	Potential adverse effects on emergency access and time to station.	Ÿ An emergency/O&M only access will be provided at the intersection of Highway 7 and Bathurst Ramp. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Feedback from ERS and O&M
	Reduction in main street intersection capacities due to rapid transit operations (Bathurst Street / Bathurst Ramp)	Implementation of 407 Transitway induces additional SBL demand in the morning peak hour.	Ÿ Additional SBLT lane will be provided to accommodate 407 Transitway related traffic. Ÿ Traffic congestion resulting from high projected background traffic growth will remain. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor intersection operations.
	(Highway 7 / Bathurst Ramp)	Implementation of 407 Transitway induces additional EBL demand in the morning peak hour.	Ÿ Dual left-turn lanes will be provided for the eastbound approach. Ÿ The intersection will continuously operate at capacity as a result of high projected background traffic growth on Highway 7. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor traffic operation parameters (v/c and queue length)
Yonge Station	No specific traffic analysis has been done at this stage. It is expected that a comprehensive transportation assessment will be undertaken as part of a future Richmond Hill Centre Transportation Study, which will involve other stakeholders, e.g. local municipalities, TTC, and GO Transit.			
Leslie Station	Connections to inter-regional transit services	Opportunity to connect to future LRT on Leslie Street and improve ridership on all transit services.	Ÿ 407 Transitway will provide a direct connection to Commerce Valley Business area and connect the Leslie LRT. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor the ridership and performance of connection to other transit services
	Compatibility with local transit services	Inconvenient transfer may adversely affect ridership.	Ÿ On-street local bus platforms are to be located close the 407 Transitway Station and GO Barrie Line Station to ensure fast and convenient transfers between services. Integrated fare system is proposed. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular review of effectiveness of transferring.
	Location of station and transit access (Leslie / Station Access road)	Potential effect of transit vehicle access to station in mixed traffic.	Ÿ Preferred station design allows buses to utilize transit-exclusive lane to leave the station. In addition, transit signal priority is to be implemented to minimize delays for buses. Ÿ Minor delay expected for general traffic. Ÿ Traffic signal timing plans need to be adjusted based on operation conditions of the time.	Monitor signal operations.
	Travel time and service reliability for on-street-stop transit services	Adverse effect of bus operations in mixed traffic.	Ÿ Transit signal priority. Ÿ Minor delays remain. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular on-going intersection performance monitoring program
	Station access by walking distance	Lack of direct and convenient access could discourage transit use.	Ÿ Station location was selected to serve potential on-site TOD. Weather-protected station facilities are provided with pedestrian/cyclist pathway and attractive streetscaping along access road and adjacent arterial/collector roads. A pedestrian underpass connects the Leslie LRT, 407 Transitway and the High School on the east side of Leslie Street. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Continuous monitoring of pedestrian/cyclist activities
	Relocation of community features	The existing trail on the west side of Leslie Street will be aligned.	Ÿ No Proposed Mitigation Measures required Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Community Consultation
	Emergency/maintenance vehicles access	Potential adverse effects on emergency access and time to station.	Ÿ An emergency/O&M connection will be provided between the station and the running way of 407 Transitway. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Feedback from ERS and O&M
Leslie Station	Reduction in main street intersection	The intersection will operate at capacity in the a.m. and	Ÿ No Proposed Mitigation Measures required.	Follow-up review of traffic

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Environmental Effects	Proposed Mitigation Measures, Built-In Positive Attributes and/or Mitigations Potential Residual Effects	Monitoring and Recommendation
(cont'd)	capacities due to rapid transit operations (Highway 407 EB off-ramp / Leslie Street)	p.m. peak hours in 2031.	Ÿ The intersection is expected to operate at capacity due to high background traffic volumes on Leslie and 407 off-ramp. Ÿ No Mitigation of Potential Residual Effects necessary.	operations issues after full built-up.
	(Leslie Street / Station Access Road)	Implementation of 407 Transitway will deteriorate the overall LOS at this intersection.	Ÿ Dual eastbound left will be provided to accommodate high outbound traffic volumes from the park-and-ride facility in the p.m. peak hour. Ÿ SBT will continue to operate at capacity due to shortened green time in both a.m. and p.m. peaks. Ÿ No Mitigation of Potential Residual Effects necessary.	On-going monitor of intersection operations after full built-out.
Woodbine / Rodick Station	Connections to local transit services	Opportunity to connect local community via transit services on Woodbine Avenue and Rodick Road.	Ÿ It allows reliable access to rapid transit for commuters from local communities. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor the ridership and performance of connection to other transit services
	Compatibility with local transit services	Inconvenient transfer may adversely affect ridership.	Ÿ On-site local bus platforms ensure fast and convenient transfers between services. Integrated fare system is proposed. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular review of effectiveness of transferring.
	Location of station and transit access (Miller Avenue / Station Access road)	Potential effect of transit vehicle access to station in mixed traffic.	Ÿ Preferred station design allows buses to utilize transit-exclusive lane to enter or leave the station. In addition, transit signal priority is to be implemented to minimize delays for buses. Ÿ Minor delay expected for general traffic. Ÿ Traffic signal timing plans need to be adjusted based on operation conditions of the time.	Monitor signal operations.
	Travel time and service reliability for on-street-stop transit services (Adverse effect of bus operations in mixed traffic)		Ÿ Transit signal priority. Ÿ Minor delays remain. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular on-going intersection performance monitoring program
	Station access by walking distance	Lack of direct and convenient access could discourage transit use.	Ÿ Station location was selected to serve potential on-site TOD. Weather-protected station facilities are provided with pedestrian/cyclist pathway and attractive streetscaping along access road and adjacent arterial/collector roads. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Continuous monitoring of pedestrian/cyclist activities
	Emergency/maintenance vehicles access	Potential adverse effects on emergency access and time to station.	Ÿ An emergency/O&M connection will be provided between the station and the running way of 407 Transitway. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Feedback from ERS and O&M
	Reduction in main street intersection capacities due to rapid transit operations (Highway 407 EB off-ramp / Woodbine Avenue)	The intersection will operate at capacity in the a.m. peak hour in 2031.	Ÿ No Proposed Mitigation Measures required. Ÿ The intersection is expected to operate at capacity due to high background SB traffic volumes on Woodbine Avenue in the a.m. peak hour. Ÿ No Mitigation of Potential Residual Effects necessary.	Review of traffic operations issues after full built-out.
	(Woodbine Avenue / Miller Avenue)	Implementation of 407 Transitway will increase SBLT demand.	Ÿ Extra SBL turning lane will be provided to accommodate increasing SBL demand. Ÿ SBT and NBT movements are expected to operate at capacity during the a.m. and p.m. peak hours, respectively. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor intersection operations.
Kennedy Station	Connections to inter-regional transit services and future UGC	Connection to Unionville GO Station will increase potential ridership and improve the overall transit modal split in Markham Centre.	Ÿ 407 Transit will provide a direct connection from southern York to GO Stouffville Line. Ÿ Increased opportunity of TOD development around this transfer point. Ÿ Protection of vacant land for TOD.	Monitor the ridership and performance of connection to Toronto
	Compatibility with local transit services	Inconvenient transfer may adversely affect ridership.	Ÿ On-site local bus platforms ensure fast and convenient transfers between services. Integrated fare system is proposed. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular review of effectiveness of transferring.
Kennedy	Location of station and transit access	Potential effect of transit vehicle access to station in	Ÿ Preferred station design allows buses to utilize transit-exclusive lane to enter or leave the	Monitor signal operations.

Environmental Value/ Criterion	Environmental Issues/Concerns	Potential Environmental Effects	Proposed Mitigation Measures, Built-In Positive Attributes and/or Mitigations Potential Residual Effects	Monitoring and Recommendation
Station (cont'd)	(YMCA Boulevard / Station Access road)	mixed traffic.	station. In addition, transit signal priority is to be implemented to minimize delays for buses. Ÿ Minor delay expected for general traffic. Ÿ Traffic signal timing plans need to be adjusted based on operation conditions of the time.	
	Travel time and service reliability for on-street-stop transit services	Adverse effect of bus operations in mixed traffic.	Ÿ Transit signal priority. Ÿ Minor delays remain. Ÿ No Mitigation of Potential Residual Effects necessary.	Regular on-going intersection performance monitoring program
	Station access by walking distance	Lack of direct and convenient access could discourage transit use.	Ÿ Station location was selected to serve potential on-site TOD. Weather-protected station facilities are provided with pedestrian/cyclist pathway and attractive streetscaping along access road and adjacent arterial/collector roads. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Continuous monitor of pedestrian/cyclist activities
	Emergency/maintenance vehicles access	Potential adverse effects on emergency access and time to station.	Ÿ An emergency/O&M connection will be provided between the station and the running way of 407 Transitway. Ÿ No Built-In Positive Attributes expected. Ÿ No Mitigation of Potential Residual Effects necessary.	Feedback from ERS and O&M
	Reduction in main street intersection capacities due to rapid transit operations (Kennedy Road / YMCA Boulevard)	EBL and NBL will operate at capacity in the a.m. peak hour due to heavy traffic volumes associated with the park-and-ride facility.	Ÿ No Proposed Mitigation Measures required. Ÿ The intersection is expected to operate at capacity due to high background SB traffic volumes on Woodbine Avenue in the a.m. peak hour. Ÿ Opportunities of providing additional road capacity in the study area of Markham Centre should be investigated in collaboration with York Region and the Town of Markham.	Review of traffic operations issues after full build-out.
	(Kennedy Road / Unionville Gate)	NBL and SBT will operate at capacity in the a.m. peak hour.	Ÿ No Proposed Mitigation Measures required. Ÿ The intersection will continue to operate at capacity. Ÿ Additional road capacity supply in the study area of Markham Centre is required and will be investigated in collaboration with York Region and the Town of Markham.	Monitor intersection operations.
	(YMCA Boulevard / Enterprise Drive)	EBL will operate at capacity due to high 407 Transitway related traffic volumes originating in Markham Centre in the a.m. and p.m. peak hours.	Ÿ Improvements are not permissible as a result of land constraints. Ÿ The overall LOS will be unacceptable in after the implementation. Ÿ Opportunities of providing additional road capacity to divert park-and-ride traffic should be discussed with the Town of Markham.	Monitor intersection operations.
	Critical left turn storage lengths (Kennedy Road / YMCA Boulevard)	High eastbound left turn volumes resulted from the 407 Transitway will cause significant queuing spillbacks in both a.m. and p.m. peaks, where queued vehicles exceed the available storage space. Same situation will occur for the northbound left turn in the a.m. peak hour.	Ÿ The left turn storage lengths have been maximized. Ÿ Due to the constraint of the intersection spacing, the maximized left turn lane lengths will not provide the required capacity. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor queuing for critical movements.
	(YMCA Boulevard / Enterprise Drive)	High eastbound left turn volumes resulted from the 407 Transitway will cause significant queuing spillbacks in both a.m. and p.m. peaks, where queued vehicles exceed the available storage space.	Ÿ The left turn storage lengths have been maximized. Ÿ Due to the constraint of the intersection spacing, the maximized left turn lane lengths will not provide the required capacity. Ÿ No Mitigation of Potential Residual Effects necessary.	Monitor queuing for critical movements.

7.5 Summary

Given that the preferred transitway alignment is mostly confined to a well-established urban transportation and utility corridor, footprint impacts are limited to removal of primarily cultural vegetation communities, minor land acquisition, conflict with utilities and the configuration of, and integration into, development lands at the Richmond Hill-Langstaff Gateway and Markham Centres. Built-in design attributes to be adopted will be typically those for bridge crossing works adjacent to, or in, flood plains and mitigation of impacts on sensitive vegetation on valley lands by configuring facilities to preserve natural features. Considerable planning effort has been applied to minimize intrusion of transitway facilities onto developable parcels based on currently available land use plans at future Regional Centre land development (i.e. Richmond Hill-Langstaff Gateway Centre and Markham Centre). In each case, where an easement across private land is required, air-rights development is a feasible mitigation measure if necessary.

Construction impacts are temporary and are limited within the zone of construction due to the availability of undeveloped lands within the PBWP between and alongside the highways. Accommodation of traffic during underpass construction at arterial roads and the four locations where Highways 407 and 404 are crossed by long-span bridges are one of the major impacts to be considered. Built-in design methods and construction staging will mitigate the effects by maintaining peak direction capacity and minimizing delays to traffic. Other typical construction impacts such as noise, dust, erosion, water quality and surplus material disposal effects will be mitigated by requirements, in contract specifications and conditions, to adopt regulatory requirements and industry best practices.

Generally, operations and maintenance impacts are minimized by the remoteness of a large portion of the transitway from sensitive neighbourhoods. While modelling of noise impacts indicates that increases to ambient levels will be imperceptible, local mitigation, will be considered if warranted by the proximity of operations. The only other potentially significant impact will be on traffic circulation in the vicinity of transitway stations. This will be mitigated by built-in design and control features at station entrances as described for specific stations in **Section 8.** The minor effects of operations on surface water quantity and quality will also be mitigated by SWM system design attributes.

Appropriate environmental protection measures were identified to address potential environmental effects resulting from this project. Proposed mitigation measures are based on the Preliminary Design and further assessment of the impacts and detailed mitigation measures will be conducted during the Detailed Design Stage of this project. The monitoring and contingency plans are also considered preliminary, dynamic and subject to refinements during the Detailed Design Stage of this project in consultation with regulatory agencies and the public. The specific monitoring requirements of any environmental permits/approvals/ exemptions secured during the Detailed Design Stage of this project will be incorporated into the monitoring and contingency plan at that time. The details of the monitoring and contingency plan will be incorporated into provisions included in the construction contracts package.

Please see **Section 9** for future commitments related to mitigation and monitoring.