

## **11.0 CUMULATIVE EFFECTS**

The Canadian Environmental Assessment Act (CEAA) requires the consideration of cumulative effects in assessing the environmental effects of a project. In order to consider the potential cumulative environmental effects of the project, this screening has identified other projects and activities that have been or can reasonably be expected to be carried out in the vicinity of the project. Existing and/or past projects/activities were considered as part of the assessment of effects on current baseline existing conditions. In regards to future activities, the cumulative effects assessment (CEA) has included the consideration of future land development activity in the vicinity of the project that has been approved by Ottawa City Council. As a result of this planned land development activity, much of the existing natural habitat located inside of the roadway arc will be removed. The cumulative effects analysis (CEA) advances this assessment further by considering the potential for construction-related cumulative effects as well as considering the long-term ongoing effects of road operations in combination with the future urban land uses on the remaining environmental features in the project area. These remaining natural features are largely located on lands outside of the roadway and in some limited cases, in pockets of natural features that are to remain inside of the roadway within the urban area.

The emphasis in this section is on “reasonably foreseeable” activities, e.g. projects that have already been proposed, approved, or that are advancing through the regulatory approvals process.

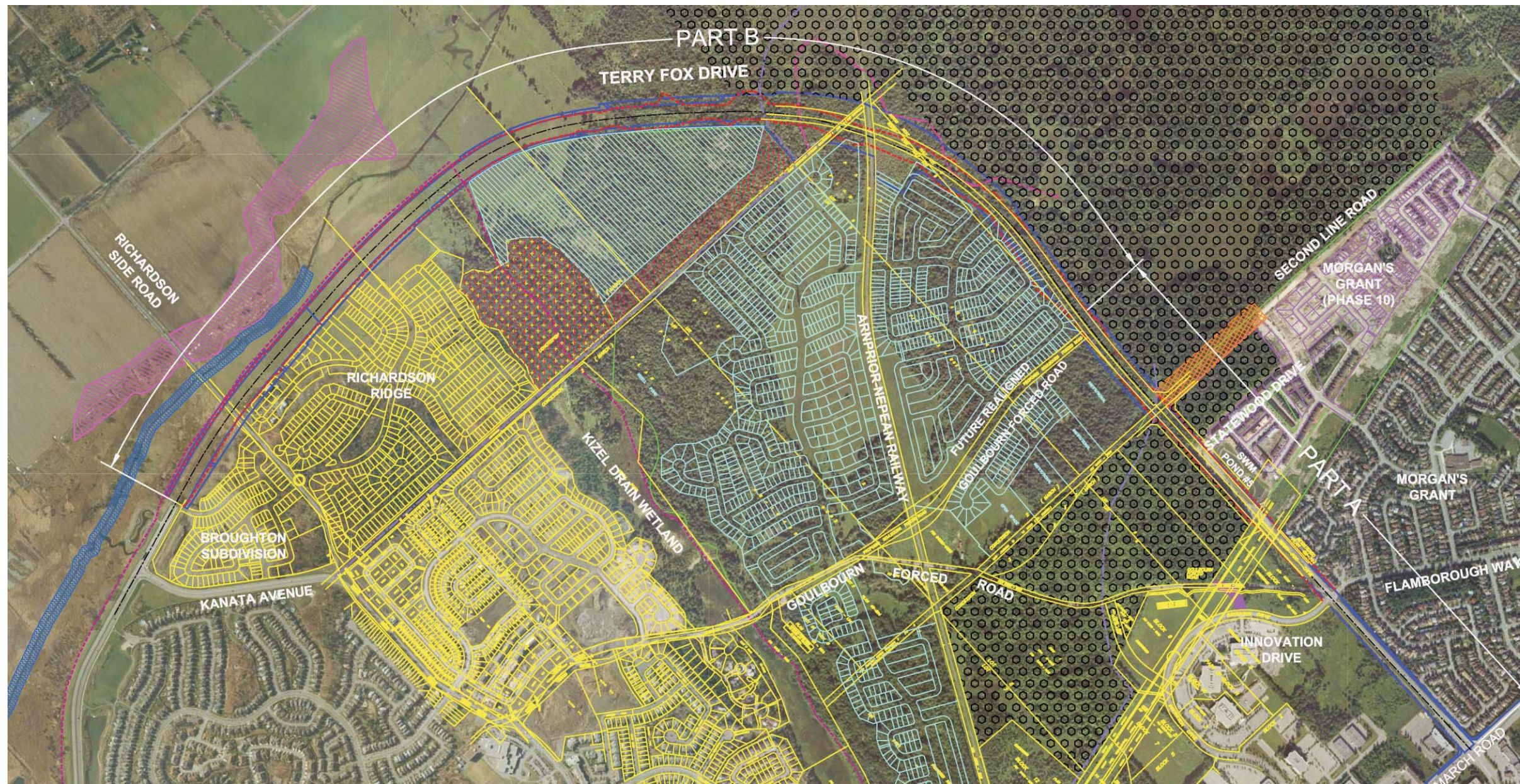
### **11.1 Description of the Future Projects and Activities**

The project study area is in a state of transition. The City of Ottawa has made a number of planning decisions regarding future development activity in the vicinity of this project. Some of these decisions have been further reviewed and supported by the Ontario Municipal Board. As a result of these planning decisions, the existing environment in the vicinity of the project is expected to change significantly. As a result of these approvals, lands inside the identified roadway alignment will be transformed from a rural/natural state to a residential suburban area. Recognizing this eminent change to the study area lands, it was deemed appropriate for the purposes of assessing future cumulative effects to include consideration of the planned future land use in the vicinity of the project. Error! Reference source not found. lists the various development proposals and other future anticipated activities in the project area which were considered in the assessment of cumulative effects. **Figure 3** presented earlier in **Chapter 2**, shows the location of these future land developments where they occur adjacent to the Terry Fox Drive alignment.

















The City of Ottawa 2008 Transportation Master Plan – Road Infrastructure Needs Study is one of the supporting documents to the 2008 Official Plan review. It determined the major road network requirements to serve the City’s population and employment by the Official Plan horizon year of 2031. The major road network of new and widened arterial roadways required to accommodate peak hour travel includes Terry Fox Drive. In the Phase 1 Implementation; 2009 – 2015, Terry Fox Drive will be required to be built to two lanes from Richardson Side Road to Goulbourn Forced Road / Flamborough Way. In the Phase 3 Implementation; 2023 – 2031, Terry Fox Drive will be required to be widened to four lanes from Richardson Side Road to March Road. The detailed Terry Fox Drive – Detailed Design; Traffic Analysis Report – September 2009, undertaken for this project, supports the future roadway capacity requirements identified through these studies.

# Terry Fox Drive Road Corridor

Figure 3: Alignment and Future Baseline Development



## Legend

-  Proposed Flood Plain Compensation Area
-  Future Development (5+ yrs)
-  Draft Approved Future Development (1-5 yrs)
-  Completed Development
-  EA Approved Terry Fox Drive Right of Way/Grading Easements
-  Shirley's Brook Alignment
-  Terry Fox Drive Centreline
-  Terry Fox Drive Grading Limit
-  City Wide Recreational Trail
-  Proposed Community Trail
-  Second Line Road Extension
-  Terry Fox Drive Temporary Construction Road
-  Southland March Highlands Conservation Forest
-  Natural Lands
-  Carp River Restoration Environmental Assessment Study Area
-  Open Space

NTS



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**Table 11-1 – Expected Future Projects/Activities**

<b>Reasonably Foreseeable</b>	<b>Time Frame</b>	<b>Location</b>
<b><i>Future Land Development Projects Considered in the Cumulative Impact Assessment</i></b>		
Broughton Subdivision	Completed concurrent with Terry Fox Part B.	Adjacent project, within the Carp River watershed.
Richardson Ridge Subdivision	Initiated prior to Part B but expected to be completed following Terry Fox Part B within 2 years.	Primarily in the Carp River Watershed, with some drainage to the Watts Creek via the Kizel Drain wetland complex.
Richcraft Lands	Future subdivision build-out more than 5 years after Terry Fox Drive.	West Shirley's Brook watershed, west of First Line Road.
Future KNL Development (Urbandale)	Future subdivision build-out more than 5 years after Terry Fox Drive.	Primarily in the Shirley's Brook Watershed, with small drainage to the Carp River.
<b><i>Other Future Projects</i></b>		
Carp River Restoration	Environmental Assessment ongoing.	Carp River Corridor from Hwy 417 northwards.
City-Wide Trail and Community Trails	Developed concurrent with Terry Fox Drive and adjacent subdivisions.	Along Carp River linking to Shirley's Brook wetlands, Recreational destination in South March Highlands.
Conservation Forest	Initial planning has begun; no set time frame.	A new proposal by the City to preserve and manage the 600 ha South March Highlands.
TFD Completion (Part A)	2010 construction season.	Next section of connected roadway; Shirley's Brook watershed.
Second Line Road extension	Concurrent with Terry Fox Part A.	Adjacent project, same watershed.
Goulbourn Forced Road Realignment	Future > 5 years.	Rerouted within the KNL Lands.

The following provides a description of the other future municipal or infrastructure projects considered in this CEAA.

***Broughton Subdivision***

The Broughton subdivision is a housing project adjacent to Terry Fox Drive, within the Carp River watershed. The proposed subdivision is Draft Plan approved and currently under construction.

This subdivision, located immediately adjacent to the project north of Kanata Avenue, has been cleared and is currently in the middle of site servicing. An intersection with Terry Fox Drive is included at Stn 12+090 at the very beginning of the current Part B phase of construction. Signals will also be installed at Richardson Side Road, of which will be partially closed as the road network is reconfigured. Stormwater management facilities are shared between the existing TFD pond at Stn 12+000 and the Broughton Subdivision, outside of this project area.

***Richardson Ridge Subdivision***

Richardson Ridge is a residential housing project primarily located in the Carp River Watershed, with some drainage to the Watts Creek / Shirley's Brook system via the Kizel Drain wetland complex.

Richardson's Ridge Woodlot and Kizel Drain wetland is protected along the northern boundary of the property.

This subdivision, located immediately adjacent to the project is currently in an advanced stage of Draft Plan approval, including the public consultation phase. Entry to Terry Fox Drive will be via a new collector road joining directly to an intersection on TFD at Stn 13+020. Joint stormwater management was discussed, but due to timing concerns will be developed separately from the TFD development. Stormwater is managed on the north-east side by routing water through the Kizel Drain wetland system. The Richardson's Ridge subdivision will remove the Richardson Farm Site and parts of the Carp Ridge forest lands. The First Line allowance will be retained to develop a City-owned community trail that will link with a City Wide Trail that swings west and crosses TFD around Stn 13+400 around the unclassified wetland beside the Carp River. The wetland elevations will be retained as it is within the 100 year storm flood-line contours.

### ***Richcraft Lands Subdivision***

The Richcraft Lands is a small planning area designated for housing within the arc of Terry Fox Drive. The terrain here is quite rough, almost entirely on the forested Canadian Shield west of the First Line road allowance. No draft plans of subdivision are yet filed with the City.

This 35 ha property owned by Richcraft Homes Ltd. is zoned for residential developments, but the owners have not yet developed a draft plan of subdivision that was available for this study. An Open Space corridor of 25 m wide has been reserved along the western edge of the First Line Road Allowance. This open space area was designated as part of OPA 16 planned by the City in 2006 and is currently fully forested, but it may not necessarily be left as forested. Drainage from this property will be split between west Shirley's Brook and via Carp Tributary 1. Culverts have been sized to allow for the future drainage needs under Terry Fox Drive.

### ***Future KNL Development (Urbandale)***

The KNL Development is a housing project situated primarily in the Shirley's Brook Watershed, with a small portion draining to the Carp River. A separate realignment of the West Shirley's Brook, east of Terry Fox Drive is proposed by KNL Developments. The realignment of Goulbourn Forced road will also be routed through this subdivision.

This 269 ha property, owned by KNL Development Inc., a subsidiary of Urbandale Developments, began the preliminary stages of planning in the early 1980's. It is now draft plan approved and zoned. The lands were designated for urban development by order of the Ontario Municipal Board in January, 1983. The current proposal includes a wide range of land uses, including a mix of residential densities, institutional uses, open space, commercial uses and natural environment areas (referred to as "Environmental Protection Area" by the former Kanata Official Plan). The land is currently zoned for "Residential Type 3A-10", "Residential Type 3A-9", "Residential Type 6A-1", "General Commercial-1", "Institutional-1" and Open Space-1" as detailed in the City of Ottawa Official Plan Amendment, Document 4 (**Appendix M**). It is not expected to break ground for at least 5 years following completion of Terry Fox Drive. As part of the Class EA project and subsequent iterations, meetings were held with the developer and consultants to plan where intersections would be required, to discuss the realignment of Shirley's Brook and the realignment of Goulbourn Forced Road.

The majority of this subdivision is located within the South March Highlands Candidate ANSI and Wetland Complex so will undergo considerable environmental scrutiny as it draws closer to the various stages of approval. The proposal is atypical of most such applications due to the legal requirement for 40% of the land area to be designated for "open space" purposes as determined by the 1983 Ontario

Municipal Board hearing. The 40% dedication relates primarily to the dedication of the Kizel Drain wetland and Trillium Woods as Nature Environment Features, and a 30 m wide buffer zone for the future realignment of West Shirley's Brook, south of the railway line. **Appendix M** to this CEAA Screening report includes the City Council summary on the land use designations and the summary of the OMB hearing from 1983 that determined the 40% rule.

### ***Carp River Restoration***

The City of Ottawa is currently executing a Class Environmental Assessment with the intent of restoring the Carp River to its historic floodplain, returning the improved watercourse to a more meandering, natural state, complete with wetlands and forested habitats along the banks in the floodplain. A detailed plan by Robinson Consultants that covers the river segments further south was reviewed as part of this project background, to determine the goals, objectives and intents of the river restoration project. The floodplain compensation conversion of marginal farmland to a wetlands system as proposed within this project is intended to be compatible with the Carp River restoration goals and objectives. A Part II Order from the Ontario Minister of the Environment directed the City to revise its methodology of hydraulic modeling to be more specific and accurate in the storage volume cut: fill balance relationship. The floodplain compensation proposed as part of this project (**Chapter 7**) has used a more sophisticated form of hydraulic model and has had due regard for the Part II order. This project is cleared of this encumbrance.

### ***City-Wide Trail and Community Trails***

The City of Ottawa has planned for a network of City Wide walking and bicycle trails to allow residents the ability to travel from one end of the City to the other via self-propelled means. One part of the trail will parallel Terry Fox from Stn 12+090 to about Stn 13+400, where it will cross into the Richardson Ridge subdivision and on east to the Carp Ridge and Kizel Drain complex. A series of smaller, recreational trails will integrate the various neighbourhoods of the subdivisions within the Terry Fox Urban area. The South March Highlands is planned as a recreational destination as there are currently several walking and mountain bike trails that cross through the natural environment areas set aside by the City.

### ***Conservation Forest***

A recent proposal has been put forward by the forest management group of the City of Ottawa to preserve the South March Highlands north-west of Terry Fox Drive and manage the area as a conservation forest. Public participation has been invited and a steering committee is currently being formed. This area is identified on **Figure 3**, but other than Trillium Woods south east of the Terry Fox Drive – Second Line intersection, the area proposed for the Conservation Forest is generally located outside of the urban boundary.

### ***Terry Fox Drive Part A***

The section of TFD northeast of Part B, east to March Road has been approved through a Municipal Class EA and will link the project roadway infrastructure to the remainder of Terry Fox Drive as it currently exists. Several butternut trees, protected under the Species at Risk Act and the Ontario Endangered Species Act, have been found on the alignment and is the subject of a formal agreement with the Provincial MNR. Additional details on butternut and species at risk are presented in **Chapter 9**. The Part A design was completed in 2005 and was tender-ready when the federal funding was requested, so is on track to be completed by the summer of 2010, slightly in advance of the Part B construction. This project will include similar tree clearing, blasting and road-work activities but has no creek or wetlands crossings. It also includes the provision of stormwater drainage, utilizing the adjacent subdivisions, wildlife

crossings and the removal of butternut trees. As this part of the road is directly connected to the Part B section of TFD, operational effects will be concurrent.

### ***Second Line Road Extension***

A 400 m section of the Second Line Road allowance will be constructed concurrently with the Part A project to connect Second Line to TFD. This will involve similar clearing and road works (although for a narrower ROW width) to Part A. Six butternut trees, two of which are retainable were found here and are included in the OMNR agreement. As these roads are connected to the Part A section of TFD, at a signalized intersection, operational effects will be concurrent and similar in nature.

### ***Goulbourn Forced Road Realignment***

Goulbourn Forced Road will be realigned through the future KNL subdivision to connect with TFD at the west end of the Part A project. Construction is not expected to occur within the next 5 year period, as such there is not potential for construction related cumulative effects from this project. As these roads are connected to Part A TFD, operational effects will be concurrent.

## **11.2 Potential for Cumulative Effects with Other Projects and Activities**

There is expected to be some very limited overlap of construction activities of other future projects with the TFD Part B project. In most cases, the TFD construction of the TFD Part B project is expected to occur in advance of most of the other expected identified other future projects in the area. The only overlapping item is the wildlife guide fencing, which will be erected in the Part A section as the sides slopes are finished off. As such, the CEA potential for cumulative effects from the other future projects and activities with the effects of the TFD Part B project is largely focused on the long- term operations period of the roadway. Potential cumulative effects that were considered include: loss of wildlife habitat, barrier effects, noise, stormwater runoff, air quality impairment, disturbance of encroachment of human activity into natural areas, and encroachment of evasive vegetation species.

The following describes by environmental component, the potential for cumulative effects. The same valued environmental components that were considered in the assessment of the direct effects of the project (**Chapters 5 to 9**) are considered in the CEA.

## **11.3 Valued Environmental Component Interactions**

### **11.3.1 Land Use and Land Use Designations**

The lands within and adjacent to TFD are vacant rural lands. Lands located on the inside of the roadway alignment have that have been largely designated for urban land development. It is expected that these lands would be fully developed in about 7-10 years time. The development of the TFD project would be developed in a manner that is consistent with future land use in this area. Some of the required supporting infrastructure (e.g. storm water management) has been designed to accommodate both the TFD project as well as other planned adjacent developments policies and plans for this area. Similarly, other planned land use developments for the area are also consistent with future plans.

No significant adverse land use cumulative effects are expected.

### **11.3.2 Land Use - Agriculture**

On the eastern side of the Carp River floodplain portion of the TFD project, the roadway will remove roughly 12.2 ha of agricultural land and isolate an additional 42.2 ha of fields currently farmed. In addition, as a result of other land use decisions, of the fields within the arc of the urban boundary 30.9 ha of agricultural land located inside of the urban boundary is to be developed for urban use. Outside the urban boundary, another 11.3 ha of privately owned agricultural lands will remain zoned for agriculture, currently in private ownership, yet within the near future but will be deeded to the City for Open Space recreational lands as part of the land development process. Terry Fox Drive is not planned to be a controlled access road, so the current landowners or tenant farmers will have access to the fields outside the arc via the new roadway for the foreseeable future.

The total area of land to be removed from agriculture in the vicinity of the project (about 43 ha) is a relatively small amount of land in the context of the amount of agricultural land in the larger Region. Affected lands are relatively small holdings compared to other farms within the region. All affected lands have been designated for future development by the City of Ottawa, and thus the long term intent of these lands is not agriculture. It is reasonable to assume that the larger impact on the agriculture resource base in the area was considered by the City. It is understood that these land use decision by the City (and subsequently the support of these decisions by the Ontario Municipal Board) in making these planning decisions were done recognizing the resulting loss of agricultural land in this area. As such, no significant adverse agricultural cumulative effects are expected.

### **11.3.3 Land Use – Aboriginal**

No aboriginal land uses or uses of resources were identified through the consultation process. Some aboriginal groups have the right to collect the Threatened Species, American Ginseng, and may be allowed to collect this species for traditional ceremonies from within the South March Highlands ANSI. The ability to collect this species here will not be hindered or effected by the project or other associated land developments as there will still be several areas within the South March highlands that provide the right climate and soils to support American Ginseng. The City's partner at the South Nations Conservation Authority is the home location for the American Ginseng Recovery Program, and this group is closely linked to aboriginal groups in the Ottawa region.

Recognizing the above, no adverse significant effects on traditional land uses by aboriginal communities are expected.

### **11.3.4 Archaeological Resources Land Use - Historic**

Three former farmsteads have been identified in close proximity to the Terry Fox Drive alignment and mitigation is ongoing to archive the artefacts. Considering the lot layouts and road allowances remaining from the past, an additional farmstead may be found somewhere within the KNL Development lands, however this is speculation at this time. As each development application is proposed through the municipal planning process, the owners will be required to conduct required archaeological investigations.

Stage 1 studies covering the TFD lands to determine if there are historic resources that need to be protected, preserved or archived has been completed. Based on the studies conducted for this project, and the background information on the area, no significant findings at a Regional or National scale are expected. With the appropriate studies conducted for the TFD and other anticipated developments in the area, and therefore no adverse significant cumulative effects are expected to result.

### **11.3.5 Bedrock and Surficial and Geology**

Terry Fox Drive Part A and most of the other planned land developments in the project area will require some blasting of bedrock, to install basements, storm sewers and sanitary sewers. These installations may affect groundwater patterns and the moisture content of the surficial soils as drainage patterns are altered. Water movement through the bedrock, which has a relatively high porosity, is surprisingly high and therefore high rates of groundwater movement, particularly along seams may be expected. Dewatering may be required during excavations in some cases, which may cause deleterious effects on the downstream watercourses. It may be expected however that Best Management Practices will be implemented and Sediment and Erosion Control Plans will be required as part of the municipal approvals process as these developments proceed. There is no expectation that mineral resources that may occur in deeper sections of the bedrock will ever be accessed once the urban areas are in place. Overall, adverse significant cumulative effects on bedrock and the surficial geology are not expected.

### **11.3.6 Groundwater Resources**

Water movement through the bedrock, which has a relatively high porosity, is surprisingly high and therefore high rates of groundwater movement, particularly along seams may be expected in the area.

Excavation activities required for the construction of the TDF Part A Project and for other planned developments in the area may affect groundwater patterns and the moisture content of the surficial soils as drainage patterns are altered. Dewatering may be required during excavations. To minimize/avoid negative effects on downstream watercourses, appropriate water quality controls will be put in place. For the other planned developments, it is reasonable to assume that Best Management Practices and Sediment and Erosion Control Plans will be required.

Groundwater resources are no longer used for drinking or potable water in the urban areas of the City of Ottawa. All future subdivisions in the area will be fully serviced with municipal water supplies and sanitary sewer collection systems. There will be no septic systems in this area that may contaminate groundwater resources, however storm runoff of residential fertilizers, potentially pathogenic bacteria, oils and greases and deicing salt from snow clearing along the roadways may cause low level contamination of ground water resources as the urban area expands. Storm discharges from Terry Fox Drive generally are directed towards the inner arc, away from the provincially significant wetlands along Shirley's Brook, so that these contaminants will generally flow overland in surface waters where they can be exposed to natural degradation processes from bacterial colonies and sunlight (ultraviolet disinfection) and nutrient uptake in downstream aquatic plant communities. Water management controls will be put in place to minimize impacts on groundwater through the Provincial Permit To Take Water application process.

Dissolved salt is one component that cannot be removed through these processes and will enter the Ottawa River where it will be highly diluted before ultimately making its way through the major St Lawrence waterways to the Atlantic Ocean where it becomes inert. Overall as a result of the project and associated activities, and with the implementation of appropriate best management practices, adverse cumulative effects on groundwater resources are not expected to be significant.

### **11.3.7 Air Quality and Dust**

Emissions from traffic using Terry Fox Drive and from fossil fuel use (e.g. home heating) in the future adjacent urban areas will combine cumulatively along with emissions from existing land use in the region. Over time, with improving standards for more efficient energy use in vehicles and home heating, the impact of air quality on the surrounding environments will be reduced.



It is recognized that the relative contribution of this roadway to overall greenhouse gas production in this region is extremely low and that the intent of the roadway is to promote free flow of traffic reducing the potential for vehicle idling and the related emissions.

The preservation of forests, wetlands and the restoration of habitats within the urban boundary can have a positive effect on air quality. Photosynthesis by green vegetation produces oxygen and consumes carbon dioxide while at night the reverse happens due to respiration, yet the net result is an overall net increase in oxygen concentrations. Forests and wetlands can also sequester atmospheric Carbon, binding it in the plant tissues for decades.

Allowing for safe site lines, all intersections, boulevards , interchange loops and medians will be planted densely, where feasible, with native trees to mitigate the short term effects on air quality and aid in the long term reduction of greenhouse gases. Through this afforestation, the planting of as many trees as possible within the abandoned farmlands and open or vacant areas along Terry Fox Drive will help to reduce the greenhouse gas contributions from this project. Further, trees in and around the residential communities will reduce wind speeds, helping to reduce heating needs in the winter and cooling needs in the summers,

The City of Ottawa is committed to following the overall planning initiatives which address the directions of the federal and provincial governments on reducing air pollutants and greenhouse gases.

Adverse cumulative effects on air quality are not considered to be significant given that regionally the contributions of the projects are minor and tree planting restoration activities will be undertaken to offset some of the effects.

### **11.3.8 Noise**

Future land development construction noise will combine with traffic noise from the operating TFD (which will be operating) but this combined effect would occur sporadically, roughly over a 5 year period, as the areas is developed so will be of limited duration. This combined noise effect could effect natural habitat on the north side of the roadway. The large areas of forest and wetlands north of the Terry Fox Drive arc will serve to attenuate sound levels, inhibiting sound from being transmitted far distances. As such, it is expected that only a narrow band of habitat immediately north of the TFD would be subject to this cumulative short-term noise effect.

When the road is operational, road noise in combination with noise from the subdivision may affect birds and other wildlife species. Again, lands immediately adjacent to the roadway along the outside of the roadway arc would be the most susceptible.

The cumulative noise effects may result in a decrease in biodiversity in close proximity to the road and increase in a more aggressive, tolerant wildlife species mix with and fewer noise sensitive wildlife species along the road edges. As the subdivisions develop and reduce the availability of forest, open field and shrub habitat, the general background noise levels are likely to rise, further inhibiting the use of habitats along the northern road edge by wildlife. Maintaining dense buffers of natural and planted trees within the subdivisions will be the most effective method in reducing the long term combined noise impacts on wildlife and people living in the area.

As the area of natural habitat to be disturbed by cumulative noise effects are limited to lands immediately adjacent to the north side of the TFD road project, the geographic extent of the effect is limited and as such, the cumulative noise effects are not considered to be significant.

### **11.3.9 Designated Natural Features**

#### **Primary, Secondary, ANSI, PSW Lands and Deer Yards**

The TFD project in combination with other approved future developments in the project area will have an impact on designated natural features in the project area. The Part B TFD project has been included by the City within its overall land use planning strategy as a transportation corridor within the expanded urban area. The proposed urban boundary has been upheld through the Official Plan Amendment process at the City and through Ontario Municipal Board Hearing decisions. The cumulative impact of the TFD project and other urban development in the South March Highland Candidate Provincially Significant ANSI/PSW and the development of the TFD may manifest in the following manner:

- The Part B TFD project will result in the removal of 11.2 ha of Primary and Secondary lands, 10.54 ha of deciduous forest of the South March Highlands candidate ANSI, 1.05 ha of Provincially Significant Wetlands and 11.5 ha of deer wintering yards. Most of these designated areas overlap considerably with the total road footprint 11.5 ha through the forested segment;
- Approved land development activities located inside of the roadway alignment will result in the removal of about 39 ha of forest, abandoned fields and wet depressions;
- With increased land development in the area, vehicular noise/light may deter the use of habitat resources and roads may act as a barrier to deer migration and dispersal, through a combination of disturbance and avoidance;
- Human access to remaining habitats will increase and displace or disturb native wildlife near recreational trails. Displacement of area-sensitive wildlife (e.g. forest interior birds, wetland species, SAR, etc.) has been positively correlated to the proximity of the urban settlement;
- Access for both common urban native avian predators like raccoons, blue jays, crows and non-native predators like cats and dogs [and opossum] will increase, however the wildlife guide fencing along Terry Fox Drive may stop many of these animals from penetrating deeper into the preserved woodlands ; and,
- Increased potential for the colonization/proliferation of non-native invasive plants.

The above future effects are largely a result of planning decisions made by the City of Ottawa and the resulting land development that is to occur in the project area. Further, the development of the Part A portion of Terry Fox Drive the road will result in some additional impact including a relatively small amount of ANSI lands being removed (4.15 ha). and ongoing noise effects to adjacent habitat.

In total, about 197 ha of designated natural habitat will be removed from a total area of 895 ha. Of this amount, the TFD project contributes 1.2% of the total habitat being removed. The remaining designated natural area will be roughly 700 ha in size. Although significantly smaller in size, a large portion to be removed is marginal, non-forested abandoned farmland, so the net effect is that the heart of the ANSI north of the TFD arc still remains as a series of isolated wetlands and forest communities. Overall, the ecological functions of the ANSI may be expected to remain intact.

With the removal of most of the existing habitat located inside the TFD arc as a result of approved land development activity, the interim wildlife barrier effects of the roadway will cease. As the roadway will be located along the edge of the urban area, the significance of the roadway effect on the designated natural habitat will be lessened.

As the additional habitat loss from the TFD road is relatively small in comparison to the habitat removed by land development, and the barrier effect of the roadway changes to an edge effect, the ultimate

cumulative effect of the road within the context of the planned developments is not considered to be significant given its limited geographic magnitude.

### **11.3.10 Vegetation**

As noted above, the Part B TFD project will result in the removal of 7.62 ha of deciduous forest of the South March Highlands candidate ANSI and an additional 1.05 ha of Provincially Significant Wetlands. Vegetation to be removed includes a combination of forest lands, open fields, shrub thickets and small unclassified wetlands or vernal pools that are vegetated. The wetland impacts have been reduced to a negligible level as a result of roadway design modifications. This has included elimination of four SWM ponds, an alignment adjustment at the railway level crossing and a narrowing the footprint through low lying areas by increasing the slope of the side embankments.

Other land development projects in the area will result in the loss of additional amounts of vegetation. As an example, the Richardson Ridge project, proposes to excavate the “Other Wetland” on Carp Tributary #1 for use as a storm water pond. This would effectively eliminate this tributary, the small wetland and the diverse Sedge community found therein.

One endangered species of herbaceous plant (American Ginseng) and one endangered tree species (Butternut) was found in the South March Highlands forest during the studies for this project. Impacts to these species are previously described in **Chapter 9**. Other planned developments in the area have the potential to impact the same plant species. As the Richcraft and KNL Developments lands are proposed for residential development, or Goulbourn Forced Road is rerouted to meet Terry Fox Drive, the proponents will be required to undertake similar floristics studies and are likely to encounter these species, and perhaps other plant species at risk. During the planning process therefore, the proponents of these other planned projects will be obliged to respect the provincial *Endangered Species Act* and provide a suitable mitigation strategy to the satisfaction of the Ontario government regulatory bodies.

With the required mitigation strategies in place, and those proposed for the TFD project and other strategies potentially required for these other planned projects (e.g. Revegetation plans, edge management, afforestation and wetland compensation), significant cumulative impacts on these sensitive species are not anticipated. It is therefore concluded that over the life of these projects, there will be no net adverse significant cumulative impacts on plant species at risk.

### **11.3.11 Wildlife**

The previously noted removal of forested lands within Designated Natural Features as a result of the TDFD project will also result in the loss of wildlife habitat including habitat for fish, small mammals, herptofauna and waterfowl. Some of these effects have already been noted under **Section 1.2.9** in discussing the effects on Designated Natural Areas. The amount of forest and other natural habitat to be removed, however, is substantially less than what will be removed as a result of planned land developments in the area which are cumulative in nature.

The forested natural areas located within the arc of the Terry Fox Drive alignment have not been designated for protection by the City of Ottawa, except for one area along the Carp Ridge / First Line road allowance. Substantial amounts of natural areas that are protected through the Official Plan are located to the north and northwest of the project, and may be managed as Conservation Forest in the future.

The TFD project (Part B) will result in the removal of 14.4 ha of wildlife habitat. Further, in the interim (7-10 years), the TFD project will result in some barrier effects to the movement of wildlife from natural areas located on each side of the roadway. However, with the development of the lands located inside the roadway arc over time, there will be an increase in the total area of wildlife habitat removed (only the

Carp Ridge Forest inside the roadway arc is expected to be preserved), although the roadway barrier effects to wildlife movement will cease (as habitat located inside the roadway will largely no longer exist).

Nonetheless in the short term, the existing wildlife habitats located within the inside of the roadway arc will be fragmented, and Terry Fox Drive will be a barrier to migrational movements. In the long term (7-10 years) when the lands inside of the road arc are developed, animals have moved out of the inner arc and the current natural habitat areas are removed (with the exception of the Carp Ridge area), then the road barrier and habitat fragmentation will no longer be an issue.

As previously described in **Section 6.7**, a series of dry and wet culverts integrated with a series of guide walls and continuous guide fences will be installed underneath Terry Fox Drive to allow wildlife to migrate safely back and forth across the alignment. As the area inside the arc develops and habitats are lost, in the future (>7 yrs) there will be no reason for the animals to migrate as they will be entering urban areas where they are likely unwelcome. Over time, unless habitat continuity is maintained through the municipal planning process, the crossings will become redundant. As development proceeds from south to north, the wildlife residents will be slowly moved northwards, out of their current habitat areas.

The loss of wildlife habitat resources from the approved future land development activity in the area will be about 190 ha in total. The development of the TFD project contributes to a small portion of this total loss (about 7.5 %). A significant amount of forest lands (700 ha) will remain intact and be protected outside the urban boundary. The area is large enough to provide interior conditions for sensitive birds, amphibians and some mammals. A distance of roughly 500 m from urban infrastructure through forested lands is required to provide sufficient isolation for these species. This area will therefore have an abundant amount of habitat to which the migrant species can relocate safely.

Other mitigation strategies to lessen the cumulative effects on wildlife are noted below.

Western Chorus Frog, an amphibian soon to be listed federally as a Threatened species, was found in at least two locations along the alignment. Although not required by current regulations, this species and therefore all other amphibians have been afforded a higher level of protection than would normally be done. The wildlife culverts, and guide wall / fence system will be effective for most amphibians, and the western chorus frog. The constructed wetland restoration on the Carp River floodplain may eventually provide habitat of high enough quality that the Western Chorus Frog will reside here along with other semi-aquatic species. This could be expected within a five year time horizon given the current methods employed in ecological restoration. Compensation for the loss of several vernal pool/wetland habitats will be entirely incorporated into the design of the new habitat area within the Carp River floodplain offset cut. This compensatory habitat restoration and enhancement plan is summarized in **Section 7.4** and on the detailed design drawings.

Mitigation to reduce the cumulative impacts of urbanization along the edge of the remaining natural features can be further reduced through an Edge Management Plan (EMP). The details of these mitigation measures are described in **Chapter 9**.

Mitigation for the loss of several vernal pool/wetland habitats will be entirely incorporated into the design of the new habitat area within the Carp River floodplain offset cut. This compensatory habitat restoration and enhancement plan is summarized in **Section 7.4**.

Further, as the East Shirley's Brook is realigned and matures over time, this will provide a new migration corridor between the low lying PSW #2 and PSW #3 at a higher elevation, and on northwards to the internal forests of the South March Highlands. In the long term, this will provide a routing parallel to

Terry Fox Drive, along which wildlife can safely travel and avoid the risk of crossing the road to access these diverse habitat resources.

The loss of wildlife habitat resources from future land development activities in the project area is substantial. The development of the TFD project will add to this loss, although its contribution to this loss of habitat is much lower. A significant amount of forest lands will remain intact and protected outside the urban boundary.

In summary, over time and recognizing the incremental effects of urbanization, the effects of the TFD project on wildlife and wildlife habitat will change from that of a barrier effect to an edge effect (as a result of habitat inside the roadway being removed from other land development activity). The barrier effect of the roadway has been previously described in **Section 6.7**. The roadway contributes a small percentage of the total area of habitat being removed in the area (about 7.5 %). The area being removed for the roadway will be converted from interior habitat to edge habitat (if the roadway was not constructed) over time as the land development proceeds in the area. The remaining natural area to be protected outside of the roadway arc is substantial, will provide internal forest conditions and will allow the ANSI/PSW to continue to function and provide habitat for displaced wildlife species. For these reasons, the cumulative effects of the TFD project within the context of the other planned activities are not considered to be significant.

#### **11.3.12 Wildlife: Migratory Birds**

Potential cumulative impacts to migratory birds primarily relate to the loss of habitat available in the study area and the interim fragmentation of internal forest conditions. Currently the only infrastructure penetrating the area is the Arnprior-Ottawa rail line which is seldom used, and the electricity transmission line along the undeveloped First Line road allowance.

The loss of migratory bird habitat relating to the TFD Part B project (largely deciduous forest habitat and some forested swamp wetlands) is relatively minimal in contrast to the other planned developments approved for the area. About 14.3 ha of woodlots and wetlands habitat will be removed through both Parts A and B of the TFD project, with roughly 63% of that occurring in Part B. Much of the current internal forest habitat that will be located along the edge of the affected by the TFD project once constructed, will be converted to less-diverse edge habitats when the area inside the urban boundary arc develops over time. Access opportunities for native nest parasites (e.g. brown-headed cowbirds) which actively seeks' edge habitats along stream corridors and roadways will increase. This could result in a decrease in passerine nesting success. Access for both common urban native avian predators like raccoons, blue jays, crows and non-native predators like domestic cats and opossum may also increase. Opossum, a meso-mammal, is a recent exotic invader to Southern Ontario which lives in the edge habitats and abandoned farms. They may be able to access the forest habitats along Terry Fox Drive to predate on young birds much more readily than they can now.

The TFD road and development-driven recreational pathways will allow the human residents greater access to the natural areas north of the arc. People will be able to to penetrate greater distances into the forested lands. Presently, access is limited with only two mountain-bike / hiking trails in the area.

The other planned developments in the area will also have an impact on migratory birds and their habitat. The effects will be similar to those previous described in **Section 11.2.11 – Wildlife**. Of the total area of natural habitat to be removed, the TFD project contributes to only 1.2% of this total loss.

With a greater level of development and the formalizing of a community trail system, the area will become more readily available to people. Although many people will study nature and appreciate the bird

life, many could also take advantage of the accessibility to poach wildlife, including the species at risk identified in this study.

As each development moves through the various stages of municipal planning, the proponents will be required to undertake studies to reduce these effects, not only on the bird and wildlife populations, but also on the forest communities, wetlands and habitats where these species reside. This would include avoiding forest/vegetation clearing activities during the bird nesting period.

The construction of Terry Fox Drive will be the first, yet smallest effect on the area as it lies at the outer limits of the planned developments. As each development moves through the various stages of municipal planning, the proponents will be required to undertake studies to reduce these effects, not only on the bird and wildlife populations, but also on the forest communities, wetlands and habitats where these species reside. While the availability of similar habitats in the Region somewhat mitigates the overall scale of impact, avian species will be able to fly to these other areas including the large natural areas to be protected on the north side of the TFD project.

Overall, with a careful, staged approach to development and the implementation of mitigation measures as described above, significant cumulative effects to migratory birds are not expected.

### **11.3.13 Surface Water Quality**

The TFD project will increase the area of impervious surface in the area that will change the stormwater runoff regime (amount and rate of flow) in the area (**Chapter 7**). Further, Terry Fox Drive will result in runoff of salt contaminated water during the winter months will contribute to the impairment of the regions watercourses, as no readily-available treatment is available to treat brackish water. Ultimately, this is an acceptable risk trade-off, as without using salt as a de-icing chemical, public safety would be impaired and the road would be unsafe to drive on during the winter months.

As the area develops over time, the percentage of impervious surfaces, due to roofs, paving, parking lots, driveways, etc will increase, resulting in a further changing the storm water runoff regime that is quite different to that what currently exists in the Carp River and Shirley's Brook sub-watersheds. Where there is presently forest and wetlands, water has the chance to slowly percolate into the ground, while in the future, water will stream from the land quicker, with greater velocities and shorter duration. Stormwater management facilities will be constructed to treat for oil, grit and quantity controls, using the currently available best management practices. Nonetheless, the runoff will not be of the same quality or quantity as that presently found in Shirley's Brook and over time the downstream water bodies will become impaired.

Significant long-term cumulative effects on water quality due to the TFD development in combination with other land development projects are not expected. State of the art, Vortechs<sup>TM</sup> storm water run-off treatment and water management systems will be in place for the TFD project to removes sediments, oils and grease from runoff. Thermal and nutrient runoff impacts will be managed by directing the water through plants and fine grained gravel beds, both within the riparian zones and in the small wetlands bordering the roadway. The use of 'Enhanced Swales' on the project has been incorporated for this purpose. It is expected that appropriate stormwater management controls will also be put in place for the planned future developments in the project area. Significant long-term cumulative effects on water quality due to the TFD development in combination with other land development projects are therefore not expected.

The Carp River is moderately polluted, sluggish and presents problems to adjacent residential communities due to storm-generated flooding. Most of this stems from its history as a farm drain. The restoration of the Carp River will be supported through the extensive floodplain compensation efforts

built into the Terry Fox Drive project. In addition to the roadbed becoming a neutral impact on flooding, the restoration of 8.2 ha of wetland will be a significant contribution to improving the health of the river, including the removal and transformation of pollutants within the constructed wetland system, increasing the species biodiversity and with the proposed 2.0 ha afforestation, actively shading the water to keep it cool and resource rich.

The effects noted above will occur over a long-term period. The mitigation measures to minimize effects on water quality that have been proposed as part of the TFD project, in combination with the measures that are expected to be implemented for the other future developments lands are expected to largely minimize if not avoid any adverse cumulative effects to water quality in the study area. Further, any residual negative impacts expected in the Shirley's Brook watershed are expected to be at least partially off-set by the benefits in the Carp River watershed that the City has committed to. Adverse significant cumulative effects on water quality are therefore not anticipated.

#### **11.3.14 Surface Water Quantity (Flooding)**

As noted above, The TFD project will contribute to changes in the stormwater regime in the affected watersheds including changes to water quantity flows. **Chapter 7** previously describes these impacts and the mitigation to be put in place.

As the Carp River watershed develops along its eastern boundary, there is an increasing potential for seasonal flooding and storm event flooding as more areas become impervious to infiltration. The 100 year flood-line contours used to guide development are based on the best available practices using hydraulic mathematical computer models that predict the likelihood of a storm event reaching specific elevations. It is mathematically possible for a storm event to exceed the predictions, so allowances must be made to allow rivers enough room for the floodwaters to accumulate and dissipate the energy of the flood flow.

Land development, including roadways and subdivisions, encroaching on the Carp River floodplains may cumulatively reduce the storage volumes necessary to mitigate flood damage, while at the same time the increase in impermeable surfaces increases the intensity and shortens the duration of runoff from the developed areas, increasing the risk of downstream flooding. The floodplain compensation area to be constructed as part of the Terry Fox Drive should ameliorate most of these effects, yet the probability of a storm exceeding the 100 year event will always remain as a known risk. Overall however, using the best available science, management techniques and ongoing monitoring, will reduce the cumulative effects of the various land developments to negligible in the long term. As such, no significant cumulative effects are expected.

#### **11.3.15 Fish and Fish Habitats**

The TFD project will impact fish and fish habitat as previously described in **Chapter 8**. The additional planned developments in the area will also contribute to impacts of fish and fish habitat as development proceeds to lay down roads and culverts.

The conversion of large forest tracts to residential use will have the potential to alter the water flow regime, water temperatures, siltation and the potential for deleterious substances such as hydrocarbons, salt and heavy metals to be released into the headwaters of the Shirley's Brook watershed. Best management practices, that can be assumed will be put in place for these other developments, for the treatment and management of stormwater will aid considerably in reducing this effect. However technology can only replace natural processes so much and there may be a long term effects on fish and fish populations as a result of the urbanization process

As the Carp River Restoration plan is decided-upon and implemented in the future, the net result will be a positive improvement of fish and aquatic habitat resources in comparison to its current state of impairment. The Terry Fox Drive roadway is a compatible development that will restrict the urban growth, and the associated disturbances of other urban development, to within the arc of the road, allowing the space between the road and river to be restored as seen fit by the restoration design group. This project has aided their efforts by restoring a relatively large 8.2 ha area of marginal farmlands toward a swamp wetland system. Although fish are not the target species for the wetlands, their ecological functions maintain compatibility with the objectives of fish habitat restoration.

The plan to protect the lands outside of the TFD road alignment arc as Conservation Forest will provide permanent protection to the headwaters of Shirley's Brook, which is the primary source of water for the watercourse. Existing federal legislation (*Fisheries Act*) and Provincial and Municipal planning policies will ensure that the fish habitat resources in the main watercourse crossing through the future development lands will be protected, and preferably enhanced. Shirley's Brook throughout this area was previously ditched and straightened resulting in negative effects on aquatic biota and fish in the system that persists to this day. Following the current OMNR "Adaptive Management of Stream Corridors in Ontario" protocols for natural channel design and the "Natural Hazards Technical Guidelines", the 250 m realignment of the East Shirley's Brook, will have a good opportunity to improve on the current fish habitat resources in the Shirley's Brook watershed (OMNR, 2001).

Undoubtedly however, the conversion of large forest tracts to residential use will have the potential to alter the water flow regime, water temperatures, siltation and the potential for deleterious substances such as hydrocarbons, salt and heavy metals to be released into the headwaters of the Shirley's Brook watershed. Best management practices for the treatment and management of stormwater will aid considerably in reducing this effect, however technology can only replace natural processes so much and there may be a long term effects on fish and fish populations as a result of the urbanization process.

In summary, converting forest lands to urban development in the Shirley's Brook watershed is likely to be a minor negative effect on the small, tolerant, non-diverse fish community as a result of the project and the other land development projects in the Shirley's Brook watershed portion of the study area. The mitigation measures to be implemented by both the TFD project and the measures that can be assumed to be put in place for the other planned land development projects are expected to be effective and reduce negative effects on aquatic habitat. With the mitigation in place it is reasonable to conclude that there will be no significant cumulative effects on aquatic habitat.

### **11.3.16 Species at Risk**

- ***Butternut***

As a result of the development of Part A and B of the TDF project, about There is the potential for a cumulative loss of butternut trees from both Parts A and B of TFD where good concentrations of butternut are known to occur. In total, if all but the moved saplings were to die, the loss of up to 63 retainable butternut trees will be removed in the area would result. . One hundred more along the alignment are diseased and will die regardless of the roadway or subdivision projects. Additional butternut trees are likely to be present within the areas of the other proposed development projects in the area, most likely along the Goulbourn Forced Road alignment and on the KNL Development lands. Minimizing the potential for overall population impacts on Butternut is a goal of the regulatory requirements associated with SARA, ESA and that of the Butternut Recovery Program based at the Rideau Valley Conservation Authority (RVCA). The City will work with the Province and it's partners to meet these requirements. For Butternut, this includes a net gain of retainable butternut so this species is not lost from the South March Highlands ANSI. Considering the large area of similar forest lands to be preserved north



of the road alignment the removal of the Butternut trees on the project are not expected to significantly impair the population to be maintained in the South March Highlands ANSI. The rate of spread of the canker disease and the incidence of infection will affect the population as a whole, however, by identifying disease resistant plants, such as tree #7 and archiving this gene pool and planting new seedlings throughout an area known for its optimum growing conditions, will provide the best opportunity for the butternut population to survive the canker disease epidemic. With the mitigation in place it is reasonable to conclude that there will be no significant cumulative effects on butternut trees.

- ***American Ginseng***

American Ginseng, once a plant of high commercial value in the Ottawa Region was found in three locations, directly on the alignment of the TFD roadway along the Carp Ridge. It is probable that they occur sporadically in other areas of the Carp Ridge and possibly within the South March Highlands ANSI that will be developed for residential subdivisions in the future. The species is quite long-lived and hardy, but takes a long time for seed germination and requires a minimum population of 170 plants to ensure cross pollination. Without assistance and intervention, the cumulative effects of the land developments in this area may result in its eventual extirpation from the area. A City partnership program, with the assistance of University of Western Ontario, Platform Technology Working Group who works collaboratively with Agriculture and Agri-Foods Canada, and the South Nations Conservation Authority, will reproduce the plants within a nursery environment and provide 100 supplemental follow-up plantings. Young seedlings will be planted into the managed Conservation Forest lands well north of the TFD alignment. We expect they should have a high potential for success if they are left undisturbed. Ultimately, the recovery of this species may be aided more by taking direct involvement in its reproduction than by leaving it alone to slowly disappear. With the mitigation in place it is reasonable to conclude that there will be no significant cumulative effects on American Ginseng

- ***Blanding's Turtle***

Potential cumulative impacts to Blanding's turtle primarily relate to the potential for habitat fragmentation, loss of wetlands habitat and for vehicle collisions from the proposed TFD roadway and other roadways in the area, including Part A TFD. The Part B TFD project crosses typical habitat for the turtle and crosses obvious migratory routes so mitigation for potential impacts to this species is warranted. The Part A portion does not cross typical turtle habitats or known migration routes, however will be treated in a like manner by fencing both sides of the road wherever the forest lands extend. For the Part B section, several wildlife passages are proposed to provide for small animal wildlife movement, including turtles, amphibians, meso-mammals and small mammals. They will be guided into the culverts by an extensive fencing and guide wall system mounted on both sides of the road throughout the forested portion. Considering the extensive efforts that will go into protecting this species from road kill, the potential effects, including cumulative effects, are not considered to be significant. As a species protected under the Ontario Endangered Species Act, the City is committed to work with the province to minimize the potential impacts to Blanding's turtle from both Parts A and B of the TFD project, by educating workers and avoiding construction in the wetlands during the periods when they are most vulnerable. This same effort may be expected to be demonstrated as the various land development projects proceed through the draft plan and secondary planning stages. With the mitigation in place it is reasonable to conclude that there will be no significant cumulative effects on Blanding's turtle

- ***Golden Wing Warbler***

As described in **Chapter 9** the Terry fox drive roadway construction is expected to provide noise and vibration disturbances to this species, but may also allow exotic or territorially aggressive species the opportunity to invade it's territory.

The Golden Winged Warbler is under ongoing pressure from a competitor, the Blue-Winged Warbler, for it's preferred habitat. The Blue Winged Warbler is a recent invader from the south, moving into this territory possibly due to climate change allowing them to survive further north than their normal range. Both species prefer swamp thickets for nesting, of which there are many such areas in the wetlands on the outside of the Terry Fox Drive arc. Cumulative effects from the urbanization of the area may occur, but the more immediate affect on this species is from it's blue-winged relative, not urban development.

- ***Western Chorus Frog***

The Western Chorus Frog (WCF) will be a new addition to the federal listings of Schedule 1- Threatened species during the course of this project. During field work in the spring of 2009, several amphibian species, including the WCF were identified in the many small vernal pools, forested swamps and ponds of the South March Highlands. Significant effort was therefore made to reduce the footprint of the road on the larger wetland communities to reduce the effects on all species of amphibian, not just the WCF. This was pro-actively done by eliminating four SWM ponds, lowering the road profile to reduce the length of side slopes and to increase the slope of the embankments so the horizontal road sections were as tight as possible.

We do expect that Western Chorus Frog will be able to utilize the CV5 & CV6 hydraulic culverts on Shirley's Brook and the Wildlife Passage Culverts TCV2, TCV3 and TCV4, and have placed suitable substrates and woody cover into the bottom to meet their needs. The wetland restoration portion of the floodplain cut compensation area has been designed to favour amphibians and turtles over fish species, and they do specifically target the species at risk noted here. The road alignment misses most of the wetland communities, and there are no more wetlands of significant size that will be removed through the land developments on the inner arc of the road. Several small wet depressions may be removed through the land development process, but the proponents will need to have regard for avoiding impacts to the Western Chorus Frog in the design of their development plans. The large, diverse wetlands north of the road arc provide abundant habitat resources for the Western Chorus frog, a large constructed wetland will be built to target all species of amphibians, including this species, and therefore the cumulative effects on this small, sensitive animal are not considered significant as a result of this project.

Although these cumulative impacts of urbanization on the identified species at risk can not be avoided in the long term, there is an abundance of similar habitats in the area and the immediate impacts can be minimized and/or compensated through the use of habitat restoration, habitat enhancement and the maintenance of wildlife corridors along the watercourses running through the subdivision developments with safe crossings of transportation corridors.

## **11.4 Cumulative Effects Summary**

**Table 11-2** provides a summary of the cumulative effects assessment.

**Table 11-2 – Cumulative Effects Assessment Summary**

Valued Environmental Component	Summary of expected Cumulative Effects	Potential Cumulative Effects	TFD Part B Project Mitigation Measures	Residual Cumulative Effects and Significance
Land Use & Land Use Designations	Most of Inner arc to be developed for residential communities	All development to be consistent with land use plans	Reduction in Traffic Congestion Intersection Improvements	Not significant
Land Use - Agriculture	Minor loss of farm land Alteration of farm land	Permanent Intermittent	Provide access to remaining agricultural lands Retain crop lands in floodplain area	Not significant with mitigation.
Land Use - Historic	Artefact Archival on Richardson Farm site	Permanent	Assess and recover where required	Not significant with mitigation.
Land Use - Aboriginal	No Effects on land use or resources Maintain right to collect Ginseng	None	Partnership with Ginseng Recovery Program at South Nations Conservation Authority	Not significant
Bedrock Geology	No cumulative effects	None	None required	Not significant
Groundwater	Possible contamination from urban runoff, particularly de-icing salt.	Possible salt contamination during operations	Vortechs™ stormwater treatment system removes most, residual basic nutrients and salt.	Not significant with mitigation.
Air Quality and Dust	Operational air quality impacts from all roadways and urban developments in the area	Contribution to poor air quality and GHG	City efforts to improve transit opportunities to reduce automobile use. Plant trees in vacant spaces.	Not significant with mitigation.
Noise	Potential for construction noise particularly rock excavation in concurrent subdivisions and roadway construction. Long term operation noise from roadway and adjacent subdivisions.	Short term and localized increase in noise levels. (see Wildlife section for effects on Wildlife)	Follow EPP and blast ordinances during construction.	Short term and localized. Not significant with mitigation.
Designated Natural Features – Primary & Secondary Lands, ANSI, PSW, Deer Yards	Loss of some natural features. Habitat Fragmentation (short term). Edge Effects.	Long term and irreversible.	Design for wildlife corridors. Previous OMB decisions pre-date the designations.	Not significant with mitigation
Wetlands	Loss of diverse habitat resources	Long term and irreversible	Eliminated 4 SWM ponds, adjusted road embankments. Wetlands replacement and restoration	Not significant with mitigation.

<b>Valued Environmental Component</b>	<b>Summary of expected Cumulative Effects</b>	<b>Potential Cumulative Effects</b>	<b>TFD Part B Project Mitigation Measures</b>	<b>Residual Cumulative Effects and Significance</b>
Vegetation	Impacts to species at risk	Direct and mitigable	Replanting strategies, Edge Management Plan Afforestation Plan Wetland restoration	Not significant with mitigation.
Wildlife	Loss of Habitat Risk of Road Kill Noise Effects Fragmentation of Habitat	Long term, direct and irreversible.	Continuous fencing / wall barrier Edge Management Plan Monitoring of Effectiveness Install wildlife passages; Road Signage	Not significant due to retention of habitats outside the urban area
Migratory Birds	Loss of Habitat Noise Effects Fragmentation of Habitat	Long term and irreversible.	Implement Edge Management Planning along roadway and in subdivisions	Not significant with mitigation.
Surface Water Quality	Construction related sediment generation in combination with concurrent projects in watershed	Short term, reversible and manageable.	Sediment and erosion control plans. Full time Environmental Monitor on site.	Not significant with mitigation.
Surface Water Quality	Operational storm water effects from all roadways in watershed affecting water quality.	Localized and persistent.	Stormwater control a component of overall TFD construction.	Not significant with mitigation.
Surface Water Quantity (Flooding)	Loss of floodplain storage Property damage, possible loss of life	Localized of high intensity on Carp River	Reduced profile of road through Carp River Offsetting floodplain excavation. Timing of construction.	Beneficial. Improved ability of floodplain to store flood waters after mitigation implemented. No significant adverse effect with mitigation.
Fish and Fish Habitats	Shirley's Brook Altered in two locations Long Term incremental degradation of habitat quality	Long Term Improvement over previous ditching	Creek Realignment to increase habitat quantity and maintain quality	Not significant with mitigation.
Species At Risk	Incremental loss of Butternut and American Ginseng genepool Potential mortality from habitat fragmentation effecting Blanding's Turtle and Western Chorus Frog in combination with similar effects from other land developments in the area	Loss of Species at Risk or habitat	Long term commitment to Ontario ESA obligations Wildlife guide wall and integrated fence system City forging partnerships with species recovery teams & research facilities City preserving remainder of forested lands outside TFD arc.	Not significant with mitigation.

**Table 11-3** cross references the Valued Environmental Components with the potential project effects to arrive at a summary tabulation of the expected residual effects of the roadway construction.

**Table 11-3 – Potential Project Effects**

Valued Environmental Component	Potential Project Effects						Residual Effects	
	Potential Adverse Effect?			Can It Be Mitigated?			Is it Significant?	
	Yes	No	Uncertain	Yes	No	Uncertain	Yes	No
Land Use Designations <sup>1</sup>		No		Yes				No
Land Use - Agriculture	Yes			Yes				No
Land Use – Historic <sup>1</sup>		No		Yes				No
Land Use- Aboriginal		No		Yes				No
Bedrock & Soils		No		Yes				No
Groundwater		No		Yes				No
Air Quality and Dust	Yes					Partially by reducing emissions		No
Noise (Vibration)	Yes			Yes				No
Designated Natural Features	Yes				No			No
Wetlands	Yes			Yes				No
Vegetation	Yes			Yes				No
Wildlife / Habitat	Yes			Yes				No
Migratory Birds	Yes			Yes				No
Surface Water Quality	Yes			Yes				No
Surface Water Quantity	Yes			Yes				No
Fish and Fish Habitat	Yes			Yes				No
Species at Risk/Habitat of Special Concern	Yes			Yes				No
<b>Other Non-Environmental Components</b>								
Socio-Economic Conditions <sup>1</sup>		No		Yes				No
Construction Waste		No		Yes				No
Transportation		No		Yes				No
Accidents and Malfunctions		No		Yes				No
Effects of Environment on the Project		No		Yes				No
<b>Cumulative Effects</b>								
Area loss of Designate features – ANSI, PSW's, Deer Yards	Yes		Interim Impact		No	Planning predates designation		No
Incremental Conversion of Habitat from internal forest to edge	Yes		Interim Impact	Yes		Manage Edge		No

1. The indirect effects on these Environmental Components resulting from a project impact on the environment must be considered. Direct effects on these Environmental Components may also be considered at the discretion of the RA.

Based on the review of potential effects measured against the current baseline, the reasonable expected land development activities adjacent to the road and the identification of available mitigation measures, it is unlikely that the construction and operation of the Terry Fox Drive - Part B project will result in significant adverse environmental impacts including cumulative effects.