

### Ranking of the 'Short-listed' Route Segments

With the relative level of effect documented for each indicator by route segment, the Project Team members used this information to collectively assign a ranking to each route segment. The rankings given by the Project Team members ranged from 'First' (most preferred route segment) to 'Second' (least preferred route segment) in case of only two route segments being comparatively evaluated. In the situations where three or more alternative route segments were being comparatively evaluated, then additional rankings were given (e.g., 'First', 'Second', 'Third', 'Fourth', etc.). Similarly, the Project Team members could determine that two or more route segments were similar in ranking, and could then apply a tied ranking (e.g., 'First (tied)').

With this in mind, the Project Team members first assigned rankings for each individual Criterion based on the level of effect determined for each indicator under that Criterion. For example, the evaluation criterion of "Groundwater" has four indicators. In each indicator's case, a level of effect (e.g., either 'No', 'Low', 'Moderate' or 'High') was given. Next, these four level of effects were considered collectively in order to determine an overall ranking for that Criterion. After each Criterion was ranked, rankings were determined for each Factor Area (Natural Environment, Social Environment, Economic/Land Use, Cultural Environment, and Technical) based on the rankings from each evaluation criterion. For example, in the case of the Natural Environment Factor, the Project Team members considered all eight of the identified rankings for a route segment corresponding to the eight Natural Environment evaluation criteria (incorporating tradeoffs and their professional judgment) in determining the Natural Environment Factor ranking.

Following this, the Project Team members determined an overall ranking of each route segment for each 'short-listed' route based on the individual Factor rankings. With this in mind, an overall ranking of 'First' for an entire route would have a greater number of higher placed individual Factor rankings (e.g., more 'First' and 'Second' place rankings).

#### 5.1.3.2 Arithmetic Approach

As previously noted, the Arithmetic Evaluation method was the secondary method of evaluation and incorporated both the level of importance of each environmental attribute, referred to as the *weight*, and the magnitude of the effect associated with an alternative, referred to as the *score*. Numerical values were derived for both the weight and the score associated with each alternative.

The weight was multiplied by the score to obtain a total. The totals for each alternative were compared to determine the preferred alternative route. This evaluation method also allowed for sensitivity testing as various weighting scenarios were applied.

### Scoring of Impacts

The score assigned to each environmental criterion was relative to the effect generated and the potential to effectively mitigate it. Relative effects ranged from a positive benefit to the environment to a negative impact or detriment to the environment.

The assessment of effects was derived from field measurements, prediction model results, secondary data sources and other means, as necessary.

### Weighting the Level of Importance

Generally, more weight was assigned to those factors that were considered to be more important in assessing effects generated by alternatives, and less weight was given to those factors that were considered to be less important.

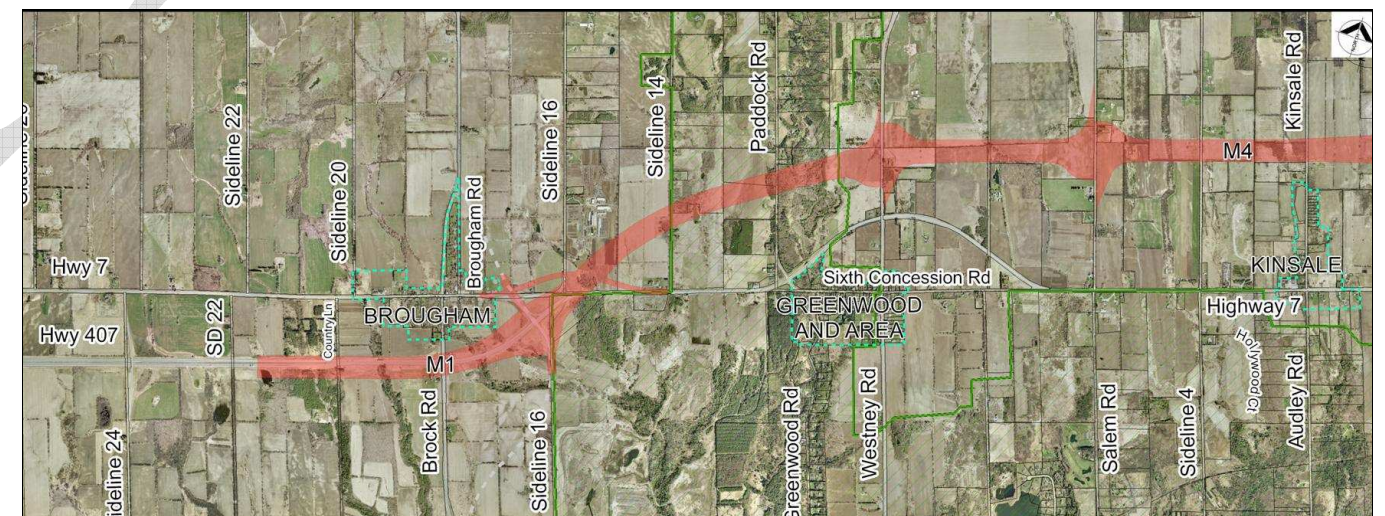
Weighting scenarios were developed in consultation with the public, regulatory agencies and municipalities. Such input provided the Project Team with an understanding of community values with respect to the relative importance of each environmental feature. It should be noted that weighting scenarios varied for different route segments in recognition of the diversity of features found across the study area. In addition, various sensitivity tests were run for the three highest ranked alternatives from the reasoned argument approach to reflect input received from stakeholders and the public.

## 5.2 Section 1 – West Mainline, Brock Road to Audley Road

### 5.2.1 Net Effects Analysis

The following provides the key net environmental effects for the single route within Section 1 as illustrated in **Figure 5.2**. Refer to the Specialist Reports in **Appendices E through M** for additional information.

**Figure 5.2: West Mainline Alternative, Brock Road to Audley Road**



### Natural Environment

This route segment crosses an area of predominately agricultural land use with scattered rural residential and settlement areas. Within this landscape, natural features consist of scattered natural and cultural woodland patches

and remnant valley systems. The most important natural feature is associated with the East Duffins Creek forested valley system.

Large natural core areas are associated with the East Duffins Creek valley and also occur to the south of the route segment and are associated with the Heber Downs Wetland Complex and adjacent upland forest communities.

The East Duffins Creek crossing will be a major bridge span across the valley. The bridge structure will be designed to maintain a large open area in the valley under the structure – however permanent removal of forest valley vegetation will be required to accommodate the structure footprint. Some interior habitat will be affected by the vegetation removal and presence of the highway ROW. However, given the large and linear north-south extent of this forest valley system, shifts in the alignment to the north or south (for example to reduce social or other effects) would yield little or no reduction in natural environment effects. Any alignment crossing of this forest valley system will result in vegetation removal and associated alteration of the linkage quality. In addition to maintaining a large valley opening with the structure, other design measures to facilitate wildlife movement will be implemented (such as minimizing extent of vegetation removal, keeping woody canopy cover close to the structure to reduce “gap” effect, providing other cover elements under the structure). Design measures will be guided by the MTO Environmental Standards Wildlife Guide, and reference to the most current TRCA/DFO stream crossing guidelines.

Several watercourses crossed by the route segment have high quality fish habitat, including Redside Dace. Overall potential impacts to fish and fish habitat will be greatly reduced by meander belt spanning structures, anticipated avoidance of instream works and implementation of stormwater management measures (e.g. water quality treatment, water quantity control and controlled discharge to creeks). Appropriate mitigation measures will be developed during the subsequent design stages to protect fish habitat.

Local linkages of varying continuity and quality are located along Brougham Creek and its Tributaries A and B, Spring Creek, East Duffins Creek Tributary B and Carruthers Creek Tributaries A, D and E. Local connections can be maintained where warranted through careful structure design following guidelines in the MTO Environmental Standards Wildlife Guide.

Summary of net effects:

- 4 permanent watercourse crossings (Brougham Creek and one of its tributaries, Spring Creek and East Duffins Creek).
- 9 intermittent watercourse crossings
- 1 online pond within route alternative footprint at Tributary B of Brougham Creek
- 1249 m of high sensitivity fish habitat being crossed associated with Brougham Creek and its tributaries, Spring Creek, East Duffins Creek and tributaries of Carruthers Creek. This habitat supports migratory and resident salmon and trout species and Redside Dace.
- Bridges that span the river valley crossings are anticipated and as such are expected to reduce net effects on sensitive fisheries.
- 194 m of low sensitivity seasonal warmwater baitfish watercourse crossed in a good quality forested valley system (deciduous forest and cultural woodland).
- 1 online pond associated with Tributary B of Brougham Creek within route alternative footprint. Removal of the pond and restoration of a natural channel and/or wetland would be a net benefit to water quality and fish and fish habitat.

- 2 offline ponds will likely require removal/infill: one is an irrigation pond; the other is a constructed bass pond (at Spring Creek). Avoidance of the pond should be explored during the design stage.
- Removal of a total of approximately 11.4 ha of upland forest.
- Potential removal of up to seven Butternuts. Two trees are confirmed within route alternative footprint and five trees are adjacent to route alternative footprint.
- Approximately 8.2 ha of unevaluated wetlands in 8 communities of low to moderate quality.
- Approximately 4.8 ha of interior forest habitat removed/disturbed due to the crossing of a large forest unit along East Duffins Creek.
- Less than 0.1 ha of interior forest habitat loss due to a small edge removal of a large forest unit.
- There are no known species of conservation concern or Species at Risk within 50 m of the route alternative.
- No new ESA crossings.
- New crossing of regional wildlife movement corridor along East Duffins Creek.
- Other potential local wildlife movement linkages of varying continuity and quality are located along several tributaries.
- Route alternative will cross existing TRCA Natural Heritage System corridors at Brougham Creek and its tributaries, Spring Creek, East Duffins Creek and Carruthers Creek tributaries.
- Route covers 156 ha of low permeability soil, crosses 19 ha of high permeability soil, intersects 6 water wells within the route and associated interchange footprints, and, intersects 18 shallow water wells in low permeability soil and 3 shallow water wells in high permeability soil within 500 m of the route and associated interchange footprints.

#### **Social Environment**

The route that extends from Brock Road to Audley Road does not have any effects with respect to community fabric. There is no encroachment on or severance of established or proposed settlement areas and the route does not create an urban or rural barrier effect. Furthermore, the route does not affect the delivery of community services including emergency services and school bussing.

The route does not affect any hiking, hunting, fishing or nature viewing or educational opportunities.

The route has a total of 35 property effects including a total of four residential displacements, which is low relative to other route alternatives and property effects experienced throughout the study area.

There are 62 noise sensitive receptors that could potentially be impacted by this route segment and 50 sensitive receptors that could potentially be impacted from an air quality perspective.

#### **Land Use/Economic Environment**

The route has a high degree of compatibility with the municipal and regional development goals and objectives as the route has been identified in the Durham Regional Official Plan.

There is a low impact for non-farm commercial activities. No businesses are displaced on this route alternative and no business accesses are affected. A used car lot and place of worship in the Brougham Road, Highway 7 area will experience increased exposure as a result of this route alternative. An equestrian centre located on Paddock Road north of the route alternative may experience some impacts on business as a result of construction.

The majority of this section of the West Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands and marsh land are crossed in this section and are located within the lower areas and stream channels. One specialty crop area (nursery stock) is affected in this area. The nursery is located on the northwest corner of Highway 7 and Sideline 16. The proposed route would result in the removal of a portion of the cropland and a further severance of a portion of the cropland from the main farm on the north side.

Twenty (20) field crop operations would be affected, resulting in the loss of land and severance of property. One (1) diary livestock operation would be affected. Eighteen (18) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Fourteen (14) parcels of land greater than 20 ha and 8 parcels less than 20 ha would be created.

Two high investment agricultural operations would be affected. These operations include the nursery identified above and a beef operation located north of the West Mainline and east of Westney Road.

No properties with the potential for site contamination will be impacted in urban areas. However, two (2) properties with the potential for site contamination will be impacted in rural areas. The properties are a small waste debris area (low to moderate potential for contamination) and a gravel pit and debris area (low potential for contamination). No (known) operating or closed waste management facilities will be disturbed by this route segment.

#### Cultural Environment

There are four archaeological sites within this segment, all situated around node M1. One site is an Aboriginal Archaic campsite; two sites are Aboriginal Late Paleo-Indian, Hi-Lo Findspots; and the fourth is a Euro-Canadian Homestead that has undergone Stage 4 salvage excavation and is considered clear of any further archaeological concern.

The potential for adverse effects to known archaeological sites and areas of archaeological potential are high albeit there may be opportunities for avoidance or mitigation of effects.

The cultural heritage analysis identified fourteen (14) cultural heritage resources including residences, roadscapes, farm complexes and agricultural lands and one built heritage resource that will be displaced or disrupted by the route alternative.

#### Technical Considerations

This route provides high accessibility to population and employment centres. Full interchanges and transit stations are planned for Brock Road, Westney Road and Salem Road. The preferred 407 alternative is compatible with the proposed Brock Road realignment east of the Village of Brougham and the proposed Westney Road realignment east of the Hamlet of Greenwood.

## 5.3 Section 2 – West Mainline, Audley Road to Ashburn Road

### 5.3.1 Net Effects Analysis

The following provides the key net environmental effects for the two routes within Section 2. Refer to the Specialist Reports in **Appendices E through M** and **Supporting Document #1** for additional information.

#### 5.3.1.1 Route WM1

Route WM1 is illustrated in **Figure 5.3**.

**Figure 5.3: Route Alternative WM1**



#### Natural Environment

This route crosses a predominantly agricultural area where most of the natural vegetation features have been previously cleared/removed. The most important natural features are associated with the West Lynde Creek and Lynde Creek valley forested systems and to a lesser degree discontinuous riparian and forest cover associated with smaller tributaries. The Lynde Creek crossing is common to both WM1 and WM2.

- West Lynde Creek and Lynde Creek valleys are designated ESAs.
- Large natural areas occur to the south of existing Highway 7 and are associated with the Heber Downs Wetland Complex and adjacent upland forest and thicket communities.
- The West Lynde and Lynde Creek crossings will result in the permanent removal of some forested valley vegetation, however, the crossings are located mainly in cultural meadow and cultural thicket. The new