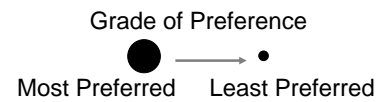


Table 5.4: Visual Representation of Reasoned Argument Evaluation Results for Section 4, Central Mainline from Simcoe Street to Enfield Road

Factor Area	Alternative	CM1	CM2
Natural		●	●
Social		•	●
Land Use /Economic		•	●
Cultural		●	●
Technical		•	●
Rec'd = Recommended Not Rec'd = Not Recommended		Not Rec'd	Rec'd



5.5.2.2 Arithmetic Results

The arithmetic evaluation results for Section 4 confirmed that Route CM2 is the Technically Recommended Route from Simcoe Street to Enfield Road. Route CM2 ranked first in four of the five Factor areas based on the initial weightings and first overall with the various alternate weightings considered as part of the sensitivity testing. The arithmetic evaluation results are summarized in **Table 5.5**, with the details provided in **Supporting Document #2**.

Table 5.5: Arithmetic Evaluation Results for Section 4, Central Mainline from Simcoe Street to Enfield Road

Factor	Rankings Based on Initial Weights		
	Alternative CM1	Alternative CM2	
Natural Environment (40%)	1	2	
Social Environment (20%)	2	1	
Land Use/Economic Environment (25%)	2	1	
Cultural Environment (5%)	2	1	
Technical Considerations (10%)	2	1	
Overall Ranking	2	1	
Sensitivity Analysis			
Factor	Rankings Based on Alternate Weights		
	Alternative CM1	Alternative CM2	
Natural Environment	High (50%)	2	1
Natural Environment	Low (20%)	2	1
Social Environment	High (40%)	2	1
Social Environment	Low (10%)	2	1
Economic Environment	High (40%)	2	1
Economic Environment	Low (10%)	2	1
Cultural Environment	High (10%)	2	1
Cultural Environment	Low (5%)	2	1

Table 5.5: Arithmetic Evaluation Results for Section 4, Central Mainline from Simcoe Street to Enfield Road

Technical Environment	High (10%)	2	1
Technical Environment	Low (5%)	2	1
Stakeholder Weights		2	1
Overall Ranking		2	1

5.6 Section 5 – East Mainline, Enfield Road to Highway 35/115

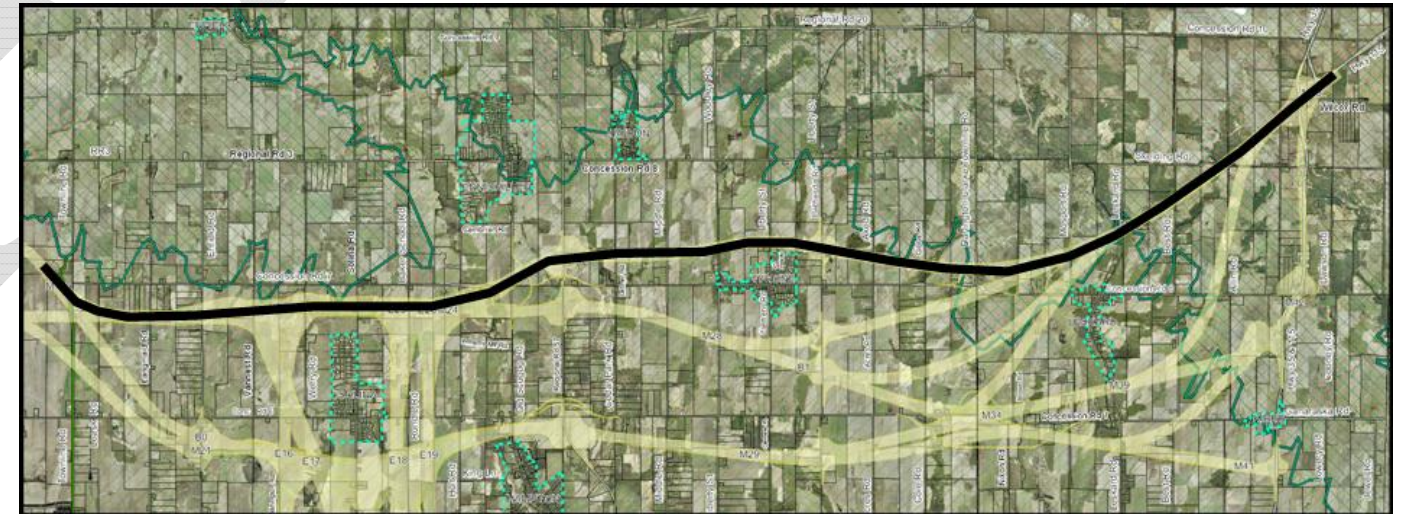
5.6.1 Net Effects Analysis

The following provides the key net environmental effects for the 12 routes within Section 5. Refer to the Specialist Reports in **Appendices E through M** and **Supporting Document #3** for additional information.

5.6.1.1 Route EM1

Route EM1 is illustrated in **Figure 5.8**.

Figure 5.8: Route Alternative EM1



Natural Environment

There are 40 surface water features that need to be crossed along route EM1. Of these crossings there are 14 high quality streams, 13 moderate quality streams, 4 low quality streams, 4 ephemeral drainage features and 5 ponds.

This route affects 3980m of high sensitivity streams, of which 1190m would be spanned and 2790 would be crossed using culverts. Also, there are 4175m of moderate sensitivity fish habitat streams to cross using culverts

and 1800m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM1 will result in the removal of 81 ha of upland vegetation and has the potential to negatively impact 31 upland vegetation units. Encroachment into one high quality vegetation unit and one significant vegetation community will occur. No species at risk or of conservation concern will be removed by the alternative.

EM1 does not remove any PSW, but removes 18 ha (23 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 50 ha of core area, 5 ha of interior habitat and 3 ha of deep interior habitat. There are about 24 ha of specialized or sensitive wildlife habitat (SSWH) area directly affected. Much of the SSWH and deep interior habitat are within one very large high quality patch (largest in East Mainline). There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM1 severs and/or encroaches into six ESAs. As per CLOCA's ESA sensitivity ranking, five of these ESAs are highly sensitive and one is moderately sensitive.

Three high quality linkages are severed by EM1. This assumes that the linkages identified through Tyrone Valley will be spanned as was recommended to avoid or reduce potential impact to other ecological features (i.e. Fisheries and Aquatic Habitat).

Route EM1 covers 301 ha of low permeability soil, crosses 151 ha of high permeability soil - 60 ha of which comprises ORM sediments, intersects 12 water wells within the route and associated interchange footprints, intersects 16 shallow water wells in low permeability soil and 2 shallow water wells in high permeability soil within 500 m of the route and associated interchange footprints (herein referred to as the 500 m buffer), intersects 19 deep wells in ORM sediment within the 500 m buffer, and has 11 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer.

Summary of net effects:

- Passes through the Oak Ridges Moraine sediments
- Low number of wells affected
- High number of surface water features crossed and moderate quality features affected
- Consistently increasing affects on high and moderate sensitivity fish habitat streams
- No Provincially Significant Wetlands are crossed
- Large amounts of core wildlife habitat, SSWH and interior habitat removed
- Severance of the Tyrone Valley ANSI
- Crosses all of the ESAs common to all routes
- Crosses important high quality linkages along the northern limits of the study area

Social Environment

The EM1 route is the most northerly of all the east mainline routes extending from the northerly option of the central mainline route. The route has a moderate impact on the community fabric criteria as the route encroaches on the communities of Solina and Tyrone. Barrier effects are created for the communities of Solina and Tyrone.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in low property impacts relative to the other alternatives, with a total of 92 properties impacted, including 10 residential displacements.

There are 111 noise sensitive receptors that could potentially be impacted by this route alternative and 203 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina and Tyrone
- 92 properties affected, including 10 residential displacements
- 111 noise sensitive receptors
- 203 air quality sensitive receptors

Land Use/Economic Environment

The route has a moderate degree of compatibility with municipal and regional development goal and objectives as it is moderately compatible with the Durham ROPA and Clarington OP. However, the general route location has not been identified in the Durham Regional Official Plan and the Clarington Official Plan.

There is moderate impact from a non-farm commercial activity perspective, as there is a large nursery displaced at Regional Road 57 and Concession 7. There is potential for increased business exposure for two Bed and Breakfasts near the route alternative. There may be possible impacts for the two Bed and Breakfasts as a result of construction activities.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. One specialty crop area or operation was affected in this area; and three livestock operations would be affected by this proposed route. Forty-nine (49) field crop operations would be affected, resulting in the loss of land and severance of property. Thirty-four (34) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Thirty-seven (37) parcels of land greater than 20 ha and 43 parcels less than 20 ha would be created. Two high investment agricultural operations (specialty crop and livestock) would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, two (2) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include an agricultural equipment company (high potential for site

contamination) and a spill occurrence location (moderate potential for site contamination). No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- Moderate compatibility with the provincial/municipal and private land use development strategies
- One business displaced (nursery)
- One specialty crop area/operation affected
- Three livestock operations and forty-nine field crop operations affected
- Two high investment agricultural operations affected
- Two properties with potential for site contamination impacted

Cultural Environment

One Undetermined archaeological site (BaGp-8) was identified within this route segment. More than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known archaeological sites and areas of archaeological potential are high albeit should this site be affected by construction activities, there may be opportunities for mitigation (protection and/or avoidance).

Route EM1 will displace or disrupt twenty-three (23) cultural heritage landscapes and two (2) built heritage resources.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM1 is approximately 18 km. The route is direct.

Alternative EM1 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM1 is moderately compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignments of Old Scugog Road and Concession Road 7/8 are required and a longer extension of Darlington-Clarke Townline Road is required. Route EM1 does provide a seamless connection with Highway 115 to Peterborough.

Alternative EM1 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM1 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link.

Alternative EM1 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM1 is \$260M.

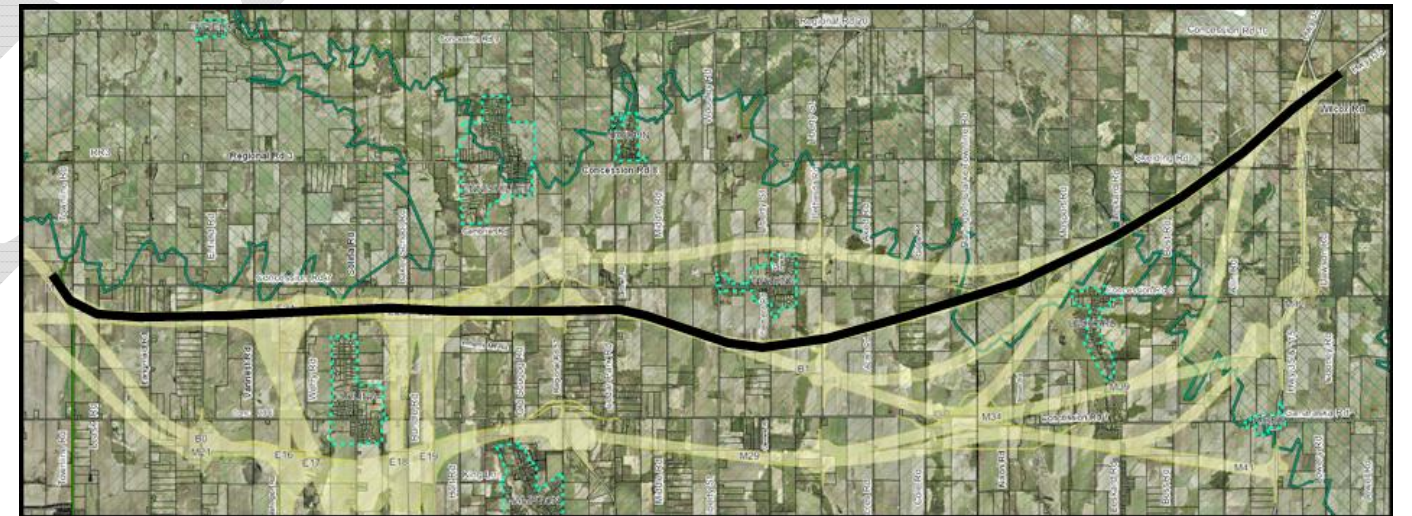
Summary of net effects:

- Very direct route
- Provides a seamless connection to Highway 115
- Requires upgrading of the regional road system beyond what is shown in Durham Region's Transportation Master Plan (TMP)
- Provides interchanges at all major arterial roads
- Low relative cost

5.6.1.2 Route EM2

Route EM2 is illustrated in **Figure 5.9**.

Figure 5.9: Route Alternative EM2



Natural Environment

There are 33 surface water features that need to be crossed along route EM2. Of these crossings there are 11 high quality streams, 12 moderate quality streams, 4 low quality streams, 3 ephemeral drainage features and 3 ponds.

This route affects 2940m of high sensitivity streams, of which 840m would be spanned and 2100m would be crossed using culverts. Also, there are 4050m of moderate sensitivity fish habitat streams to cross using culverts.

and 2000m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM2 will result in the removal of 113 ha of upland vegetation and has the potential to negatively impact 37 upland vegetation units. Encroachment into two high quality vegetation units and one significant vegetation community will occur. No species at risk or of conservation concern will be removed by the alternative.

EM2 does not remove any PSW, but removes 14 ha (21 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 75 ha of core area, 9 ha of interior habitat and 3 ha of deep interior habitat. There are about 27 ha of specialized or sensitive wildlife habitat (SSWH) area directly affected. Much of the SSWH and deep interior habitat are within one very large high quality patch (largest in East Mainline). There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM2 severs and/or encroaches into five ESAs. As per CLOCA's ESA sensitivity ranking, four of these ESAs are highly sensitive and one is moderately sensitive.

Three high quality linkages are severed by EM2.

Route EM2 covers 301 ha of low permeability soil, crosses 161 ha of high permeability soil - 60 ha of which comprises ORM sediments, intersects 10 water wells within the route and associated interchange footprints, intersects 18 shallow water wells in low permeability soil and 6 shallow water wells in high permeability soil within the 500 m buffer, intersects 19 deep wells in ORM sediment within the 500 m buffer, and has 11 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer.

Summary of net effects:

- Passes through the Oak Ridges Moraine sediments
- Low number of wells affected
- High number of surface water features crossed and moderate quality features affected
- Substantially high net effects in regards to vegetation
- Deep interior habitat is removed
- Crosses important high quality linkages along the northern limits of the study area

Social Environment

The EM2 route extends from the northerly central mainline route option. This route has a moderate impact on the community fabric criteria as it encroaches on the communities of Solina and Tyrone. Barrier effects are created for the communities of Solina and Tyrone.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in low property impacts relative to the other alternatives with a total of 98 properties impacted including 18 residential displacements.

There are 92 noise sensitive receptors that could potentially be impacted by this route alternative and 170 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina and Tyrone
- 98 properties affected, including 18 residential displacements
- 92 noise sensitive receptors
- 170 air quality sensitive receptors

Land Use/Economic Environment

The route has a moderate degree of compatibility with municipal and regional development goal and objectives because the route would be partially compatible with the Durham ROPA and Clarington OP. However; the general route location has not been identified in the Durham Regional Official Plan and the route differs from the route shown in the Clarington Official Plan.

There is a low impact to non-farm commercial activity as there is a home occupation displaced at Clemens Rd. There is a potential to increase business exposure for two Bed and Breakfasts near the route alternative. There may be possible impacts for the two Bed and Breakfasts as a result of construction activities.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. One specialty crop area or operation and one livestock operation would be affected by this proposed route. Forty-five (45) field crop operations would be affected, resulting in the loss of land and severance of property. Thirty-three (33) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Thirty-eight (38) parcels of land greater than 20 ha and 33 parcels less than 20 ha would be created. Two high investment agricultural operations (specialty crop and livestock) would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, two (2) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include an agricultural equipment company (high potential for site contamination) and a spill occurrence location (moderate potential for site contamination). No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- Moderate compatibility with the provincial/municipal and private land use development strategies
- One businesses displaced (home occupation)
- One specialty crop area/operation affected
- One livestock operation and forty-five field crop operations affected

- Two high investment agricultural operations affected
- Two properties with potential for site contamination impacted

Cultural Environment

One Undetermined archaeological site (BaGp-8) was identified within this route segment. There is also one Aboriginal isolated find (AlGq-7) within this route segment. More than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites and areas of archaeological potential are high albeit should this site be affected by construction activities, there may be opportunities for mitigation (protection and/or avoidance).

Route EM2 will displace or disrupt twenty-five (25) cultural heritage landscapes and one (1) built heritage resource.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM2 is approximately 18 km. The route is direct.

Alternative EM2 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM2 is moderately compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Two realignments of Concession Road 7/8 are required and a longer extension of Darlington-Clarke Townline Road is required. Route EM2 does provide a seamless connection with Highway 115 to Peterborough.

Alternative EM2 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM2 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link.

Alternative EM2 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM2 is \$250M.

Summary of net effects:

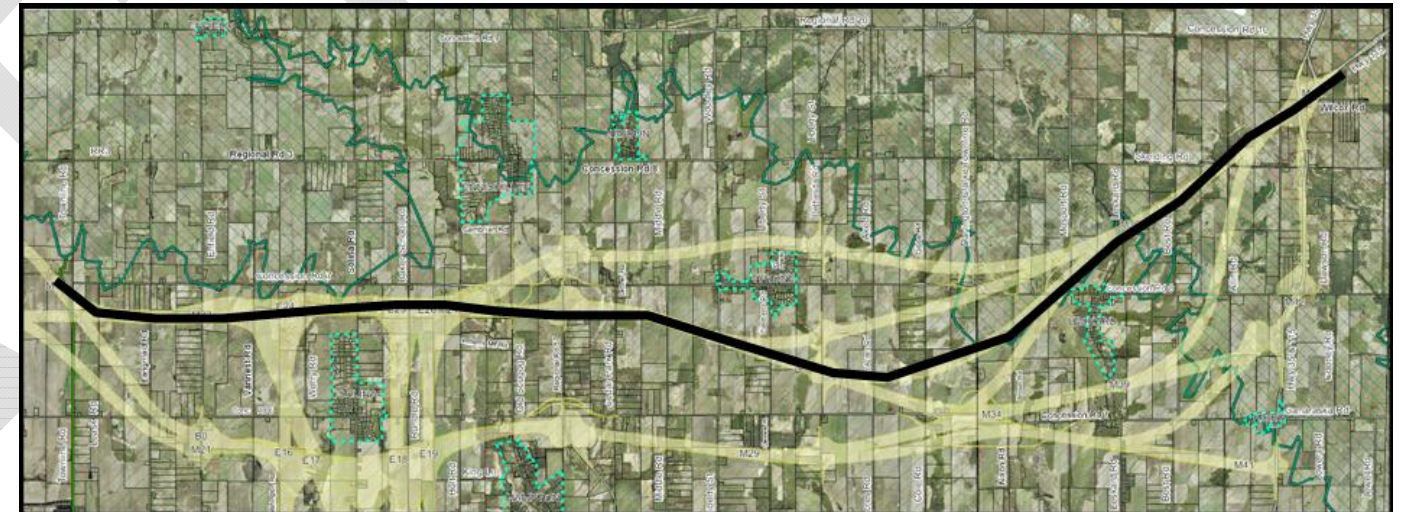
- Very direct route

- Provides a seamless connection to Highway 115
- Requires upgrading of the regional road system beyond what is shown in Durham Region's Transportation Master Plan (TMP)
- Provides interchanges at all major arterial roads
- Low relative cost

5.6.1.3 Route EM3

Route EM3 is illustrated in **Figure 5.10**.

Figure 5.10: Route Alternative EM3



Natural Environment

There are 33 surface water features that need to be crossed along route EM3. Of these crossings there are 10 high quality streams, 12 moderate quality streams, 5 low quality streams, 4 ephemeral drainage features and 2 ponds.

This route affects 2460m of high sensitivity streams, of which 840m would be spanned and 1620m would be crossed using culverts. Also, there are 3675m of moderate sensitivity fish habitat streams to cross using culverts and 2875m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM3 will result in the removal of 106 ha of upland vegetation and has the potential to negatively impact 30 upland vegetation units. Encroachment into two high quality vegetation units and one significant vegetation community will occur. No species at risk or of conservation concern will be removed by the alternative.

EM3 does not remove any PSW, but removes 13 ha (19 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 64 ha of core area, 6 ha of interior habitat and 3 ha of deep interior habitat. There are about 30 ha of specialized or sensitive wildlife habitat (SSWH) area directly affected. Much of the SSWH and deep interior habitat are within one very large high quality patch (largest in East Mainline). There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM3 severs and/or encroaches into five ESAs. As per CLOCA's ESA sensitivity ranking, four of these ESAs are highly sensitive and one is moderately sensitive.

Three high quality linkages are severed by EM3.

Route EM3 covers 293 ha of low permeability soil, crosses 154 ha of high permeability soil - 61 ha of which comprises ORM sediments, intersects 10 water wells within the route and associated interchange footprints, intersects 18 shallow water wells in low permeability soil and 4 shallow water wells in high permeability soil within the 500 m buffer, intersects 19 deep wells in ORM sediment within the 500 m buffer, and has 11 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer.

Summary of net effects:

- Passes through the Oak Ridges Moraine sediments
- Low number of wells affected
- High number of surface water features crossed and moderate quality features affected
- Consistently increasing affects on high and moderate sensitivity fish habitat streams
- High net effects in terms of vegetation
- No Provincially Significant Wetlands are crossed
- Removal of large amounts of core wildlife habitat, interior habitat and SSWH
- Deep interior habitat removed

Social Environment

The EM3 route extends from the northerly central mainline route option. The route has a moderate impact on the community fabric criteria as it encroaches on the communities of Solina and Leskard and slightly encroaches on the Village of Tyrone. Barrier effects are created for the communities of Solina and Tyrone.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in low property impacts relative to the other alternatives with a total of 93 property impacts including 19 residential displacements.

There are 89 noise sensitive receptors that could potentially be impacted by this route alternative and 178 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina, Leskard and slightly on Tyrone
- 93 properties affected, including 19 residential displacements
- 89 noise sensitive receptors
- 178 air quality sensitive receptors

Land Use/Economic Environment

The route has a moderate degree of compatibility with municipal and regional development goal and objectives because the route would be partially compatible with the Durham ROP and Clarington OP. However, the general route location has not been identified in the Durham Regional Official Plan and the route differs from the route shown in the Clarington Official Plan.

There is a low impact on businesses displaced, with one home occupation displaced. There is potential for increased business exposure for an orchard, cider house and home occupation.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. One specialty crop area or operation were observed or affected in this area, and one livestock operation would be affected by this proposed route. Forty-six (46) field crop operations would be affected, resulting in the loss of land and severance of property. Thirty-four (34) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Forty-three (43) parcels of land greater than 20 ha and 24 parcels less than 20 ha would be created. Two high investment agricultural operations (specialty crop and livestock) would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, two (2) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include an agricultural equipment company (high potential for site contamination) and a spill occurrence location (moderate potential for site contamination). No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- Moderate compatibility with the provincial/municipal and private land use development strategies
- One business displaced (home occupation)
- One specialty crop area/operation affected
- One livestock operation and forty-six field crop operations affected
- Two high investment agricultural operations affected
- Two properties with potential for site contamination impacted

Cultural Environment

One Undetermined archaeological site (BaGp-8) was identified within this route segment. There is also one Aboriginal isolated find (AlGq-7) within this route segment. More than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites and areas of archaeological potential are high albeit should this site be affected by construction activities, there may be opportunities for mitigation (protection and/or avoidance).

Route EM3 will displace or disrupt twenty-five (25) cultural heritage landscapes and one (1) built heritage resource.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM3 is approximately 19 km. The route is direct.

Alternative EM3 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM3 is moderately compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignment of Concession Road 7 and Mosport Road are required and a longer extension of Darlington-Clarke Townline Road is required. Route EM3 does provide a seamless connection with Highway 115 to Peterborough.

Alternative EM3 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM3 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link.

Alternative EM3 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM3 is \$245M.

Summary of net effects:

- Very direct route
- Provides a seamless connection to Highway 115
- Requires upgrading of the regional road system beyond what is shown in Durham Region's Transportation Master Plan (TMP)
- Provides interchanges at all major arterial roads
- Low relative cost

5.6.1.4 Route EM4

Route EM4 is illustrated in **Figure 5.11**.

Figure 5.11: Route Alternative EM4



Natural Environment

There are only 31 surface water features that need to be crossed along route EM4. Of these crossings there are 11 high quality streams, 9 moderate quality streams, 2 low quality streams, 7 ephemeral drainage features and 2 ponds.

This route affects 2535m of high sensitivity streams, of which 1145m would be spanned and 1390m would be crossed using culverts. Also, there are 3480m of moderate sensitivity fish habitat streams to cross using culverts and 1300m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM4 will result in the removal of 122 ha of upland vegetation and has the potential to negatively impact 33 upland vegetation units. Encroachment into two high quality vegetation units and one significant vegetation community will occur. No species at risk or of conservation concern will be removed by the alternative.

EM4 does not remove any PSW, but removes 14 ha (23 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 59 ha of core area, 5 ha of interior habitat and 3 ha of deep interior habitat. There are about 29 ha of specialized or sensitive wildlife habitat (SSWH) area directly affected. Much of the SSWH and deep interior habitat are within one very large high quality patch (largest in East Mainline). There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM4 severs and/or encroaches into five ESAs. As per CLOCA's ESA sensitivity ranking, four of these ESAs are highly sensitive and one is moderately sensitive.

Three high quality linkages are severed by EM4.

Route EM4 covers 303 ha of low permeability soil, crosses 186 ha of high permeability soil - 68 ha of which comprises ORM sediments, intersects 16 water wells within the route and associated interchange footprints, intersects 21 shallow water wells in low permeability soil and 16 shallow water wells in high permeability soil within the 500 m buffer, intersects 19 deep wells in ORM sediment within the 500 m buffer, and has 11 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer.

Summary of net effects:

- High net effects for ground water
- Increased number of features crossed and increase in moderate quality features affected
- Substantially higher net effects on vegetation
- No Provincially Significant Wetlands are crossed
- Removal of large amounts of core wildlife habitat, interior habitat and SSWH
- Deep interior habitat removed

Social Environment

The EM4 route extends from the northerly central mainline route option. The route has a moderate impact on the community fabric criteria as it encroaches on the communities of Solina and Leskard, and slightly encroaches on the Village of Tyrone. Barrier effects are created for the communities of Solina and Tyrone.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in moderate property impacts relative to the other alternatives with a total of 114 properties affected including 18 residential displacements.

There are 112 noise sensitive receptors that could potentially be impacted by this route alternative and 203 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina, Leskard and slightly on Tyrone
- 114 properties affected, including 18 residential displacements
- 112 noise sensitive receptors
- 203 air quality sensitive receptors

Land Use/Economic Environment

The route has a moderate degree of compatibility with municipal and regional development goal and objectives because the route is partially compatible with the Durham ROPA and Clarington OP. However, the general route location has not been identified in the Durham Regional Official Plan and the route differs from the route shown in the Clarington Official Plan.

There is a low impact for non-farm commercial activity with an orchard displaced. There is a potential for increased business exposure for six businesses located adjacent to the route alternative along Concession Road 78, Clemens Road, Liberty Street, Cole Road and Highway 35/115. There may be possible impacts for the two Bed and Breakfasts during construction.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. One specialty crop area or operation and one livestock operation would be affected by this proposed route. Forty-five (45) field crop operations would be affected, resulting in the loss of land and severance of property. Thirty-three (33) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Thirty-eight (38) parcels of land greater than 20 ha and 33 parcels less than 20 ha would be created. Two high investment agricultural operations (specialty crop and livestock) would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, two (2) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include an agricultural equipment company (high potential for site contamination) and a spill occurrence location (moderate potential for site contamination). No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- Moderate compatibility with the provincial/municipal and private land use development strategies
- One business displaced (orchard)
- One specialty crop area/operation affected
- One livestock operation and forty-five field crop operations affected
- Two high investment agricultural operations affected
- Two properties with potential for site contamination impacted

Cultural Environment

One archaeological isolated find (AIGq-7) was identified within this route segment and more than 50% of the segment identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites is low while there is a potentially high net effect for areas of archaeological potential.

Route EM4 will displace or disrupt twenty-three (23) cultural heritage landscapes and zero (0) built heritage resources.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM4 is approximately 20 km. The route is less direct than other alternatives.

Alternative EM4 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM4 is highly compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignments of Concession Road 7 and Concession Road 6/7 are required and a longer extension of Darlington-Clarke Townline Road is required. Route EM4 does provide a seamless connection with Highway 115 to Peterborough.

Alternative EM4 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM4 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link.

Alternative EM4 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM4 is \$260M.

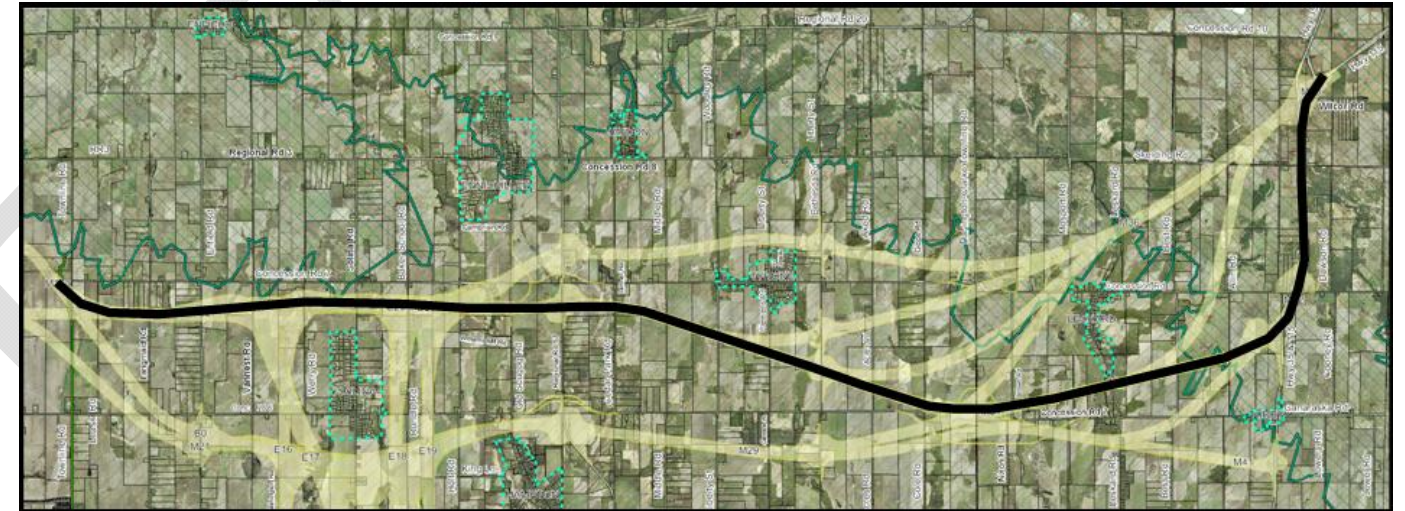
Summary of net effects:

- Moderate out-of-way travel
- Provides a seamless connection to Highway 115
- Does not require upgrading of the regional road system beyond what is shown in Durham Region's Transportation Master Plan (TMP)
- Provides interchanges at all major arterial roads
- One of the lowest cost alternatives

5.6.1.5 Route EM5

Route EM5 is illustrated in **Figure 5.12**.

Figure 5.12: Route Alternative EM5



Natural Environment

There are 32 surface water features that need to be crossed along route EM5. Of these crossings there are 10 high quality streams, 9 moderate quality streams, 2 low quality streams, 9 ephemeral drainage features and 2 ponds.

This route affects 2235m of high sensitivity streams, of which 1145m would be spanned and 1090m would be crossed using culverts. Also, there are 3480m of moderate sensitivity fish habitat streams to cross using culverts and 1300m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM5 will result in the removal of 70 ha of upland vegetation and has the potential to negatively impact 24 upland vegetation units. Encroachment into two high quality vegetation units will occur. No significant vegetation communities, species at risk or of conservation concern will be removed by the alternative.

EM5 does not remove any PSW, but removes 14 ha (24 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects the least amount of core area (37 ha), a negligible amount of interior habitat and no deep interior habitat. There are about 6 ha of specialized or sensitive wildlife habitat area directly affected. There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM5 severs and/or encroaches into five ESAs. As per CLOCA's ESA sensitivity ranking, four of these ESAs are highly sensitive and one is moderately sensitive.

One high quality linkage is severed by EM5.

Route EM5 covers 322 ha of low permeability soil, crosses 164 ha of high permeability soil - 29 ha of which comprises ORM sediments, intersects 19 water wells within the route and associated interchange footprints, intersects 21 shallow water wells in low permeability soil and 15 shallow water wells in high permeability soil within the 500 m buffer, intersects 16 deep wells in ORM sediment within the 500 m buffer, and has 8 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer.

Summary of net effects:

- Passes through the Oak Ridges Moraine sediments
- Effects on high and moderate sensitivity fish habitat streams
- Removes little upland vegetation, hits few high quality vegetation units and does not require the removal of Provincially Significant Vegetation communities
- No Provincially Significant Wetlands are crossed
- Low amount of core wildlife habitat, a negligible amount of interior habitat and low amount of specialized and sensitive wildlife habitat (SSWH) is removed

Social Environment

The EM5 route extends from the northerly central mainline route option. The route has a moderate impact on the community fabric criteria as it encroaches on the communities of Solina and Leskard and slightly encroaches on the Village of Tyrone. Barrier effects are created for the communities of Solina and Tyrone.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in high property impacts relative to the other alternatives with a total of 138 properties affected including 23 residential displacements

There are 107 noise sensitive receptors that could potentially be impacted by this route alternative and 191 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina, Leskard and slightly on Tyrone
- 138 properties affected, including 23 residential displacements
- 107 noise sensitive receptors
- 191 air quality sensitive receptors

Land Use/Economic Environment

The route has a moderate degree of compatibility with municipal and regional development goals and objectives. The general route location has not been identified in the Durham Regional Official Plan. The route is not identified in the Clarington Official Plan.

There is a high impact on non-farm commercial activities with one home occupation displaced and 8 businesses displaced along Highway 35/115 (Boatland RV, Speedway Collision, 1st Auto Parts, Esso/ All in One Stop, Tim Hortons, Petro Canada, Sun Doors and Windows, Freskiw's Garden Centre). There is a high impact because more than 25 employees are displaced. There is a potential for increased business exposure for the orchard, cider house, two home occupations, a nursery and two Bed and Breakfast operations.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. One specialty crop area or operation was affected in this area, and one livestock operation would be affected by this proposed route. Forty-six (46) field crop operations would be affected, resulting in the loss of land and severance of property. Forty-two (42) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Forty-two (42) parcels of land greater than 20 ha and 40 parcels less than 20 ha would be created. Two high investment agricultural operations (specialty crop and livestock) would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, six (6) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include an agricultural equipment company (high potential for site contamination), a transformer station (moderate potential for site contamination), two fuel service stations (high potential for site contamination), one spill location (moderate potential for site contamination) and an automotive garage (high potential for site contamination). No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- Moderate compatibility with the provincial/municipal and private land use development strategies
- Nine businesses displaced
- One specialty crop area/operation affected
- One livestock operation and forty-six field crop operations affected
- One high investment agricultural operation affected
- Six properties with potential for site contamination impacted

Cultural Environment

One archaeological isolated find (AIGq-7) was identified within this route segment and more than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites is low while there is a potentially high net effect for areas of archaeological potential.

Route EM5 will displace or disrupt twenty-three (23) cultural heritage landscapes and one (1) built heritage resource.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM5 is approximately 23 km. The route is less direct than other alternatives.

Alternative EM5 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM5 is highly compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignment of Concession Road 7 and Concession Road 6/7 are required and a longer extension of Darlington-Clarke Townline Road is required. EM5 allows for the upgrading of Highway 35/115 north of Kirby to a higher class freeway standard. Route EM5 does provide a seamless connection with Highway 115 to Peterborough.

Alternative EM5 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM5 provides moderate accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link but also requires conversion of an existing full moves interchange at Concession Rd. 8 and Hwy 35/115 to a partial interchange (to-from the north).

Alternative EM5 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM5 is \$305M.

Summary of net effects:

- Relatively indirect route; moderate out-of-way travel
- Does not provide a seamless connection to Highway 115
- Provides interchanges at all major arterials roads
- Low relative cost

5.6.1.6 Route EM6

Route EM6 is illustrated in **Figure 5.13**.

Figure 5.13: Route Alternative EM6



Natural Environment

There are 34 surface water features that need to be crossed along route EM6. Of these crossings there are 11 high quality streams, 10 moderate quality streams, 2 low quality streams, 9 ephemeral drainage features and 2 ponds.

This route affects 2380m of high sensitivity streams, of which 1120m would be spanned and 1260m would be crossed using culverts. Also, there are 3650m of moderate sensitivity fish habitat streams to cross using culverts and 1300m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM6 will result in the removal of 68 ha of upland vegetation and has the potential to negatively impact 16 upland vegetation units. Encroachment into two high quality vegetation units will occur. No significant vegetation communities are encroached upon by the alternative. Ten species at risk specimens (Butternut and Goldenseal) will be removed by the alternative.

EM6 does not remove any PSW, but removes 17 ha (34 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 40 ha of core area, 4 ha of interior habitat and no deep interior habitat. There are about 11 ha of specialized or sensitive wildlife habitat area directly affected. There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM6 severs and/or encroaches into five ESAs. As per CLOCA's ESA sensitivity ranking, four of these ESAs are highly sensitive and one is moderately sensitive.

No linkages are crossed by EM6.

Route EM6 covers 309 ha of low permeability soil, crosses 107 ha of high permeability soil, intersects 18 water wells within the route and associated interchange footprints, and intersects 21 shallow water wells in low permeability soil and 10 shallow water wells in high permeability soil within the 500 m buffer.

Summary of net effects:

- Does not pass through the Oak Ridges Moraine sediments
- One of the routes that remove the least amount of upland vegetation, hits fewer high quality vegetation units and do not require the removal of Provincially Significant Vegetation communities
- No Provincially Significant Wetlands are crossed
- SSWH and core wildlife habitat are affected, as is some interior habitat
- Does not cross any linkages between core areas

Social Environment

Route EM6 extends from the northerly central mainline route option. The route has a moderate impact on the community fabric criteria as the route encroaches on the community of Solina and slightly encroaches on Tyrone. Barrier effects are created for the communities of Solina and Tyrone.

The route results in high property impacts relative to the other alternatives with a total of 107 properties affected including 26 residential displacements.

There are 107 noise sensitive receptors that could potentially be impacted by this route alternative and 185 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina, Leskard and slightly on Tyrone
- 107 properties affected, including 26 residential displacements
- 107 noise sensitive receptors
- 185 air quality sensitive receptors

Land Use/Economic Environment

The route has a moderate degree of compatibility with municipal and regional development goals and objectives. The general route location has not been identified in the Durham Regional Official Plan. The route is not the same as the route shown in the Clarington Official Plan.

There is a low impact for non-farm commercial activity with a home occupation displaced at Clemens Road. There is potential for increased business exposure for a cider house and three home occupations.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. One specialty crop area or operation were observed or affected in this area and one livestock operation would be affected by this proposed route. Forty-six (46) field crop operations would be affected, resulting in the loss of land and severance of property. Forty-two (42) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Forty-two (42) parcels of land greater than 20 ha and 40 parcels less than 20 ha would be created. Three high investment agricultural operations would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, one (1) property with the potential for site contamination will be directly impacted by this route alternative in rural areas. The property is an agricultural equipment company and has a high potential for site contamination. One (1) former waste disposal site will be disturbed by this route alternative, and has a high potential for site contamination. Under the EPA, no land used for the disposal of waste may be used for any other purpose, if the waste disposal site has been closed for less than 25 years, without a Minister's Order.

Summary of net effects:

- Moderate compatibility with the provincial/municipal and private land use development strategies
- One business displaced (home occupation)
- One specialty crop area/operation affected
- One livestock operation and forty-six field crop operations affected
- Three high investment agricultural operations affected
- One property with potential for site contamination and one former waste disposal site impacted

Cultural Environment

There are three archaeological Aboriginal isolated finds (AIGq-7, BaGp-18 and BaGp-23) within this route segment and more than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites is low while there is a potentially high net effect for areas of archaeological potential.

Route EM6 will displace or disrupt twenty-two (22) cultural heritage landscapes and one (1) built heritage resource.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM6 is approximately 16 km. The route is the least direct alternative resulting in out of way travel using of Highway 35/115.

Alternative EM6 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM6 has a low degree of compatibility with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be

required. Realignments of Concession Road 7 and Concession Road 6/7 are required and a longer extension of Darlington-Clarke Townline Road is required. Route EM6 does not provide a seamless connection with Highway 115 to Peterborough and may preclude a potential future higher class freeway connection along Highway 35/115 to Highway 115.

Alternative EM6 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM6 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link.

Alternative EM6 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM6 is \$245M.

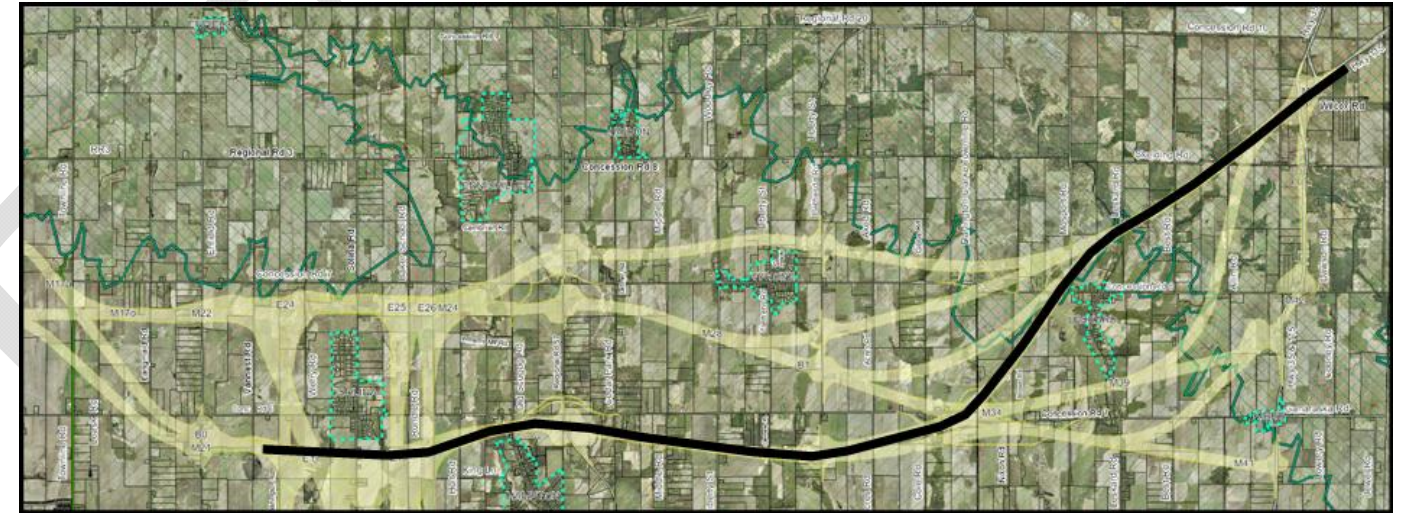
Summary of net effects:

- Relatively indirect route; moderate out-of-way travel
- Does not provide a seamless connection to Highway 115
- Provides interchanges at all major arterials roads
- Low relative cost

5.6.1.7 Route EM7

Route EM7 is illustrated in **Figure 5.14**.

Figure 5.14: Route Alternative EM7



Natural Environment

There are only 32 surface water features that need to be crossed along route EM7. Of these crossings there are 11 high quality streams, 6 moderate quality streams, 4 low quality streams, 6 ephemeral drainage features and 5 ponds.

This route affects 2700m of the high sensitivity streams, of which 1445m would be spanned and 1255m would be crossed using culverts. Also, there are 2095m of moderate sensitivity fish habitat streams to cross using culverts and 870m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM7 will result in the removal of 93 ha of upland vegetation and has the potential to negatively impact 33 upland vegetation units. Encroachment into two high quality vegetation units and one significant vegetation community will occur. No species at risk or of conservation concern will be removed by the alternative.

EM7 removes 0.94 ha of Provincially Significant Black-Farewell wetland complex and 17 ha (34 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 76 ha of core area, 8 ha of interior habitat and 3 ha of deep interior habitat. There are about 40 ha of specialized or sensitive wildlife habitat (SSWH) area that would be directly affected. These SSWH are in numerous large patches, including the largest patch in the East Mainline. There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM7 severs and/or encroaches into six ESAs. As per CLOCA's ESA sensitivity ranking, five of these ESAs are highly sensitive and one is moderately sensitive.

Two high quality linkages are severed by EM7.

Route EM7 covers 142 ha of low permeability soil, crosses 234 ha of high permeability soil - 60 ha of which comprises ORM sediments, intersects 12 water wells within the route and associated interchange footprints, intersects 9 shallow water wells in low permeability soil and 32 shallow water wells in high permeability soil within the 500 m buffer, intersects 19 deep wells in ORM sediment within the 500 m buffer, and has 11 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer. In addition the route crosses the high permeability soils of the Iroquois shoreline which act as headwater areas for streams south of the glaciolacustrine feature.

Summary of net effects:

- Few moderate quality surface water features affected
- Impacts on high and moderate sensitivity fish habitat streams
- High net effects on wetlands
- Large amount of core wildlife habitat and SSWH removed

Social Environment

The EM7 route extends from the southerly central mainline route options. The route has a moderate impact on the community fabric criteria as the route encroaches on the communities of Solina, Leskard and Hampton. Barrier effects are created for the communities of Solina, Leskard and Hampton.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in low property impacts relative to the other alternatives with a total of 109 property impacts including 13 residential displacements.

There are 109 noise sensitive receptors that could potentially be impacted by this route alternative and 181 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina, Leskard and Hampton
- 109 properties affected, including 13 residential displacements
- 109 noise sensitive receptors
- 181 air quality sensitive receptors

Land Use/Economic Environment

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

There is a moderate impact on non-farm commercial activity with two equestrian centres displaced at Regional Road 57. There is a potential for increased business exposure for four businesses including a construction yard, lumber mill, junk yard and industrial site. There are two businesses that could be potentially affected during construction.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. No specialty crop area or operations were observed or affected in this area and no livestock operations would be affected by this proposed route. Thirty-five (35) field crop operations would be affected, resulting in the loss of land and severance of property. Twenty-three (23) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Forty-two (42) parcels of land greater than 20 ha and 42 parcels less than 20 ha would be created. One high investment agricultural operation would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, two (2) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include a spill location (moderate potential for site contamination) and an autowrecking and recycling facility (high potential for site contamination). No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- High compatibility with the provincial/municipal and private land use development strategies
- Two businesses displaced (equestrian centres)
- No specialty crop areas/operations affected
- No livestock operations and thirty-five field crop operations affected
- One high investment agricultural operation affected
- Two properties with potential for site contamination impacted

Cultural Environment

One Undetermined archaeological site (BaGp-8) was identified within this route segment. More than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites and areas of archaeological potential are high albeit should this site be affected by construction activities, there may be opportunities for mitigation (protection and/or avoidance).

Route EM7 will displace or disrupt twelve (12) cultural heritage landscapes and two (2) built heritage resources.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM7 is approximately 19 km. The route is less direct than other alternatives.

Alternative EM7 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM7 is highly compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignments of Concession Road 6, Concession Road 6/7, and Mosport Road are required. Route EM7 does provide a seamless connection with Highway 115 to Peterborough.

Alternative EM7 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM7 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link.

Alternative EM1 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM7 is \$260M.

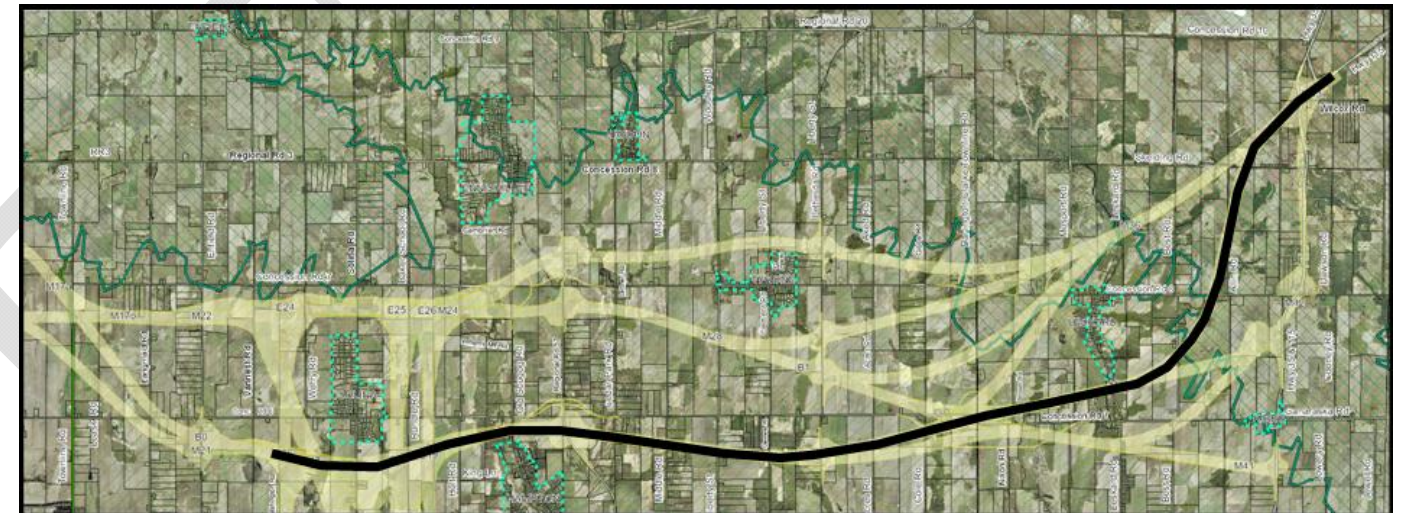
Summary of net effects:

- Moderate out-of-way travel
- Provides a seamless connection to Highway 115
- Does not require upgrading of the regional road system beyond what is shown in Durham Region's Transportation Master Plan (TMP)
- Provides interchanges at all major arterials roads
- Low relative cost

5.6.1.8 Route EM8

Route EM8 is illustrated in **Figure 5.15**.

Figure 5.15: Route Alternative EM8



Natural Environment

There are 28 surface water features that need to be crossed along route EM8. Of these crossings there are 11 high quality streams, zero moderate quality streams, 4 low quality streams, 8 ephemeral drainage features and 5 ponds.

This route affects 2575m of high sensitivity fish habitat streams, of which 1500m would be spanned and 1075m would be crossed using culverts. Also, there are no moderate sensitivity fish habitat streams to cross and 870m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM8 will result in the removal of 104 ha of upland vegetation and has the potential to negatively impact 36 upland vegetation units. Encroachment into one high quality vegetation unit and one significant vegetation community will occur. No species at risk or of conservation concern will be removed by the alternative.

EM8 removes 0.94 ha of Provincially Significant Black-Farewell wetland complex and 14 ha (18 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 75 ha of core area, 8 ha of interior habitat and 3 ha of deep interior habitat. There are 45 ha of specialized or sensitive wildlife habitat (SSWH) area that would be directly affected. These SSWH are in numerous large patches, including the largest patch in the East Mainline. There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM8 severs and/or encroaches into six ESAs. As per CLOCA's ESA sensitivity ranking, five of these ESAs are highly sensitive and one is moderately sensitive.

Two high quality linkages are severed by EM8.

Route EM8 covers 123 ha of low permeability soil, crosses 270 ha of high permeability soil - 68 ha of which comprises ORM sediments, intersects 9 water wells within the route and associated interchange footprints, intersects 9 shallow water wells in low permeability soil and 37 shallow water wells in high permeability soil within the 500 m buffer, intersects 19 deep wells in ORM sediment within the 500 m buffer, and has 11 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer. In addition the route crosses the high permeability soils of the Iroquois shoreline which act as headwater areas for streams south of the glaciolacustrine feature.

Summary of net effects:

- Low impacts to surface water quality
- Impacts on high sensitivity fish habitat streams and similar anticipated risk to moderate and low sensitivity fish habitat
- Requires the removal of greater than 100 ha of upland vegetation
- High net effects for wetlands
- Large amounts of core wildlife habitat and SSWH are removed

Social Environment

The EM8 route extends from the southerly central mainline route option. The route has a moderate impact on the community fabric criteria as the route encroaches on the communities of Solina, Leskard, and Hampton. Barrier effects are created for the communities of Solina, Leskard and Hampton.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in low property impacts relative to the other alternatives with a total of 107 properties affected including 10 residential displacements.

There are 130 noise sensitive receptors that could potentially be impacted by this route alternative and 206 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina, Leskard and Hampton
- 107 properties affected, including 10 residential displacements
- 130 noise sensitive receptors
- 206 air quality sensitive receptors

Land Use/Economic Environment

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

There is a moderate impact on non-farm commercial activity with two equestrian centres displaced at Regional Road 57. There is potential for increased business exposure for six businesses including a construction yard, lumber mill, junk yard, industrial site and two home occupations. There are two businesses that could potentially be affected during construction.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. No specialty crop areas or operations were observed or affected in this area, and no livestock operations would be affected by this proposed route. Thirty-five (35) field crop operations would be affected, resulting in the loss of land and severance of property. Twenty-three (23) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Forty-two (42) parcels of land greater than 20 ha and 42 parcels less than 20 ha would be created. One high investment agricultural operation would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, two (2) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include a spill location (moderate potential for site contamination) and an autowrecking and recycling facility (high potential for site contamination). No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- High compatibility with the provincial/municipal and private land use development strategies
- Two businesses displaced (equestrian centres)
- No specialty crop areas/operations affected
- No livestock operations and thirty-five field crop operations affected
- One high investment agricultural operation affected
- Two properties with potential for site contamination impacted

Cultural Environment

There are no known archaeological sites within this route segment but more than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites is low while there is a potentially high net effect for areas of archaeological potential.

Route EM8 will displace or disrupt nineteen (19) cultural heritage landscapes and two (2) built heritage resources.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM8 is approximately 20 km. The route is less direct than other alternatives.

Alternative EM8 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM8 is highly compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignment of Concession Road 6 and Concession Rd. 6/7 required are required. Route EM8 does provide a seamless connection with Highway 115 to Peterborough and allows for upgrading of Highway 35/115 to higher class freeway standards north of Kirby. EM8 results in Highway 35/115 and Highway 407 running nearly in parallel between Best Road and Highway 35/115.

Alternative EM1 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM8 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link.

Alternative EM8 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM8 is \$260M.

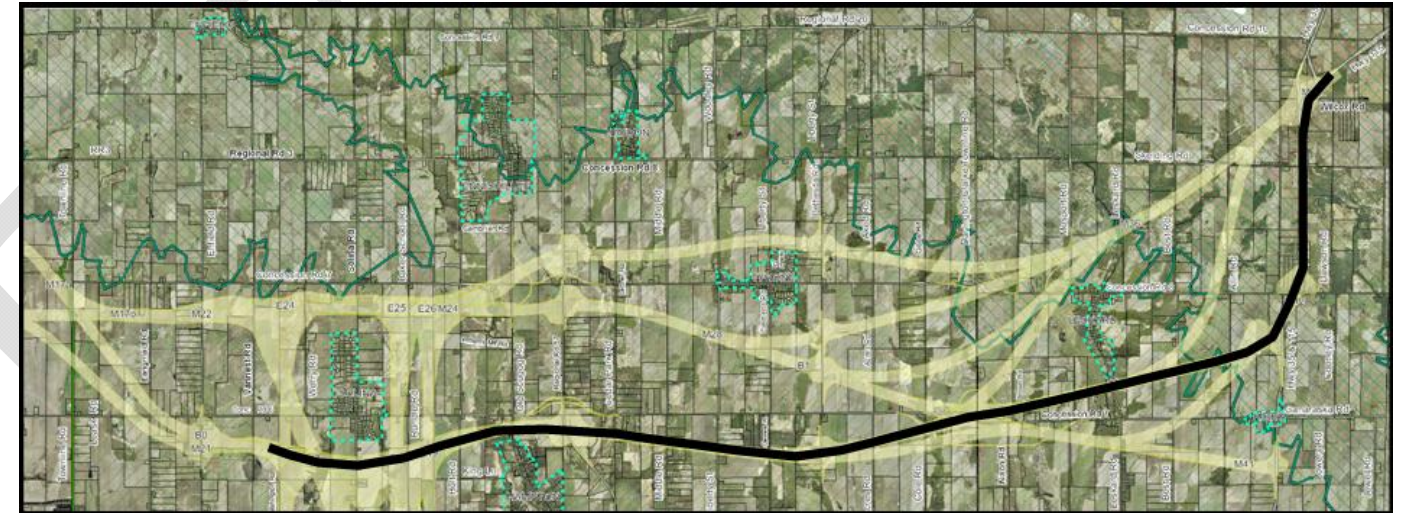
Summary of net effects:

- Moderate out-of-way travel
- Provides a seamless connection to Highway 115
- Does not require upgrading of the regional road system beyond what is shown in Durham Region's Transportation Master Plan (TMP)
- Provides interchanges at all major arterial roads
- Low relative cost

5.6.1.9 Route EM9

Route EM9 is illustrated in **Figure 5.16**.

Figure 5.16: Route Alternative EM9



Natural Environment

There are 29 surface water features that need to be crossed along route EM9. Of these crossings there are 10 high quality streams, zero moderate quality streams, 4 low quality streams, 10 ephemeral drainage features and 5 ponds.

This route affects 2275m of high sensitivity fish habitat streams, of which 1500m would be spanned and only 775m would be crossed using culverts. Also, there are no moderate sensitivity fish habitat streams to cross and 870m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM9 will result in the removal of 70 ha of upland vegetation and has the potential to negatively impact 30 upland vegetation units. Encroachment into one high quality vegetation unit will occur. No significant vegetation communities, species at risk or of conservation concern will be removed by the alternative.

EM9 removes 0.94 ha of Provincially Significant Black-Farewell wetland complex and 14 ha (19 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 55 ha of core area, and 3 ha of interior habitat. It had no deep interior habitat affects. There is about 22 ha of specialized or sensitive wildlife habitat (SSWH) area that is directly affected. These SSWH are in several large patches. There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM9 severs and/or encroaches into six ESAs. As per CLOCA's ESA sensitivity ranking, five of these ESAs are highly sensitive and one is moderately sensitive.

One high quality linkage is severed by EM9.

Route EM9 covers 143 ha of low permeability soil, crosses 264 ha of high permeability soil - 46 ha of which comprises ORM sediments, intersects 12 water wells within the route and associated interchange footprints, intersects 9 shallow water wells in low permeability soil and 36 shallow water wells in high permeability soil within the 500 m buffer, intersects 16 deep wells in ORM sediment within the 500 m buffer, and has 8 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer. In addition the route crosses the high permeability soils of the Iroquois shoreline which act as headwater areas for streams south of the glaciolacustrine feature.

Summary of net effects:

- Low impacts to surface water quality
- Affects a low amount of high sensitivity fish habitat streams
- No anticipated risks to moderate sensitivity fish habitat
- Removes a small amount of upland vegetation, hits few high quality vegetation units and does not require the removal of Provincially Significant Vegetation communities
- Removes portions of a Provincially Significant Wetland

Social Environment

The EM9 route extends from the southerly central mainline route option. The route has a moderate impact on the community fabric criteria as the route encroaches on the communities of Solina, Leskard and Hampton. Barrier effects are created for the communities of Solina, Leskard and Hampton.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in moderate property impacts relative to the other alternatives with a total of 130 properties affected including 15 residential displacements.

There are 126 noise sensitive receptors that could potentially be impacted by this route alternative and 196 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina, Leskard and Hampton
- 130 properties affected, including 15 residential displacements
- 126 noise sensitive receptors
- 196 air quality sensitive receptors

Land Use/Economic Environment

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

There is a high impact on non-farm commercial activity with seven business displaced. There is potential for increased business exposure for seven businesses including a construction yard, lumber mill, junk yard, industrial site, orchard cider house and two home occupations. There are two businesses that could potentially be affected during construction.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. No specialty crop areas or operations were observed or affected in this area and no livestock operations would be affected by this proposed route. Thirty-five (35) field crop operations would be affected, resulting in the loss of land and severance of property. Twenty-three (23) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Forty (40) parcels of land greater than 20 ha and 42 parcels less than 20 ha would be created. One high investment agricultural operation would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. Seven (7) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include a transformer station (moderate potential for site contamination), two fuel service stations (high potential for site contamination), a spill location (moderate potential for site contamination), an autowrecking and recycling facility (high potential for site contamination), and two automotive garages (high potential for site contamination). In addition, an automotive garage is located in a rural area adjacent to this route alternative, but it will not be directly impacted. No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- High compatibility with the provincial/municipal and private land use development strategies
- Seven businesses displaced
- No specialty crop areas/operations affected
- No livestock operations and thirty-five field crop operations affected
- One high investment agricultural operation affected
- Seven properties with potential for site contamination impacted

Cultural Environment

There are no known archaeological sites within this route segment but more than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites is low while there is a potentially high net effect for areas of archaeological potential.

Route EM9 will displace or disrupt nineteen (19) cultural heritage landscapes and two (2) built heritage resources.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM9 is approximately 23 km. The route is less direct than other alternatives.

Alternative EM9 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM9 is highly compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignments of Concession Road 6 and Concession Rd. 6/7 are required and a longer extension of Darlington-Clarke Townline Road is required. EM9 allows for the upgrading of Highway 35/115 north of Kirby to a higher class freeway standard and provides a seamless connection with Highway 115 to Peterborough.

Alternative EM9 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM9 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link.

Alternative EM9 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM9 is \$310M.

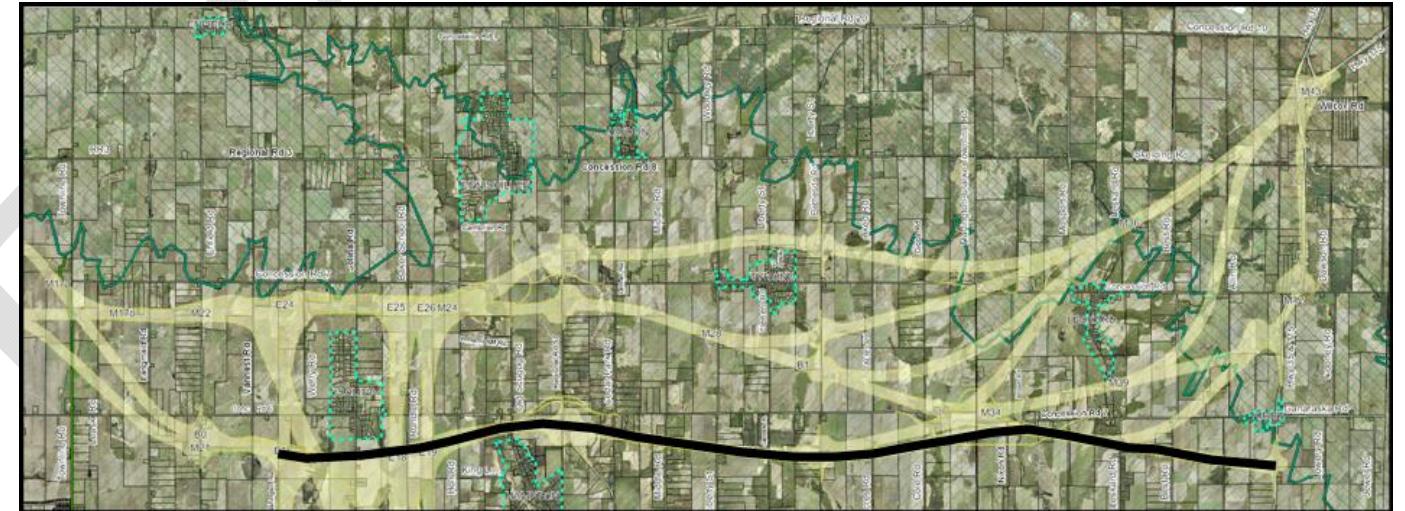
Summary of net effects:

- Moderate out-of-way travel
- Provides a seamless connection to Highway 115
- Does not require upgrading of the regional road system beyond what is shown in Durham Region's Transportation Master Plan (TMP)
- Provides full or partial interchanges at all major arterial roads
- High relative cost

5.6.1.10 Route EM10

Route EM10 is illustrated in **Figure 5.17**.

Figure 5.17: Route Alternative EM10



Natural Environment

There are 28 surface water features that need to be crossed along route EM10. Of these crossings there are 11 high quality streams, 1 moderate quality streams, 5 low quality streams, 7 ephemeral drainage features and 4 ponds.

This route affects 2650m of high sensitivity fish habitat streams, of which 1525m would be spanned and 1125m would be crossed using culverts. Also, there are only 170m of moderate sensitivity fish habitat streams to cross using culverts and 1040m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM10 will result in the removal of 91 ha of upland vegetation and has the potential to negatively impact 26 upland vegetation units. Encroachment into one high quality vegetation unit will occur. No significant vegetation communities will be affected by the alternative. Ten species at risk (Butternut and Goldenseal) will be removed by the alternative.

EM10 removes 0.94 ha of Provincially Significant Black-Farewell wetland complex and 14 ha (21units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 56 ha of core area, and 7 ha of interior habitat. It had no deep interior habitat affects. There are about 28 ha of specialized or sensitive wildlife habitat (SSWH) area that would be directly affected. These SSWH are in numerous large patches. There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM10 severs and/or encroaches into six ESAs. As per CLOCA's ESA sensitivity ranking, five of these ESAs are highly sensitive and one is moderately sensitive.

No linkages are crossed by EM10.

Route EM10 covers 124 ha of low permeability soil, crosses 191 ha of high permeability soil, intersects 12 water wells within the route and associated interchange footprints, intersects 13 shallow water wells in low permeability soil and 33 shallow water wells in high permeability soil within the 500 m buffer, and crosses the high permeability soils of the Iroquois shoreline which act as headwater areas for stream south of the physiographic feature.

Summary of net effects:

- Low impacts to surface water quality
- Impacts on high sensitivity fish habitat streams
- High net effects regarding wetlands
- Large amounts of core wildlife habitat, interior habitat and SSWH removed
- Does not cross any linkages between core areas

Social Environment

The EM10 route extends from the southerly central mainline route option. The route has a moderate impact on the community fabric criteria as the route encroaches on the communities of Solina and Hampton. Barrier effects are created for the communities of Solina and Hampton.

The route results in high property impacts relative to the other alternatives with a total of 102 properties affected including 22 residential displacements.

There are 121 noise sensitive receptors that could potentially be impacted by this route alternative and 183 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina and Hampton
- 102 properties affected, including 22 residential displacements
- 121 noise sensitive receptors
- 183 air quality sensitive receptors

Land Use/Economic Environment

The route has a moderate degree of compatibility with municipal and regional development goals and objectives. The general route location has not been identified in the Durham Regional Official Plan and the Clarington Official Plan.

There is a moderate impact on non-farm commercial activity with two equestrian centres displaced at Regional Road 57. There is potential for increased business exposure for six businesses including a construction yard, lumber mill, junk yard, industrial site, and two home occupations.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. No specialty crop area or operations were observed or affected in this area. No livestock operations would be affected by this proposed route. Thirty-five (35) field crop operations would be affected, resulting in the loss of land and severance of property. Twenty-three (23) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Forty (40) parcels of land greater than 20 ha and 42 parcels less than 20 ha would be created. One high investment agricultural operation would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, one (1) property with the potential for site contamination will be directly impacted by this route alternative in rural areas. The property is an autowrecking and recycling facility and has a high potential for site contamination. One (1) former waste disposal site will be disturbed by this route alternative, and has a high potential for site contamination. Under the EPA, no land used for the disposal of waste may be used for any other purpose, if the waste disposal site has been closed for less than 25 years, without a Minister's Order.

Summary of net effects:

- Moderate compatibility with the provincial/municipal and private land use development strategies
- Two businesses displaced (equestrian centres)
- No specialty crop areas/operations affected
- No livestock operations and thirty-five field crop operations affected
- One high investment agricultural operation affected
- One property with potential for site contamination and one former waste disposal site impacted

Cultural Environment

There are two Aboriginal isolated finds (BaGp-18 and BaGp-23) within this route segment and more than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites is low while there is a potentially high net effect for areas of archaeological potential.

Route EM10 will displace or disrupt seventeen (17) cultural heritage landscapes and three (3) built heritage resources.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM10 is approximately 16 km. The route is the least direct alternative resulting in out of way travel using of Highway 35/115.

Alternative EM10 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM10 has a low degree of compatibility with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignments of Concession Road 6 and Concession Road 6/7 are required and a longer extension of Darlington-Clarke Townline Road is required. Route EM10 does not provide a seamless connection with Highway 115 to Peterborough and may preclude a potential future higher class freeway connection along Highway 35/115 to Highway 115.

Alternative EM10 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM10 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Additionally, it allows for a full interchange at Taunton Road on the East Link.

Alternative EM10 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM10 is \$235M.

Summary of net effects:

- Moderate out-of-way travel
- Does not provide a seamless connection to Highway 115; "lower-order" section of highway (Highway 35/115) retained
- Provides full or partial interchanges at all major arterial roads
- Low relative cost

5.6.1.11 Route EM11

Route EM11 is illustrated in **Figure 5.18**.

Figure 5.18: Route Alternative EM11



Natural Environment

There are 34 surface water features that need to be crossed along route EM11. Of these crossings there are 10 high quality streams, 10 moderate quality streams, 3 low quality streams, 8 ephemeral drainage features and 3 ponds.

This route affects 2380m of high sensitivity streams, of which 1120m would be spanned and 1260m would be crossed using culverts. Also, there are 3330m of moderate sensitivity fish habitat streams to cross using culverts and 1475m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM11 will result in the removal of 79 ha of upland vegetation and has the potential to negatively impact 32 upland vegetation units. Encroachment into two high quality vegetation units will occur. No significant vegetation communities will be affected by the alternative. Nine species at risk specimens (Butternut) will be removed by the alternative.

EM11 does not remove any PSW, but removes 17 ha (34 units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 46 ha of core area, 4 ha of interior habitat and no deep interior habitat. There are 11 ha of specialized or sensitive wildlife habitat area directly affected. There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM11 severs and/or encroaches into five ESAs. As per CLOCA's ESA sensitivity ranking, four of these ESAs are highly sensitive and one is moderately sensitive.

One high quality linkage is severed by EM11.

Route EM11 covers 294 ha of low permeability soil, crosses 149 ha of high permeability soil - 29 ha of which comprises ORM sediments, intersects 20 water wells within the route and associated interchange footprints, intersects 26 shallow water wells in low permeability soil and 15 shallow water wells in high permeability soil within the 500 m buffer, intersects 19 deep wells in ORM sediment within the 500 m buffer, and has 11 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer. In addition the route crosses the high permeability soils of the Iroquois shoreline which act as headwater areas for streams south of the glaciolacustrine feature.

Summary of net effects:

- Moderate quality features affected
- No Provincially Significant Wetlands are crossed
- Great amounts of SSWH and core wildlife habitat are affected, as is some interior habitat
- One high quality linkage severed

Social Environment

The EM11 route extends from the southerly central mainline route option. The route has a moderate impact on the community fabric criteria as it encroaches on the communities of Solina and Leskard and slightly encroaches on Tyrone. Barrier effects are created for the communities of Solina, Leskard and Tyrone.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in high property impacts with a total of 106 property impacts including 21 residential displacements.

There are 119 noise sensitive receptors that could potentially be impacted by this route alternative and 223 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina, Leskard and slightly on Tyrone
- 106 properties affected, including 21 residential displacements
- 119 noise sensitive receptors
- 223 air quality sensitive receptors

Land Use/Economic Environment

The route has a moderate degree of compatibility with municipal and regional development goals and objectives. The general route location has not been identified in the Durham Regional Official Plan or the Clarington Official Plan.

There is a high impact on non-farm commercial activity with one home occupation displaced at Clemens Road and 8 businesses displaced along Highway 35/115 (Boatland RV, Speedway Collision, 1st Auto Parts, Esso/ All in One Stop, Tim Hortons, Petro Canada, Sun Doors and Windows, Freskiw's Garden Centre). There is potential for increased business exposure for the orchard cider house and one home occupation.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. One specialty crop area or operation was observed or affected in this area. One livestock operation would be affected by this proposed route. Forty-nine (49) field crop operations would be affected, resulting in the loss of land and severance of property. Forty-four (44) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Forty-four (44) parcels of land greater than 20 ha and 40 parcels less than 20 ha would be created. Three high investment agricultural operations would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, seven (7) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include an agricultural equipment company (high potential for site contamination), a transformer station (moderate potential for site contamination), two fuel service stations (high potential for site contamination), a spill location (moderate potential for site contamination), an automotive garage (high potential for contamination), and an automotive centre and storage yard (high potential for site contamination). No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- Moderate compatibility with the provincial/municipal and private land use development strategies
- Nine businesses displaced
- One specialty crop area/operation affected
- One livestock operation and forty-nine field crop operations affected
- Three high investment agricultural operations affected
- Seven properties with potential for site contamination impacted

Cultural Environment

There is one Aboriginal isolated find (AIGq-7) along this route segment and more than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites is low while there is a potentially high net effect for areas of archaeological potential.

Route EM11 will displace or disrupt thirty-three (33) cultural heritage landscapes and two (2) built heritage resources.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM11 is approximately 22 km. The route is less direct than other alternatives.

Alternative EM11 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM11 is moderately compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignments of Concession Road 7 and Concession Rd. 6/7 are required and a longer extension of Darlington-Clarke Townline Road is required. Route EM11 allows for the upgrading of Highway 35/115 north of Kirby to a higher class freeway standard and provides a seamless connection with Highway 115 to Peterborough.

Alternative EM11 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM11 provides moderate accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. EM11 requires conversion of an existing full moves interchange at Concession Road 8 and Highway 35/115 to a partial interchange (to-from the north)

Alternative EM11 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM11 is \$305M.

Summary of net effects:

- Moderate out-of-way travel
- Provides a seamless connection to Highway 115
- Does not require upgrading of the regional road system beyond what is shown in Durham Region's Transportation Master Plan (TMP)
- Provides full or partial interchanges at all major arterial roads
- One of the more costly routes

5.6.1.12 Route EM12

Route EM12 is illustrated in **Figure 5.19**.

Figure 5.19: Route Alternative EM12



Natural Environment

There are 27 surface water features that need to be crossed along route EM12. Of these crossings there are 10 high quality streams, 1 moderate quality streams, 4 low quality streams, 9 ephemeral drainage features and 3 ponds.

This route affects 1920m of high sensitivity fish habitat streams, of which 1525m would be spanned and only 395m would be crossed using culverts. Also, there are only 850m of moderate sensitivity fish habitat streams to cross using culverts and 875m of low sensitivity fish habitat streams to cross using culverts. There are no known Species-at-risk found within any of the aquatic features along the route.

EM12 will result in the removal of 108 ha of upland vegetation and has the potential to negatively impact 24 upland vegetation units. Encroachment into three high quality vegetation units will occur. No significant vegetation communities will be affected by the alternative. Nine species at risk specimens will be removed by the alternative.

EM12 removes 0.94 ha of Provincially Significant Black-Farewell wetland complex and 14 ha (22units) of unevaluated wetland. The unevaluated wetland units affected are primarily swamp units that are associated with valley features across this route alternative.

This route affects 63 ha of core area, and 7 ha of interior habitat. It had no deep interior habitat affects. There are about 28 ha of specialized or sensitive wildlife habitat (SSWH) area that would be directly affected. These SSWH are in numerous large patches. There are no known Species-at-risk habitats along the route, and there are several patches of potential habitat for avian species on Schedule 1, Species At Risk Act.

EM12 severs and/or encroaches into seven ESAs. As per CLOCA's ESA sensitivity ranking, six of these ESAs are highly sensitive and one is moderately sensitive.

No linkages are crossed by EM12.

Route EM12 covers 176 ha of low permeability soil, crosses 266 ha of high permeability soil - 29 ha of which comprises ORM sediments, intersects 20 water wells within the route and associated interchange footprints, intersects 20 shallow water wells in low permeability soil and 54 shallow water wells in high permeability soil within the 500 m buffer, intersects 19 deep wells in ORM sediment within the 500 m buffer, and has 11 wells down-gradient of the route footprint in ORM sediments of the 500 m buffer. In addition the route crosses the high permeability soils of the Iroquois shoreline which act as headwater areas for streams south of the glaciolacustrine feature.

Summary of net effects:

- Low impacts to surface water quality
- Low impact to fisheries
- Requires the removal of greater than 100 ha of upland vegetation
- High net effects regarding wetlands
- Does not cross any linkages between core areas

Social Environment

The EM12 route extends from the southerly central mainline route option. The route has a moderate impact on the community fabric criteria as the route encroaches on the communities of Solina, Leskard and Hampton. Barrier effects are created for the communities of Solina, Leskard and Hampton.

The route impacts the Leskard Trail system resulting in a moderate impact on recreational opportunities.

The route results in high property impacts relative to the other alternatives with a total of 117 properties affected including 25 residential displacements.

There are 134 noise sensitive receptors that could potentially be impacted by this route alternative and 189 sensitive receptors that could potentially be impacted from an air quality perspective. No critical receptors are affected by this route.

Summary of net effects:

- Encroaches on communities of Solina, Leskard and Hampton
- 117 properties affected, including 25 residential displacements
- 134 noise sensitive receptors
- 189 air quality sensitive receptors

Land Use/Economic Environment

The route has a moderate degree of compatibility with municipal and regional development goals and objectives. The general route location has not been identified in the Durham Regional Official Plan and the Clarington Official Plan.

There is a high impact on non-farm commercial activity with a home occupation displaced at Regional Road 57 and eight businesses displaced along Highway 35/115 (Boatland RV, Speedway Collision, 1st Auto Parts, Esso/ All in One Stop, Tim Hortons, Petro Canada, Sun Doors and Windows, Freskiw's Garden Centre). There is potential for increased business exposure for seven businesses including a construction yard, lumber mill, junk yard, industrial site, orchard, cider house and two home occupations.

The majority of this section of the East Mainline crosses Class 1 – 3 lands. Smaller areas of Class 4 – 7 lands are crossed in this section and are located within the lower areas and stream channels. No specialty crop areas or operations were observed or affected in this area, and no livestock operations would be affected by this proposed route. Thirty-eight (38) field crop operations would be affected, resulting in the loss of land and severance of property. Thirty-five (35) farm properties greater than 20 ha would be impacted due to the loss of land and potential severance of property. Twenty-three (23) parcels of land greater than 20 ha and 30 parcels less than 20 ha would be created. One high investment agricultural operation would be affected.

No properties with the potential for site contamination will be directly impacted by this route alternative in urban areas. However, seven (7) properties with the potential for site contamination will be directly impacted by this route alternative in rural areas. The properties include a transformer station (moderate potential for site contamination), two fuel service stations (high potential for site contamination), a spill location (moderate potential for site contamination), an autowrecking and recycling facility (high potential for site contamination), an automotive garage (high potential for contamination), and an automotive centre and storage yard (high potential for site contamination). No (known) operating or closed waste management facilities will be disturbed.

Summary of net effects:

- Moderate compatibility with the provincial/municipal and private land use development strategies
- Nine businesses displaced
- No specialty crop areas/operations affected
- No livestock operations and thirty-eight field crop operations affected
- One high investment agricultural operation affected
- Seven properties with potential for site contamination impacted

Cultural Environment

One Aboriginal isolated find (BaGp-23) was identified within this route segment and more than 50% of the segment is identified as having archaeological potential. The potential for adverse effects to known significant archaeological sites is low while there is a potentially high net effect for areas of archaeological potential.

Route EM12 will displace or disrupt twenty-three (23) cultural heritage landscapes and four (4) built heritage resources.

Technical Considerations

There is low potential for traffic diversion to neighbouring communities.

The route length for Alternative EM12 is approximately 22 km. The route is less direct than other alternatives.

Alternative EM12 has moderate potential to support or attract transit ridership through a dedicated transitway and transit stations. This route alternative is not situated close to major urban centres.

EM12 is moderately compatible with the existing and planned road network because improvements to the north-south arterial road network, beyond what is shown in Durham Region's Transportation Master Plan, would be required. Realignment of Concession Road 6 and Concession Rd. 6/7 are required and a longer extension of Darlington-Clarke Townline Road is required. Route EM12 does provide a seamless connection with Highway 115 to Peterborough.

Alternative EM1 can accommodate transit stations at key interchange locations. Transit stations have been designated at Highway 407E/Enfield Road, Highway 407E/Regional Road 57, Highway 407E/Bethesda Road and Highway 35/115.

EM12 provides high accessibility to population and employment centres. Full interchanges are provided at Bethesda Rd. and Highway 35/115 and a partial or full interchange (depending on the choice of East Link route) is provided at Regional Road 57. Route EM12 requires conversion of an existing full moves interchange at Concession Road 8 and Highway 35/115 to a partial interchange (to-from the north)

Alternative EM12 has a high potential to improve emergency access/routing, with interchanges provided at Enfield Road, Regional Road 57, Bethesda Road and Highway 35/115. Overall, response time will be shortened for emergency service vehicles using Highway 407E. Response times for most non-Highway 407E trips will remain the same since there are no significant changes proposed for the local road network.

The preliminary construction cost for Alternative EM12 is \$295M.

Summary of net effects:

- Moderate out-of-way travel
- Provides a seamless connection to Highway 115
- Does not require upgrading of the regional road system beyond what is shown in Durham Region's Transportation Master Plan (TMP)
- Provides full or partial interchanges at all major arterial roads
- High relative cost

5.6.2 Comparative Evaluation

5.6.2.1 Reasoned Argument Results

The reasoned argument evaluation results for Section 5, the East Mainline from Enfield Road to Simcoe Street, are summarized below, with the details provided in the Technical Specialist Reports in **Appendices E through M** and **Supporting Document #3**.

Natural Environment

Routes EM9 and EM11 are ranked first from a Natural Environment perspective as they both have low effects to fisheries and aquatic habitat and low effects to vegetation and Environmental Significant Features. Route EM2 ranked second.

Social Environment

For the East Mainline, from Enfield Road to Hwys 35/115, several route alternatives ranked the highest from a socio-economic perspective. The routes that ranked the highest with the least amount of impact were routes EM8, EM1, EM2 and EM3 as they had least impacts in a majority of criteria and were least impacting on residential displacements.

Land Use/Economic Environment

Routes EM7 and EM8 ranked 1ST in the Economic Factor area because they are the most compatible with Provincial/Municipal Development Strategies and have the lowest net effects within the Non-Farm Commercial Activities and Property Contamination and Waste criteria. In relation to Businesses affected and Agriculture, these two Route rank within the top three of each of these criteria as well. Routes EM3, EM9, EM10 and EM12 tied for second based primarily on the net effects for the Agriculture criterion since the relative effects for the other criteria within this factor area are comparable between these routes.

Cultural Environment

Routes EM8, EM9, and EM12 were ranked as tied for first from a Cultural Environment Factor perspective because they all have no known significant archaeological sites associated with them and only moderate net effects on built heritage and cultural landscape resources. Routes EM4, EM5, EM6, EM7, and EM11 were ranked as tied for second from a Cultural Environment Factor perspective because they each only have one or two isolated aboriginal finds associated with them. The remaining routes were all ranked lower because they each have an undetermined archaeological site associated with them and have either moderate or high net effects on built heritage and cultural landscape resources.

Technical Considerations

Routes EM1-EM4, EM7 and EM8 were ranked first in Technical Considerations. Each of these 6 routes received first-place rankings in Cost and Accessibility. Routes EM1-EM3 were disadvantaged in Transportation System Compatibility (with 2nd place rankings), however this was offset by their first-place rankings in Overall Transportation System Performance. Similarly, routes EM7 and EM8 were disadvantaged in Overall Transportation System Performance, but this was offset by first-place rankings in Transportation System Compatibility. Routes EM5, EM9, EM11 and EM12 were ranked second in the Technical Considerations Factor because of their relatively

low rankings in Accessibility and Cost. Routes EM6 and EM10 were ranked last because of their low rankings in Overall Transportation System Performance and Transportation System Compatibility.

Overall Ranking and Rationale for the East Mainline

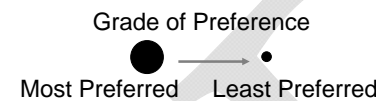
In summary, Route EM 9 is recommended for the following primary reasons:

- Has less significant crossings of vegetation and environmentally significant features
- Has less significant impacts to fisheries and aquatic habitat
- Is least impacting on hydrological features and wetlands
- Displaces fewer residential properties
- Impacts fewer specialty crop and livestock/dairy operations
- Impacts no known archaeological sites

Table 5.6 provides a visual representation of the evaluation results. The results have been revised from those presented at PIC #3 as a result of public comment, peer review and reassessment.

Table 5.6: Visual Representation of Reasoned Argument Evaluation Results for Section 5, East Mainline from Enfield Road to Highway 35/115

Factor Area	Alternative	EM 1	EM 2	EM 3	EM 4	EM 5	EM 6	EM 7	EM 8	EM 9	EM 10	EM 11	EM 12
Natural		•	•	•	•	•	•	•	•	•	•	•	•
Social		•	•	•	•	•	•	•	•	•	•	•	•
Land Use /Economic		•	•	•	•	•	•	•	•	•	•	•	•
Cultural		•	•	•	•	•	•	•	•	•	•	•	•
Technical		•	•	•	•	•	•	•	•	•	•	•	•
Rec'd = Recommended Not Rec'd = Not Recommended		Not Rec'd	Not Rec'd	Not Rec'd	Not Rec'd	Not Rec'd	Not Rec'd	Not Rec'd	Not Rec'd	Rec'd	Not Rec'd	Not Rec'd	Not Rec'd



5.6.2.2 Arithmetic Results

The arithmetic evaluation results for Section 5 confirmed that Route EM9 is the Technically Recommended Route from Enfield Road to Highway 35/115. Route EM9 ranked first overall based on the initial weightings and first overall with the various alternate weightings considered as part of the sensitivity testing. The arithmetic evaluation results are summarized in Table 5.7, with the details provided in Supporting Document #3.

Table 5.7: Arithmetic Evaluation Results for Section 5, East Mainline from Enfield Road to Highway 35/115

Factor		Rankings Based on Initial Weights		
		Alternative EM8	Alternative EM9	Alternative EM12
Natural Environment (40%)		3	1	2
Social Environment (15%)		3	2	1
Land Use/Economic Environment (25%)		1	2	3
Cultural Environment (5%)		1	1	3
Technical Considerations (15%)		1	3	2
Overall Ranking		3	1	2
Sensitivity Analysis				
Factor		Rankings Based on Alternate Weights		
		Alternative EM8	Alternative EM9	Alternative EM12
Natural Environment	High (50%)	3	1	2
Natural Environment	Low (20%)	1	3	2
Social Environment	High (30%)	3	2	1
Social Environment	Low (5%)	2	1	3
Economic Environment	High (50%)	1	2	3
Economic Environment	Low (20%)	3	1	2
Cultural Environment	High (15%)	1	2	2
Cultural Environment	Low (5%)	2	1	3
Technical Environment	High (25%)	1	2	3
Technical Environment	Low (5%)	3	1	2
Stakeholder Weights		3	1	2
Overall Ranking		3	1	2