Ministry of Transportation

Highway 417 (Ottawa Queensway)

from Highway 416 Easterly to Anderson Road
Preliminary Design Study and Environmental Assessment

G.W.P. 663-93-00

Transportation Environmental Study Report
Volume 1 - Main Report and Appendix A

January 2007

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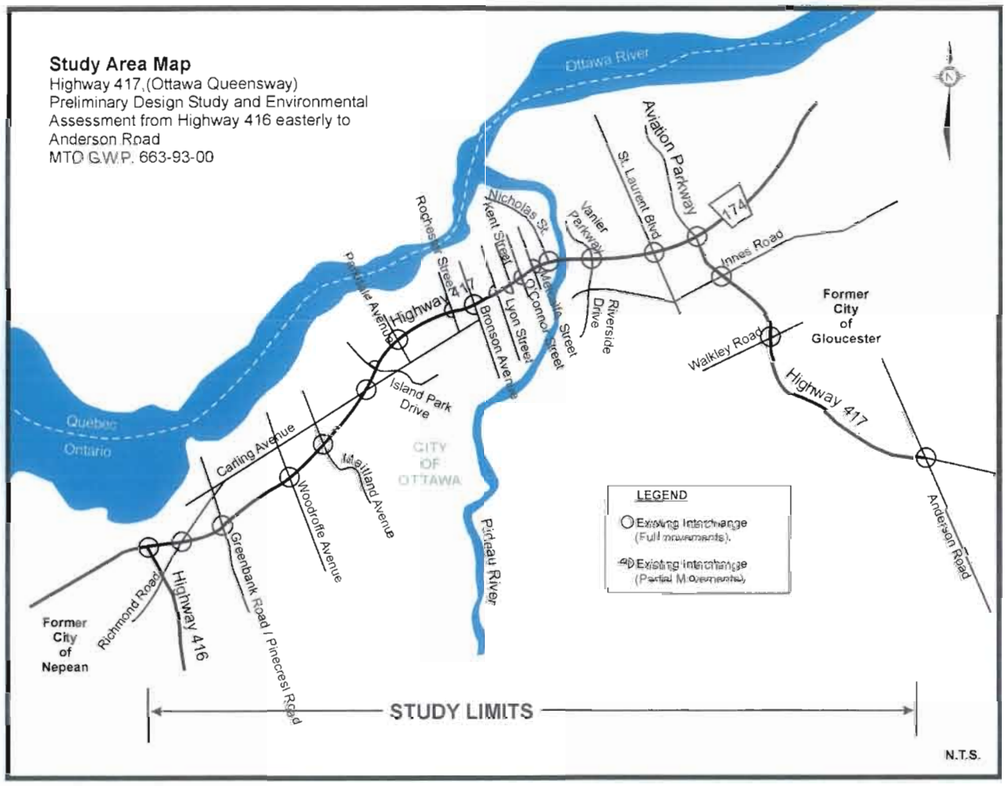

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G.W.P. 663-93-00

Transportation Environmental Study Report

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January 2007

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April 2004

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February 2004

PUBLIC RECORD

Ministry of Transportation

HIGHWAY 417 from Highway 416 easterly 26 km to Anderson Road

TRANSPORTATION ENVIRONMENTAL STUDY REPORT
G.W.P. 663-93-00

A copy of this document has been sent to the following office of the Ministry of Environment to be placed in the public record:

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120 Metcalfe Street
Ottawa, ON K1P 5M2
Tel. 613-236-0301

Elmvale Acres Branch
1910 St-Laurent Boulevard
Ottawa ON K1G 1A4
(613) 738-0619

Blackburn Hamlet Branch
199 Glen Park Drive
Ottawa ON K1B 5B8
(613) 824-6926

North Gloucester Branch
2036 Ogilvie Road
Ottawa ON K1J 7N8
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Carlingwood Branch
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Nepean, ON K2G 5K7
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Ottawa ON K1K 0Z8
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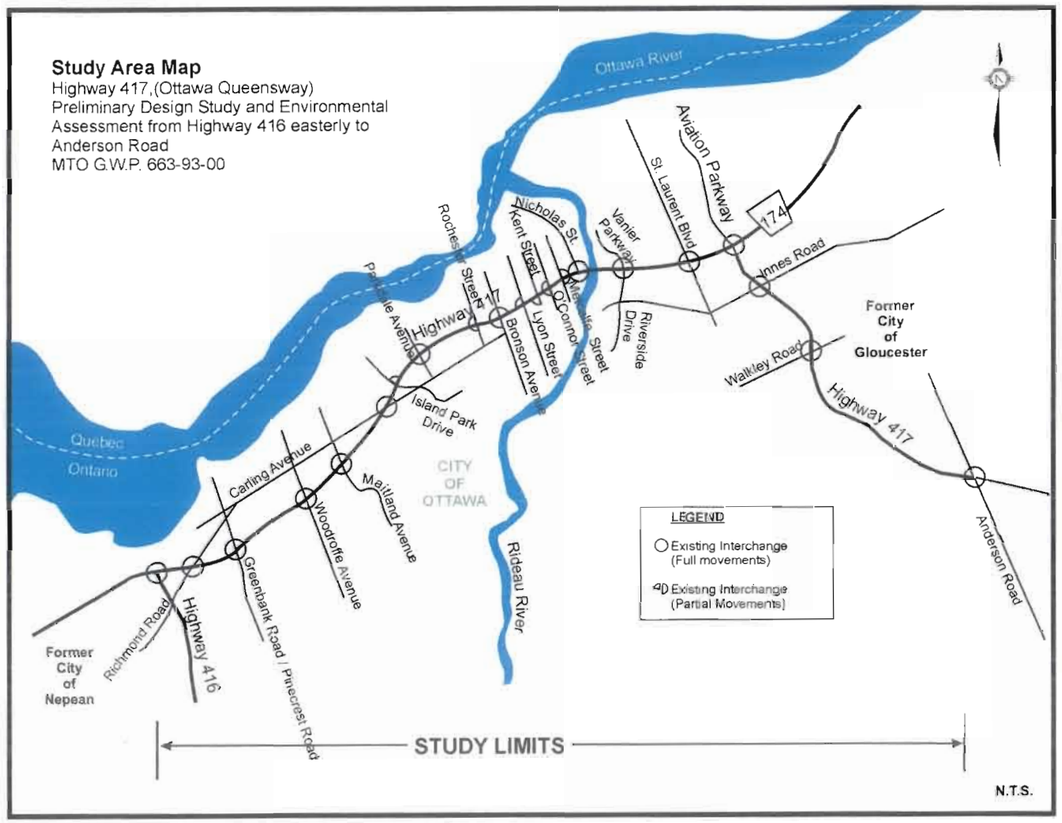
Rosemount Branch
18 Rosemount Avenue
Ottawa ON K1Y 1P4
(613) 729-8664

EXECUTIVE SUMMARY

Introduction and Description of the Undertaking:

In response to growing traffic volumes in the City of Ottawa, the Ministry of Transportation (MTO) initiated this comprehensive operational review of Highway 417 (Ottawa Queensway) from west of Highway 416 easterly to west of Anderson Road, a distance of about 26 km. This study evaluated opportunities to optimize the use of the existing facility, while providing for the efficient movement of people and goods and reducing gridlock. It examined existing and future problems and opportunities and provided a Recommended Plan to guide the evolution of the Queensway over the next 20 years. The study examined the mainline, as well as all interchanges and crossing roadways within the interchange limits. **Exhibit E-1** illustrates the study limits.

Exhibit E-1 Study Area



This *Transportation Environmental Study Report* (TESR) was prepared in accordance with the *Class Environmental Assessment for Provincial Transportation Facilities, 2000*, which has been approved under the Ontario *Environmental Assessment Act* for highway projects undertaken by the Ontario Ministry of Transportation (MTO).

The undertaking, or project, generally includes the following measures:

- Widen Highway 417 by one lane per direction to four mainline lanes in each direction from Highway 416 to Carling Avenue and from Metcalfe Street to Ottawa Road (OR)174;
- Retain the existing number of mainline lanes from Carling Avenue to Metcalfe Street;
- Widen Highway 417 by one lane per direction to three lanes in each direction from Ottawa Road 174 to east of Walkley Road;
- Retain the existing basic horizontal and vertical mainline geometry throughout;
- Modify the interchanges at Richmond Road, Greenbank Road, Woodroffe Avenue, Carling Avenue, Parkdale Avenue, Bronson Avenue, Lyon Street, Nicholas Street and St. Laurent Boulevard to improve safety and traffic operations. The modification at Parkdale Avenue will require the removal of 19 homes on the south side of Westmount Avenue;
- Revise/enhance the drainage system to accommodate proposed widening;
- Rehabilitate pavement, bridges, and the illumination system as required;
- Upgrade/expand the existing Advanced Traffic Management System (ATMS) including additional pavement loop detectors, cameras, changeable message signs and queue end warning devices;
- Upgrade noise walls to current standards; and
- Replace/enhance landscaping.

In the section of Highway 417 from Maitland Avenue to Island Park Drive, construction of the mainline widening will utilize the widened platform built under the *Bridge Rehabilitations Class EA Study – G.W.P. 4058-01-00* to accommodate the additional lane in each direction. No further platform widening will be required within these limits. The environmental impacts, concerns and proposed mitigation measures associated with this work, including the property acquisition requirements and landscaping treatments, were addressed as part of the Bridge Rehabilitations Class EA Study.

Consultation:

Throughout the duration of the study, the public, community and interest groups and agencies were encouraged to participate through a proactive approach that included contact letters and notices, a project web site, three series of Public Involvement Centres, a Municipal Technical Advisory Committee, a Public Advisory Committee and presentations to the Transportation Committee of the City of Ottawa, as well as coverage of events on local television and in newspapers.

Agencies provided valuable input during the course of the study, assisting the Project Team in the collection of background data and the development, evaluation and refinement of alternatives and the Recommended Plan. Agency participation is summarized as follows:

- City of Ottawa provided input on key project issues, transportation information, provided comments on study documentation as it proceeded and participated in the evaluation of design alternatives;
- National Capital Commission (NCC) provided input on the Island Park Drive interchange alternatives and participated in the evaluation of design alternatives;
- Ministry of the Environment and Environment Canada provided advice on the investigation of environmental issues;
- The Canadian Environmental Assessment Agency coordinated the federal EA review of the project;
- Public Works and Government Services Canada provided input on design alternatives at Parkdale Avenue and Island Park Drive;
- Indian and Northern Affairs Canada provided contact information from Aboriginal groups;
- Parks Canada provided input on the bridge over the Rideau Canal; and
- Algonquin's of Pikwakanagan provided information relating to land claims in the area.

The public was actively involved in the study, participating in Public Involvement Centres and providing many comments for consideration. Close to 1400 stakeholders were included in the consultation database by the end of the study. Comments received from the public during the study are summarized as follows:

- Support for public transit priority;
- Support for the proposed strategic widening and many of the recommended interchange improvements;
- General opposition to the alternative to realign the Island Park Drive off-ramp to the west side of Island Park Drive in an area of Hampton Park (this alternative was dropped from the Recommended Plan);
- Concern about traffic operations and safety at many locations;
- Concern about the loss of green space and mature trees, property impacts, neighbourhood impacts, noise, air quality and vibration impacts.

Project Need:

The following problems were identified as a result of the analysis of existing (2001) and future (2021) traffic operations, review of safety data and issues and assessment of the condition of existing infrastructure:

- Mobility and congestion are issues in some sections of Highway 417 during the existing a.m. and p.m. peak travel periods as there is insufficient capacity to accommodate travel demands;
- Mobility and congestion will become even greater issues in sections along Highway 417 during the future a.m. and p.m. peak travel periods as there is insufficient capacity to accommodate projected travel demands despite allowing for the achievement of the City of Ottawa's transit mode share of 30%;
- Congestion and associated delays adversely affect safety and the movement of people and goods;
- Areas of higher than expected collision frequency often coincide with areas of recurring congestion;
- Significant portions of the existing highway infrastructure (e.g. pavement, bridges, lighting, noise walls) are approaching the end of their expected service life;
- There is opportunity to improve road/transit interfaces to improve existing and/or future transit operations;
- Much of the corridor is heavily urbanized, which would significantly limit the amount of widening of the existing highway that could be accommodated without creating significant impact to the local communities that abut the highway; and
- Operational and safety concerns are associated with interchange geometry at some interchanges.

In addition, there are opportunities to support population and employment growth forecasted in the *Ottawa 20/20 Transportation Master Plan, 2003* and the *City of Ottawa Official Plan, 2003,* which in turn will support economic development. By supporting the City target for 30% transit mode share, this work also supports a responsible mobility solution to improvements to the transportation network.

Methodology for the Assessment and Evaluation of Alternatives:

In accordance with the Ontario Environmental Assessment Act, a broad definition of the environment was used to develop the list of factors and sub-factors with corresponding measures used to compare competing alternatives. Both quantitative and qualitative approaches to evaluation were used where appropriate during the process. In order to assess the robustness of the result, a variety of weights were applied to the various factors.

Planning Alternatives:

To resolve the identified problems and the short term (0 to 10 years) to longer term (10 to 20 years) transportation service needs for the Highway 417 corridor within the project limits, the following "Alternatives to" the undertaking were considered:

- Do Nothing
- Alternative Modes – Rail, Water and Air
- Alternative Mode – Bus and Rail Transit
- Alternative Road Solutions:
  - Diversion of traffic to other roads
  - Transportation demand management
  - Improve existing highway
    - Major widening with general purpose lanes
    - Major widening high occupancy vehicle lanes
    - Strategic widening with general purpose lanes
    - Strategic widening with high occupancy vehicle lanes
  - New provincial highway

Following the assessment and evaluation of these alternatives, the following "Alternatives to" the undertaking were carried forward for further analysis. It was determined that the Alternatives that were carried forward would satisfy the traffic and transportation requirements for the Queensway corridor while minimizing property and environmental impacts.

- Do Nothing (i.e. no widening, retain the existing number of lanes) for the existing section of the Queensway from Carling Avenue to Metcalfe Street. While no widening will occur in this section, improvements at interchanges will be considered as part of this alternative;
- Improve existing highway – strategic widening and interchange modifications from Highway 416 to Carling Avenue to provide eight basic lanes, from Metcalfe Street to Ottawa Road 174 to provide eight basic lanes and from Ottawa Road 174 to Walkley Road to provide six basic lanes; and
- Implement transportation demand management and Advanced Traffic Management System measures and improve transit throughout the Queensway corridor to complement other proposed improvements.

Existing Conditions:

Natural Environment:
On the basis of the field inventories and the secondary source investigations conducted as part of this study, the features of natural environmental significance within the study area are as follows:

- A total of 11 watercourses identified as fish habitat (all warm water fish habitat);
- Several areas of vegetation (e.g. woodlot within 417/416 interchange, small forest associated with Pinecrest Creek) and scattered pockets of landscaping throughout the study area primarily situated outside of the existing right-of-way;
- The presence of one Regionally Rare (Butternut) and four Regionally Uncommon vascular species and a pair of Merlins in Hampton Park.

Social-Economic Environment:
The urban setting of the study area means that there are many land uses along the freeway corridor that are significant to the social environment. These include residential (single to multi-family), institutional (churches, schools, embassy), commercial (office buildings, shopping centres, car dealerships, business park, hotels, etc.), recreational (open space

park land, baseball diamonds) and industrial (Ottawa Works yard, car repair). Access to these land uses during construction for vehicles, transit, pedestrians and cyclists will be an important consideration.

Cultural Environment:
While a Stage II archaeological assessment revealed that the existing right-of-way and adjacent area are significantly disturbed with no evidence of archaeological resources found, there is potential for the presence of archaeological resources to be found at any undisturbed location beyond the existing right-of-way.

Built heritage resources, such as the former municipal building on Main Street, do exist adjacent to the Highway 417 corridor and were identified during the existing land use review.

Transportation and Engineering:
The existing Queensway is 3-lanes per direction from Highway 416 to Carling Avenue; 4-lanes per direction from Carling Avenue to Kent Street; 3-lanes per direction from Kent Street to OR 174; and 2-lanes per direction from OR 174 to the east project limit.

Access to the Queensway is provided at grade separated interchanges, many of which do not meet current design standards for a 400 series freeway.

Much of the existing infrastructure is ageing and will require rehabilitation or replacement through the 20 year planning horizon of this study.

Problem Statement:

The following primary concerns were noted for the study area:

- Insufficient capacity to accommodate existing and projected travel demands for the study corridor;
- Locations of higher than expected collision frequency typically associated with locations of recurring congestion;
- The standards used for the original construction and subsequent modifications to Highway 417 through the study area have resulted in a number of features that are considered sub-standard by today's standards, including mainline horizontal and vertical alignment elements, ramp geometry and lane/shoulder widths; and
- The majority of the existing highway infrastructure is in need of significant rehabilitation and/or replacement over the planning horizon of this study in order to maintain its functionality.

Design Alternatives:

The Highway 417 study corridor was divided into independent segments, interchanges and groups of interchanges for the development, assessment and evaluation of design alternatives. Each independent set of alternatives was reviewed to determine the applicable factors and sub-factors for the evaluation process. A multi-disciplinary team with representatives from the City, NCC, MTO and the consultants preformed the evaluation with input for the sensitivity testing from the Public Advisory Committee. The preferred alternatives were then presented to the public and agencies at Public Involvement Centre #2 and refinements were made to reflect input received.

Mainline:
The alternatives for the mainline widening were limited to:

- Do Nothing; and
- Strategic Widening including application of positive guidance measures, ATMS and the following basic mainline lanes:
  - Widen from 3 to 4 basic lanes per direction from Highway 416 to Carling Avenue;
  - Retain existing 4 basic lanes per direction from Carling Avenue to Kent Street;
  - Retain existing 3/4 basic lanes per direction from Kent Street to Metcalfe Street;
  - Widen from 3 to 4 basic lanes per direction from Metcalfe Street to Ottawa Road 174; and
  - Widen from 2 to 3 basic lanes per direction from Ottawa Road 174 to east of Walkley Road.

Following the evaluation, strategic widening was selected as the preferred design alternative as it addressed traffic operations and safety issues while minimizing impacts on the environment. In order to avoid property impacts to the extent practical, retaining walls were incorporated into the highway design wherever possible. Remaining property requirements to accommodate the proposed widening consist of one residence and some strips of property. A landscaping concept was developed to guide mitigation measures for unavoidable impacts on existing roadside vegetation.

There will be benefits to the City road network as a result of the strategic widening as traffic will be more balanced between Highway 417 and City streets. The strategic widening will help address the future east-west capacity shortfall identified by the City (even with the achievement of the established 30% transit mode share target).

The strategic widening received general support during consultation and was carried forward to the Recommended Plan.

Interchanges:
For each interchange location, alternative ramp configurations and/or closures were identified to address traffic, safety and/or geometric concerns. Some alternatives were developed with input from the public and/or agencies. With the selection of the strategic widening alternative for the mainline, the "base case" alternative for each of the interchanges included modifications to the ramps to fit the mainline widening, where required.

Input from the public was instrumental in the refinement of the technically preferred alternatives. In particular, the initially proposed modification of the ramp at Island Park Drive was removed from consideration. **Table E-1** summarizes the technically preferred alternatives at each location within the Study Area along with the rationale for the selection of that alternative and the associated impacts:

Table E-1 Technically Preferred Interchange Alternatives (See Appendix A for Plans)

Location: **Technically Preferred Alternative**	**Rationale and Impacts**
Merged Ramp from Highway 416/417 to Holly Acres Road:	
Do nothing	Separation of traffic streams or realignment of one of the ramps was not feasible due to the proximity of other roads and bridges
Richmond Road	
North Side: Implement positive guidance measures on westbound off-ramp	This improves safety without requiring geometric changes (no impacts)
South Side: Close Richmond Road eastbound on-ramps; provide new eastbound on-ramp from Holly Acres Road.	This maintains all moves without requiring property from properties along Queensline backing onto the Queensway (some impacts to Graham Creek, traffic operations, emergency response, level of service, trees and shrubs and costs)
Pinecrest / Greenbank Road	
Widening/Profile Change: Do nothing	Additional lane(s) would not address the traffic issues associated with this area. Visibility of traffic signals can be improved without replacing the overpass
North Side: Modify ramps as needed to accommodate the West Transitway and station	Approved plans for West Transitway include interchange modifications at Pinecrest Road that were incorporated into this study.

Table E-1 Technically Preferred Interchange Alternatives (See Appendix A for Plans)

Location: Technically Preferred Alternative	Rationale and Impacts
South Side: Modify curvature of on-ramp from northbound Greenbank Road to the eastbound Queensway. Maintain Ashley Street connection.	Ramp realignment improves geometrics and safety with minor impacts to vegetation and costs. Closure of the Ashley Street ramp connection would have resulted in unacceptable traffic infiltration, operations and safety impacts.
Woodroffe Avenue	
Widening: Widen Woodroffe Avenue to provide northbound left turn lane to the westbound on-ramp	Bridge widening removes left turners from the through lane, improving safety with minor property impacts.
North Side: Reconfigure interchange. Combine the exit to northbound and southbound Woodroffe into one loop ramp on west side of the bridge (Parclo B configuration). Provide direct transit-only ramp connection on east side.	This new configuration addresses safety concerns for pedestrians and cyclists while maintaining transit and general traffic operations and minimizing residential and institutional property impacts.
South Side: Eliminate free flow right turn	This removes free flow conflict with acceptable impact on traffic operations.
Maitland Avenue	
Widening: Widen Maitland Avenue to improve northbound left turn lane for the westbound on-ramp	Bridge widening provides more storage for left turners in both directions with minor impact on institutional property.
North Side: Do nothing	Interchange re-configuration would result in unacceptable impacts to residential and institutional land uses and to traffic on local City streets.
South Side: Do nothing	Interchange re-configuration would result in unacceptable impacts to residential land use. Modifications to signalization to be investigated by the City.
Carling Avenue	
North Side: Do nothing	No reasonable alternatives identified for MTO corridor. Reconfiguration of the interchange would have significant impacts, staging/constructability concerns and be very costly.
South Side: Extend acceleration lanes for on-ramps to the eastbound Queensway from eastbound Carling Avenue and westbound Carling Avenue	The additional acceleration lane length maximizes safety while avoiding impact on Embassy property.
Island Park Drive	
Do nothing	The identified impacts on Hampton Park associated with various alternatives were considered unacceptable.
Parkdale Avenue Interchange	
North Side: Realign westbound off-ramp to the south	Addressed traffic operations, safety and emergency response. Maintains access to Hospital, residential, employment and commercial areas. Requires the removal of 19 homes along the south side of Westmount Avenue.
South Side: Increase length of deceleration lane for eastbound off-ramp and formalize the two-lane approach to Parkdale Avenue	Improves off-ramp capacity thereby reducing queuing onto the highway while minimizing impacts to adjacent property and City streets
Rochester Street	
North Side: Do nothing	Minor traffic control improvements subject to implementation by the City of Ottawa.
Bronson Avenue to Metcalfe Street	
Westbound: Provide lane drop on 417 west of Metcalfe Street off-ramp; retain O'Connor Street on-ramp, close Lyon Street on-ramp except during the p.m. peak; retain Bronson Avenue off-ramp and on-ramp	Improves lane balance through the lane drop. Maintains capacity onto the westbound Queensway during the critical p.m. peak while addressing the weave between Lyon and Bronson ramps during the remainder of the day. Avoids unacceptable traffic impacts.

Table E-1 Technically Preferred Interchange Alternatives (See Appendix A for Plans)

Location: Technically Preferred Alternative	Rationale and Impacts
Eastbound: Lengthen deceleration for eastbound off-ramp at Bronson Avenue and widen ramp to three lanes in the vicinity of the ramp terminal intersection; realign Chamberlain Avenue	Improves capacity and operations at Bronson interchange. Requires removal of institutional building (Ottawa Board of Education building) on east side of Bronson Avenue. Provides opportunity for landscaping. Concerns regarding speed management shared with City for consideration as part of the Area Traffic Management Program.
Metcalfe Street to Nicholas Street	
North Side: Do nothing	Construction of a grade separation to eliminate the weave between Nicholas and Metcalfe would have unacceptable property and social impacts and would be costly. Current geometric standards would be difficult to achieve.
South Side: Do nothing	Construction of a grade separation to eliminate the weave between Metcalfe and Nicholas would have unacceptable property and social impacts and would be costly. Current geometric standards would be difficult to achieve.
Nicholas Street	
North Side: Do nothing	Increasing the ramp radius would reduce the weaving length between Nicholas and Metcalfe.
South Side: Realign eastbound off-ramp to Lees Avenue to line up with Chestnut Street	The improved radius results in a new ramp terminal that can be signalized and a slightly longer weaving distance between Metcalfe and Nicholas. If traffic infiltration becomes a problem, it can be addressed through signage and enforcement in consultation with the City.
Vanier Parkway / Riverside Drive	
Widening: Do nothing	Bridge widening would not address traffic operations issues on the Vanier Parkway.
North Side: Do nothing	Any ramp improvements would reduce the weaving distance between Vanier Parkway and Nicholas Street
St. Laurent Boulevard	
North Side: Provide combined off-ramp from Ottawa Road 174 to Highway 417 eastbound and St. Laurent northbound; preclude access to St. Laurent westbound off -ramp from Highway 417 westbound	Addresses safety concerns by eliminating weave between Highway 417 and Ottawa Road 174 traffic east of St. Laurent and allowing signalization of Labelle intersection. Maintains connection for the majority (2/3) of westbound traffic exiting at St. Laurent. There are resulting impacts on traffic operations along alternative routes, access to commercial district, trees and shrubs, emergency response level of service and fish habitat.
South Side: Close S-E ramp to general purpose traffic; modify ramp diverge at St. Laurent Boulevard for ramp use by transit only.	Partially addresses safety concerns for weaving between St. Laurent and the split. Maintains access from commercial district to eastbound Queensway. Avoids impacts to Cyrville Road south of the Queensway.
Aviation Parkway	
Implement positive guidance measures on ramps	
Innes Road	
Both Sides: Implement positive guidance measures on ramps	Positive guidance measures will improve safety without the significant costs and impacts of ramp realignment especially with the proximity of Green's Creek to the south.
Walkley Road	

Table E-1 Technically Preferred Interchange Alternatives (See Appendix A for Plans)

Location: Technically Preferred Alternative	Rationale and Impacts
East (North) Side: Signalize ramp terminal intersection	Signalization was not warranted at the time of the analysis; however traffic volumes should be monitored and signals installed when the warrants are met. This is expected to occur during the planning horizon of this study.
West (South) Side: Do nothing	In order to address the identified traffic operation problems, additional lanes would have to be added to Walkley Road to the west. Since Walkley Road is under the jurisdiction of the City of Ottawa, this is outside the scope of this study.
Hunt Club Road	
Beyond the scope of this study.	Based on municipal need for a new interchange here, City of Ottawa is the proponent for a separate EA Study currently underway.

The technically preferred alternatives described above were carried forward for preliminary design and further refinement as the Recommended Plan.

Changes Made to the Technically Preferred Alternative:

The Technically Preferred Alternative was presented to review agencies, the Municipal Technical Advisory Committee, the City of Ottawa Transportation Committee, the Public Advisory Committee and the general public at Public Involvement Centre #2. Refinements made to the technically preferred alternatives following this consultation and additional assessment included:

- Addition of transit-only lane at the eastbound off-ramp and the eastbound on-ramp at Holly Acres including a bus stop with platform;
- Addition of transit-only queue jump lane on northbound (eastbound) Richmond Road at the Holly Acres Road/ Nanaimo Drive intersection;
- Deletion of off-ramp modification at Island Park Drive;
- Removal of new connection between Rosemount Avenue and Beverly Avenue on the north side of the Queensway east of Parkdale Avenue;
- Addition of candidate sites for retrofit noise barriers (North side of Highway 417 from Bronson to Lyon; South side of Highway 417 from east of Preston to the existing Parkdale barrier and a series of barriers from Elgin westerly to Glendale);
- Prohibition of southbound left turn from Bronson Avenue to realigned Chamberlain Avenue at the eastbound ramp terminal and inclusion of realigned connection from Imperial Avenue to Chamberlain Avenue;
- Closure of Lyon Street on-ramp except during the p.m. peak period;
- Retention of the ramp from northbound St. Laurent Boulevard to eastbound Highway 417 for transit-only use.

Recommended Plan:

Based on the Technically Preferred Alternatives and the modifications noted above, the recommended plan was developed and then presented to the public and agencies during the third round of Public Involvement Centres. The Recommended Plan included:

- Widen Highway 417 from three to four mainline lanes in each direction from Highway 416 to Carling Avenue and from Metcalfe Street to OR 174;
- Retain the existing number of mainline lanes from Carling Avenue to Metcalfe Street;
- Widen Highway 417 from two to three lanes in each direction from OR 174 to east of Walkley Road;
- Retain the basic horizontal and vertical geometry throughout;
- Modify the interchanges at Richmond Road, Greenbank Road, Woodroffe Avenue, Carling Avenue, Parkdale Avenue, Bronson Avenue, Lyon Street, Nicholas Street and St. Laurent Boulevard to improve safety and traffic operations;
- Revise/enhance drainage system to accommodate proposed widening;
- Rehabilitate pavement, bridges, and the illumination system as required;
- Upgrade the existing Advance Traffic Management System including additional pavement loop detectors, cameras, changeable message signs and queue end warning devices;
- Upgrade noise walls to current standards; and
- Replace/enhance landscaping.

Construction Staging:
The Recommended Plan will be implemented in a series of contracts staged over a number of years. The following factors will be considered in developing proposed packages of work:

- Priority of need;
- System continuity and lane balance; and
- The ability to combine works into logical packages so that traffic impacts are minimized for all users.

In accordance with the *Geometric Design Standards for Ontario Highways (GDSOH)*, the Queensway improvements will be designed for a design speed of 120 km/h, wherever possible. The design speed of a highway is generally set 20 km/h above the posted speed limit. The *GDSOH* also recommends that a design speed of 120 km/h be used for traffic detours required during construction staging. In areas with significant constraints, the design speed may be reduced to 100 km/h to minimize impacts. In these cases, the posted speed on the highway is generally reduced during operation of the detours.

Environmental Impacts:
The Recommended Plan was refined and mitigation measures identified to minimize impacts to the extent practical as follows:

- Natural Environment:
  - If agencies confirm presence of harmful alteration, destruction or disruption of fish habitat as a result of the Recommended Plan, improve aquatic habitat in areas of disturbance and in accordance with the fisheries compensation plan;
  - Replace vegetation, where feasible, in accordance with the landscape concept plan;
  - Minimize vegetation removal; provide protection for those trees to remain;
  - Design stormwater management facilities to reduce runoff to pre-construction rates;
- Social and Cultural Environment:
  - Implement landscaping to enhance aesthetic design of bridges and retaining walls, where appropriate, to minimize visual intrusion and to provide visual screening and aesthetic enhancement; (e.g. Rideau River)
  - Provide noise barrier in the southeast quadrant of the Bronson Avenue interchange to mitigate impacts due to building removal;
  - Provide retrofit noise barriers identified on the Ministry's program;
- Land Use and Property:
  - Use retaining walls to minimize property requirements;
  - Compensate for property acquisition through the MTO Property Acquisition process;
  - Complete environmental site assessments and provide mitigation to address site contamination, where indicated, for property to be acquired.

The contract documents will include standard and special provisions to minimize environmental and traffic impacts and control the work of the Contractor. Mitigation measures to minimize adverse impacts during construction include:

- Monitor construction activities. Monitor environmental protection measures;
- Restrict timing of in-stream works; prevent sediment and debris from entering watercourse;
- If deeply buried archaeological remains are encountered during construction, notify the Ministry of Culture immediately;
- Implement Traffic Management Plan:
  - Maintain existing number of lanes on Queensway at most times;
  - Preclude lane restrictions during peak travel times;
  - Maintain access to businesses and other properties throughout construction;
  - Accommodate the needs of pedestrians and cyclists;
  - Do not close adjacent crossings at the same time;
  - Provide alternative route and advance warning during temporary closures;
  - Ensure ongoing communication with emergency services;
  - Implement elements of an Advanced Traffic Management System;
- Require Contractor to maintain equipment in an operating condition that prevents unnecessary noise and restrict idling of equipment to the minimum necessary to perform the specified work.

Conclusion:

The Recommended Plan documented in this TESR addresses the short and longer term needs for the Queensway (Highway 417) from Highway 416 easterly to west of Anderson Road in order to improve safety, enhance mobility and reduce congestion.

GLOSSARY OF TERMS

Abutments	Abutments support each end of a bridge. The abutments have vertical concrete walls and concrete footings that transfer the load into the ground.
Accessibility	Ease with which people can reach their destinations. Ability to reach a desired destination at a reasonable cost with reasonable choices.
Alternative	Well-defined and distinct course of action that fulfills a given set of requirements. The EA Act distinguishes between alternatives to the undertaking and alternative methods of carrying out the undertaking.
ATMS	Advanced Traffic Management System – a system of detectors including cameras and in-pavement loops to measure traffic flow. The information is collected in a control centre and distributed to users as required to improve the efficiency of a facility's operation.
Auxiliary Lane	A travel lane that connects the end of an on ramp to the off ramp at the next downstream interchange. This lane is not continuous throughout the study area.
Basic Lanes	These lanes are continuous through the study area and are also referred to as the main or driving lanes.
Beams / Girders	The beams (or girders) support the bridge deck between the abutments and piers.
Bridge abutment	The abutment is that portion of a bridge located at the ends that supports the beams.
Bridge deck	The deck is the portion of the bridge that provides the overall driving surface. In most cases, the decks are reinforced concrete overlain with asphalt.
Bridge piers	The piers are interim supports located between the bridge abutments that support the beams/girders.
Congestion	When the demand for travel on a portion of the transportation system is greater than the ability of that portion to handle travel efficiently.
CSP	A corrugated steel pipe culvert used to convey road drainage to an outlet.
Dichotomous Utility Function	A utility function that represents a desirable or undesirable response (yes/no, present/absent, true/false)
Double Counting	Unintentionally accounting for a particular condition more than once through the selection of a number of sub-factors and measures as part of the evaluation method.
EA	Environmental Assessment
EB	Eastbound
Dimensionless Number	A number that does not have a measurement unit, such as length, associated with it. Examples include utility score and overall score.
Evaluation Process	The process involving the identification of those factors, sub-factors and measures that help to distinguish between the alternatives under consideration, rating of predicted impacts, assignment of weights, and aggregation of weights to produce an ordering of alternatives.
Factor	A component used to identify a particular consideration within each Factor Area. For example, under Natural Environment, factors could include wildlife, fisheries, vegetation and groundwater.
Factor Area	A broad component of the environment such as Natural, Social, Economic, Cultural, used to group factors used during the assessment and evaluation of alternatives.

GLOSSARY OF TERMS

Function Form	See Utility Function
HOV	High Occupancy Vehicle – a vehicle that is carrying two or more passengers.
Level of Service (LOS) - roads	Level of Service is used to describe traffic conditions. Various approaches have been defined for describing the LOS for freeways, roadway segments, intersections and other components of the road network. The best level of service (free flow conditions) is designated "LOS A" while the poorest level of service (congested conditions) is designated "LOS F". Levels of service for specific components of the road network are further described in the text.
Linear Utility Function	A function that can be defined using a linear equation of the form: y = a + bx, where y is the dependent variable (raw score); x is the independent variable (measurement); b is the slope of the function; and a is the y intercept, normalized in this study to be equal to one or zero.
MTAC	Municipal Technical Advisory Committee. For this study, members included MTO, the City of Ottawa, NCC and TSH.
Mitigation	Taking actions that avoid, prevent, remove or alleviate to some degree the negative impacts associated with the implementation of alternatives.
Mobility	Ability to satisfy the demand to move a person or goods. Reaching a desired destination with relative ease within a reasonable time.
Overall Score	The final value of an alternative's score derived by summing all of the weighted scores.
Overpass	An overpass is a structure carrying the highway over another road such as the bridges at Carling Avenue and Bronson Avenue.
PAC	Public Advisory Committee
Performance Factor	See Utility Function
PIC	Public Involvement Centre
Ranking	The ordering of alternatives from first to last for comparison purposes.
Raw data	The measurement of the impact, or measured data, under each measure/sub-factor.
Replicable	The degree to which separate review teams will arrive at the same conclusion using the same inputs
Risk	Probability that a given outcome will or will not materialize. Distinct from uncertainty in that the alternative outcomes are known or defined and that the probability of each is measurable.
SCL	Speed Change Lane is an auxiliary lane that allows vehicles entering or leaving the freeway to adjust their speed to prior to entering or after leaving the freeway traffic. These lanes are associated with interchanges.
Screening	Process of eliminating alternatives from further consideration. Alternatives may be "screened out" if they do not address the identified problem/opportunity, if they do not meet specified conditions or requirements and/or if they would result in unacceptable impacts.

GLOSSARY OF TERMS

Step Utility Function	A function can be defined by several linear functions within separate ranges that have a slope equal to zero. For this study, two linear functions are used: y = 1, for x = desirable y = 0, for x = undesirable
Sub-factor	Explicit feature or consideration used for comparison of alternatives. Each sub-factor is grouped under one of the factors.
Superstructure	The deck and the beams together form the "superstructure" of the bridge.
TAC	MTO / TSH Technical Advisory Committee
TC	City of Ottawa Transportation Committee
TESR	Transportation Environmental Study Report prepared to satisfy the requirements outlined in the *Class Environmental Assessment for Provincial Transportation Facilities*, 2000.
TMP	City of Ottawa Transportation Master Plan, 2003; completed in conjunction with the City of Ottawa Official Plan Update of 2003.
Traceability	Characteristics of an evaluation process that enables its development and implementation to be followed with ease by someone reviewing the work.
Underpass	An underpass is a structure carrying the highway under another road such as the bridges at Richmond Road and St. Laurent Boulevard.
Utility Function	A function (linear, step, dichotomous) that represents the utility score versus the sub-factor's measurement or desirableness. Utility functions are used during the evaluation process.
Utility Score	The "y " value derived from the utility function of the measurement of the impact induced by a particular alternative's sub-factor/measure (a number between 0 and 1).
Weight	The importance attributed to a factor area, factor or sub-factor relative to others. The value of the weight is expressed in a percentage and the sum of all weights is equal to 100%. A range of weights is used to test the sensitivity of the result to the range of community values.
Weighted Additive Method	The arithmetic method used in the evaluation of alternatives, which converts the relevant measures to a dimensionless number for each alternative, suitable for comparison.
Weighted Score	A raw score that has been multiplied by the factor weight.
WB	Westbound

1 1.0 OVERVIEW OF THE UNDERTAKING

1.1 INTRODUCTION

Highway 417 (Ottawa Queensway) is the major east-west provincial corridor in the Ottawa area serving provincial inter-city travel as well as regional and local commuter traffic. It is a vital economic, recreational, and commuter link in Eastern Ontario and joins Canada's capital to major population centres to the east and west. It fulfils a significant provincial function by connecting these major population centres, but it also serves a vital local function as the most important road in the City of Ottawa. As such, any study of the Queensway cannot be undertaken in isolation, but rather a more holistic approach must be used to identify issues of concern to the overall transportation system in the Ottawa area.

Construction of the Queensway started in the 1950's to provide a controlled-access highway to replace Highway 17. Much of the original Queensway was constructed on a constrained former railway ROW, and as such, several freeway design standards could not be attained and modifications, particularly to interchanges, had to be made in order to fit the road to the local site conditions. The original 4-lane freeway was opened in sections as it was completed. Over the years Highway 417 has been expanded to serve growing travel demand and traffic volumes currently exceed the theoretical capacity of the highway during several hours of the day. Traffic volumes are continuing to grow, and as a result, periods of congestion and associated delays are increasing and are expected to continue to increase, in the absence of significant modifications.

Current conditions have necessitated a comprehensive operational review of Highway 417 within the study area to determine if the existing infrastructure can be upgraded to accommodate the increased mobility needs. The Ministry of Transportation (MTO) initiated this study to:

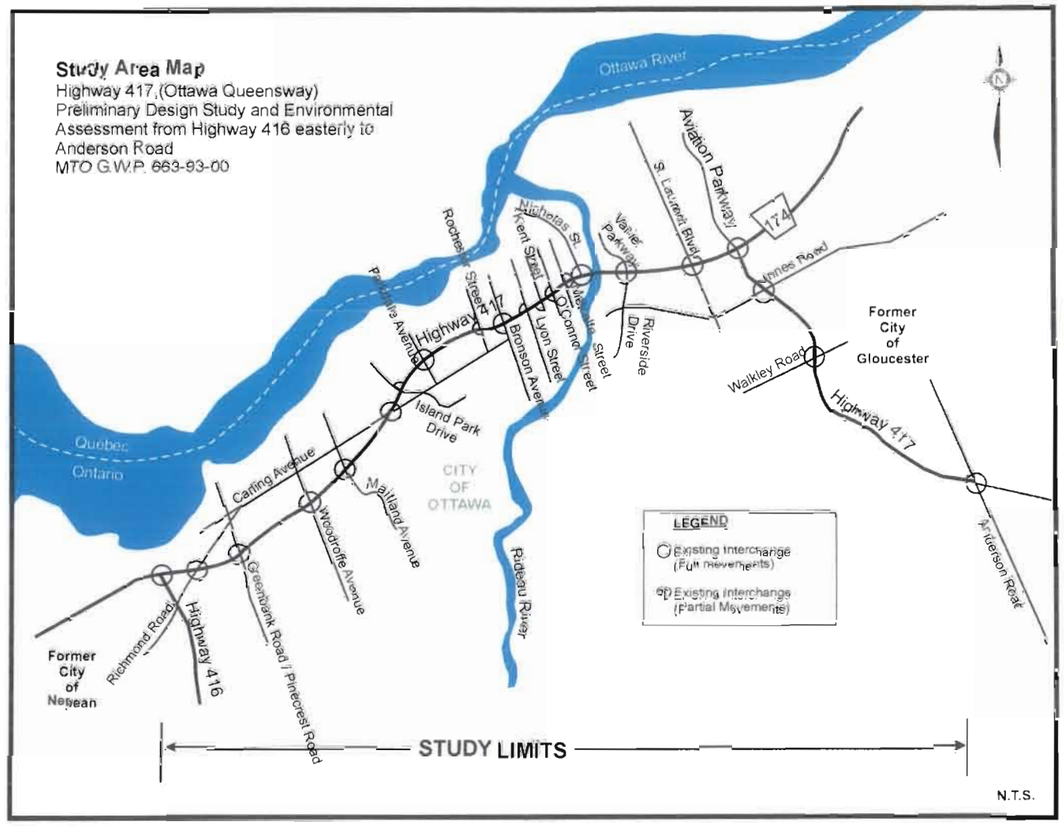
- Determine the need and feasibility of providing additional capacity (person and goods movement) in this corridor;
- Investigate opportunities to improve safety, and
- Review existing infrastructure to identify the requirement for rehabilitation/replacement of infrastructure components within the 20 year planning horizon of this study.

This study followed the formal process detailed under the *Class Environmental Assessment for Provincial Transportation Facilities, 2000* for projects of this type.

1.1.1 PROJECT LOCATION

The portion of Highway 417 that was examined during this study is located within the City of Ottawa and includes the Highway 417 (Ottawa Queensway) mainline from just west of Highway 416 easterly to west of Anderson Road, a distance of about 26 km, as well as all interchanges and crossing roadways within the interchange limits. **Figure 1-1**: Study Area, illustrates the project location.

Figure 1-1: Study Area



1.1.2 GROWTH IN TRANSPORTATION DEMANDS

The portion of the Highway 417 corridor under consideration experiences significant congestion during the a.m. and p.m. peak travel periods. Furthermore, communities on the west, south, and east sides of Ottawa are expanding, and growth is expected to continue. This additional demand on the highway will add to the existing congestion and associated safety concerns.

2003 Official Plan Projections

To illustrate Ottawa's expected growth, **Table 1.1** provides data extracted from the City of Ottawa's *Transportation Master Plan*, (TMP) September 2003 (page 20) for existing (2001) and projected (2021) population and employment levels in the City. The following map from page 20 of the TMP illustrates the areas described in the table.

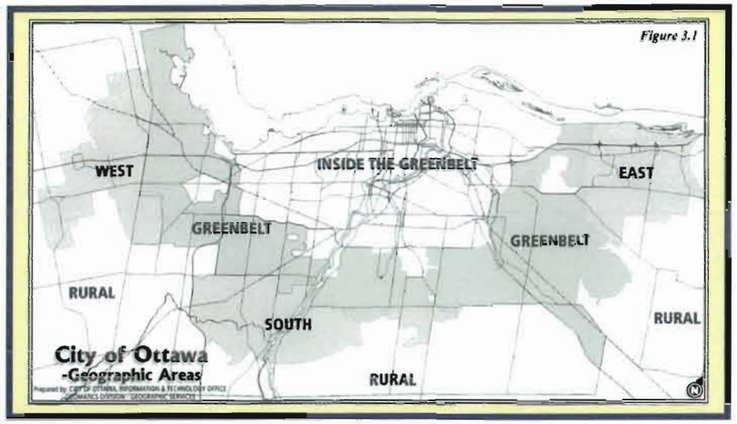


Table 1.1 Existing and Projected Population and Employment Levels

Population	2001	2021	Percent of Growth
Inside Greenbelt	517,000	588,000	18%
Outside Greenbelt	283,000	604,000	82%
West Urban Centre	73,000	186,000	29%
South Urban Centre	42,000	172,000	33%
East Urban Centre	88,000	131,000	11%
Rural Area	80,000	115,000	9%
Total	**800,000**	**1,192,000**	
Employment	**2001**	**2021**	**Percent of Growth**
Inside Greenbelt	400,000	514,000	46%
Outside Greenbelt	97,500	234,000	54%
West Urban Centre	36,000	90,000	22%
South Urban Centre	8,000	70,000	25%
East Urban Centre	15,000	45,000	12%
Rural Area	18,000	29,000	4%
Total	**497,500**	**748,000**	

Should the noted projections of the TMP be realized, then considerable pressure will be placed on Ottawa's transportation infrastructure, including the Queensway, both over the shorter term before significant new transportation infrastructure can be constructed, and in the longer term as part of a balanced transportation system. The City noted their intention to work in conjunction with the provincial government to develop future transportation systems (TMP, page 66).

The Role of Transit in Meeting Transportation Demands

Transit does, and will continue to play a vital role in the overall transportation network in Ottawa.

As noted in Table 1.1, the *City of Ottawa Official Plan, 2003*, forecasted population growth over the next 20 years of almost 50%, with the majority of the growth occurring outside of the Greenbelt. Further, employment is also expected to grow by about 50%, with about half of the growth occurring within the Greenbelt and half outside of the Greenbelt. During the TMP process, the City targeted significant growth in transit, walking and cycling to reduce the demand for vehicular capacity and also considered operational improvements to increase the capacity of the existing road network. Despite these measures, the TMP identified the need for undefined additional east-west road capacity as well as a number of specific improvements to City streets.

The demand forecasting work undertaken for the Queensway study built on the work undertaken for the TMP and assumed that all of the transit ridership targets contained in the *Transportation Master Plan, 2003* and Official Plan would be achieved. As part of the Queensway transportation demand forecasting work, the study team generated total travel demand for existing conditions and for 2011 and 2021 at various locations throughout the corridor. For the future years, the study team assumed that City transportation improvements as identified in the OP would be in place, and that the City's transit targets would be met. In analyzing the data, it was concluded that even with these improvements in place, including planned transit improvements, that the demand for travel would exceed the capacity of the transportation network. Consequently, modifications to the Queensway would have to be considered as part of the overall City of Ottawa transportation network.

In other words, even though transit is an important and integral component of Ottawa's transportation system, and even though the percentage of travelers using transit will grow more than any other travel mode, improved transit on its own cannot satisfy the total demand created by the City's expected growth.

Range of Alternatives Considered for Highway 417 and Study Process

Alternatives considered for the Highway 417 corridor to meet increasing mobility needs included:

- Additional general use lanes;
- Review of interchange operations to improve safety and reduce congestion;
- High Occupancy Vehicle (HOV) facilities; and
- Ramp metering; traffic demand management including Advanced Traffic Management Systems (ATMS).

In determining whether an identified roadway solution was recommended, the Project Team considered the magnitude of the identified problem and the impacts associated with implementing the potential solution, and thoroughly weighed each prior to reaching a decision. In situations where the impacts exceeded the anticipated benefits, then the solution was not recommended.

This study completed the detailed technical analysis needed to determine the extent and timing of short and longer-term modifications to Highway 417 and this report documents the results of the analysis. The study team developed several technical alternatives for a modification scheme that was then subjected to evaluation and refinement by the Project Team based on comments received from agencies and the public.

The study also identified and addressed existing ("now") operational concerns, and identified and addressed operational concerns that could be expected to arise in the future (by considering the effects of the projected 2011 and 2021 horizon year traffic volumes). These concerns were identified through an extensive traffic modeling effort that was undertaken for the Queensway Corridor. This model was developed/updated by analyzing and incorporating existing traffic, population, employment, and development data from various sources, including the *Ottawa 20/20 Transportation Master Plan, 2003*. The traffic model and associated Traffic Report forms a large measure of the technical background for this study. (Refer to Appendix D for this report)

1.2 Project Purpose and Justification

Highway 417 is an east-west freeway handling large volumes of commuter traffic as well as serving substantial tourist and commercial inter-city and intra-city traffic. Travelling westbound, the freeway has two basic lanes from Anderson Road to Ottawa Road (OR) 174 (the "Split"); three basic lanes from the Split to O'Connor Street; four basic lanes from O'Connor Street to Carling Avenue; and three basic lanes from Carling Avenue to Highway 416. Travelling eastbound the freeway has three basic lanes from Highway 416 to Carling Avenue; four basic lanes from Carling Avenue to Kent Street; three basic lanes from Kent Street to the split; and two basic lanes from the split to Anderson Road.

Much of Highway 417 under study was constructed in the 1950's and 1960's and has been periodically rehabilitated or reconstructed as needed. Rehabilitation or replacement of most of the infrastructure components is now required to maintain the asset and ensure safe operations.

The need and justification for this project is summarized below:

- Highway 417 currently experiences congestion and associated delays during the a.m. and p.m. peak travel periods;
- Traffic volumes on Highway 417 within the study area are high and are increasing annually;
- Continuing expansion of communities to the west, south and east sides of Ottawa, based on the *City of Ottawa Official Plan, 2003*, will result in additional traffic demands in the Queensway corridor;
- Congestion and associated delays adversely affect safety;
- In order to sustain economic growth and provide for the efficient movement of people and goods on the Queensway, there is a need to assess reasonable alternatives to improve traffic operations and safety;
- Portions of the existing highway infrastructure (e.g. pavement, bridges, lighting, noise walls) are reaching the end of their expected service life and must be assessed for improvement; and
- Design standards have changed over the lifetime of Highway 417, thus upgrades to the highway need to be assessed in some areas to improve the safety and operation of the highway.

The purpose of this study was to develop a comprehensive plan for the Queensway corridor for the next twenty years to address existing and future problems and opportunities and maintain the highway asset to serve the community and then to obtain environmental assessment (EA) clearance for the proposed improvements.

1.3 General Description of the Undertaking

The undertaking is generally described as follows:

- Widen Highway 417 from three to four mainline lanes in each direction from Highway 416 to Carling Avenue and from Metcalfe Street to OR 174;
- Retain the existing number of mainline lanes from Carling Avenue to Metcalfe Street;
- Widen Highway 417 from two to three lanes in each direction from OR 174 to east of Walkley Road;
- Retain the basic horizontal and vertical mainline geometry throughout;
- Modify the interchanges at Richmond Road, Greenbank Road, Woodroffe Avenue, Carling Avenue, Parkdale Avenue, Bronson Avenue, Lyon Street, Nicholas Street and St. Laurent Boulevard to improve safety and traffic operations;
- Revise/enhance drainage system to accommodate proposed widening;
- Rehabilitate pavement, bridges, and the illumination system as required;
- Upgrade the existing Advanced Traffic Management System including additional pavement loop detectors, cameras, changeable message signs and queue end warning devices;
- Upgrade noise walls to current standards; and
- Replace/enhance landscaping where possible.

The Recommended Design is detailed in **Section 6.0** of this report and is illustrated on the Recommended Design Plates in **Appendix A**.

1.4 Purpose of the Transportation Environmental Study Report

This **Transportation Environmental Study Report (TESR)** was prepared in compliance with the requirements of the *Class Environmental Assessment for Provincial Transportation Facilities (2000)*, which has been approved under the *Ontario Environmental Assessment Act* for highway projects undertaken by MTO.

Because widening sections of the highway is included as part of the undertaking, this Class EA study followed the planning process for a Group 'B' undertaking. Consultation with the City of Ottawa, National Capital Commission (NCC), community associations, adjacent property owners, external agencies and the public was undertaken as part of this process.

This TESR is available for a 30-day public review period commencing January 29, 2007. Interested persons are encouraged to review this document and provide comments. If, after consulting with the Ministry's consultants and staff, a person has serious unresolved concerns, they have the right to request that the Minister of the Environment (135 St. Clair Avenue West, Toronto, Ontario, M4V 1P5) "bump-up" (i.e. make a Part II Order for) this project. A Part II Order may lead to the preparation of an individual environmental assessment. A copy of the "bump-up" request should be forwarded to the Ministry of Transportation at the address noted in **Section 1.6**.

If there are no outstanding concerns upon completion of this public review period, the project receives environmental clearance and may proceed to detail design, contract preparation, award and construction.

This TESR contains a description of the project and its purpose, a summary of the assessment of alternatives, environmental effects, commitments to mitigation of these effects, and monitoring of activities associated with the implementation and on-going operation of the project.

1.5 Summary of Compliance with the Class Environmental Assessment Principles

The five governing principles for transportation engineering and environmental under a Group B project are described in the *Class Environmental Assessment for Provincial Transportation Facilities (2000)*. These principles and a brief description of the activities and tasks undertaken for this project are described in the following sections.

1.5.1 Transportation Engineering Principles

The Transportation Engineering Principles ensure that a project provides for an *effective and safe transportation system*. This study examined the operations of the existing road network and documented problems and opportunities. The Recommended Plan was developed based on MTO standards with consideration for the existing and future environmental conditions, while minimizing property requirements.

1.5.2 Environmental Protection Principles

The Environmental Protection Principles ensure that a project provides for *effective environmental protection*. Existing environmental conditions and sensitivities are described in this report. Environmental protection requirements and their relationship with transportation engineering considerations were assessed. This assessment was used to develop mitigation measures to avoid / prevent / reduce and monitor any residual adverse effects. The factor specific considerations identified for this project included the following environmental factors:

- Natural Environment (Wildlife, Fisheries, Vegetation, Stormwater Management);
- Social and Cultural Environment (Air Quality, Noise, Landscaping, Archaeology and Heritage Resources); and
- Land Use and Property (Community, Recreation, Commercial, Industrial, Institutional, Contamination/ Waste).

1.5.3 Evaluation Principles

The Evaluation Principles ensure that there is an *effective evaluation* that provides a balance between transportation engineering and environmental protection principles and fulfills the project goals. The evaluation process used for this project was traceable, replicable and understandable, and recognized that the safety and effectiveness of the transportation system is fundamental. Trade-offs were assessed using a reasoned argument approach and/or a

quantitative (arithmetic) method. The evaluation factors, process and results presented to the public are described in more detail in this report.

1.5.4 Consultation Principles

The Consultation Principles ensure that there is *effective consultation* with stakeholders. This project included a proactive consultation approach whereby the public and external agencies were notified and asked to participate in the study. The consultation program was designed to address identified stakeholder concerns. Government notices were placed in local papers to advise of the study commencement, the Public Involvement Centres (PICs) and the filing of this TESR. These notices were also sent by direct mail to those on the study mailing list. Potentially directly affected property owners were also contacted regarding PIC's and possible impacts. In some cases, notices were delivered by hand to homes. Three series of PICs were held as well as meetings with a Public Advisory Committee and a Municipal Technical Advisory Committee. Individual meetings were also held with other stakeholders during the course of the study to ensure effective consultation. A project web site was established and maintained. The consultation program is described in more detail in **Section 2** of this report.

1.5.5 Documentation and Bump-up Principles

The Documentation and Bump-up Principles ensure that there is *effective environmental documentation* and that the *opportunity to challenge the project* is provided. The environmental documentation required for this project is this Transportation Environmental Study Report and includes the following:

- Study objectives;
- Transportation engineering issues;
- Environmental issues;
- Consultation;
- Changes made as a result of external consultation;
- Alternatives developed and evaluated;
- Recommended Plan; and
- Commitments to future action.

The bump-up process (i.e. make request for a Part II Order) for Group "B" projects provides an appeal process to address a concern. A bump-up request may be submitted during the 30-day review period following the placement of the 'Notice of TESR Submission' in local papers. During this period the document is available to agencies and the public for review.

1.6 Additional Information Requests

Additional background information for this project resides with the Ministry of Transportation. The Ministry's Project Engineer and Consultant Project Manager for this project, noted below, may be contacted at any time to further discuss this project:

Mr. David Lindensmith, P. Eng., Senior Project Engineer
Planning & Design Section
Eastern Region
Ministry of Transportation
1355 John Counter Boulevard
Kingston, Ontario K7L 5A3
1-800-267-0295
(613) 540-5130
Fax (613) 540-5106
e-mail: **dave.lindensmith@ontario.ca**

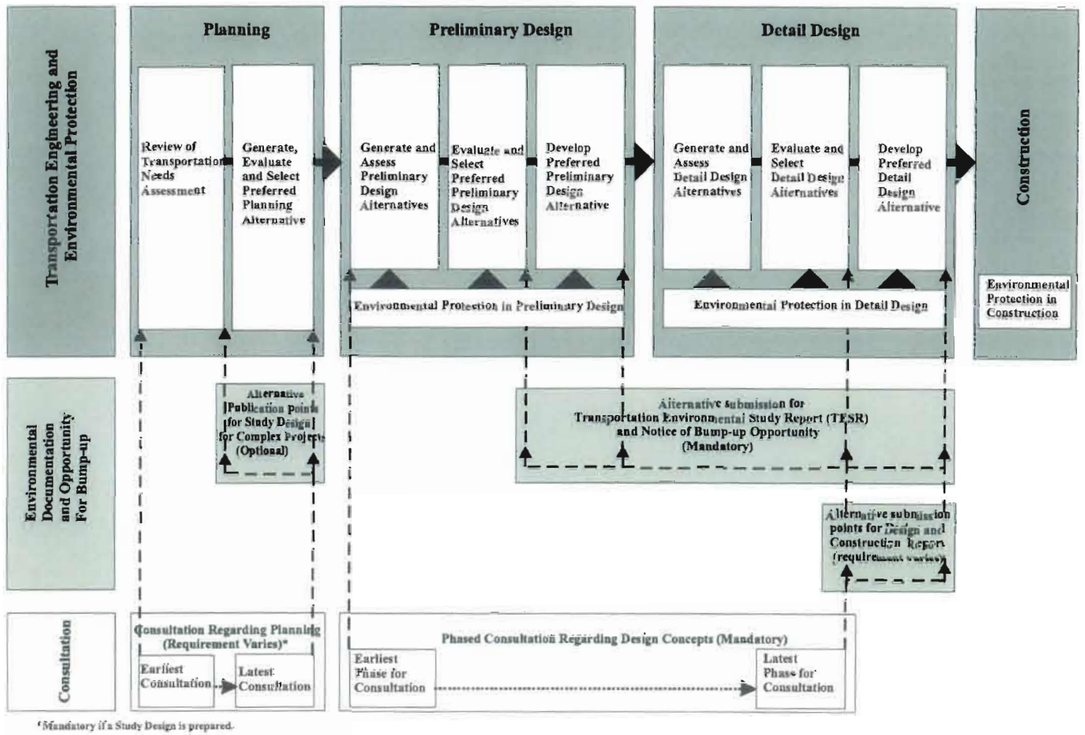
Mr. Brian Ruck, P. Eng. C.V.S., Consultant Project Manager
Manager, Major Projects Division
TSH engineers architects planners
300 Water Street
Whitby, Ontario L1N 9J2
1-800-668-1983
(905) 668-4021 ext. 2250
Fax: (905) 665-4867
e-mail: **bruck@tsh.ca**

2 ENVIRONMENTAL ASSESSMENT PROCESS

2.1 Project Specific Study Process

The study process undertaken for this project consisted of two of the three basic phases to meet the requirements of the Ontario Environmental Assessment Act, namely the Planning and Preliminary Design Phases. The Detail Design Phase was not part of the current study and will be undertaken at a later date. The approach to the study complied with the requirements for a Group 'B' project, under the *Class Environmental Assessment for Provincial Transportation Facilities, 2000* (Class EA document). The study process is illustrated on **Figure 2-1, Overview of Class EA Process for Group "B" Projects,** taken from Exhibit 3.7 of the Class EA document (page 3-11).

Figure 2-1: Overview of Class EA Process for Group "B" Projects



The Planning phase included Information Gathering and Generation of Alternative Planning Solutions (also called Alternatives to the Undertaking) for the study area. This phase involved the collection of relevant data and carrying out detailed field investigations and inventories of the natural and social environments and the development and the assessment of Alternative Planning Solutions.

The Preliminary Design phase of the project involved the development and evaluation of Preliminary Design Alternatives (also called Alternative Methods of Carrying Out the Undertaking), through a traceable and systematic evaluation process. The effects and mitigation measures required to minimize or alleviate any environmental impacts were developed and refined at this stage.

To complete the Preliminary Design phase of the study process, the Recommended Design was selected and the study was documented including the information gathered, analysis and evaluation undertaken and public consultation completed.

The study process addressed the requirements of the *Ontario Environmental Assessment Act*, including:

- Inventories of the natural, social and cultural environments;
- Identification, analysis and evaluation of Alternative Planning Solutions including "Do Nothing";
- Identification of reasonable Preliminary Design Alternatives;
- Assessment of the Preliminary Design Alternatives;
- Thorough public participation process; and
- Identification of impacts and appropriate mitigation measures.

At the commencement of the study, an extensive list of contacts was developed and information was sought from these contacts regarding the study area, including constraints and issues. The identification of concerns required that certain project-specific field investigations be undertaken to quantify impacts and develop mitigation. When accepted by the relevant regulatory bodies, mitigation measures recommended in this TESR will be developed into contract specifications or special provisions, which will be included in the construction contract and thus ensure that the work is undertaken in a manner that minimizes environmental impacts.

2.2 CONSULTATION PROCESS

2.2.1 Consultation Process Overview

The Project Team solicited, responded to, and incorporated into the planning process, input from both the general public and government agencies at various levels throughout the study. Input was sought early in the study and was encouraged throughout, reflecting the importance of public involvement to the EA process. The consultation process was in compliance with the requirements of the French Language Services Act, and as such, any correspondence received in French was replied to in kind, and French speaking callers were directed to French speaking staff. Bilingual staff also attended each Public Involvement Centre (PIC).

The consultation plan consisted of the following sequential items:

- Agency contact letters;
- Ontario Government Notices advising of the commencement of the study and for all PICs;
- Preparation of a Study Design Report outlining how the study would be carried out;
- Establishment and ongoing maintenance of agency and public mailing lists;
- Establishment of Municipal and Public Advisory Committees (MTAC and PAC) to facilitate full and open identification of concerns and evaluation of alternatives, with regular meetings held throughout the duration of the study;
- Presentations to the City of Ottawa Transportation Committee;
- Public Involvement Centre #1 held on January 21, 22, 23, and 30, 2003 to review preliminary drawings, present preliminary background inventory work, the proposed evaluation techniques, and to seek input on the Study Design Report and the overall perceived needs within the study area;
- Public Involvement Centre #2 held on June 21, 22 and 23, 2004 to present and seek public comment on the alternatives and the technically preferred alternatives as identified by the study team;
- Public Involvement Centre #3 held on June 20, 21 and 22, 2005 to present and seek public comments on the Recommended Plan as presented at a preliminary design level of detail;
- A focused public meeting held in conjunction with the third round of PICs on June 29, 2005 to address specific concerns about the Recommended Plan for the Island Park Drive interchange, and
- A Notice advising of the completion of this *Transportation Environmental Study Report* and where it can be reviewed.

Throughout the duration of the study, the public, interest groups and agencies were encouraged to participate. This proactive, coordinated approach provided an opportunity for all interested parties to comment both on the process and findings. The consultation process was revised as needed to address specific issues and concerns as they arose throughout the duration of the project.

Components of the consultation process are described in more detail below. Supporting documentation, including correspondence and the PIC Summary Reports, are provided in **Appendix B**.

2.2.2 PUBLIC ADVISORY COMMITTEE

In order to facilitate the receipt of public input and dissemination of study information, the Study Team established a Public Advisory Committee (PAC) early in the study. Letters of introduction including an invitation to participate on the Committee were sent to over 100 community associations, business groups and other non government agencies identified in consultation with the City of Ottawa and the Ministry of Transportation. Representatives from seventeen (17) community associations and nine (9) interest groups expressed their interest in participating on the Committee. Further solicitation for participation on the PAC was undertaken at the first round of PICs. During the course of the study, there were seven meetings held with either the full committee, or some of the members to discuss items of specific interest to their communities. In spring 2004, PAC members provided their weightings for the evaluation of alternatives and these were incorporated into the sensitivity testing of the evaluation results.

Copies of the PAC meeting notes are located in **Appendix B** of this report.

2.2.3 EXTERNAL AGENCY INVOLVEMENT

Individual notification letters were sent to federal, provincial and municipal agencies and utilities to inform them about the study and to invite them to contact the Project Team and attend the Public Involvement Centres. A list of groups and agencies in the study area that might have some interest in the study was developed with the assistance of the MTO and the City of Ottawa. This list was updated and revised throughout the study. Following is a listing of the initial agency contacts:

Table 2.1 Initial Agency Contacts

Agency	Response	
	Yes	No
Provincial Agencies		
Ministry of Agriculture, Food and Rural Affairs	X	
Ministry of Tourism, Eastern Region		X
Ministry of Natural Resources, South Central Region		X
Ministry of Natural Resources, Kemptville District Office	X	
Ministry of the Environment, Ottawa District Office		X
Ministry of Economic Development and Trade, Ottawa Office		X
Ministry of Municipal Affairs and Housing, Eastern Region		X
Ontario East Economic Development Commission		X
Municipal Agencies		
Ottawa-Carleton Catholic Separate School Board		X
Ottawa-Carleton District School Board		X
Conseil Des Ecoles Publiques De L'Est De L'Ontario		X
French Public School Board	X	
Conseil Des Ecoles Catholiques De Langue Francaise Du Centre Est		X

Table 2.1 Initial Agency Contacts

Agency	Response	
	Yes	No
Rideau Valley Conservation Authority		X
Ministry of Environment, Ottawa District Office		X
OC Transpo, City of Ottawa Transit Services	X	
City of Ottawa Transportation Committee	X	
Federal Agencies		
Public Works and Government Services Canada	X	
National Capital Commission	X	
Navigable Waters Protection Program – Canadian Coast Guard	X	
Environment Canada, Ontario Region Great Lakes and Corporate Affairs	X	
Health Canada	X	
National Energy Board		X
Department of Fisheries and Oceans, Prescott District Office	X	
Indian and Northern Affairs Canada	X	
Canadian Environmental Assessment Agency	X	

The responses from Health Canada and Department of Fisheries and Oceans were through participation in the *Canadian Environmental Assessment Act* process only and did not include formal written correspondence.

As noted in Section 2.2.1, a Municipal Technical Advisory Committee (MTAC) was established for this study and included representatives from the City of Ottawa (Transit, Traffic Operations, Planning and Growth Management, Infrastructure Management, Emergency Services), the National Capital Commission and the Ontario Provincial Police. A total of 7 formal meetings were held with MTAC to present and receive information on common study issues. This forum was an excellent vehicle to ensure that the ideas being considered for Queensway improvements by the Project Team were consistent and complemented initiatives being undertaken by the City and NCC. The notes from the MTAC meetings are included in **Appendix B**.

Individual meetings were held with interested agencies on request, including contact by environmental specialists during their investigations of existing conditions. For example, a meeting was held with Public Works and Government Services Canada concerning the impact of alternatives on access to their work sites. Meetings were also held with the NCC and with specific groups within the City of Ottawa, such as Traffic and Parking Operations to develop a better understanding of their issues and the possible means of addressing them.

A summary of the municipal and external agency comments received during the course of the study is provided in **Table 2.2**, with the supporting documentation provided in **Appendix B**.

Table 2.2 Summary of Municipal and External Agency Consultation

AGENCY	COMMENTS RECEIVED
City of Ottawa	• Provided input on key project issues at outset of project, such as accommodation of pedestrians and cyclists, transit priority, emergency services, traffic management during construction, Hunt Club Road Interchange, etc.) • Provided input regarding Transportation Master Plan Update Study, including TMP traffic projections and transit ridership targets. • Provided documentation regarding Alta Vista Transportation Corridor (AVTC) EA; requested Nicholas Street Interchange alternatives incorporate AVTC. • Provided comments on Traffic Operations Report, Corridor Analysis Plans, Alternatives Report, Evaluation Results, Technically Preferred Alternative and Preliminary Design for the Recommended Plan. • Participated in evaluation of design alternatives.
National Capital Commission (NCC)	• Provided input and identified concerns pertaining to the Island Park Drive Interchange Alternatives. • Participated in evaluation of design alternatives.
Ministry of the Environment	• Requested that the TESR address potential impacts to noise, surface water and wells and management of surplus materials/waste. • Requested that the evaluation and mitigation of noise impacts be conducted in accordance with *A Protocol for Dealing with Noise Concerns During the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments*.
Canadian Environmental Assessment Agency (CEAA)	• Coordinated federal environmental assessment review of project. • Identified Parks Canada and Transport Canada as potential Responsible Authorities along with DFO and Canadian Transportation Agency.
Public Works and Government Services Canada	• Requested that the ramps at the Parkdale and Island Park interchanges not be closed. • Requested that existing access options to the highway be maintained or improved.
Indian and Northern Affairs Canada	• Requested that the team contact Aboriginal groups directly with regard to this project. Noted that the Canadian Environmental Assessment (CEA) Agency would contact INAC for input, should they be involved.
Algonquin's of Pikwakanagan	• Provided information of land claims in the area.
Environment Canada	• Noted that the proposed undertaking may affect EC's interests related to migratory birds, wildlife habitat, species at risk, biodiversity, wetlands, water quality, air quality and toxic substances. • Identified mandates and issues related to above noted aspects of the environment. • Provided the following comments regarding Air Quality Methodology: o Use five years of representative meteorological data for the worst-case dispersion modelling, as indicated in the U.S. Environmental Protection Agency's Guidelines on Air Quality Models. o Note important differences between Canadian fleet composition, vehicle emission and fuel standards and the corresponding values used as inputs if EPA's MOBILE 6.2 emissions model is used. Comment qualitatively on potential implications of these differences. o Use the NavCanada observing site at the Ottawa Airport for meteorological data. o Submit copy of the Dust Impact Management Plan during detail design for review.
Canadian Coast Guard	• Noted that they are responsible for maintaining navigability of waterways. • Noted that Coast Guard approval is required prior to construction of the proposed improvements at Rideau River and Rideau Canal; identified approval requirements. • Note: Responsibility for *Navigable Waters Protection Act* now rests with Transport Canada – Marine
Parks Canada	• Noted that Parks Canada has jurisdiction over Rideau Canal. • Requested additional information regarding proposed modifications to canal or bridge crossing the canal. • Advised that Rideau Canal's navigability must be maintained through all phases of construction (pre-construction, during construction, and post-construction/operation).
Health Canada	• Requested copy of Noise Report for review.

Note: These comments were addressed in carrying out this study, and issues requiring further work are summarized in **Table 6.4.**

2.2.4 PUBLIC INVOLVEMENT

2.2.4.1 Notification

Notification for the study involved newspaper publications, brochures delivered within select areas and letters mailed directly to people expressing an interest in the study and those potentially directly affected. The mailing list included members of the public, interest groups, community associations and agencies.

The "Initial Notice" announcing the commencement of the study asked people to identify their interest in the study by sending in their contact information. The responses, together with stakeholders identified by The City of Ottawa and MTO, formed the basis for the study mailing list, which was expanded and used throughout the study. The initial notice was placed in the following newspapers during the week of July 7, 2002:

- Ottawa Citizen (English Version)
- Ottawa Sun (English Version)
- Ottawa Le Droit (French Version)
- Nepean This Week (English Version)
- Kanata Kourier (English Version)
- The Star (Gloucester) - (English Version)
- Weekend Outaouais (French Version)

Public Involvement Centres (PICs):
Prior to each of the three rounds of Public Involvement Centres, the Project Team met with the following groups to present study findings and to solicit feedback for consideration in advance of the PICs:
• Municipal Technical Advisory Committee • Public Advisory Committee • City of Ottawa Transportation Committee

The Notice advertising for the 1st round of Public Involvement Centres (PICs), announcing the date, time and location of the PICs, was placed in the following papers the week of January 13, 2003:

- Ottawa Citizen (English Version)
- Ottawa Sun (English Version)
- Ottawa Le Droit (French Version)
- Nepean This Week (English Version)
- Kanata Kourier (English Version)
- The Star (Gloucester) - (English Version)
- Weekly Journal - East Edition (English Version)
- Weekend Outaouais (French Version)

The Notice for the additional PIC held on Thursday January 30, 2003 was placed in the following newspapers on January 22 and 25, 2003:

- Ottawa Citizen (English Version)
- Ottawa Sun (English Version)
- Le Droit (French Version)

In addition to the newspaper notices, letters of notification for the 1st round of PICs were mailed to everyone on the mailing list. Bilingual flyers were delivered to a number of high exposure locations in proximity to the Queensway corridor on Wednesday January 8, 2003. These locations included the Royal Ottawa Hospital; Queensway Carleton Hospital; Ottawa Civic Hospital; Ottawa Citizen; National Post; Ottawa Carleton School Board; Westgate Plaza; MTO Licensing Facilities – Walkley and Tremblay Roads; Loblaws – Metcalfe and Isabella; YMCA – Argyle Street and the lobbies of apartment buildings at 169, 170, 171, 180 and 190 Lees Avenue.

Following the first round of PICs and in response to numerous public requests, the Project Team established a project specific website in order to disseminate project information, including plans and key reports, to stakeholders. The public response to the website at ***http://www.mto.gov.on.ca/english/engineering/417ea*** *was very positive. The index showing the type of information available on the website is presented in Appendix B.*

The Notice advertising for the 2nd series of PICs, announcing the date, time and location for the Public Involvement Centre, was placed in the following papers between June 12 and June 18, 2004:

- Ottawa Citizen (English Version)
- Ottawa Sun (English Version)
- Ottawa Le Droit (French Version)
- Nepean This Week (English Version)
- Kanata Kourier (English Version)
- The Star (Gloucester) – (English Version)
- Weekly Journal – East Edition (English Version)
- Weekend Outaouais (French Version)

Again, in addition to the newspaper notices, letters of notification for the PIC were mailed to all stakeholders and interested parties on the growing mailing list. Letters were also hand delivered to residents that were directly affected by the Technically Preferred Alternative on June 1, 2004, including one resident on Concord Street and those along the south side of Westmount Avenue. The PIC Notice was also placed on the project website.

The Notice advertising for the 3rd and final series of PICs, announcing the date, time and location for the Public Involvement Centre, was placed in the following papers between June 11 and June 17, 2005:

- Ottawa Citizen (English Version)
- Ottawa Sun (English Version)
- Ottawa Le Droit (French Version)
- Nepean This Week (English Version)
- Kanata Kourier (English Version)
- The Star (Gloucester) – (English Version)
- Weekly Journal – East Edition (English Version)
- Weekend Outaouais (French Version)

In addition to the newspaper notices, letters of notification were hand delivered on June 17, 2005 to residents where property would be required as a result of the Recommended Plan. They were encouraged to attend the PIC, view the presentation material and discuss their concerns with the Project Team. Notices were also mailed to the municipal, provincial and federal agencies, interest and community groups, as well as all individuals on the project mailing list.

Notices for a meeting to specifically discuss the issues related to the Island Park Drive Interchange were placed in the following newspapers on Wednesday June 22, 2005 and Saturday June 25, 2005:

- Ottawa Citizen (English Version)

- Ottawa Sun (English Version)
- Le Droit (French Version)

In addition to the newspaper notices, approximately 3000 bilingual meeting notice flyers were hand delivered to residents in the vicinity of the Island Park Drive Interchange, namely in the area bounded roughly by Churchill Avenue, Carling Avenue, Holland Avenue and Richmond Road/Wellington Street.

Throughout the course of the study, the Project Team continued to encourage stakeholders to identify themselves and to have their names added to the project mailing list. As a result of these efforts, close to 1400 stakeholders were entered in the public consultation database maintained by TSH by the end of the study.

The Notice of Study Completion was placed in the following list of newspapers when this *Transportation Environmental Study Report (TESR)* was made available for public review:

- Ottawa Citizen (English Version)
- Ottawa Sun (English Version)
- Ottawa Le Droit (French Version)
- Nepean This Week (English Version)
- Kanata Kourier (English Version)
- The Star (Gloucester) – (English Version)
- Weekly Journal – East Edition (English Version)
- Weekend Outaouais (French Version)

In addition, the Notice was published on the project website and distributed to all persons/agencies on the project mailing list.

In summary, notification of the project was communicated to the general public and all identified community groups, interest groups and federal, provincial and municipal agencies in a proactive and responsive manner. The consultation program was modified during the study and additional meetings held to address specific concerns as they arose.

2.2.4.2 First Round of Public Involvement Centres

The dates and locations for the first round of Public Involvement Centres were:

Tuesday, January 21, 2003	Wednesday, January 22, 2003	Thursday, January 23, 2003
Pineview Golf Club	Jim Durrell Arena	Confederation High School
471 Blair Road	1265 Walkley Road	1645 Woodroffe Avenue

The PIC sessions were held from 4:00 p.m. to 8:00 p.m. A Municipal and Agency Review Session was held from 2:00 p.m. to 4:00 p.m. prior to the first session on Tuesday January 21.

In response to public requests, a fourth PIC was held from 4:00 p.m. to 9:00 p.m. on:

Thursday, January 30, 2003
Ottawa City Hall at 110 Laurier Avenue West

Ministry of Transportation and TSH staff were available at all times to assist in the review of material. Text and visual displays, and roll plans were set up in an informal walk-through format. Bilingual staff were available to assist attendees as required.

The total number of people who signed the register and the number of comment sheets that were received during the first round of PICs are summarized as follows:

- Ninety-five (95) persons registered and fifty (50) comment sheets were received for Tuesday January 21st;
- One hundred (100) persons registered and forty-nine (49) comment sheets were received for Wednesday January 22nd;
- Ninety-four (94) persons registered and forty-seven (47) comment sheets were received for Thursday January 23rd; and
- Two hundred thirty-seven (237) persons registered and one hundred seventy-six (176) comment sheets were received for Thursday January 30th.

In addition, approximately one hundred fifty-four (154) e-mails, twenty-seven (27) letters and faxes, and thirteen (13) telephone calls were received in the two weeks following the PICs.

The results of the comment sheets received and discussions held at the first round of PICs are generally summarized below:

- The majority of attendees stated that public transit needs to be a priority, not the addition of lanes to the Queensway, which will provide increased capacity for cars. Other alternatives to the undertaking, such as High Occupancy Vehicle (HOV) lanes, should also be reviewed further;
- A number of attendees stated that they were opposed to the widening of the Queensway;
- The main areas of concern included property impacts, property loss, neighbourhood impacts, noise, air quality and vibration impacts, and safety;
- Members of the public were concerned about the loss of heritage buildings in Old Ottawa East, including the Old City Hall building. In general, the public showed concern about changes to their community due to the possible demolition of houses and buildings, and the loss of neighbours;
- Concern was expressed that the study was being carried out without input from the City of Ottawa;
- A number of concerns were site-specific in nature, including concerns about particular ramps and specific alternatives under consideration;
- A number of attendees requested that their name be added to the mailing list. There were also several requests to be added to the Public Advisory Committee;
- There were requests for a project-specific website and/or hard copies for the PIC presentation material.

More details regarding the PIC's are provided in the PIC 1 Summary Report in Appendix B. As noted in Section 2.2.3.1, a project specific website was established following the first round of PICs in response to public requests for this method of information sharing.

2.2.4.3 Second Round of Public Involvement Centres

The dates and locations for the second round of Public Involvement Centres were:

Monday, June 21, 2004	Tuesday, June 22, 2004	Wednesday, June 23, 2004
Civic Centre, Salon A	Nepean Sportsplex, Hall A	Pineview Golf Club
1015 Bank Street	1701 Woodroffe Avenue	1471 Blair Road

The PIC sessions were held from 4:00 p.m. to 8:00 p.m. A Municipal and Agency Review Session was held from 3:00 p.m. to 4:00 p.m. prior to the first session on Monday June 21st. Ministry of Transportation and TSH staff were available at all times to assist in the review of material. Text and visual displays and roll plans were set up in an informal walk-through format. Bilingual staff were available to assist attendees as required.

The total number of people who signed the register and the number of comment sheets that were received during the second round of PICs are summarized as follows:

- One hundred seventy-eight (178) persons registered and eighty-one (81) comment sheets were received for Monday June 21st;
- One hundred nine (109) persons registered and forty (40) comment sheets were received for Tuesday June 22nd; and
- Seventy-nine (79) persons registered and twenty-five (25) comment sheets were received for Wednesday June 23rd.

In addition, approximately fifty-three (53) e-mails, letters, faxes or telephone calls were received by July 28th, within the four week period following the PICs.

The results of the comment sheets received and discussions held at the second round of PICs are generally summarized below:

- Attendees expressed their belief that public transit needs to be a priority not the addition of lanes to the Queensway, which will provide increased capacity for cars;
- The main areas of concerns were site-specific in nature, including concerns about particular ramps and specific modifications under consideration;
- Members of the public expressed concern about property impacts, property loss, neighbourhood impacts, noise, air quality and vibration impacts, and safety;
- Concern was expressed about the loss of green space and mature trees;
- A number of attendees supported the widening of the Queensway and the Technically Preferred Alternative;
- There were requests for hard copies of specific information presented at the PIC.

More details regarding the PIC's are provided in the PIC 2 Summary Report in Appendix B.

2.2.4.4 Third Round of Public Involvement Centres

The dates and locations for the third round of Public Involvement Centres were:

Monday, June 20, 2005	Tuesday, June 21, 2005	Wednesday, June 22, 2005
Nepean Sportsplex, Halls C & D	Ottawa City Hall	Capones, Rochester Room
1701 Woodroffe Avenue	110 Laurier Street	831 Industrial Avenue

The PIC sessions were held from 4:00 p.m. to 8:00 p.m. A Municipal and Agency Review Session was held from 3:00 p.m. to 4:00 p.m. prior to the first session on Monday June 20. Ministry of Transportation and consultant representatives were available to respond to any inquiries.

The total number of people who signed the register and the number of comment sheets that were received during the third round of PICs are summarized as follows:

- Ninety-two (92) persons registered and thirty-two (32) comment sheets were received for Monday June 20th;
- One hundred and thirty-seven (137) persons registered and eighty-three (83) comment sheets were received for Tuesday June 21st;
- Fifty (50) persons registered and eighteen (18) comment sheets were received for Wednesday June 22nd.

In addition, approximately fifty-two (52) e-mails, letters or faxes were received following the PICs.

The results of the comment sheets received and discussions held at the third round of PICs are generally summarized below:

- A number of the attendees stated that public transit needs to be a priority not the addition of lanes to the Queensway, which will provide increased capacity for cars; however, there was more overall support for the proposed widening and interchange modifications since a downtown widening is not part of the Recommended Plan;
- The main areas of concerns were site-specific in nature, including concerns about particular ramps and specific modifications under consideration;
- There was general support for the proposed interchange reconfigurations other than at Island Park Drive;
- Members of the public expressed concern about property impacts, property loss, neighbourhood impacts, noise, air quality and vibration impacts, and safety;
- A number of attendees supported the widening of the Queensway and the Recommended Plan;
- There were requests for hard copies of specific information presented at the PIC.

More details regarding the PIC's are provided in the PIC 3 Summary Report in Appendix B.

2.2.4.5 Island Park Drive Interchange Alternative – Special Public Meeting

In response to concerns expressed regarding the Recommended Plan at the Island Park Drive Interchange, MTO arranged to conduct a separate public meeting to focus on the concerns raised regarding the Island Park Drive Interchange area.

The meeting to discuss the issues related to the Island Park Drive Interchange was held on Wednesday June 29, 2005 from 7:00 p.m. to 11:00 p.m. at the Travelodge Hotel on Carling Avenue. A presentation was given by staff from the Ministry of Transportation and the consultant team followed by a question and answer session.

A total of 287 people signed the register and thirty-eight (38) comment sheets were received that evening. In addition, approximately fifty-six (56) e-mails, letters or faxes were received following the public meeting.

The results of the comment sheets received and discussions held at the meeting regarding the Island Park Drive Interchange are generally summarized below:

- There was general opposition to the proposal to realign the Island Park Drive off-ramp to the west side of Island Park Drive in an area of Hampton Park;.
- Concern was expressed about the loss of green space and mature trees in Hampton Park and related impacts to wildlife habitat;
- Concern was expressed for the safety of pedestrians and cyclists, increase in noise due to trucks heading south on Merivale Road;
- There were requests for additional information.

2.2.4.6 Incorporation of Public Comments

The comments received during the consultation were considered during the generation and refinement of design alternatives and the Recommended Plan. Where changes were made as a result of consultation, this has been noted in the text of this TESR where the alternative designs and the Recommended Plan are documented.

2.3 CANADIAN ENVIRONMENTAL ASSESSMENT ACT (CEAA) COORDINATION

A Project Description Report under CEAA was prepared and provided to the CEA Agency for circulation to federal agencies. A copy of this report is included in **Appendix C** of this TESR. Given the multi-disciplinary nature of this project, the CEA Agency is acting as the Federal Environmental Assessment Coordinator (FEAC) for the CEAA process providing a one window approach to federal contact.

Following circulation of the Project Description, a meeting was convened on May 19, 2005 to discuss potential federal requirements. Representatives from the Canadian Transportation Agency, Fisheries and Oceans Canada

(DFO), Parks Canada, National Capital Commission (NCC), Transport Canada, CEA Agency, Health Canada and Environment Canada participated in the meeting with MTO and TSH staff.

Parks Canada and Transport Canada were identified as potential Responsible Authorities along with DFO and the Canadian Transportation Agency. The NCC was also identified as having EA requirements. Other federal departments participating in the process include Health Canada, Environment Canada and Public Works and government Services Canada (PWGSC).

In MTO will continue to coordinate study activities with the CEA Agency as the federal EA process progresses in order to address provincial/federal harmonization principles.

A note on Environmental Assessment Harmonization (Provincial and Federal Processes (Harmonized EA)

On January 29, 1998, all the ministers, excluding Quebec, signed the Canada-Wide Accord on Environmental Harmonization (Accord) and three sub-agreements. In signing the Accord, the provincial and federal governments agreed that they would use a cooperative approach to develop and implement consistent environmental measures in all jurisdictions, including policies, standards, objectives, legislation and regulations.

The Accord outlines the following objectives of harmonization:

- *to enhance environmental protection;*
- *to promote sustainable development; and*
- *to achieve greater effectiveness, efficiency, accountability, predictability and clarity of environmental management for issues of Canada-wide interest, by:*
    - *using a cooperative approach to develop and implement consistent environmental measures in all jurisdictions, including policies, standards, objectives, legislation and regulations;*
    - *delineating the respective roles and responsibilities of the federal, provincial and territorial governments within an environmental partnership by ensuring that specific roles and responsibilities will generally be undertaken by one order of government only;*
    - *reviewing and adjusting Canada's environmental management regimes to accommodate environmental needs, innovation, expertise and capacities, and addressing gaps and weaknesses in environmental management; and*
    - *preventing overlapping activities and inter-jurisdictional disputes.*

Source: http://www.ene.gov.on.ca/envision/ceaa/CEAA2.htm

3 TRANSPORTATION NEEDS ASSESSMENT

This section provides a description of the problems and opportunities that were identified through extensive traffic and highway engineering work. It then describes the alternatives to the undertaking that were identified to address the identified problems and opportunities. The alternatives to the undertaking are then assessed and evaluated and a preferred Alternative to the Undertaking selected.

Given the complexity and importance of this vital roadway to the overall transportation network in Ottawa, this study significantly enhanced the level of analysis that is normally undertaken for an MTO Class EA Study. In general terms, the analysis consisted of the following elements:

- Gathering all available background information from various sources including the MTO, City of Ottawa, NCC and other agencies;
- Ensuring that the macro traffic model, which looks at the overall transportation network in Ottawa and includes all modes of travel including pedestrians, cyclists, transit and roads, was updated and consistent with the City of Ottawa's model used to update the Official Plan and Transportation Master Plan (TMP). Several iterations were required to ensure that these models were consistent;
- Using the macro model to predict future travel demands and resulting network performance throughout the planning horizon of the study;
- Carry out a detailed safety analysis for input into the problem identification;
- Using the macro model to analyse several scenarios which incorporated different future growth assumptions and infrastructure availability in compliance with the TMP;
- Building a micro model that simulates existing traffic performance on the Queensway and interchanges;
- Testing the model against observed performance and modifying the model to ensure that it fairly represents the current operating conditions;
- Use the micro model as a supporting tool and cross check against the more traditional traffic procedures as outlined in the Highway Capacity Manual;
- Development of alternatives that address the observed and predicted transportation deficiencies;
- Carrying out detailed analysis of the alternatives to select the preferred option. The analysis tool used for the selection was chosen because it is understandable, traceable, and replicable. This selection process included using both the macro and micro models to provide predictions of network performance;
- Modifying or adding new alternatives to address input received from agencies and the public;
- Selection of Technically Preferred Alternatives for the mainline and each interchange;
- Carrying out sensitivity analyses to test the rigour of the outcome;
- Modifying the Technically Preferred Alternatives based on input received and generation of the Recommended Plan.

3.1 PROBLEMS AND OPPORTUNITIES

3.1.1 INTRODUCTION

At the outset of the study, the Project Team undertook an extensive review of the Queensway and surrounding area within the study limits in order to identify existing and future problems that should be examined as part of this study. Discussions were held with key MTO staff to identify recurring areas of concern. Meetings were also held with key stakeholders including the City of Ottawa, NCC, OPP, and others. This review was enhanced with field investigations carried out by members of the Project Team including experts in transportation engineering, road safety, landscaping, fisheries, natural environment, social environment, noise, archaeology, and urban planning.

The intent of this phase of the work was to identify recurring problems and their extent, and begin to identify potential solutions for further analysis. The key problems identified during the transportation needs assessment and detailed in subsequent portions of Section 3.1, are summarized below:

- Mobility and congestion are issues in some sections of Highway 417 during the existing a.m. and p.m. peak travel periods as there is insufficient capacity to accommodate travel demands;
- Mobility and congestion will become even greater issues in sections along Highway 417 during the future a.m. and p.m. peak travel periods as there is insufficient capacity to accommodate projected travel demands despite allowing for the achievement of the City of Ottawa's transit mode share of 30%;
- Congestion and associated delays adversely affect safety and the movement of people and goods;
- Areas of higher than expected collision frequency often coincide with areas of recurring congestion;
- Significant portions of the existing highway infrastructure (e.g. pavement, bridges, lighting, noise walls) are approaching the end of their expected service life;
- There is opportunity to improve road/transit interfaces to improve existing and/or future transit operations;
- Much of the corridor is heavily urbanized, which would significantly limit the amount of widening of the existing highway that could be accommodated without creating significant impact to the local communities that abut the highway; and
- Operational and safety concerns are associated with interchange geometry at some interchanges.

In addition to above problems, improvements to the transportation system in Ottawa are associated with a number of opportunities to support community planning and development:

- Support Ottawa's *Transportation Master Plan (TMP), September 2003*;
- Support Planned Development and the *City of Ottawa Official Plan (OP), May 2003*;
- Support Economic Development;
- Support for a Responsible Mobility Solution.

In the TMP (page 65), the City notes its general support for any actions to change the provincial highway system to improve road safety and reduce emissions. It also notes its likely opposition to any actions that have substantial neighbourhood impacts or that increase congestion on City streets. The operational review of Highway 417 is referenced in the TMP but, as the results of this current study were not available during the preparation of the TMP, no changes to the provincial highway were assumed in the City's work. In the TMP (page 66), the City commits to working with the provincial government to develop future transportation systems that support the City's growth management objectives. An efficient transportation system, inclusive of transit, arterial road and freeway improvements, would support intensification within the urban area and travel between the existing and proposed town centres in the West, East and South Urban Communities as defined in the OP.

A reliable transportation system is key to economic development in Ottawa and will encourage existing and future businesses to locate in the National Capital Region. This will help promote development of the mixed use, employment and enterprise areas established in the City's OP.

A transportation system comprised of freeway, arterial road, transit and other modes provides a range of choices. A network with route continuity and connectivity is also flexible as it provides alternative routes and modes during peak travel periods and when construction and collisions affect travel mobility. Transfer of longer distance trips from the arterial road system to the freeway system is consistent with the role and function of the road hierarchy.

3.1.2 TRAFFIC OPERATIONS

This section documents existing and projected future traffic operations within the section of the Highway 417 corridor from Highway 416 to west of Anderson Road that formed the basis for the assessment of transportation needs. The analysis of future traffic operations assumed no improvements to the Highway 417 mainline or interchanges, except for the addition of an interchange at Hunt Club Road by 2021. Further traffic analysis to assess proposed alternative improvements and to refine the Recommended Plan was completed during subsequent phases of the study.

One of the key documents produced during this phase of the study was the *Traffic Operations Report*. This report was produced in two stages, the first being a detailed summary of existing conditions, and the second being a projection of operating characteristics in the future. The horizon years for the future conditions analysis were chosen to match those used in the City of Ottawa's TMP.

The *Traffic Operations Report* is an extensive document, and what follows in Section 3.1.2 is a brief summary of the major findings of that report. The report can be found in **Appendix D** of this TESR and can also be viewed on the project website at the following link http://www.mto.gov.on.ca/english/engineering/417ea/traffic/.

The initial analysis of future traffic operations was completed in October 2002. At the time of the initial analysis, the revisions to the TRANS EMME/2 model as part of the 2003 TMP study had not been completed. The initial analysis was therefore based on the model of the day, which included assumptions related to recommended network, transit mode split and trip origins and destinations for the horizon year from the 1997 Ottawa TMP. Adjustments were made to the travel demands in the model to account for changes in forecast population and employment as documented the 2002 Ottawa Official Plan update.

With the completion of the 2003 TMP and the related modifications to the demand forecasting process, model inputs and outputs, the analysis was revisited to ensure consistency between the 2003 TMP and this EA study for Highway 417. Some of the changes in the modelling approach generated higher travel demand on Highway 417, while others resulted in reductions. The following changes in the modelling process resulted in increased auto demand predictions:

- Change in modelling process;
- Use of 1996 travel survey instead of 1986 survey;
- Adjustments to work trips to account for increased labour force participation between 1995 and 2021;
- Adjustments to account for commercial activity; and
- Higher community to community trip making in the 2003 TMP.

The change in the overall transit mode share target from 20% in the 1997 TMP to 30% in the 2003 TMP produced a decrease in the predicted auto demand.

The net effect of these changes was a reduction in overall auto trips on the National Capital Region road network compared to the earlier models but a small increase in projected auto travel demand on Highway 417 due to a larger proportion of long-distance peak hour trips.

3.1.2.1 Data Collection

Existing traffic volumes and operating conditions within the Study Area were established using 2000 and 2001 counts provided by MTO and TSH, respectively. The City of Ottawa provided ramp terminal intersection turning movement counts (completed between 1999 and 2002), as well as: existing traffic signal timing plans, intersection configuration drawings; transit route and schedule data; and a complete listing of all Highway 417 mainline, ramp and ramp terminal intersection collisions reported from 1998 to 2001. This data was supplemented by on-site reviews completed in August 2001 and August 2002, as well as digital base plans, mapping, aerial photos and discussions with MTO and City of Ottawa staff.

3.1.2.2 Travel Demand Forecasting

The TRANS EMME/2 travel demand forecasting model of the National Capital Region was used to project future travel demands on Highway 417 and the surrounding road system under a variety of different growth scenarios. This macroscopic model was used to predict transportation demands on a network wide basis and is a commonly accepted

model used for predicting the performance of large area wide transportation networks. The version of the model used for this report is the same one used by the City of Ottawa in preparing its 2003 TMP, and is based on the City's most current projections of future land use, road network improvements, travel modes, etc. The travel demand forecasts used in this Traffic Operations Study are therefore consistent with the current City of Ottawa OP and TMP.

The model was used to generate p.m. peak hour auto vehicle and transit person travel demands for the 2001 base year and the 2021 horizon year. A total of seven 2021 scenarios were modelled, including "do nothing", probable improvements to the City road network, added capacity on Highway 417 and potential new freeway facilities (Outer Transportation Corridor and inter-provincial bridges).

3.1.2.3 Traffic Volume Projections

Traffic volume growth factors derived from the TRANS EMME/2 model results were applied to the 2001 traffic volumes to estimate 2021 p.m. peak hour traffic volumes for every Highway 417 mainline link, ramp and ramp terminal intersection in the Study Area. 2011 traffic volume projections were produced by interpolating between the 2001 and 2021 volumes in proportion to the city-wide population and employment growth projected in the Ottawa Official Plan. Existing ratios of p.m. peak hour to a.m. peak hour and daily traffic volumes were used to estimate a.m. peak hour volumes and AADT's for each horizon year. Existing and projected future traffic volumes on the Highway 417 mainline are summarized in **Figures 3-1, 3-2** and **3-3**.

Figure 3-1: Highway 417 Mainline Current and Projected AADT

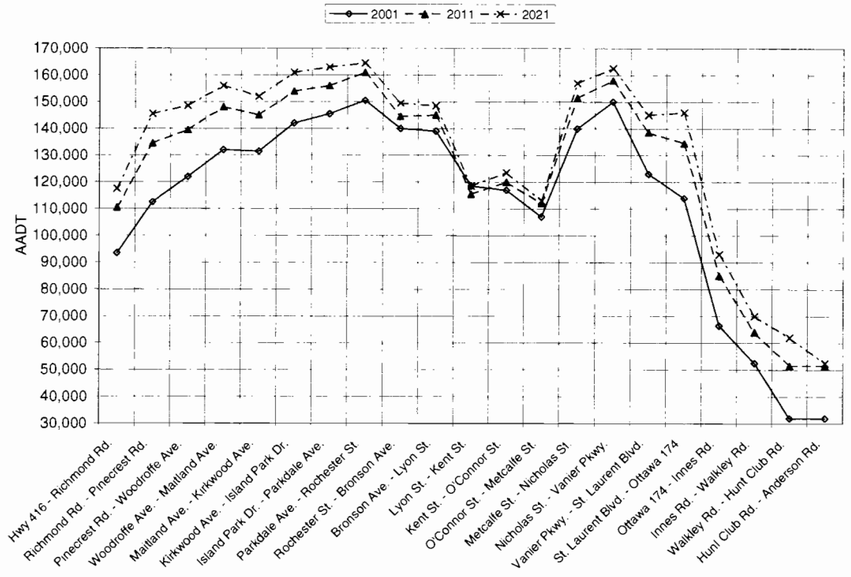


Figure 3-2: Highway 417 Mainline Current and Projected a.m. Peak Hour Two-Way Volumes

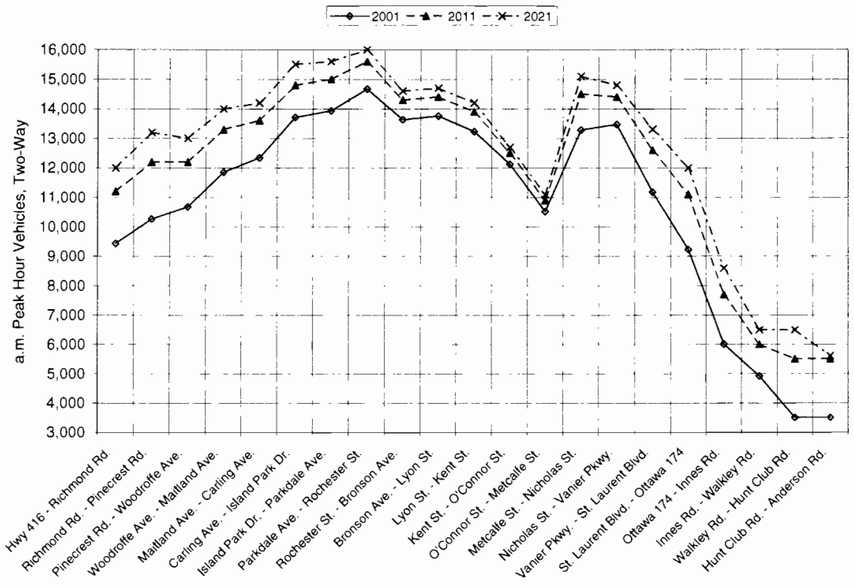
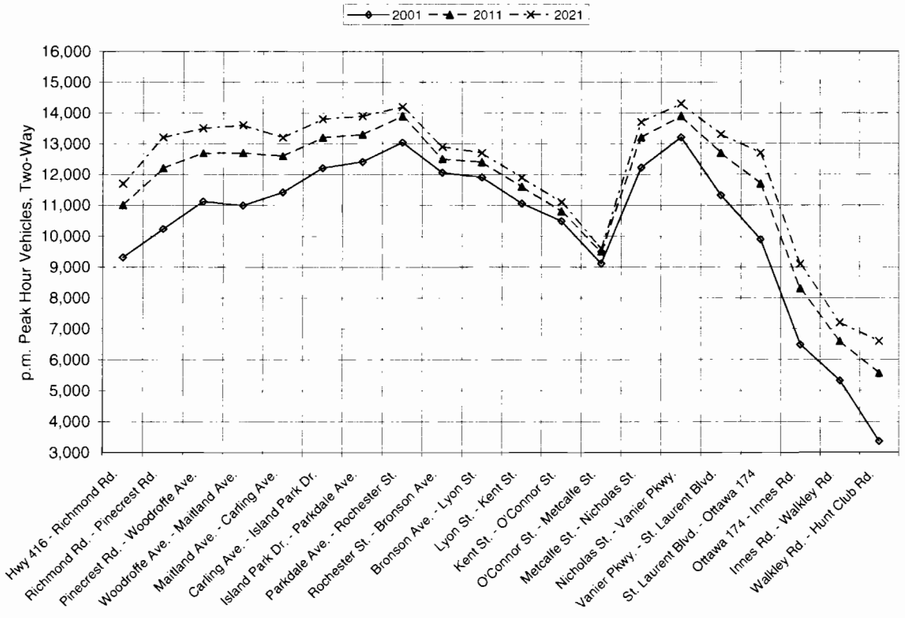


Figure 3-3: Highway 417 Mainline Current and Projected p.m. Peak Hour Two-Way Volumes



3.1.2.4 INTEGRATION Modelling

INTEGRATION is a microscopic simulation model capable of simulating the movement of individual vehicles through a road network and capturing all interactions among the various components of the corridor (signalized intersections, on-ramps, off-ramps and freeway mainline sections). This is an excellent tool to use to analyse the operation of a single facility, in this case the Queensway, and to be able to assess how the Queensway operation would change if certain changes were made to it. This data was then used to evaluate competing alternatives to solve existing and predicted traffic operation problems under existing and projected 2011 and 2021 traffic volumes that were provided from the macroscopic EMME-2 model. The INTEGRATION simulation covered a three-hour morning peak period and a three-hour afternoon peak period.

The 2001 model was calibrated to ensure that it accurately reflected actual observed peak period operating conditions. The calibrated model was then used with the 2011 and 2021 volume scenarios from EMME/2 to assess the effectiveness of any proposed changes to the Queensway and/or interchanges. For the 3 years modelled (2001, 2011, 2021) the road network assumed in the model included the existing lane configuration on Highway 417 and the City road network as described for each year in the TMP (the City road network included a new interchange at Hunt Club Road by 2021).

The INTEGRATION model was used to determine the location and duration of traffic congestion, section by section throughout the Highway 417 corridor. The output data was used by the Project Team during the evaluation phase of the study to assist in the comparison of competing alternatives.
(Details on the Evaluation Methodology can be found in Section 3.2 of this report and online at http://www.mto.gov.on.ca/english/engineering/417ea/alternatives/methodology.htm.)

A graphical summary of the INTEGRATION results is provided in Appendix F of the Traffic Operations Report, included in **Appendix D** of this TESR. The model also provided summaries of travel speed and vehicle stops to facilitate assessment of overall Queensway performance.

A level of service (LOS) (see Figure 3.7 for an explanation of LOS) was assigned to each Highway 417 mainline section for each 15-minute simulation period using the density statistics produced by INTEGRATION and the LOS criteria from the 2000 Edition of the *Highway Capacity Manual*. The LOS results were reviewed to identify sections that operate at LOS F, congested operation, during one or both peak periods, in each horizon year. The congested sections were classified as experiencing "Congestion" or "Major Congestion" according to the duration of LOS F operations, as follows:

- "Congestion" – LOS F for 0.5 to 1.5 hours during a three-hour peak period; and
- "Major Congestion" – LOS F for 1.5 to 3 hours during a three-hour peak period.

The results are summarized in **Figure 3.4** for the a.m. peak period and **Figure 3.5** for the p.m. peak period. The actual length of congestion may be longer for those sections where the LOS was still F at the end of the modelling period. The results are also summarized on schematic maps (see Appendix F of the Traffic Operations Report in TESR **Appendix D**). A discussion of the results is provided following each figure.

In reviewing the results summarized in the figures and schematic maps, it is apparent that congestion is expected to generally increase throughout the Study Area in future years. However, some locations may be indicated as having improved operating conditions in a later horizon year compared to an earlier one. This condition generally results from a combination of two factors:

- EMME/2 modelling may forecast lower volumes on certain ramps in future years due to shifts in travel patterns in response to network congestion, mode split changes, City road network improvements (2021) and/or demographic changes; and
- When a section upstream of a previously identified bottleneck becomes congested in a future year, it limits the amount of traffic that can reach the previous bottleneck during the congested period. This "metering" effect produces a diminished level of congestion in the downstream section.

These effects occur in only a few sections of the Study Area and are small relative to the overall degradation in traffic operations expected in future years.

Figure 3.4 - Summary of A.M. Peak Period Congestion – Existing Network

	Location	Congestion/Major Congestion *		
		2001	2011	2021
Eastbound				
1	Hwy 416 off-ramp – Richmond Road	-	Congestion	Congestion
2	Richmond Road – Pinecrest Road/Greenbank Road off-ramp	-	Major Congestion	Major Congestion
3	Pinecrest Road/Greenbank off-ramp – Woodroffe Avenue off-ramp	Congestion	-	-
4	Woodroffe Avenue Interchange	Congestion	-	-
5	Woodroffe Avenue on-ramp – Maitland Avenue	Major Congestion	Congestion	Congestion
6	Maitland Avenue – Carling Avenue off-ramp	Major Congestion	Major Congestion	Major Congestion
7	Upstream of Parkdale Avenue off-ramp	Congestion	Congestion	Congestion
8	Upstream of Rochester Street off-ramp	-	Congestion	-
9	Upstream of Bronson Avenue off-ramp	Congestion	-	-
10	Bronson Avenue – Kent Street	Congestion	Congestion	-
11	Kent Street – Metcalfe Street	Major Congestion	Congestion	-
12	Upstream of Nicholas Street off-ramp	Congestion	-	-
13	Downstream of Nicholas Street on-ramp	Congestion	-	-
Westbound				
14	Anderson Road – Hunt Club Road off-ramp	-	Congestion	Major Congestion
15	Hunt Club off-ramp – Walkley Road off-ramp	-	Congestion	Major Congestion
16	Walkley Road off-ramp – Innes Road on-ramp (Inner)	-	Major Congestion	Congestion
17	Innes Road on-ramp (Inner) – Ottawa Road 174 off-ramp	Congestion	Major Congestion	Major Congestion

Figure 3.4 - Summary of A.M. Peak Period Congestion – Existing Network

Location		Congestion/Major Congestion *		
		2001	2011	2021
18	Ottawa Road 174 Interchange	Congestion	Major Congestion	Major Congestion
19	Ottawa Road 174 on-ramp – St. Laurent Boulevard on-ramp (Inner)	Congestion	Major Congestion	Major Congestion
20	St. Laurent Boulevard on-ramp (Inner) – Vanier Parkway on-ramp (Direct)	Major Congestion	Major Congestion	Major Congestion
21	Vanier Parkway on-ramp (Direct) – Nicholas Street off-ramp	Congestion	Major Congestion	Major Congestion
22	Nicholas Street Interchange	Congestion	-	Congestion
23	Nicholas Street on-ramp – Metcalfe Street off-ramp	Congestion	Congestion	Major Congestion

* Major Congestion – LOS "F" observed for duration more than 1.5 hours in a modelling period of 3 hours
Congestion – LOS "F" observed for duration 0.5 - 1.5 hours in a modelling period of 3 hours

The following are some key observations from the a.m. peak period INTEGRATION modelling results:

- Eastbound Highway 417 from the Highway 416 interchange to Pinecrest Road/Greenbank Road is expected to become an area of major congestion by 2011 due to high traffic volumes and weaving conditions between the Richmond Road interchange and the Pinecrest Road/Greenbank Road interchange.

- Eastbound Highway 417 from Pinecrest Road/Greenbank Road to Woodroffe Avenue experiences recurring congestion under existing conditions due to high traffic volumes (average 1863 vph/lane from 7-8 a.m. west of Woodroffe Avenue). Based on the 2011 and 2021 simulation results, this portion of highway may not experience congestion in future years due to the metering effect of major congestion upstream of this location, at Pinecrest Road/Greenbank Road.

- Eastbound Highway 417 from Woodroffe Avenue to Carling Avenue experiences recurring congestion under existing conditions due to high traffic volumes (average 2140 vph/lane from 7-9 a.m. west of Maitland Avenue). This section of Highway 417 will continue to experience recurring congestion through 2011 and 2021 due to high projected traffic volumes in the future years (average 2333 vph/lane in 2011, west of Maitland Ave) and considerable weaving upstream of the Carling Avenue off-ramp.

- Eastbound Highway 417 generally from Parkdale Avenue to Nicholas Street experiences recurring congestion under existing conditions due to high traffic volumes and considerable weaving (average 2070 vph/lane from 7-9 a.m. west of Metcalfe Street). This section of Highway 417 will continue to experience recurring congestion through 2011 and 2021, due to high projected traffic volumes (average 2333 vph/lane in 2011, west of Kent Street) and considerable weaving upstream of the off-ramps at Rochester Street, Bronson Avenue, Kent Street, Metcalfe Street and Nicholas Street. Based on the 2021 simulation results, this portion of highway may not experience congestion in the long term due to "metering" of the flow by the major congestion upstream of this location at the Carling Avenue off-ramp.

- Westbound Highway 417 from Anderson Road to Walkley Road will likely begin experiencing recurring congestion by 2011 due to high projected traffic volumes (average 2150 vph/lane in 2011, south of Walkley Road). Once the Hunt Club Road interchange is constructed (2021 scenario), westbound Highway 417 from the Hunt Club Road off-ramp to Walkley Road is likely to develop into an area of major congestion due to high projected traffic volumes (average 2500 vph/lane in 2021, south of Walkley Road) and considerable weaving.

- Westbound Highway 417 from Innes Road to Ottawa Road 174 presently experiences recurring congestion due to the merge of Highway 417 and Ottawa Road 174. Once the congestion builds up at the merge, the traffic backs up as far as Innes Road. This section of highway is expected to experience increasing congestion through 2011 and 2021 due to increasing traffic volumes through the Highway 417/Ottawa Road 174 merge.

- Westbound Highway 417 from Ottawa Road 174 to Metcalfe Street presently experiences recurring congestion due to high traffic volumes and significant weaving. This section of highway is likely to experience increasing congestion through 2011 and 2021 due to high projected traffic volumes (average 2075 vph/lane in 2021, west of St. Laurent Boulevard) and significant weaving.

Figure 3.5 - Summary of P.M. Peak Period Congestion Locations

Location		Congestion/Major Congestion *		
		2001	2011	2021
Eastbound				
1	Upstream of Hwy 416 off-ramp	-	Congestion	Major Congestion
2	Hwy 416 off-ramp – Richmond Road	-	Congestion	Congestion
3	Upstream of Pinecrest Road off-ramp	-	Major Congestion	Major Congestion
4	Pinecrest Road/Greenbank Road Interchange	-	Congestion	Congestion
5	Pinecrest Road/Greenbank Road on-ramp (Direct) – Woodroffe Avenue off-ramp	-	Congestion	Major Congestion
6	Woodroffe Avenue off-ramp – Maitland Avenue off-ramp	-	Major Congestion	Major Congestion
7	Maitland Avenue off-ramp – Carling Avenue off-ramp	-	Major Congestion	Major Congestion
8	Carling Avenue off-ramp – Parkdale Avenue off-ramp	-	Major Congestion	Major Congestion
9	Parkdale Avenue off-ramp – Upstream of Rochester Street off-ramp	-	Major Congestion	Major Congestion
10	Upstream of Rochester Street off-ramp – Bronson Avenue	Congestion	Major Congestion	Major Congestion
11	Bronson Avenue – Metcalfe Street on-ramp	Major Congestion	Major Congestion	Major Congestion
12	Metcalfe Street on-ramp – Nicholas Street off-ramp	Major Congestion	Major Congestion	Major Congestion

Figure 3.5 - Summary of P.M. Peak Period Congestion Locations

	Location	Congestion/Major Congestion *		
		2001	2011	2021
13	Nicholas Street Interchange	Major Congestion	Major Congestion	Major Congestion
14	Downstream of Nicholas Street on-ramp	Major Congestion	Major Congestion	Major Congestion
15	Downstream of Nicholas Street on-ramp – Riverside Drive on-ramp	-	Major Congestion	Major Congestion
16	Riverside Drive on-ramp – St. Laurent Boulevard	Major Congestion	Major Congestion	Major Congestion
17	St. Laurent Boulevard – Ottawa Road 174	Major Congestion	Major Congestion	Major Congestion
Westbound				
18	Hunt Club off-ramp – Walkley Road off-ramp	-	-	Congestion
19	Walkley Road on-ramp (Inner) – Innes Road	-	Congestion	Congestion
20	Innes Road – Ottawa Road 174 off-ramp	-	Congestion	Major Congestion
21	Ottawa Road 174 Interchange	-	Congestion	Major Congestion
22	Ottawa Road 174 on-ramp – St. Laurent Boulevard on-ramp (Direct)	-	Congestion	Major Congestion
23	St. Laurent Boulevard on-ramp (Direct) - Vanier Parkway off-ramp (Direct)	-	Major Congestion	Major Congestion
24	Vanier Parkway Interchange	-	Major Congestion	Major Congestion
25	Downstream of Vanier Parkway on-ramp (Direct)	Congestion	Major Congestion	Major Congestion
26	Nicholas Street Interchange	-	Congestion	Major Congestion
27	Downstream of Nicholas Street on-ramp	-	Congestion	Major Congestion
28	Downstream of Nicholas Street on-ramp – Metcalfe Street off-ramp	-	Congestion	Major Congestion
29	Metcalfe Street off-ramp - Bronson Avenue	-	Major Congestion	Major Congestion
30	Bronson Avenue – Downstream of Rochester Street on-ramp	Congestion	Major Congestion	Major Congestion

Figure 3.5 - Summary of P.M. Peak Period Congestion Locations

	Location	Congestion/Major Congestion *		
		2001	2011	2021
31	Downstream of Rochester Street on-ramp - Upstream of Parkdale Avenue off-ramp	Congestion	Major Congestion	Major Congestion
32	Upstream of Parkdale Avenue off-ramp	Major Congestion	Major Congestion	Major Congestion
33	Parkdale Avenue Interchange	Congestion	Major Congestion	Major Congestion
34	Parkdale Avenue on-ramp – Island Park Drive	Major Congestion	Major Congestion	Major Congestion
35	Island Park Drive – Carling Avenue off-ramp	Congestion	Major Congestion	Major Congestion
36	Carling Avenue off-ramp – Woodroffe Avenue	Major Congestion	Major Congestion	Major Congestion
37	Downstream of Woodroffe Avenue on-ramp (Direct)	-	Congestion	Major Congestion

* Major Congestion – LOS "F" observed for duration more than 1.5 hours in a modelling period of 3 hours
Congestion – LOS "F" observed for duration 0.5 - 1.5 hours in a modelling period of 3 hours

The following are some key observations from the afternoon peak period INTEGRATION modelling results:

- Eastbound Highway 417 from Rochester Street to Riverside Drive/Vanier Parkway presently experiences recurring congestion due to high traffic volumes (average 1725 vph/lane from 3-5 p.m. west of Metcalfe Street). Significant weaving is observed from the Metcalfe Street on-ramp to Riverside Drive/Vanier Parkway off-ramp due to the close proximity of the Metcalfe, Nicholas and Riverside/Vanier Parkway ramps. This section of highway will continue to experience congestion through 2011 and 2021 due to higher projected traffic volumes (average 1925 vph/lane in 2021, east of Nicholas Street).

- Eastbound Highway 417 from St. Laurent Boulevard to Ottawa Road 174 presently experiences significant weaving due to the close proximity of the on-ramps from St. Laurent Boulevard and the split of Highway 417/Ottawa Road 174. Once the congestion builds up at the split, the traffic backs up as far as the Vanier Parkway. Modelling of the 2011 and 2021 horizon years indicates that traffic may back up all the way to Highway 416 in the future.

- Westbound Highway 417 from Bronson Avenue to Woodroffe Avenue presently experiences recurring congestion due to high traffic volumes and significant weaving (average 1505 vph/lane from 3-5 p.m. west of Maitland Avenue). This congestion is likely to extend eastward up to Ottawa Road 174 by 2011 and up to Innes Road by 2021 due to high projected traffic volumes and significant weaving (average 1900 vph/lane in 2021, west of Maitland Avenue).

- The section of westbound Highway 417 from the Hunt Club Road off-ramp to Ottawa Road 174 is projected to experience congestion throughout by 2021, due to high projected traffic volumes (average 2150 vph/lane at Ottawa Road 174 in 2021).

As noted above, some highway sections that currently experience recurring congestion are projected to have improved traffic operations in future years due to "metering" of the traffic demand by major upstream congestion. In these cases, capacity improvement of the upstream section can be expected to result in the redevelopment of congestion in the downstream section.

3.1.2.5 Corridor Performance

INTEGRATION was also used to produce measures of the performance of the entire model network for each horizon year, to provide indications of the expected changes in congestion and impacts on mobility throughout the primary Study Area as traffic volumes grow and their distribution changes. The two measures produced by the model are:

- Average Corridor Speed, calculated as follows: Total vehicle travel time is computed as the summation of trip times across all vehicle trips that are completed within the simulation period. The total vehicle kilometres is computed as the sum of the trip lengths for all vehicle trips that are completed within the simulation period. Average Network Speed is calculated by dividing the total vehicle kilometres by total vehicle travel time.

- Average Corridor Stops, calculated as follows: Each time a vehicle decelerates, the drop in speed is recorded as a partial stop. The total vehicle stops are computed as the summation of the number of vehicle stops per trip for all vehicle trips that were completed within the simulation period. The average vehicle stops are computed as the total vehicle stops divided by the total vehicle trips.

Figure 3.6 summarizes the corridor performance measures for the modelled a.m. and p.m. peak periods in 2001, 2011 and 2021.

The model indicates that increasing congestion and degradation in mobility can be expected over the next 20 years even with the planned improvements to the City's transportation system. For example, average network speed between 4 p.m. and 5 p.m. is projected to decrease by 26 km/h (39%) by 2011 and by 32 km/h (47%) by 2021. The impact is less during the a.m. peak period; for example, the average network speed between 8 a.m. and 9 a.m. is projected to decrease by 7 km/h (11%) by 2021. While the congestion increases in the a.m. peak period are projected to be less severe than in the p.m. peak period, they are still highly significant when considering the traffic volumes using Highway 417 through the Study Area each morning.

Figure 3.6 - INTEGRATION Corridor Performance Statistics

Time Period	Average Corridor Speed (km/h)			Average Corridor Stops (%)		
	2001	2011	2021	2001	2011	2021
a.m. Peak Period						
6:00-7:00 a.m.	105.6	106.2	104.9	4.5	4.2	4.6
7:00-8:00 a.m.	81.7	78.3	72.6	8.3	8.5	9.0
8:00-9:00 a.m.	64.4	60.4	57.4	10.5	10.2	10.8
p.m. Peak Period						
3:00-4:00 p.m.	80.7	63.4	58.4	10.3	12.2	13.4
4:00-5:00 p.m.	68.0	41.8	35.9	11.4	14.7	16.2
5:00-6:00 p.m.	59.2	30.7	27.4	12.2	16.4	17.7

The model indicates a minor improvement in overall corridor performance during the first hour of the a.m. peak period in 2011. This result appears to be caused by a redistribution of traffic volumes, as a result of volume balancing and the travel pattern changes predicted by the EMME/2 model. The redistribution produces a more uniform flow through key sections of the Study Area, delaying the onset of congestion in these areas. The overall improvement in corridor performance is not considered to be significant and is not sustained into the second hour of the peak period or the 2021 horizon year.

3.1.2.6 Analysis of Traffic Operations

Traffic operations analyses were completed using the methodologies of the *Highway Capacity Manual, 2000* (HCM). These methodologies require that the Highway 417 corridor be broken down into basic freeway segments, weaving sections, merge areas, diverge areas and intersections, with each analyzed separately. The analyses therefore did not reflect all interactions among the various components of the corridor.

For all freeway facilities, including basic freeway segments, weaving sections and ramp influence areas, the HCM defines LOS in terms of density (passenger cars per lane km). Density provides a measure of drivers' ability to manoeuvre within the traffic stream. As density increases, drivers' ability to select their desired lane and travel speed is increasingly restricted and their comfort level is diminished. The HCM LOS definitions for basic freeway segments, weaving sections and ramp influence areas are summarized in **Figure 3.7.**

Figure 3.7 - Level of Service Definitions for Freeway Facilities (HCM 2000)

Level of Service	Density (passenger cars/km/lane)			Comments
	Basic Freeway Segment	Weaving Section	Ramp Influence Area	
A	≤ 7	≤ 6	≤ 6	Free-flow
B	>7-11	>6-12	>6-12	Minor manoeuvrability reduction
C	>11-16	>12-17	>12-17	Manoeuvrability restricted; speeds near free-flow
D	>16-22	>17-22	>17-22	Limited manoeuvrability; speeds decline; minor incidents cause queues
E	>22-28	>22-27	>22	Operation up to capacity; unstable – any incident causes major queues
F	>28	>27	*	Breakdown (demand > capacity); congested operation; within queue

* Density not calculated at LOS F

For intersections, the HCM defines LOS in terms of average control delay per vehicle. Control delay is defined as the increased travel time of a vehicle approaching and passing through a signal or stop controlled intersection compared with a (theoretical) free-flow vehicle approaching and passing through the intersection with no control. The control delay ranges for each LOS for signalized and unsignalized intersections are summarized in the **Figure 3.8**.

Figure 3.8 - Level of Service Definitions for Intersections (HCM 2000)

Level of Service	Average Control Delay (s/veh)	
	Signalized	Unsignalized
A	≤ 10	≤ 10
B	>10-20	>10-15
C	>20-35	>15-25
D	>35-55	>25-35

Level of Service	Average Control Delay (s/veh)	
	Signalized	Unsignalized
E	>55-80	>35-50
F	>80	>50

The analysis produced an a.m. peak hour and a p.m. peak hour level of service for each freeway section or intersection analyzed under the 2001, 2011 and 2021 volume scenarios.

3.1.2.7 Highway 417 Mainline

The existing and projected future levels of service (LOS) for all Highway 417 mainline sections (basic freeway segments, ramp merge/diverge areas, weaving sections) are summarized in tables provided the Traffic Operations Report located in Appendix D of this TESR. These tables list all of the mainline segments for each direction of travel, in the order in which a driver would encounter them, to assist in identifying LOS patterns and problem areas. The results are also summarized on the Corridor Analysis Composite Plans following **Section 3.1.5** of this TESR.

Existing (2001) Traffic Operations Problems

The analysis of weaving sections, ramp influence areas and basic freeway segments indicated that the following sections of the Highway 417 mainline currently experience traffic operations problems:

- Eastbound from the Woodroffe Avenue interchange to the Carling Avenue/Kirkwood Avenue interchange in the a.m. peak hour – The analysis results indicate significant congestion throughout this section in 2001. Most ramp merge and diverge areas at the Woodroffe Avenue, Maitland Avenue and Carling Avenue/Kirkwood Avenue interchanges were operating at LOS F. The basic freeway segment between Maitland Avenue and Carling Avenue was also operating at LOS F.

- Eastbound between Parkdale Avenue and Rochester Street interchanges – The analysis shows this basic freeway segment to be operating near capacity, at LOS E, in the 2001 a.m. peak hour.

- Eastbound between the Metcalfe Street interchange and the Vanier Parkway interchange, a.m. and p.m. peak hours – The analysis indicates several areas of near capacity and congested operation through this section. The weaving section between Metcalfe Street and Nicholas Street operates at LOS E in the a.m. peak hour and LOS F in the p.m. peak hour. The weaving section between the on-ramp from Lees Avenue and the Vanier Parkway operates close to capacity (LOS E) in the p.m. peak hour. The diverge area at the Metcalfe Street off-ramp operates at LOS F in the a.m. peak hour. The merge areas of the Vanier Parkway on-ramps operate at LOS F in the p.m. peak hour.

- Westbound at the Maitland Avenue interchange in the p.m. peak hour – The analysis indicates an area of congestion, localized at the interchange, with the Maitland Avenue ramp N/S-W merge area operating at LOS F in 2001. The basic freeway segment between Carling Avenue and Maitland Avenue was operating at LOS E, indicating unstable, near capacity operations upstream of the interchange.

- Westbound between the Vanier Parkway interchange and the O'Connor Street interchange, a.m. and p.m. peak hours – The analysis indicates that this section also includes several areas of congested and near capacity operation. The weaving sections between the Vanier Parkway and Nicholas Street (analyzed as two ramp influence areas, due to length of section > 750 m) and between Nicholas Street and Metcalfe Street operate at LOS F in the a.m. peak hour. In the p.m. peak hour, the Vanier-Nicholas weave operates at LOS F, while the Nicholas-Metcalfe weave is close to capacity (LOS E). The O'Connor Street on-ramp merge area operates at LOS F in the a.m. peak hour. In addition, the basic freeway segment between Metcalfe Street and O'Connor Street operates near capacity (LOS E) in the a.m. peak hour.

- The St. Laurent Boulevard ramp N-W merge area operates at LOS F in the a.m. peak hour.

Future (2011, 2021) Traffic Operations Problems

The following is a summary of the most significant traffic operations problems indicated by the traffic operations analysis of the 2011 and 2021 traffic volume projections.

Eastbound A.M. Peak Hour:

- Pinecrest Road/Greenbank Road interchange to the Parkdale Avenue interchange – Existing congestion (LOS F) is projected to remain through 2021 at most ramp merge/diverge areas through the Woodroffe Avenue, Maitland Avenue and Carling Avenue interchanges and at the Maitland Avenue to Carling Avenue basic freeway segment. By 2011, congested operations are projected to extend to the Pinecrest Road/Greenbank Road interchange, with near capacity operations (LOS E) from Carling Avenue to Parkdale Avenue. By 2021, congested operations are projected for most mainline sections from the Pinecrest Road/Greenbank Road interchange to the Parkdale Avenue interchange.

- Parkdale Avenue interchange to Rochester Street interchange – Existing near capacity operation of this basic freeway segment is projected to continue through 2011 and develop into congested operations by 2021. Congested operations are also expected at the Rochester Street off-ramp by 2011.

- Kent Street off-ramp diverge area – Congestion is projected to occur by 2011 and continue through 2021.

- Metcalfe Street to Nicholas Street weaving section – Existing near capacity operations of this weaving section are projected to continue, worsening to congested operations by 2021.

Eastbound P.M. Peak Hour

- Maitland Avenue interchange to Carling Avenue interchange – This basic freeway segment is projected to operate near capacity (LOS E) by 2011 and experience congested operations (LOS F) by 2021.

- Metcalfe Street interchange to Innes Road interchange – Existing congestion through the section from Metcalfe Street to St. Laurent Boulevard is projected to remain through 2021. The analysis indicates near capacity operation of the St. Laurent Boulevard to Ottawa Road 174 and Ottawa Road 174 to Innes Road weaving sections starting by 2011, with congested operations in these sections by 2021. Field observations and INTEGRATION modelling found significant existing congestion in the St. Laurent Boulevard to Ottawa Road 174 weaving section. The operations analysis results indicate operations better than indicated by observation. This discrepancy appears to result from a combination of a downstream bottleneck on Ottawa Road 174 and over-estimation of the weaving section capacity by HCS.

- Innes Road interchange to east of the Walkley Road interchange – The analysis indicates near capacity operation of the basic freeway segment between Innes Road and Walkley Road by 2011, but by 2021 congested operations are projected for most mainline sections from the Innes Road interchange to east of the Walkley Road interchange.

Westbound A.M. Peak Hour

- East of the Walkley Road interchange to Innes Road interchange – Congested (LOS F) and near capacity (LOS E) operations are projected to occur by 2011 upstream of Walkley Road and Innes Road. Congestion is projected to spread throughout the section between the Hunt Club Road interchange and the Innes Road interchange by 2021.

- Innes Road interchange to Bronson Avenue interchange – Existing congested areas are concentrated between the Vanier Parkway and O'Connor Street interchanges. By 2011, congested operations are projected for almost all sections from the Aviation Parkway ramp diverge to the O'Connor Street ramp merge, with near capacity operation in the Innes Road to Ottawa Road 174 and Lyon Street to Bronson Street weaving sections. By 2021 congested operations are projected throughout the area from Innes Road to O'Connor Street, with continued near capacity operation of the Lyon Street to Bronson Street weaving section.

- Carling Avenue interchange to Maitland Avenue interchange – The analysis projects congested operation at the Carling Avenue interchange and near capacity operations in the downstream basic freeway segment by 2011. By 2021, congested operations are expected for the Highway 417 mainline from Carling Avenue to Maitland Avenue.

Westbound P.M. Peak Hour

- Vanier Parkway Interchange to Metcalfe Street interchange – The existing congested operations of the Vanier Parkway on ramp merge area are projected to continue through 2021. The off ramp diverge at Nicholas Street is also projected to become congested by 2021. The existing near capacity operation of the Nicholas Street to Metcalfe Street weaving section is projected to continue through 2021. The improved operations indicated by the HCS analysis for the Metcalfe Street to O'Connor Street section results from a minor decrease in volumes as part of the balancing of the existing condition volumes.

- Carling Avenue interchange to Maitland Avenue interchange – Near capacity operation of the Carling Avenue to Maitland Avenue basic freeway segment and congested operation of the Maitland Avenue Ramp on ramp merge area are projected to continue. By 2011, congested operations are projected for all but one of the mainline sections between the westbound off-ramp diverge at the Carling Avenue interchange and the Maitland Avenue on-ramp merge area. By 2021, congested operations are expected in all of the mainline sections throughout this area.

- Woodroffe Avenue interchange to Richmond Road interchange – Congested operations are projected to begin in the Woodroffe Avenue and Pinecrest Road/Greenbank Road interchanges by 2011 and continue through 2021. Near capacity operation of the weaving section between Pinecrest Road/Greenbank Road and Richmond Road is projected by 2021.

3.1.3 Safety Review

A detailed statistical analysis of collision records for the years 1998 through 2001 was completed to identify locations with a higher than expected occurrence of collisions. A probability analysis methodology was used to review a total of 3291 collision records and 259 locations within the Highway 417 Study Area, including all freeway mainline sections, ramps and ramp terminal intersections. **Figure 3.9** provides a breakdown of collision occurrence by location, type and severity. In general, the review revealed that areas of higher than expected collision frequency often coincide with areas of recurring congestion.

A full copy of the safety review report is presented as Appendix H within the Traffic Operations Report located in **Appendix D.**

Figure 3.9 - Highway 417 Collision Counts by Severity and Area Type, 1998-2001

Area Type	Severity			
	Fatal	Injury	PDO*	Total
Diverge	1	95	379	475
Merge	0	43	115	158
Ramp Intersection	0	153	372	525
Off-Ramp	0	33	117	150
On-Ramp	0	47	152	199
Mainline between interchanges	1	220	929	1150
Mainline within interchanges	5	154	475	634
Total	7	745	2539	3291

* PDO – Property Damage Only

The Study Area was also reviewed in the field from a "human factors" perspective. Human factors deals with human physical, perceptual and cognitive abilities and limitations, and how they affect our interactions with tools, machines and workplaces. The goal of human factors in road transportation is to understand as fully as possible the abilities and limitations of road users and to study the human-machine-situational interactions that occur, in order to capitalize on this knowledge to implement improvements in engineering design. By adapting the tools and machines – the roads and the vehicles - and by shaping the conditions under which humans as road users must perform, human factors seeks to optimize performance by design, leading to improvements in both safety and efficiency.

Based on the findings of the review, the following conclusions were drawn:

- There are no systemic deficiencies in the existing geometry of the Highway 417 mainline, when viewed from a human factors perspective, however there are several instances of violations of expectation (e.g. left exits and "must exits"). Where they exist, violations of expectation have been conspicuously identified using traffic control devices. All of these locations of concern were captured as either "Primary" or "Secondary" locations of higher than expected collision probability.

- There exist site-specific safety concerns regarding the available stopping sight distance for drivers in the left (median) lane through horizontal curves to the left, (where the median barrier limits sight distance), and for all drivers on crest vertical curves (where the road surface limits sight distance). These locations were identified initially based on Plan and Profile drawings and confirmed in the field. These concerns, and their implications, are detailed further in the Highway Geometrics section below and in the *Existing Conditions Report – Highway Geometrics* located in **Appendix E** of this TESR.

- Drivers on the Highway 417 mainline are provided with an adequate level of positive guidance. Signs, markings, delineation and geometry are all well-integrated and relatively consistent throughout.

- Drivers entering Highway 417 from on-ramps within the urban boundary are often challenged to match the operating speed of traffic and merge before their lane either ends or exits. Opportunities to provide more generous acceleration/merge lanes, to minimize the use of continuous auxiliary/"must exit" lanes, and to provide greater preview of the traffic ahead and alongside, should be explored.

- Drivers exiting Highway 417 via off-ramps located within the urban boundary are often confronted with tight geometry, limited sight distances, and the need to significantly reduce speed to match road geometry and traffic conditions in short distances. Additional emphasis on advisory speeds, enhanced delineation, improved sight distance and adequate perception/reaction/manoeuvre time is required.

- The geometry and lane arrangement of many of the crossing roadways are complex and demanding on the unfamiliar driver. While significant efforts to communicate these configurations through signs and markings have been made, it is necessary to consider physical channelization at some locations in order to reduce the frequency and severity of vehicular conflicts.

3.1.4 HIGHWAY GEOMETRICS

In addition to the transportation operations and safety reviews described above, a thorough analysis of the existing highway components (e.g. curves, sight distance, lane and shoulder widths, etc.) was undertaken to identify existing deficiencies and opportunities for elimination of those deficiencies. A copy of the *Existing Conditions Report – Highway Geometrics* is included in **Appendix E** and the key findings are summarized below.

- Seven horizontal curves on Highway 417 do not satisfy current standards for the minimum radius for a 120 km/h design speed;
- A further seventeen horizontal curves on Highway 417 do not meet all current design standards;
- One horizontal deflection on Highway 417 exceeds the 0.5° maximum deflection;
- Nine horizontal curves on Highway 417 and thirteen curves on various interchange ramps do not provide minimum stopping sight distance (the obstruction is typically the median or roadside barrier but in some cases, the obstruction is existing vegetation or noise barrier);
- There are sixteen crest vertical curves on Highway 417 and ten sag vertical curves that do not achieve the minimum standard;
- Fifteen vertical curves on Highway 417 are too short;
- There are twenty-three freeway ramps where the horizontal radius is not within the current acceptable range and thirty-one that are within the acceptable range but are not standard;
- Twenty-eight freeway exit / entrance terminals are shorter than current design standards and twenty crossing road exit / entrance terminals are shorter than current design standards;
- There are twenty-three crossing road intersections at ramp terminals where the existing grade on the crossing road or ramp is greater than desirable;
- Eight crossing road exit terminals are of the incorrect type (e.g. Direct Spiral instead of Direct Taper);
- There are eleven locations where ramp terminal spacing does not achieve current design standards;
- At five locations, available weaving length is not in accordance with current design standards;
- Twenty-seven kilometres of freeway have lane widths not in accordance with current design standards; and
- There are numerous locations where the shoulders are narrower than current standards.

3.1.5 PROBLEM SUMMARY – CORRIDOR ANALYSIS COMPOSITE PLANS

Given the extensive review of the existing problems associated with the Queensway and the volume and complexity of the information gathered and generated, the Project Team developed an illustrated summary of the key issues at each location in the areas of highway geometry, traffic operations, and safety and presented this summary on Corridor Analysis Composite Plans). This helped the Project Team and study stakeholders to better understand the existing and projected problems. This understanding was a key prerequisite to the development of alternative solutions to address problems and opportunities.

The Corridor Analysis Composite Plans were presented to the MTAC, PAC and to the public at the first round of Public Involvement Centres for information and feedback. The input received ensured that the Project Team had fully captured the existing problems prior to commencing the development and analysis of alternatives. The input was considered by the Project Team and the Corridor Analysis Composite Plans were revised accordingly. The Corridor Analysis Composite Plans are presented as **Plates 1 – 12**. The areas of Highway Geometry, Traffic Operations and Safety are depicted as G, T and S on the plates. (The phrase "higher than expected collision probability" is used to describe how the safety performance of a specific location compares to other similar locations with similar features on the Queensway (e.g. compares on ramps with other on ramps).

3.1.6 OVERALL CONCLUSIONS

As a result of the work undertaken to identify the problems and opportunities related to Highway 417 from Highway 416 to Anderson Road, the following conclusions were drawn:

- Continuing population and employment growth in the City of Ottawa will result in significant growth in travel demands through the Study Area.

- With a few minor exceptions, traffic operations on Highway 417 through the Study Area are projected to deteriorate over the next 20 years if no capacity improvements are implemented.

- With no modifications to Highway 417 through the Study Area, traffic volume growth on Highway 417 will be capacity constrained, resulting in the lengthening of peak periods, increases in travel delays, and diversion of trips to the local road network. As a result, the safety performance of the highway is expected to degrade since most areas that demonstrate higher than expected collision rates are associated with areas of recurring congestion. As a result, any measures that reduce the existing congestion or limit the amount of overall congestion on the Queensway are expected to result in better safety performance.

- If the capacity of Highway 417 through the Study Area is increased, traffic will be attracted from other facilities (City roads) or from the shoulders of the peak periods until a new equilibrium is reached. No significant change would be expected to the level of service on Highway 417 in the peak travel hours, but an overall improvement in network operations would be achieved as well as on Highway 417 in non peak travel periods.

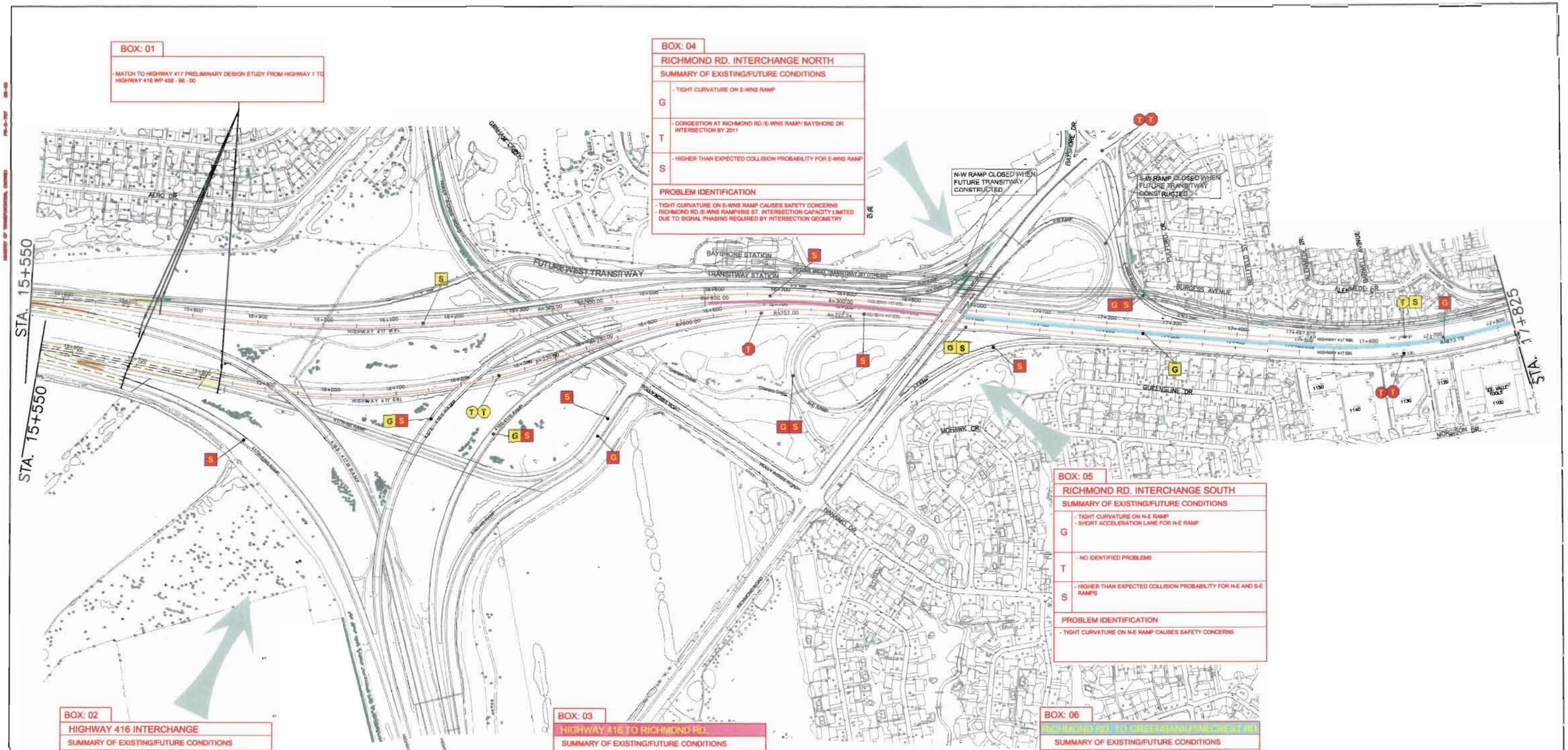
- As detailed in the Traffic Operations Report, major network improvements (new inter-provincial bridge(s), new Outer Transportation Corridor) do not significantly change the travel demands on Highway 417 through the Study Area, but they do enhance overall network performance.

- Existing areas of congestion are projected to expand over time. Substantial growth in congestion is expected in the following locations:
  - Westbound from Walkley Road or Hunt Club Road through the Ottawa Road 174 interchange in the a.m. peak period;
  - Westbound from Ottawa Road 174 into the downtown area in the a.m. peak period;
  - Westbound from the downtown area towards Highway 416 in the p.m. peak period;
  - Eastbound from the Pinecrest Road/Greenbank Road interchange toward the downtown area in the a.m. peak period; and
  - Eastbound from the downtown area to Ottawa Road 174 in the p.m. peak period.

- Traffic operations analysis indicates that adding lanes to Highway 417 could maintain acceptable operations throughout most of the Study Area during most hours of the day.

- Many of the ramp terminal intersections (26 in total) throughout the Study Area have existing traffic operations problems or are expected to develop problems in the future, most within 10 years.

- Statistical analysis of the 1998 through 2001 collision history at 259 locations found 106 locations with collision probability indicators higher than the overall collision probability for the Study Area. Of these, 76 locations were found to have collision probability indicators higher than the overall collision probability for all locations of the same type within the Study Area. These locations have the highest potential for safety improvement. The remaining 30 locations have a lower, but still significant, potential for safety improvement.



BOX: 01

- MATCH TO HIGHWAY 417 PRELIMINARY DESIGN STUDY FROM HIGHWAY 7 TO HIGHWAY 416 WP 458 - 98 - 00

BOX: 04

RICHMOND RD. INTERCHANGE NORTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON E-WNS RAMP
T	- CONGESTION AT RICHMOND RD./E-WNS RAMP/ BAYSHORE DR. INTERSECTION BY 2011
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR E-WNS RAMP

PROBLEM IDENTIFICATION

- TIGHT CURVATURE ON E-WNS RAMP CAUSES SAFETY CONCERNS
- RICHMOND RD./E-WNS RAMP/IRIS ST. INTERSECTION CAPACITY LIMITED DUE TO SIGNAL PHASING REQUIRED BY INTERSECTION GEOMETRY

BOX: 05

RICHMOND RD. INTERCHANGE SOUTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON N-E RAMP - SHORT ACCELERATION LANE FOR N-E RAMP
T	- NO IDENTIFIED PROBLEMS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR N-E AND S-E RAMPS

PROBLEM IDENTIFICATION

- TIGHT CURVATURE ON N-E RAMP CAUSES SAFETY CONCERNS

BOX: 02

HIGHWAY 416 INTERCHANGE

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NARROW SHOULDERS ON RAMPS 416S-417E & 417E-416S RESTRICT STOPPING SIGHT DISTANCES - SHORT WEAVING LENGTH BETWEEN 417W-NS/416S-NS RAMP MERGE AND HOLLY ACRES ROAD
T	- NO IDENTIFIED PROBLEMS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR RAMPS 417W-416S, 416S-417E, 417E-416S & 416/417 RAMPS TO HOLLY ACRES ROAD

PROBLEM IDENTIFICATION

- RESTRICTED STOPPING SIGHT DISTANCE ON RAMPS 416S-417E & 417E-416S
- WEAVING ON THE RAMP APPROACH TO HOLLY ACRES ROAD CAUSES INCREASED COLLISION PROBABILITY

BOX: 03

HIGHWAY 416 TO RICHMOND RD.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- VERTICAL (CREST) CURVATURE EAST OF RICHMOND RD. RESTRICTS WB SIGHT DISTANCE FOR LANE ARRANGEMENT CHANGES APPROACHING HWY. 416
T	- HWY. 417 WB TRAFFIC OPERATIONS CONCERNS DUE TO RIGHT LANE DROP THROUGH RICHMOND RD. INTERCHANGE - 416S-417E MERGE AREA CONGESTION DURING PEAK PERIODS BY 2021
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB & WB HWY. 417

PROBLEM IDENTIFICATION

- WB LANE DROP THROUGH RICHMOND RD. INTERCHANGE, IN AREA OF RESTRICTED SIGHT DISTANCE

BOX: 06

RICHMOND RD. TO GREENBANK/PINECREST RD.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- VERTICAL (CREST) CURVATURE RESTRICTS STOPPING SIGHT DISTANCE - NARROW MEDIAN SHOULDER RESTRICTS EB STOPPING SIGHT DISTANCE THROUGH HORIZONTAL CURVE - EB RIGHT LANE DROP AT PINECREST/GREENBANK RD.
T	- EB HWY. 417 CONGESTION DURING PEAK PERIODS BY 2011 - WB HWY. 417 CONGESTION DURING PEAK PERIODS BY 2021
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR WB HWY. 417, PARTICULARLY IN RAMP MERGE AND DIVERGE AREAS

PROBLEM IDENTIFICATION

- INSUFFICIENT THROUGH LANE CAPACITY
- EB RIGHT LANE DROP AT PINECREST/GREENBANK RD. CAUSES TRAFFIC OPERATIONS CONCERNS

Ministry of Transportation Ontario

DH engineers architects planners

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN
FROM STA. 15+550 TO STA. 17+825

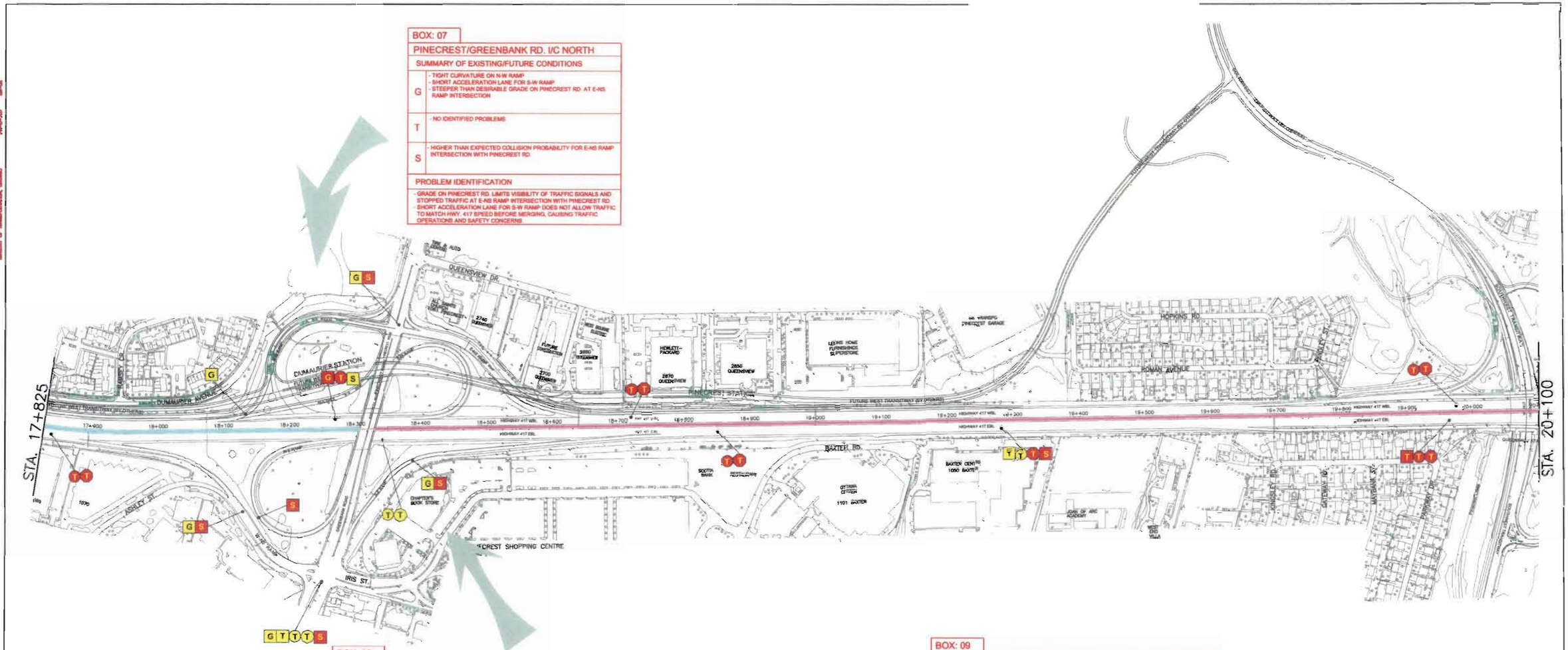
LEGEND:

- G GEOMETRICS--MINOR DEVIATION FROM STANDARDS
- G GEOMETRICS--MAJOR DEVIATION FROM STANDARDS
- T YEAR 2001 TRAFFIC OPERATIONS--CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS--CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS--CONGESTION
- T YEAR 2001 TRAFFIC OPERATIONS--MAJOR CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS--MAJOR CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS--MAJOR CONGESTION
- S SAFETY--HIGHER THAN EXPECTED COLLISION PROBABILITY
- S SAFETY--SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE: 50m 0 100m Horizontal

PLATE 1

PLI-CDR_ANALYSIS-TRAFFICLWG 12/20/03 09:05



BOX: 07

PINECREST/GREENBANK RD. I/C NORTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON N-W RAMP - SHORT ACCELERATION LANE FOR S-W RAMP - STEEPER THAN DESIRABLE GRADE ON PINECREST RD. AT E-NS RAMP INTERSECTION
T	- NO IDENTIFIED PROBLEMS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR E-NS RAMP INTERSECTION WITH PINECREST RD.

PROBLEM IDENTIFICATION

- GRADE ON PINECREST RD. LIMITS VISIBILITY OF TRAFFIC SIGNALS AND STOPPED TRAFFIC AT E-NS RAMP INTERSECTION WITH PINECREST RD.
- SHORT ACCELERATION LANE FOR S-W RAMP DOES NOT ALLOW TRAFFIC TO MATCH HWY. 417 SPEED BEFORE MERGING, CAUSING TRAFFIC OPERATIONS AND SAFETY CONCERNS

BOX: 08

PINECREST/GREENBANK RD. I/C SOUTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON S-E RAMP - SHORT WEAVING LENGTH ON W-NS RAMP DUE TO ASHLEY ST CONNECTION - STEEPER THAN DESIRABLE GRADE ON GREENBANK RD. AT W-NS RAMP/IRIS ST. INTERSECTION
T	- CONGESTION AT GREENBANK RD./W-N/S RAMP/IRIS ST. INTERSECTION DURING PEAK PERIODS - WEAVING BETWEEN TRAFFIC ON W-NS RAMP AND TRAFFIC FROM ASHLEY ST.
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR ALL RAMPS AND GREENBANK RD./W-NS RAMP/IRIS ST. INTERSECTION

PROBLEM IDENTIFICATION

- TIGHT CURVATURE ON S-E RAMP CAUSES SAFETY CONCERNS
- DIRECT ACCESS TO W-NS RAMP FROM RESIDENTIAL ROAD (ASHLEY ST.) CAUSES SAFETY CONCERNS DUE TO SHORT WEAVING LENGTH AND SPEED DIFFERENTIAL
- GREENBANK RD./W-NS RAMP/IRIS ST. INTERSECTION CAPACITY LIMITED DUE TO TRAFFIC SIGNAL PHASING REQUIRED BY INTERSECTION GEOMETRY

BOX: 09

GREENBANK/PINECREST RD. TO WOODROFFE AVE.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NO SITE SPECIFIC ISSUES
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS, PARTICULARLY IN RAMP MERGE AND DIVERGE AREAS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB HWY. 417 IN MERGE AND DIVERGE AREAS

PROBLEM IDENTIFICATION

- INSUFFICIENT THROUGH LANE CAPACITY

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HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

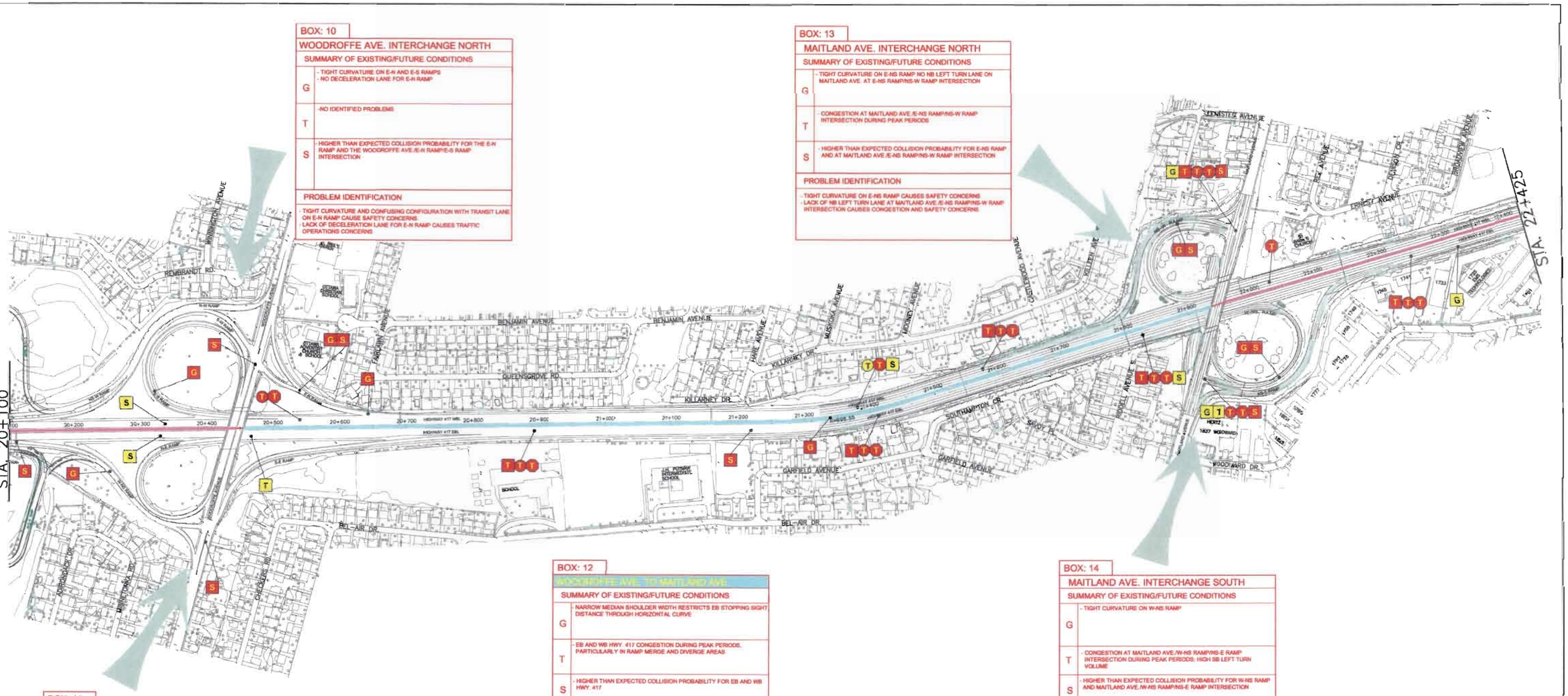
CORRIDOR ANALYSIS COMPOSITE PLAN
FROM STA. 17+825 TO STA. 20+100

LEGEND:
G GEOMETRICS–MINOR DEVIATION FROM STANDARDS
G GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
T YEAR 2001 TRAFFIC OPERATIONS–CONGESTION
T YEAR 2011 TRAFFIC OPERATIONS–CONGESTION
T YEAR 2021 TRAFFIC OPERATIONS–CONGESTION
T YEAR 2001 TRAFFIC OPERATIONS–MAJOR CONGESTION
T YEAR 2011 TRAFFIC OPERATIONS–MAJOR CONGESTION
T YEAR 2021 TRAFFIC OPERATIONS–MAJOR CONGESTION
S SAFETY–HIGHER THAN EXPECTED COLLISION PROBABILITY
S SAFETY–SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE
50m 0 100m
Horizontal

PLATE
2

PL2-COR_ANALYSIS-TRAFFIC.DWG 12/22/03 09:56



BOX: 10

WOODROFFE AVE. INTERCHANGE NORTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON E-N AND E-S RAMPS - NO DECELERATION LANE FOR E-N RAMP
T	-NO IDENTIFIED PROBLEMS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR THE E-N RAMP AND THE WOODROFFE AVE./E-N RAMP/E-S RAMP INTERSECTION

PROBLEM IDENTIFICATION

- TIGHT CURVATURE AND CONFUSING CONFIGURATION WITH TRANSIT LANE ON E-N RAMP CAUSE SAFETY CONCERNS
- LACK OF DECELERATION LANE FOR E-N RAMP CAUSES TRAFFIC OPERATIONS CONCERNS

BOX: 13

MAITLAND AVE. INTERCHANGE NORTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON E-NS RAMP NO NB LEFT TURN LANE ON MAITLAND AVE. AT E-NS RAMP/NS-W RAMP INTERSECTION
T	- CONGESTION AT MAITLAND AVE./E-NS RAMP/NS-W RAMP INTERSECTION DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR E-NS RAMP AND AT MAITLAND AVE./E-NS RAMP/NS-W RAMP INTERSECTION

PROBLEM IDENTIFICATION

- TIGHT CURVATURE ON E-NS RAMP CAUSES SAFETY CONCERNS
- LACK OF NB LEFT TURN LANE AT MAITLAND AVE./E-NS RAMP/NS-W RAMP INTERSECTION CAUSES CONGESTION AND SAFETY CONCERNS

BOX: 12

WOODROFFE AVE. TO MAITLAND AVE.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NARROW MEDIAN SHOULDER WIDTH RESTRICTS EB STOPPING SIGHT DISTANCE THROUGH HORIZONTAL CURVE
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS, PARTICULARLY IN RAMP MERGE AND DIVERGE AREAS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB AND WB HWY. 417

PROBLEM IDENTIFICATION

- INSUFFICIENT THROUGH LANE CAPACITY

BOX: 14

MAITLAND AVE. INTERCHANGE SOUTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON W-NS RAMP
T	- CONGESTION AT MAITLAND AVE./W-NS RAMP/NS-E RAMP INTERSECTION DURING PEAK PERIODS; HIGH SB LEFT TURN VOLUME
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR W-NS RAMP AND MAITLAND AVE./W-NS RAMP/NS-E RAMP INTERSECTION

PROBLEM IDENTIFICATION

- TIGHT CURVATURE ON W-NS RAMP CAUSES SAFETY CONCERNS; TRAFFIC SLOWING FOR RAMP CONTRIBUTES TO SAFETY CONCERN ON EB HWY. 417
- HIGH SB LEFT TURN VOLUME AT MAITLAND AVE./W-NS RAMP/NS-E RAMP INTERSECTION CONTRIBUTES TO CONGESTION AND SAFETY CONCERNS

BOX: 11

WOODROFFE AVE. INTERCHANGE SOUTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON W-NS RAMP - DISTANCE BETWEEN SUCCESSIVE RAMPS DOES NOT MEET CURRENT STANDARD
T	- NO IDENTIFIED PROBLEMS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR W-NS RAMP AND THE WOODROFFE AVE./W-NS RAMP INTERSECTION

PROBLEM IDENTIFICATION

- TIGHT CURVATURE ON W-NS RAMP CAUSES SAFETY CONCERNS

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HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN
FROM STA. 20+100 TO STA. 22+425

LEGEND:

- G GEOMETRICS–MINOR DEVIATION FROM STANDARDS
- G GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
- T YEAR 2001 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2001 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–MAJOR CONGESTION
- S SAFETY–HIGHER THAN EXPECTED COLLISION PROBABILITY
- S SAFETY–SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE 50m 0 100m Horizontal

PLATE 3

PLS-COR_ANALYSIS-TRAFFIC.DWG 12/17/03 13466

BOX: 17

CARLING AVE. INTERCHANGE NORTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- SHORT DISTANCE BETWEEN CARLING AVE./E-WNS RAMP MERGE AND KIRKWOOD AVE
T	- POOR TRAFFIC OPERATIONS OBSERVED ON WB CARLING AVE. AND E-WNS RAMP DUE TO SHORT WEAVING LENGTH BETWEEN RAMP MERGE AND KIRKWOOD AVE. - CONGESTION AT CARLING AVE./KIRKWOOD AVE. INTERSECTION IN PEAK PERIODS BY 2011
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR E-WNS RAMP DIVERGE AREA SAFETY CONCERNS WITH WEAVING MANOEUVRES BETWEEN E-WNS RAMP AND KIRKWOOD AVE.

PROBLEM IDENTIFICATION

- SHORT WEAVING LENGTH BETWEEN CARLING AVE./E-WNS RAMP MERGE AND KIRKWOOD AVE. CAUSES TRAFFIC OPERATIONS AND SAFETY CONCERNS INSUFFICIENT CAPACITY AT CARLING AVE./KIRKWOOD AVE INTERSECTION

BOX: 19

ISLAND PARK DR. INTERCHANGE

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NO DECELERATION LANE FOR E-N RAMP
T	- NO IDENTIFIED PROBLEMS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR E-N RAMP

PROBLEM IDENTIFICATION

- LACK OF DECELERATION LANE FOR E-N RAMP REQUIRES EXITING VEHICLES TO SLOW DOWN ON THE HWY. 417 WB THROUGH LANE CAUSING TRAFFIC OPERATIONS AND SAFETY CONCERNS

STA. 22+425

STA. 24+725

BOX: 15

MAITLAND AVE. TO CARLING AVE.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- VERTICAL (CREST) CURVATURE RESTRICTS STOPPING SIGHT DISTANCE
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB AND WB HWY. 417

PROBLEM IDENTIFICATION

- INSUFFICIENT THROUGH LANE CAPACITY

BOX: 16

CARLING AVE. INTERCHANGE SOUTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- LESS THAN DESIRABLE DISTANCE BETWEEN CARLING AVE./W-ENS RAMP MERGE AND KIRKWOOD AVE. - SHORT ACCELERATION LANE FOR S-E RAMP MERGE
T	- CONGESTION AT CARLING AVE./KIRKWOOD AVE. INTERSECTION DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR W-ENS AND S-E RAMPS

PROBLEM IDENTIFICATION

- WEAVING BETWEEN CARLING AVE./W-ENS RAMP MERGE AND KIRKWOOD AVE. CAUSES SAFETY CONCERNS AND CONGESTION
- INSUFFICIENT CAPACITY AT CARLING AVE./KIRKWOOD AVE. INTERSECTION
- SHORT ACCELERATION LANE FOR S-E RAMP DOES NOT ALLOW VEHICLES TO MATCH HWY. 417 TRAFFIC SPEED BEFORE MERGING

BOX: 18

CARLING AVE. TO ISLAND PARK DR.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- VERTICAL (CREST) CURVATURE RESTRICTS STOPPING SIGHT DISTANCE
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS, PARTICULARLY IN RAMP MERGE AND DIVERGE AREAS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB AND WB HWY. 417

PROBLEM IDENTIFICATION

- INSUFFICIENT WB HWY 417 CAPACITY FROM CARLING AVE. E-WNS RAMP WESTERLY INSUFFICIENT HWY 417 EB CAPACITY THROUGH CARLING AVE. INTERCHANGE

Ministry of Transportation Ontario

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN
FROM STA. 22+425 TO STA. 24+725

LEGEND:
- G GEOMETRICS - MINOR DEVIATION FROM STANDARDS
- G GEOMETRICS - MAJOR DEVIATION FROM STANDARDS
- T YEAR 2001 TRAFFIC OPERATIONS - CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS - CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS - CONGESTION
- T YEAR 2001 TRAFFIC OPERATIONS - MAJOR CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS - MAJOR CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS - MAJOR CONGESTION
- S SAFETY - HIGHER THAN EXPECTED COLLISION PROBABILITY
- S SAFETY - SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE 50m 0 100m Horizontal

PLATE 4

PLA-CDR_ANALYSIS-TRAFFIC.DWG 18/02/03 10:04

BOX: 20

ISLAND PARK DR. TO PARKDALE AVE.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NARROW MEDIAN SHOULDER RESTRICTS WB STOPPING SIGHT DISTANCE THROUGH HORIZONTAL CURVE IN VICINITY OF PARKDALE AVE
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB AND WB HWY. 417

PROBLEM IDENTIFICATION

- INSUFFICIENT WB HWY 417 CAPACITY DOWNSTREAM (CARLING AVE WESTERLY)
- INSUFFICIENT EB HWY. 417 CAPACITY DOWNSTREAM (EAST OF BRONSON AVE.)

BOX: 21

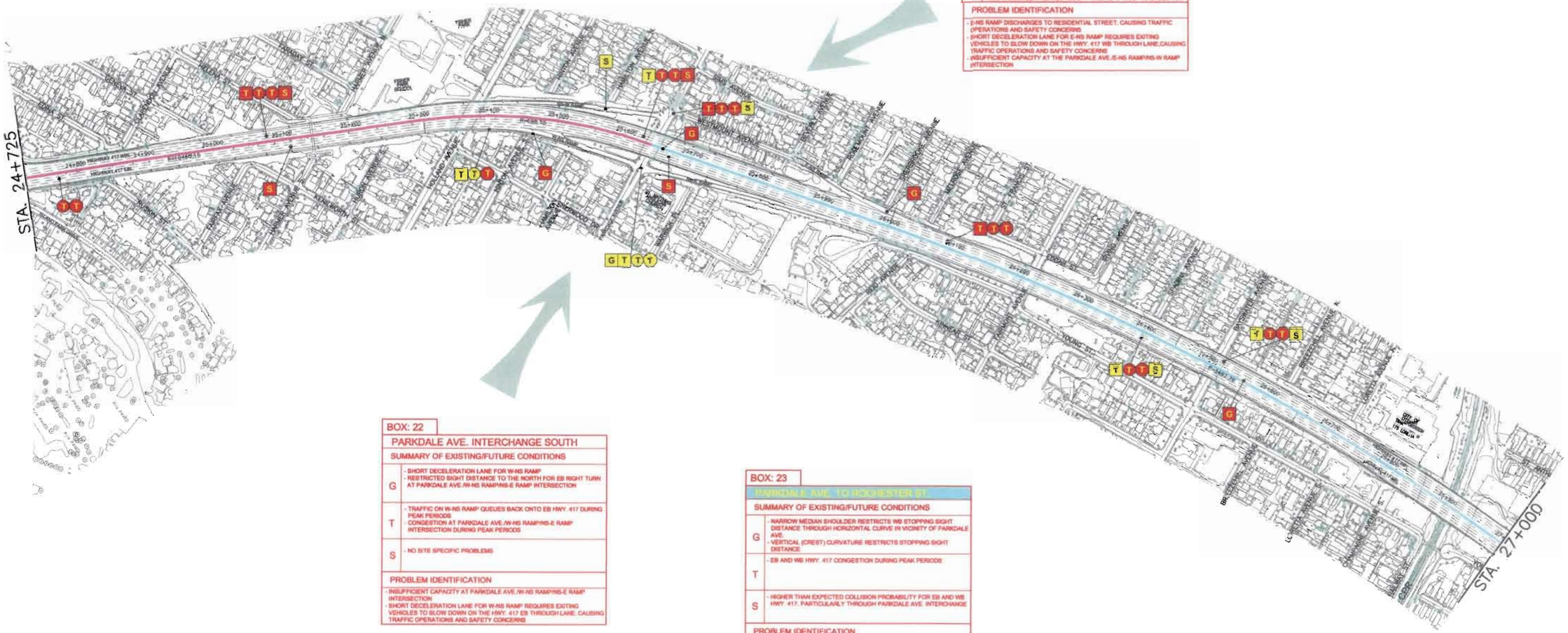
PARKDALE AVE. INTERCHANGE NORTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- SHORT DECELERATION LANE FOR E-NS RAMP WESTMOUNT AVE AND NS-W RAMP OFFSET AT PARKDALE AVE. INTERSECTION
T	- LOCAL STREET (WESTMOUNT AVE.) FUNCTIONS AS PART OF THE E-NS RAMP - CONGESTION AT PARKDALE AVE./WESTMOUNT AVE./NS-W RAMP INTERSECTION DURING PEAK PERIODS
S	- SAFETY CONCERNS ASSOCIATED WITH E-NS RAMP DISCHARGING TO LOCAL STREET, INCLUDING DIRECT ACCESS FROM RESIDENTIAL PROPERTIES, ON-STREET PARKING AND OPERATING SPEED DIFFERENTIALS - HIGHER THAN EXPECTED COLLISION PROBABILITY FOR NS-W RAMP AND PARKDALE AVE./WESTMOUNT AVE./NS-W RAMP INTERSECTION

PROBLEM IDENTIFICATION

- E-NS RAMP DISCHARGES TO RESIDENTIAL STREET, CAUSING TRAFFIC OPERATIONS AND SAFETY CONCERNS
- SHORT DECELERATION LANE FOR E-NS RAMP REQUIRES EXITING VEHICLES TO SLOW DOWN ON THE HWY. 417 WB THROUGH LANE,CAUSING TRAFFIC OPERATIONS AND SAFETY CONCERNS
- INSUFFICIENT CAPACITY AT THE PARKDALE AVE./E-NS RAMP/NS-W RAMP INTERSECTION



BOX: 22

PARKDALE AVE. INTERCHANGE SOUTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- SHORT DECELERATION LANE FOR W-NS RAMP - RESTRICTED SIGHT DISTANCE TO THE NORTH FOR EB RIGHT TURN AT PARKDALE AVE./W-NS RAMP/NS-E RAMP INTERSECTION
T	- TRAFFIC ON W-NS RAMP QUEUES BACK ONTO EB HWY. 417 DURING PEAK PERIODS - CONGESTION AT PARKDALE AVE./W-NS RAMP/NS-E RAMP INTERSECTION DURING PEAK PERIODS
S	- NO SITE SPECIFIC PROBLEMS

PROBLEM IDENTIFICATION

- INSUFFICIENT CAPACITY AT PARKDALE AVE./W-NS RAMP/NS-E RAMP INTERSECTION
- SHORT DECELERATION LANE FOR W-NS RAMP REQUIRES EXITING VEHICLES TO SLOW DOWN ON THE HWY. 417 EB THROUGH LANE, CAUSING TRAFFIC OPERATIONS AND SAFETY CONCERNS

BOX: 23

PARKDALE AVE. TO ROCHESTER ST.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NARROW MEDIAN SHOULDER RESTRICTS WB STOPPING SIGHT DISTANCE THROUGH HORIZONTAL CURVE IN VICINITY OF PARKDALE AVE. - VERTICAL (CREST) CURVATURE RESTRICTS STOPPING SIGHT DISTANCE
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB AND WB HWY. 417, PARTICULARLY THROUGH PARKDALE AVE. INTERCHANGE

PROBLEM IDENTIFICATION

- COMBINATION OF CONGESTION AND RESTRICTED STOPPING SIGHT DISTANCE CAUSES SAFETY CONCERNS
- INSUFFICIENT WB HWY. 417 CAPACITY DOWNSTREAM (CARLING AVE WESTERLY)
- INSUFFICIENT EB HWY. 417 CAPACITY DOWNSTREAM (EAST OF BRONSON AVE.)

Ministry of Transportation Ontario

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN

FROM STA. 24+725 TO STA. 27+000

LEGEND:

- G GEOMETRICS–MINOR DEVIATION FROM STANDARDS
- G GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
- T YEAR 2001 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2001 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–MAJOR CONGESTION
- S SAFETY–HIGHER THAN EXPECTED COLLISION PROBABILITY
- S SAFETY–SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE: 50m 0 100m horizontal

PLATE 6

PLS-CDR_ANALYSIS-TRAFFIC.DWG 12/17/03 13:41

BOX: 25

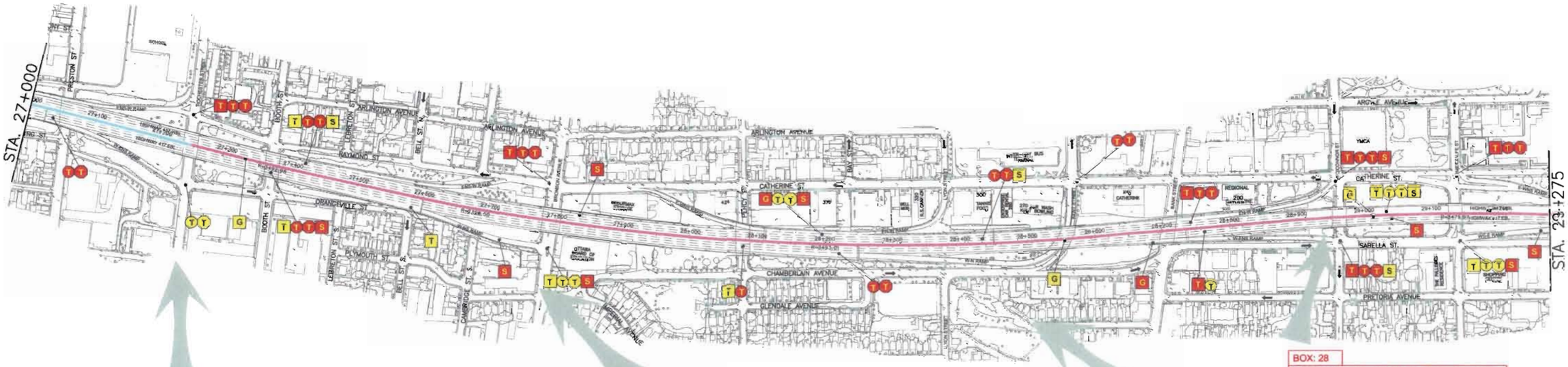
ROCHESTER ST. TO NICHOLAS ST.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- VERTICAL (CREST) CURVATURE RESTRICTS STOPPING SIGHT DISTANCES - INTERCHANGE SPACING LESS THAN DESIRABLE - EB HWY. 417 RIGHT LANE FORCED TO EXIT AT KENT ST. - EB HWY. 417 LANE ADDED AT METCALFE ST. WB-E RAMP BECOMES FORCED EXIT AT NICHOLAS ST. W-N/W-S RAMP - WB HWY. 417 LANE ADDED AT NICHOLAS ST. N-W RAMP BECOMES FORCED EXIT AT METCALFE ST. E-W/NB RAMP
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB AND WB HWY. 417, PARTICULARLY AT/NEAR RAMP MERGE/DIVERGE AREAS

PROBLEM IDENTIFICATION

- INSUFFICIENT HWY 417 WB CAPACITY FROM RIDEAU CANAL TO BANK ST
- INSUFFICIENT HWY 417 EB CAPACITY FROM KENT ST. TO NICHOLAS ST.
- CLOSE SPACING OF INTERCHANGES RESULTS IN WEAVING PROBLEMS WHICH CAUSE TRAFFIC OPERATIONS AND SAFETY CONCERNS (SEE BOXES 26, 27, 28, 30)
- FORCED EXITS AT KENT ST., METCALFE ST. AND NICHOLAS ST. CAUSE TRAFFIC OPERATIONS AND SAFETY CONCERNS



BOX: 24

ROCHESTER ST. INTERCHANGE

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NO SITE SPECIFIC ISSUES
T	- CONGESTION AT THE ROCHESTER ST./RAYMOND ST./ENS-W RAMP INTERSECTION DURING PEAK PERIODS - CONGESTION AT THE ROCHESTER ST./ELIZABETH ST./W-ENS RAMP INTERSECTION DURING PEAK PERIODS BY 2011
S	- NO SITE SPECIFIC ISSUES

PROBLEM IDENTIFICATION

- STOP CONTROL ON RAYMOND STREET PROVIDES INSUFFICIENT OPPORTUNITIES TO CROSS/ACCESS ROCHESTER ST. AT THE ROCHESTER ST./RAYMOND ST./ENS-W RAMP INTERSECTION
- SIGNAL TIMING REVISIONS REQUIRED AT THE ROCHESTER ST./ELIZABETH ST./W-ENS RAMP INTERSECTION BY 2011 DUE TO TRAFFIC VOLUME GROWTH

BOX: 26

BRONSON INTERCHANGE / LYON ST. RAMP

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- SHORT WEAVING LENGTH ON WB HWY. 417 BETWEEN LYON ST. EN-W RAMP AND BRONSON AVE. E-W/NS RAMP
T	- CONGESTION AT BRONSON AVE./W-NS RAMP INTERSECTION DURING PEAK PERIODS CAUSES QUEUING ON EB HWY. 417 - CONGESTION AT BRONSON AVE./CATHERINE ST./RAYMOND ST. INTERSECTION DURING PEAK PERIODS CAUSES QUEUING ON WB CATHERINE ST. AND THE E-W/NS RAMP - CONGESTION IN WB WEAVING AREA BETWEEN LYON ST. EN-W RAMP AND BRONSON AVE. E-W/NS RAMP DURING PEAK PERIODS BY 2011
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR BRONSON AVE. W-NS RAMP AND RAMP TERMINAL INTERSECTION - HIGHER THAN EXPECTED COLLISION PROBABILITY FOR WB HWY. 417 BETWEEN LYON ST. EN-W RAMP AND BRONSON AVE. E-W/NS RAMP

PROBLEM IDENTIFICATION

- EB RIGHT TURN FROM W-NS RAMP TO BRONSON AVE. RESTRICTED BY DOWNSTREAM CONGESTION ON BRONSON AVE.; RESULTING QUEUE EXTENDS BACK ONTO EB HWY. 417, CAUSING TRAFFIC OPERATIONS AND SAFETY CONCERNS
- INSUFFICIENT CAPACITY AT BRONSON AVE./CATHERINE ST./RAYMON ST. INTERSECTION
- WEAVING BETWEEN TRAFFIC ENTERING WB HWY. 417 AT THE LYON ST. EN-W RAMP AND EXITING AT THE BRONSON AVE. E-W/NS RAMP CAUSES SAFETY CONCERNS AND WILL CAUSE CONGESTION BY 2011

BOX: 27

KENT ST. INTERCHANGE

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NO SITE SPECIFIC ISSUES
T	- CONGESTION AT THE KENT ST./CATHERINE ST. INTERSECTION AND THE W-N RAMP DIVERGE AREA DURING PEAK PERIODS BY 2011
S	- NO SITE SPECIFIC ISSUES

PROBLEM IDENTIFICATION

- INSUFFICIENT CAPACITY AT KENT ST./CATHERINE ST. INTERSECTION BY 2011
- HWY 417 EB RIGHT LANE FORCED EXIT AT KENT ST. W-N RAMP WILL CAUSE MAJOR CONGESTION BY 2011

BOX: 28

O'CONNOR/METCALFE ST. INTERCHANGES

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- SHORT DECELERATION LANE FOR O'CONNOR ST. W-E/NS RAMP - WEAVING LENGTH BETWEEN METCALFE ST. WB-E RAMP AND NICHOLAS ST. W-N/W-S RAMP SHORTER THAN DESIRABLE - WEAVING LENGTH BETWEEN NICHOLAS ST. N-W RAMP AND METCALFE ST. E-W/NS RAMP SHORTER THAN DESIRABLE
T	- ALL RAMP TERMINAL INTERSECTIONS CONGESTED DURING PEAK PERIODS - INTERSECTION CAPACITY LIMITED BY COMPLEX GEOMETRY
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR METCALFE ST. WB-E RAMP AND FOR METCALFE ST./ISABELLA ST., O'CONNOR ST./CATHERINE ST. AND O'CONNOR ST./ISABELLA ST INTERSECTIONS

PROBLEM IDENTIFICATION

- LIMITED WEAVING LENGTHS ON EB AND WB HWY. 417 BETWEEN METCALFE ST. AND NICHOLAS ST. CAUSE TRAFFIC OPERATIONS AND SAFETY CONCERNS
- INSUFFICIENT EB THROUGH LANE CAPACITY ON ISABELLA ST. TO ACCOMMODATE TRAFFIC FROM THE O'CONNOR ST. W-E/NS RAMP
- INSUFFICIENT CAPACITY FOR NB RIGHT TURN ONTO WB-E RAMP AT METCALFE ST. INSUFFICIENT WB THROUGH LANE CAPACITY ON CATHERINE ST. DUE TO SPLIT TRAFFIC SIGNAL PHASING REQUIRED TO ACCOMMODATE WB CATHERINE ST. AND E-W/NS RAMP TRAFFIC
- INSUFFICIENT CAPACITY FOR SB O'CONNOR ST. TO EN-W RAMP MOVEMENT
- COMPLEX INTERSECTION GEOMETRY AND INSUFFICIENT CAPACITY CAUSE HIGHER THAN EXPECTED COLLISION PROBABILITIES

Ministry of Transportation Ontario

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HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN
FROM STA. 27+000 TO STA. 29+275

LEGEND:
G GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
G GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
T YEAR 2001 TRAFFIC OPERATIONS–CONGESTION
T YEAR 2011 TRAFFIC OPERATIONS–CONGESTION
T YEAR 2021 TRAFFIC OPERATIONS–CONGESTION
T YEAR 2001 TRAFFIC OPERATIONS–MAJOR CONGESTION
T YEAR 2011 TRAFFIC OPERATIONS–MAJOR CONGESTION
T YEAR 2021 TRAFFIC OPERATIONS–MAJOR CONGESTION
S SAFETY–HIGHER THAN EXPECTED COLLISION PROBABILITY
S SAFETY–SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE 50m 0 100m Horizontal

PLATE 6

PLS-CDR_ANALYSIS-TRAFFIC.DWG 12/17/03 13:08

BOX: 30

NICHOLAS ST. INTERCHANGE NORTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON N-W RAMP - WEAVING LENGTH BETWEEN NICHOLAS ST. N-W RAMP AND METCALFE ST. E-W/N5 RAMP SHORTER THAN DESIRABLE
T	- NO IDENTIFIED PROBLEMS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR N-W RAMP AT GREENFIELD AVE. CONNECTION, THROUGH TIGHT CURVE

PROBLEM IDENTIFICATION

- TIGHT CURVATURE OF N-W RAMP CAUSES SAFETY CONCERNS
- LIMITED WEAVING LENGTH ON WB HWY. 417 BETWEEN NICHOLAS ST. N-W RAMP AND METCALFE ST. E-W/N5 RAMP CAUSES TRAFFIC OPERATIONS AND SAFETY CONCERNS
- GREENFIELD AVE. CONNECTION MERGES IN CLOSE PROXIMITY TO TIGHT CURVE ON N-W RAMP

BOX: 31

NICHOLAS ST. TO SANDER PRAY AVENUE (W)

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- VERTICAL (CREST) CURVATURE EAST OF RIDEAU RIVER RESTRICTS STOPPING SIGHT DISTANCE - NARROW MEDIAN AND OUTSIDE SHOULDERS RESTRICT STOPPING SIGHT DISTANCE THROUGH HORIZONTAL CURVES - HORIZONTAL CURVATURE TIGHTER THAN DESIRABLE - INTERCHANGE SPACING LESS THAN DESIRABLE
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB AND WB HWY. 417

PROBLEM IDENTIFICATION

- INSUFFICIENT THROUGH LANE CAPACITY
- CLOSE SPACING OF INTERCHANGES RESULTS IN WEAVING PROBLEMS WHICH CAUSE TRAFFIC OPERATIONS AND SAFETY CONCERNS

BOX: 29

NICHOLAS ST. INTERCHANGE SOUTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- WEAVING LENGTH BETWEEN METCALFE ST. WB-E RAMP AND NICHOLAS ST W-N/W-S RAMP SHORTER THAN DESIRABLE - TIGHT CURVATURE ON W-S, W-N, N-E AND S-E RAMPS
T	- LEES AVE./W-S RAMP INTERSECTION CONGESTED DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR W-S RAMP, W-N RAMP, N-E RAMP, S-E RAMP AND LEES AVE./W-S RAMP INTERSECTION

PROBLEM IDENTIFICATION

- TIGHT CURVATURE OF RAMPS CAUSES SAFETY CONCERNS
- LIMITED WEAVING LENGTH ON EB HWY. 417 BETWEEN METCALFE ST. WB-E RAMP AND NICHOLAS ST. W-N/W-S RAMP CAUSES TRAFFIC OPERATIONS AND SAFETY CONCERNS
- ALL-WAY STOP CONTROL AT LEES AVE./W-S RAMP INTERSECTION DOES NOT PROVIDE SUFFICIENT CAPACITY, MAKING ACCESS TO LEES AVE. DIFFICULT
- W-S/W-N RAMP SPLIT NOT EXPECTED BY DRIVERS

STA. 29+275

STA. 10+150

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HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN
FROM STA. 29+275 TO STA. 10+150

LEGEND:

- G GEOMETRICS–MINOR DEVIATION FROM STANDARDS
- G GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
- T YEAR 2001 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2001 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–MAJOR CONGESTION
- S SAFETY–HIGHER THAN EXPECTED COLLISION PROBABILITY
- S SAFETY–SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

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SCALE 50m 100m Horizontal

PLATE 7

PL7-COR_ANALYSIS-TRAFFIC.DWG 12/17/03 13:26

BOX: 32

VANIER PKWY./RIVERSIDE DR. I/C NORTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON E-NS AND N-W RAMPS - SHORT ACCELERATION LANE FOR S-W RAMP
T	- NO IDENTIFIED PROBLEMS
S	- NO SITE SPECIFIC ISSUES

PROBLEM IDENTIFICATION

- SHORT ACCELERATION LANE FOR S-W RAMP DOES NOT ALLOW TRAFFIC TO MATCH HWY. 417 SPEED BEFORE MERGING, CAUSING TRAFFIC OPERATIONS AND SAFETY CONCERNS

BOX: 34

VANIER PKWY./RIVERSIDE DR. TO ST. LAURENT BLVD.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NARROW MEDIAN SHOULDER RESTRICTS WB STOPPING SIGHT DISTANCE THROUGH HORIZONTAL CURVE - HORIZONTAL CURVATURE TIGHTER THAN DESIRABLE
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS, PARTICULARLY IN RAMP MERGE AND DIVERGE AREAS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB HWY. 417

PROBLEM IDENTIFICATION

- INSUFFICIENT THROUGH LANE CAPACITY

BOX: 35

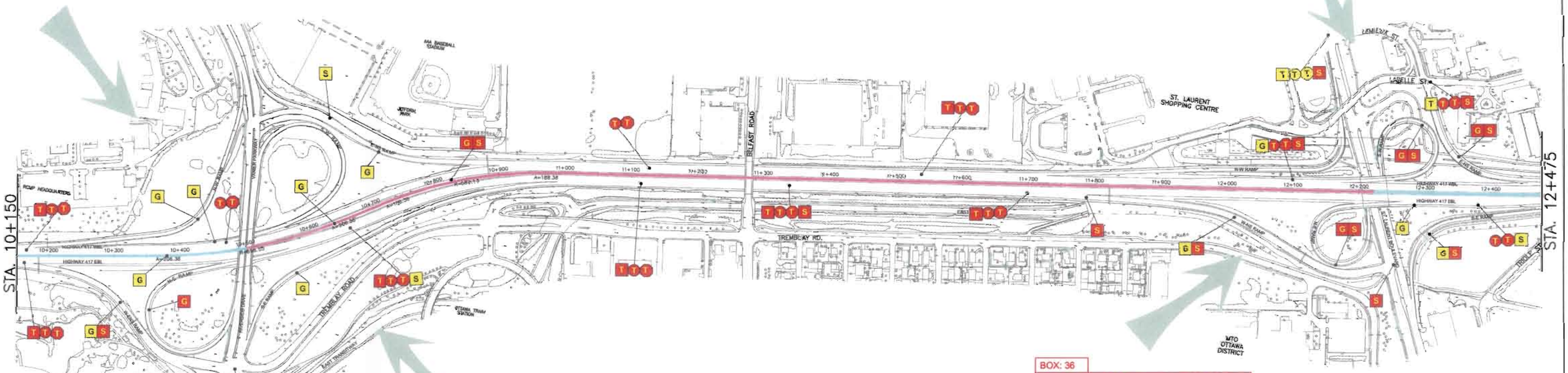
ST. LAURENT BLVD. INTERCHANGE NORTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NARROW SHOULDER WIDTH ON RAMPS RESTRICTS STOPPING SIGHT DISTANCE - TIGHT CURVATURE ON E-NS AND S-W RAMPS - SHORT ACCELERATION LANE FOR S-W RAMP
T	- CONGESTION AT LABELLE ST./LEMIEUX ST./E-NS RAMP AND ST. LAURENT BLVD./LEMIEUX ST. INTERSECTIONS DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR E-NS RAMP AND S-W RAMP AND FOR LABELLE ST./LEMIEUX ST./E-NS RAMP AND ST. LAURENT BLVD./LEMIEUX ST. INTERSECTIONS

PROBLEM IDENTIFICATION

- TIGHT CURVATURE ON E-NS AND S-W RAMPS CAUSES SAFETY CONCERNS
- LEMIEUX ST./LABELLE ST. INTERSECTION ON E-NS RAMP IS UNEXPECTED CAUSING TRAFFIC OPERATIONS AND SAFETY CONCERNS
- SIGNAL TIMING CAUSES DELAYS TO WB LEFT TURNS AT ST. LAURENT BLVD./LEMIEUX ST. INTERSECTION



BOX: 33

VANIER PKWY./RIVERSIDE DR. I/C SOUTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON W-ENS, N-E AND S-E RAMPS - STEEP GRADE THROUGH RIVERSIDE DR./TREMBLAY RD./W-ENS RAMP INTERSECTION
T	- CONGESTION AT RIVERSIDE DR./TREMBLAY RD./W-ENS RAMP INTERSECTION DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR W-ENS RAMP

PROBLEM IDENTIFICATION

- INSUFFICIENT CAPACITY AT RIVERSIDE DR./TREMBLAY RD./W-ENS RAMP INTERSECTION CAUSES TRAFFIC OPERATIONS AND SAFETY CONCERNS

BOX: 36

ST. LAURENT BLVD. INTERCHANGE SOUTH

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- TIGHT CURVATURE ON ALL RAMPS - SHORT ACCELERATION LANE FOR N-E RAMP
T	- NO IDENTIFIED PROBLEMS
S	-HIGHER THAN EXPECTED COLLISION PROBABILITY FOR ALL RAMPS AND ST. LAURENT BLVD./W-NS RAMP INTERSECTION

PROBLEM IDENTIFICATION

- TIGHT CURVATURE, SIGHT DISTANCE RESTRICTIONS AND HWY. 417 MAINLINE CONGESTION CAUSE SAFETY CONCERNS ON THE RAMPS

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PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN

FROM STA. 10+150 TO STA. 12+475

LEGEND:

- G GEOMETRICS--MINOR DEVIATION FROM STANDARDS
- G GEOMETRICS--MAJOR DEVIATION FROM STANDARDS
- T YEAR 2001 TRAFFIC OPERATIONS--CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS--CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS--CONGESTION
- T YEAR 2001 TRAFFIC OPERATIONS--MAJOR CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS--MAJOR CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS--MAJOR CONGESTION
- S SAFETY--HIGHER THAN EXPECTED COLLISION PROBABILITY
- S SAFETY--SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

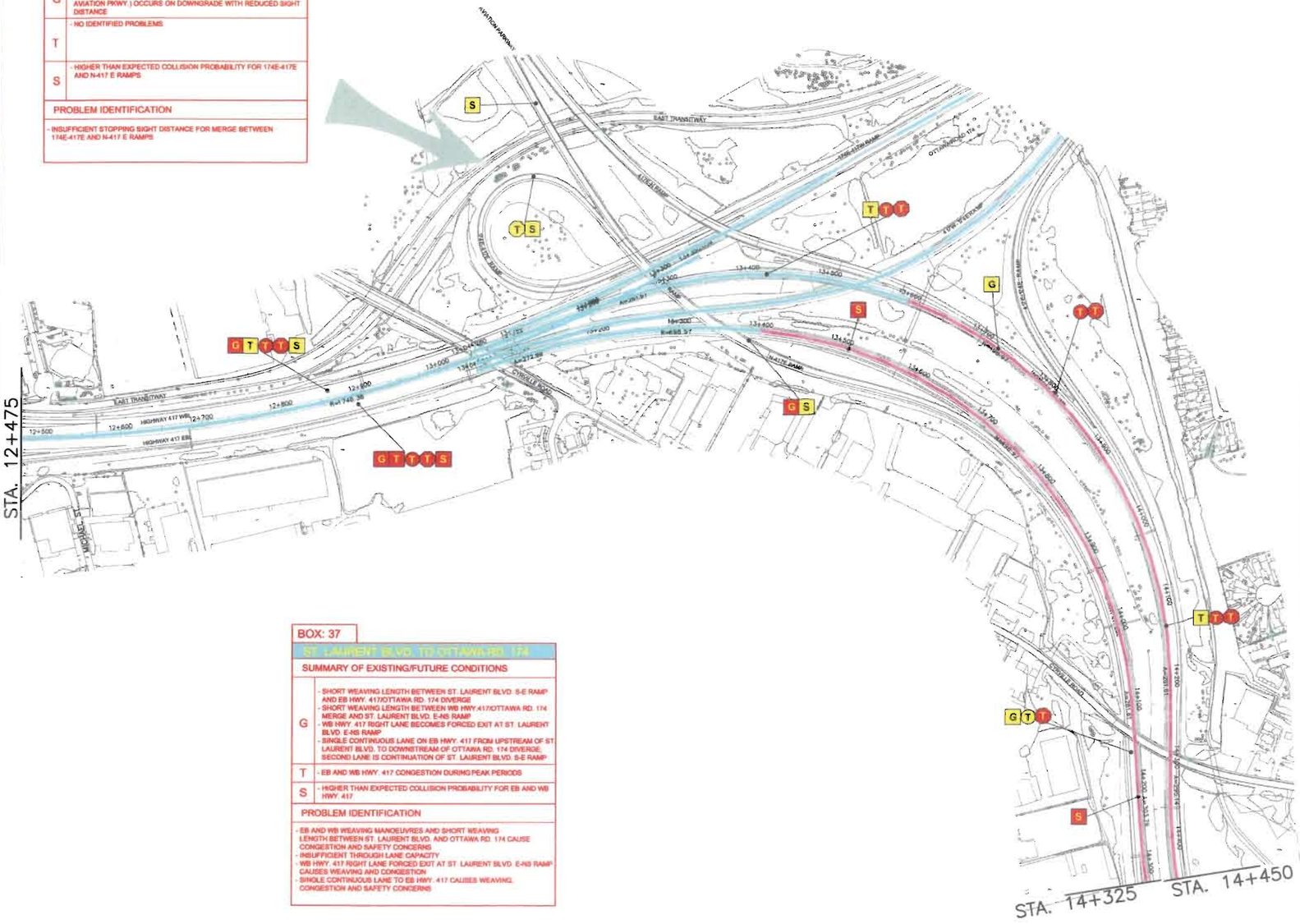
SCALE 50m 0 100m Horizontal

PLATE 8

PLO-CDR_ANALYSIS-TRAFFIC.DWG 12/17/03 13:45

BOX: 38

AVIATION PKWY./OTTAWA RD. 174 I/C	
SUMMARY OF EXISTING/FUTURE CONDITIONS	
G	- NARROW SHOULDER ON N-417E RAMP RESTRICTS STOPPING SIGHT DISTANCE - MERGE BETWEEN 174E-417E RAMP AND N-417E RAMP (FROM AVIATION PKWY.) OCCURS ON DOWNGRADE WITH REDUCED SIGHT DISTANCE
T	- NO IDENTIFIED PROBLEMS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR 174E-417E AND N-417 E RAMPS
PROBLEM IDENTIFICATION	
- INSUFFICIENT STOPPING SIGHT DISTANCE FOR MERGE BETWEEN 174E-417E AND N-417 E RAMPS	



BOX: 37

ST. LAURENT BLVD. TO OTTAWA RD. 174	
SUMMARY OF EXISTING/FUTURE CONDITIONS	
G	- SHORT WEAVING LENGTH BETWEEN ST. LAURENT BLVD. S-E RAMP AND EB HWY. 417/OTTAWA RD. 174 DIVERGE - SHORT WEAVING LENGTH BETWEEN WB HWY.417/OTTAWA RD. 174 MERGE AND ST. LAURENT BLVD. E-NS RAMP - WB HWY. 417 RIGHT LANE BECOMES FORCED EXIT AT ST. LAURENT BLVD. E-NS RAMP - SINGLE CONTINUOUS LANE ON EB HWY. 417 FROM UPSTREAM OF ST. LAURENT BLVD. TO DOWNSTREAM OF OTTAWA RD. 174 DIVERGE; SECOND LANE IS CONTINUATION OF ST. LAURENT BLVD. S-E RAMP
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB AND WB HWY. 417
PROBLEM IDENTIFICATION	
- EB AND WB WEAVING MANOEUVRES AND SHORT WEAVING LENGTH BETWEEN ST. LAURENT BLVD. AND OTTAWA RD. 174 CAUSE CONGESTION AND SAFETY CONCERNS - INSUFFICIENT THROUGH LANE CAPACITY - WB HWY. 417 RIGHT LANE FORCED EXIT AT ST. LAURENT BLVD. E-NS RAMP CAUSES WEAVING AND CONGESTION - SINGLE CONTINUOUS LANE TO EB HWY. 417 CAUSES WEAVING, CONGESTION AND SAFETY CONCERNS	

BOX: 39

OTTAWA RD. 174 TO INNES RD.	
SUMMARY OF EXISTING/FUTURE CONDITIONS	
G	- NARROW MEDIAN SHOULDER RESTRICTS STOPPING SIGHT DISTANCE THROUGH HORIZONTAL CURVES - HORIZONTAL CURVATURE TIGHTER THAN DESIRABLE
T	- WB HWY.417 CONGESTION DURING PEAK PERIODS EB HWY. 417 CONGESTION DURING PEAK PERIODS BY 2011
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB HWY. 417
PROBLEM IDENTIFICATION	
- INSUFFICIENT THROUGH LANE CAPACITY	

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HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN
FROM STA. 12+475 TO STA. 14+450

LEGEND:
- G GEOMETRICS–MINOR DEVIATION FROM STANDARDS
- G GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
- T YEAR 2001 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2001 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–MAJOR CONGESTION
- S SAFETY–HIGHER THAN EXPECTED COLLISION PROBABILITY
- S SAFETY–SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE: 50m 0 100m Horizontal

PLATE 9

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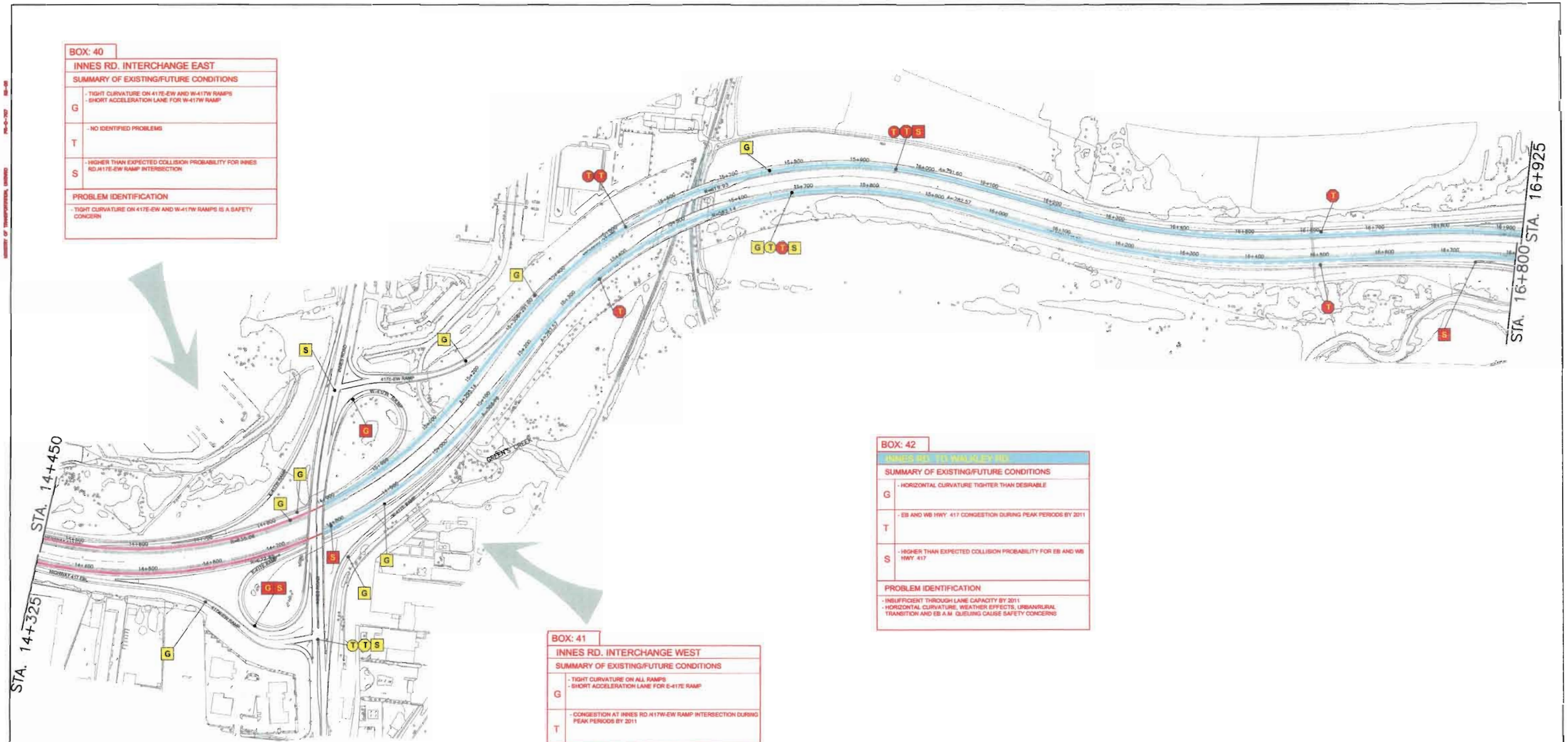
PLS-CDR_ANALYSIS-TRAFFIC.DWG 12/17/03 13:00



BOX: 40

INNES RD. INTERCHANGE EAST	
SUMMARY OF EXISTING/FUTURE CONDITIONS	
G	- TIGHT CURVATURE ON 417E-EW AND W-417W RAMPS - SHORT ACCELERATION LANE FOR W-417W RAMP
T	- NO IDENTIFIED PROBLEMS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR INNES RD./417E-EW RAMP INTERSECTION
PROBLEM IDENTIFICATION	
- TIGHT CURVATURE ON 417E-EW AND W-417W RAMPS IS A SAFETY CONCERN	

BOX: 41

INNES RD. INTERCHANGE WEST	
SUMMARY OF EXISTING/FUTURE CONDITIONS	
G	- TIGHT CURVATURE ON ALL RAMPS - SHORT ACCELERATION LANE FOR E-417E RAMP
T	- CONGESTION AT INNES RD./417W-EW RAMP INTERSECTION DURING PEAK PERIODS BY 2011
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR E-417E RAMP AND INNES RD./417W-EW RAMP INTERSECTION
PROBLEM IDENTIFICATION	
- TIGHT RAMP CURVATURE AND CONGESTION CAUSE SAFETY CONCERNS	

BOX: 42

INNES RD. TO WALKLEY RD.	
SUMMARY OF EXISTING/FUTURE CONDITIONS	
G	- HORIZONTAL CURVATURE TIGHTER THAN DESIRABLE
T	- EB AND WB HWY. 417 CONGESTION DURING PEAK PERIODS BY 2011
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB AND WB HWY. 417
PROBLEM IDENTIFICATION	
- INSUFFICIENT THROUGH LANE CAPACITY BY 2011 - HORIZONTAL CURVATURE, WEATHER EFFECTS, URBAN/RURAL TRANSITION AND EB A.M. QUEUING CAUSE SAFETY CONCERNS	

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HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN

FROM STA. 14+325 TO STA. 16+925

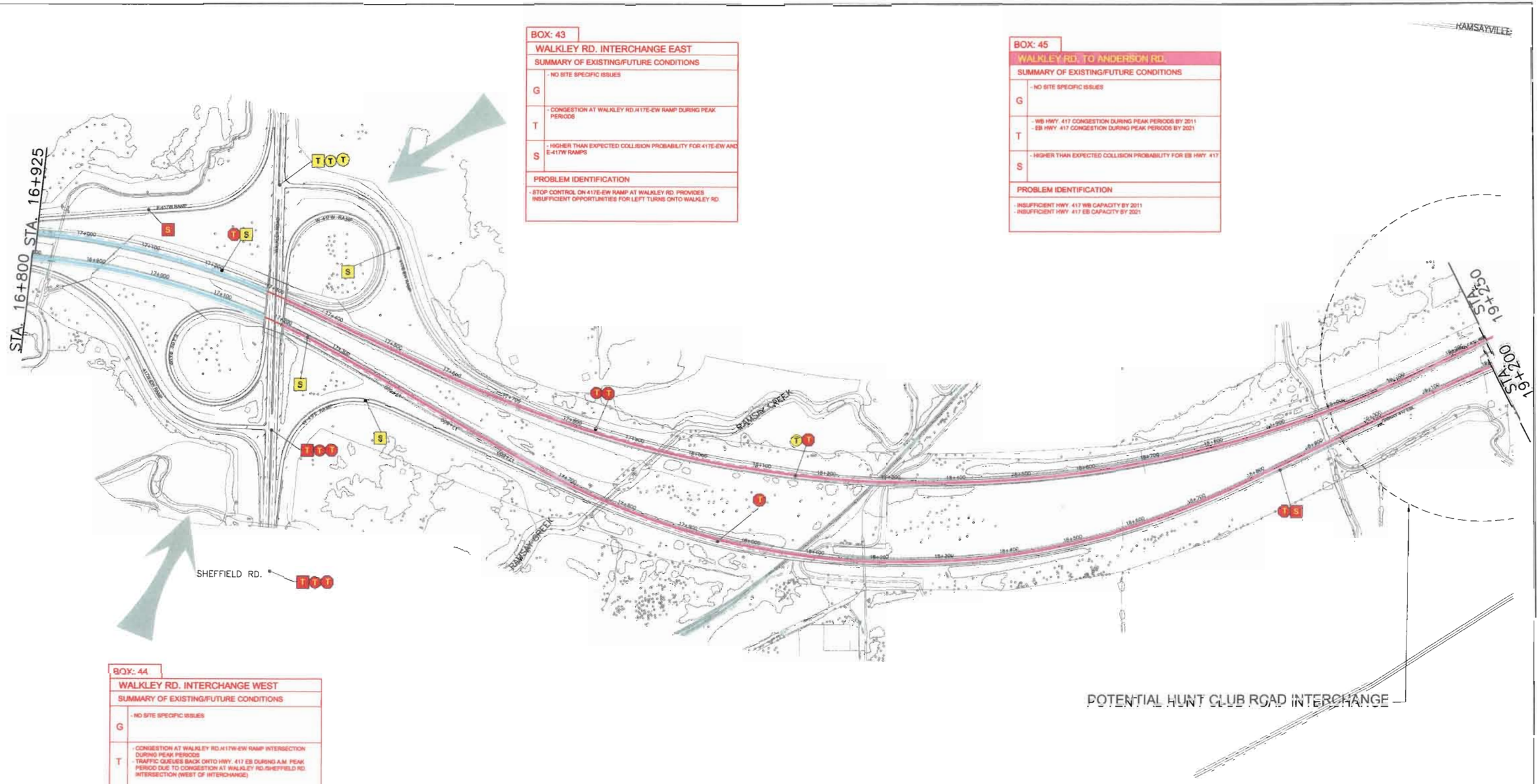
LEGEND:

- G GEOMETRICS–MINOR DEVIATION FROM STANDARDS
- G GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
- T YEAR 2001 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2001 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–MAJOR CONGESTION
- S SAFETY–HIGHER THAN EXPECTED COLLISION PROBABILITY
- S SAFETY–SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE 50m 0 700m Horizontal

PLATE 10

PLS-CDR_ANALYSIS-TRAFFIC.DWG 12/17/03 13:54



BOX: 43

WALKLEY RD. INTERCHANGE EAST

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NO SITE SPECIFIC ISSUES
T	- CONGESTION AT WALKLEY RD./417E-EW RAMP DURING PEAK PERIODS
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR 417E-EW AND E-417W RAMPS

PROBLEM IDENTIFICATION

- STOP CONTROL ON 417E-EW RAMP AT WALKLEY RD. PROVIDES INSUFFICIENT OPPORTUNITIES FOR LEFT TURNS ONTO WALKLEY RD.

BOX: 45

WALKLEY RD. TO ANDERSON RD.

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NO SITE SPECIFIC ISSUES
T	- WB HWY. 417 CONGESTION DURING PEAK PERIODS BY 2011 - EB HWY. 417 CONGESTION DURING PEAK PERIODS BY 2021
S	- HIGHER THAN EXPECTED COLLISION PROBABILITY FOR EB HWY. 417

PROBLEM IDENTIFICATION

- INSUFFICIENT HWY. 417 WB CAPACITY BY 2011
- INSUFFICIENT HWY. 417 EB CAPACITY BY 2021

BOX: 44

WALKLEY RD. INTERCHANGE WEST

SUMMARY OF EXISTING/FUTURE CONDITIONS

G	- NO SITE SPECIFIC ISSUES
T	- CONGESTION AT WALKLEY RD./417W-EW RAMP INTERSECTION DURING PEAK PERIODS - TRAFFIC QUEUES BACK ONTO HWY. 417 EB DURING A.M. PEAK PERIOD DUE TO CONGESTION AT WALKLEY RD./SHEFFIELD RD. INTERSECTION (WEST OF INTERCHANGE)
S	- VEHICLES QUEUE ON 417W-EW RAMP AND HWY. 417 EB SHOULDER DURING A.M. PEAK PERIOD DUE TO CONGESTION AT WALKLEY RD./SHEFFIELD RD. INTERSECTION

PROBLEM IDENTIFICATION

- INSUFFICIENT THROUGH LANES ON WALKLEY RD. WEST OF SHEFFIELD RD. CAUSE CONGESTION AND SAFETY CONCERNS
- STOP CONTROL ON 417E-EW RAMP AT WALKLEY RD. PROVIDES INSUFFICIENT OPPORTUNITIES FOR LEFT TURNS ONTO WALKLEY RD.

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HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN
FROM STA. 16+800 TO STA. 19+250

LEGEND:
- G: GEOMETRICS–MINOR DEVIATION FROM STANDARDS
- G: GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
- T: YEAR 2001 TRAFFIC OPERATIONS–CONGESTION
- T: YEAR 2011 TRAFFIC OPERATIONS–CONGESTION
- T: YEAR 2021 TRAFFIC OPERATIONS–CONGESTION
- T: YEAR 2001 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T: YEAR 2011 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T: YEAR 2021 TRAFFIC OPERATIONS–MAJOR CONGESTION
- S: SAFETY–HIGHER THAN EXPECTED COLLISION PROBABILITY
- S: SAFETY–SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE 50m 0 100m Horizontal

PLATE 11

PLI-CDR_ANALYSIS-TRAFFIC.DWG 12/23/03 13:27

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HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

CORRIDOR ANALYSIS COMPOSITE PLAN
FROM STA. 19+200 TO STA. 21+575

LEGEND:

- G GEOMETRICS–MINOR DEVIATION FROM STANDARDS
- G GEOMETRICS–MAJOR DEVIATION FROM STANDARDS
- T YEAR 2001 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–CONGESTION
- T YEAR 2001 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2011 TRAFFIC OPERATIONS–MAJOR CONGESTION
- T YEAR 2021 TRAFFIC OPERATIONS–MAJOR CONGESTION
- S SAFETY–HIGHER THAN EXPECTED COLLISION PROBABILITY
- S SAFETY–SIGNIFICANTLY HIGHER THAN EXPECTED COLLISION PROBABILITY

SCALE
50m 0 100m
Horizontal

PLATE
12

RL12-COR_ANALYSIS-TRAFFIC.DWG 12/03/03 15:56

- The most common factor identified as contributing to the collision history in the locations with higher than expected collision probability was recurring congestion. If no improvements are made to the Queensway, then this congestion will continue to grow and will have detrimental effects on the safety performance of the highway. Restrictive geometric design was also found to be a significant contributing factor, particularly when combined with heavy traffic volumes and recurring congestion. Examples include short acceleration, deceleration and weaving distances, tight interchange curve radii and restricted sight distances.

- The positive guidance review found no systemic deficiencies in the existing geometry of the Highway 417 mainline, but identified several locations with violations of motorists' expectations (e.g. left exit, "must exit" lane, entrance on tangent to mainline curve, etc.). These locations were all found to be correlated with higher than expected collision probability.

- Signage and delineation were found to generally provide an adequate level of positive guidance. Some opportunities were identified for improved signage and/or delineation in areas of motorist expectation violations, restrictive geometric design and complex geometry.

- Much of the existing highway infrastructure; pavement, bridges, lighting, traffic barriers, noise barriers, and drainage systems will require major rehabilitation or replacement by 2021.

3.1.7 Summary of Problems/Opportunities

This study has established that there is a need for modifications to the Highway 417 corridor through the Study Area to address existing operations and safety issues and to accommodate the expected growth in travel demand anticipated by Ottawa's *Transportation Master Plan*. The travel demand forecasting (EMME-2) completed as part of this study indicated that construction of (or expansion to) alternative transportation facilities (such as the Outer Transportation Corridor) will not significantly reduce the expected increase in travel demand on Highway 417. Accordingly, the following modifications were identified for consideration during subsequent phases of the study:

- ***Mainline Widening*** – The travel demand forecasting indicates that providing additional mainline lanes will provide relief to the City road network surrounding the Highway 417 corridor. Congestion on Highway 417 during peak periods will remain as drivers will be attracted to the controlled access highway to make their trips. Maximizing the available capacity on Highway 417 will encourage through traffic to remain on the highway, reducing traffic growth on City streets.

- ***Geometric Improvements*** – In areas where the existing geometric design does not meet current standards, improvements will decrease the probability of collisions and facilitate smoother traffic flow. Removing violations of motorists' expectations should also be a priority, as these are correlated with higher than expected collision probabilities and can also disrupt smooth traffic flow.

- ***Intersection Improvements*** – Improvements to increase the capacity of critical movements at intersections will benefit operations. Improvements to reduce ramp queue lengths will prevent queue spill-back onto the Highway 417 mainline where future operating conditions indicate such potential exists.

- ***Positive Guidance Improvements*** – Signing, pavement marking, delineation and the overall "message" conveyed to motorists by the roadway and surrounding environment will promote safety as part of the improvements recommended above.

- ***Congestion Management*** – Measures to manage congestion, such as the application of Intelligent Transportation Systems, transportation demand management and high occupancy vehicle lanes were considered as part of the design of corridor improvements in order to minimize the effects of congestion on traffic operations and safety.

This summary of problems is based on the outcomes of the travel demand forecasting, INTEGRATION modelling, traffic operations analysis, safety review and geometric review. The technical feasibility, environmental impacts, property impacts and costs were assessed during the consideration of alternatives.

3.2 Assessment and Evaluation Methodology

Additional details regarding the assessment and evaluation methodology is contained in the *Preliminary Alternatives Report, March 2004* provided in **Appendix P**.

3.2.1 EA Classification

As noted in Section 2.1, this project is being undertaken in accordance with the requirements for a Group 'B' Project, under the *Class Environmental Assessment for Provincial Transportation Facilities, 2000.* Assessment and evaluation of alternatives is an essential component of the planning process. In the first "Planning" phase, Alternatives to the Undertaking are considered. (Note that the MTO class document uses the term "Planning Alternatives" instead of the term "Alternatives to the undertaking" used in the EA Act. In this report the term "Alternatives to" the undertaking will be used.) In the second "Preliminary Design" phase, "Alternative Methods" for carrying out the undertaking will be considered and the Technically Preferred Alternative for the project will be selected. (Note that the MTO class document uses the term "Design Alternatives" instead of "Alternative Methods". In this report the term "Alternative Methods" will be used.)

3.2.2 Transportation Goals and Objectives

To assist in the development of the specific goals and objectives for the Highway 417 Preliminary Design Study, relevant provincial and municipal documents were considered.

3.2.2.1 Provincial and Municipal Policies

The transportation vision articulated in provincial and municipal documents recognizes the benefits of improved transportation, as well as the need to minimize the negative impacts that result from these improvements. In MTO's *Statement of Environmental Values* (SOEV), its commitment to the environment is noted in its strategic direction statement "Implement and support activities which promote sustainable development and are sensitive to environmental concerns as related to broader government activities." (Section B, SOEV)

In addition documentation arising from the provincial smart growth initiative includes *Shape the Future: Eastern Ontario Smart Growth Panel Final Report, December 2003*. In this document, transportation infrastructure is characterized as the "lifeblood of the economy and of communities" but automobile dependence, increased truck traffic and increased congestion are identified as concerns. The report notes that transportation must be both efficient and environmentally friendly. Especially in the City of Ottawa, public transit needs to play a large role in the transportation system. (Shape the Future, page 8)

In the January 2002 draft report, *Eastern Ontario Strategic Transportation Directions* (EOSTD), MTO identified four key themes and objectives:

- Fiscal management
  - Maximize use of existing facilities
  - Consider innovative approaches to finance improvements to transportation systems and services
  - Promote and support efficient and cost-effective transportation systems
- Economic development
  - Support provincial and regional economic development through the efficient movement of people and goods
  - Support the economic competitiveness of Ontario industry, including resource industries and tourism

- Promote the integration of transportation systems
- Support the efficient operation of international and interprovincial trade corridors and gateways

- Safety and user needs
  - Recognize the need for mobility through the development of an integrated transportation system that is safe, efficient and provides reasonable choice and accessibility
  - Ensure that safety is an important element in all aspects of transportation
  - Provide appropriate transportation choices to travellers
- Environmental quality
  - Support Smart Growth principles related to land use
  - Promote a balanced transportation system that reduces energy consumption and vehicle emissions (EOSTD page 2)

The National Capital Region was identified as one of the key transportation market areas of Eastern Ontario. (EOSTD, page 5)

The *Ottawa 20/20 – Transportation Master Plan* (TMP) 2003, described the transportation vision and principles for the City. The keys to success were identified as action in four areas: land use planning, transportation demand management, transportation supply management and new infrastructure and services (TMP, page 29). The TMP noted that "motor vehicle traffic volumes will grow even if the City successfully achieves this plan's ambitious objectives to reduce automobile modal split and preserve automobile occupancy levels." (TMP, page 34). The TMP recognized the ongoing studies by MTO on Highway 417 and made no assumptions about recommendations resulting from this work. The TMP did note that "the City would likely favour actions to improve road safety and reduce emissions, but is not likely to favour actions that have substantial neighbourhood impacts or increase congestion on parallel or intersecting City streets." (TMP page 65)

Municipal and provincial goals and objectives are complementary and consistent in their purpose and direction.

3.2.2.2 Goals and Objectives for this Study

With consideration for the transportation policies of the province and municipality and with consideration for the need to address the specific problems and opportunities identified for the area under study, the following goals and objectives are suggested for the "Alternatives to" the undertaking for the Highway 417 Class EA Study.

A. Promote the Safe, Effective and Efficient Use of the Transportation System for the Movement of People and Goods;
B. Support Alternative Modes of Travel;
C. Support Measures by the City and Province (where applicable) to Manage Transportation through Land Use Planning, Transportation Demand Management, Transportation Supply Management and New Infrastructure and Services.

The following tables relate these goals to objectives and the identified problems and opportunities.

Goal A:	*Promote the Safe, Effective and Efficient Use of the Transportation System for the Movement of People and Goods*
Objectives	• Optimize use of existing roads and transit • Provide for a peak hour level of service that is approaching capacity in the horizon year (i.e. don't overbuild, taking into account the City's mode share objectives) • Construct new infrastructure only where/when necessary to facilitate the achievement of Ottawa's mode share targets and to maintain an acceptable level of service on existing facilities • Consider the needs for goods movement in transportation corridors
Related Problems	• There is existing congestion in peak travel periods that is expected to increase and extend easterly and westerly in the future. • There are safety and operational issues in the Highway 417 corridor associated with existing features at interchanges and along the mainline. • Rehabilitation and reconstruction of components of Highway 417 is required. Coordination is needed to minimize the impact of this work on transportation efficiency. • Planned improvements to City arterials and transit will not by themselves address congestion in peak travel periods with the growth planned in Ottawa policy documents.
Related Opportunities	• Support for Ottawa's TMP and OP and planned development • Support for economic development

Goal B:	*Support Alternative Modes of Travel*
Objectives	• Provide practical and attractive opportunities for travelers to walk, cycle and use transit • Support the use of the automobile for trips that cannot be readily made by other modes • Facilitate ride-sharing for trips by automobile
Related Problems	• There is existing congestion in peak travel periods that is expected to increase in the future. • The existing Ottawa transitway system provides excellent service to downtown but service to other destinations needs improvement to encourage ridership. • The recommended rapid transit network for Ottawa will take some time to implement.
Related Opportunities	• Support for Ottawa's TMP and OP and planned development • Support for a responsible transportation solution

Goal C:	*Support Measures by the City and Province (where applicable) to Manage Transportation through Land Use Planning, Transportation Demand Management, Transportation Supply Management and New Infrastructure and Services*
Objectives	• Ensure compatibility of transportation improvements with existing/ planned growth and transit infrastructure • Maximize accessibility within the analysis area through coordination of land use and transportation planning • Support Ottawa policies and planned growth
Related Problems	• Densification in areas adjacent to existing and proposed rapid transit stations and in areas of new development is required in order to achieve Ottawa's modal split objectives. • Planned improvements to City arterials and transit will not by themselves address congestion in peak travel periods with the growth planned in Ottawa policy documents.
Related Opportunities	• Support for Ottawa's TMP and OP and planned development • Support for a responsible transportation solution

The above goals were used during the assessment and evaluation of "Alternatives to" the undertaking. Potential impacts on the environment are considered at a general level of detail during the assessment, commensurate with the level of detail available for the "Alternatives to" the undertaking themselves. The assessment and evaluation of the "Alternatives to" the undertaking are provided in **Section 3.3.4** of this report.

The assessment and evaluation of Alternatives Methods were considered at a greater level of detail, commensurate with the level of detail available to those alternatives. The evaluation processes are described in more detail below.

3.2.3 Evaluation Principles

In accordance with the environmental assessment process, the evaluation of alternatives is based on five key principles:

- Comprehensive;
- Understandable;
- Traceable;
- Replicable; and
- Participatory.

There are various methods available for the assessment and evaluation of alternatives and the selection of an evaluation method to be used is usually dependent on the group of alternatives being evaluated. The evaluation of "Alternatives to" the undertaking was done using a qualitative (reasoned argument) approach, commensurate with the level of detail available for these alternatives. The evaluation of Alternative Methods was done using both the reasoned argument approach (to provide a textual description and context) and a quantitative (arithmetic) approach (to minimize the degree of subjectivity). The two methods that were used on this project are described below.

3.2.4 Qualitative (Reasoned Argument) Method

The reasoned argument (trade-off) method highlights the differences in net impacts associated with the various alternatives. Based on these differences, the advantages and disadvantages of each alternative are identified. The relative significance of the impacts is examined to provide a clear rationale for the selection of a preferred alternative. The rationale that favours the selection of one alternative over all others was derived from the following sources:

- Government legislation, policies and guidelines;
- Municipal policy (i.e. Official Plan);
- Issues and concerns identified during consultation with ministries and agencies, municipalities, interest groups and the general public; and
- Project team expertise.

3.2.5 Quantitative (Arithmetic) Method

The arithmetic evaluation method incorporated both the level of importance of each factor/sub factor (referred to as the weight) and the magnitude of the impact (or benefit) associated with an alternative (referred to as the score). Numerical values were derived for both the level of importance (weight) and the magnitude of the impact (score) associated with each alternative. The weight was multiplied by the score to obtain a total. The totals for each alternative were compared to determine the preferred alternative. This common quantitative method is called the "Weighted Additive, Multi-Attribute Trade-off Method".

The evaluation methodology included the following steps:

1. Development of the long list of factors and sub-factors (performance measures).
2. Development of a long list of potential alternatives. The long-list of alternatives consists of all reasonable alternatives that can address the identified deficiencies.
3. Establishment of utility functions.
4. Collection of data/environmental inventories to provide input to the assessment and evaluation.
5. With consideration for each group of alternatives being assessed, screening of the long list to generate a list of relevant factors.
6. Weighting of factors and sub-factors.
7. Rating of alternatives.
8. Sensitivity testing by selecting other weights.
9. Selection of Technically Preferred Alternatives (TPAs).
10. Review by TAC and MTO Senior Management.
11. Review by MTAC, PAC and Public.
12. Preparation of Recommendations and presentation of a Recommended Plan.

3.2.6 Groups of Alternatives for Evaluation Purposes

For this study, a two-step process was followed for the evaluation of "Alternative Methods". First, the requirements for mainline Highway 417 were assessed (i.e. widening or no widening) by section as follows:

- Highway 416 to Carling Avenue;
- Carling Avenue to Kent Street;
- Kent Street to Nicholas Street;
- Nicholas Street to Ottawa Road 174; and
- Ottawa Road 174 to Anderson Road.

Once the mainline widening was determined, interchange alternatives were then assessed. At interchanges in areas where widening was recommended, the "base case" was to modify ramps to fit the widened mainline. At interchanges in areas where widening was not recommended, the "base case" was "Do nothing".

3.2.7 Evaluation Factors and Sub-Factors

The initial task in the evaluation was to develop a long list of factors that could be used to assess the alternatives and make comparisons with consideration for the broad definition of the environment as provided in the EA Act. This was broken down into a two-step process that included the identification of factor areas followed by the selection of a number of factors and sub-factors under the factor areas.

The factor areas were presented to the public at the first round of Public Involvement Centres. Following this consultation, these factor areas were accepted as describing the broad definition of the environment to be evaluated. Factor areas for this study are:

- Traffic and Transportation;
- Natural Environment;
- Social and Cultural Environment;
- Land Use and Property Impacts; and
- Cost.

These factor areas were the starting point for the development of a comprehensive list of factors and sub-factors. Factors reflect the various components of that segment of the environment (natural, social, etc.). Sub-factors are the individual descriptors for the evaluation. The selection of the sub-factors is important to the decision-making process because they must adequately describe the issue to be evaluated. During the evaluation, one or more factors/sub-factors were screened out if it was determined that there was not a meaningful, measurable difference among the alternatives being assessed for that factor/sub-factor.

For each sub-factor, a measure was identified to indicate how the evaluation team would assess the alternatives.

The long-list of factors and sub-factors developed for the project, along with the measurement and the utility function, is provided in **Table 3.1**. Further details on the utility functions are provided in **Appendix P** of this report.

Table 3.1 Long List of Factors and Sub-Factors

Factor Area/Factor	Sub-Factor	Measure	Utility Function
Traffic and Transportation			
Mobility	Person Throughput	Change in person throughput on Highway 417 during the peak period for 2021 horizon year (person-km)	Linear
		Change in person throughput on a network basis during the peak period for 2021 horizon year (person-km)	Linear
	Vehicle Throughput	Change in vehicle throughput on Highway 417 during the peak period for 2021 horizon year (vehicle-km)	Linear
		Change in vehicle throughput on the network during the peak period for 2021 horizon year (vehicle-km)	Linear
	Average Vehicle Travel Speed	Average vehicle travel speed on Highway 417 during the peak period for 2021 horizon year (km/h)	Linear
		Average vehicle travel speed over the network during the peak period for 2021 horizon year (km/h)	Linear
	Total Delay	Total network delay during the peak hour for the 2021 horizon year (person-hours)	Linear
	Duration and extent of congested conditions	During the peak period for 2021 horizon year, the time when level of service is below "E" and the length of network affected (Lane-km-hours)	Linear
	Effect on existing public transit operations	Change in transit level of service (travel time and route) (improvement, no change, reduction)	Step
	Interchange Operation	Ramp terminal intersection volume to capacity ratio (v/c) in peak period for 2021 horizon year	Linear
Accessibility and Safety	Network Connectivity (out of way travel)	Increase in travel distance due to a ramp closure or turn prohibitions, etc. (km)	Linear
	Mean travel time to all destinations	Mean travel time needed to complete a trip on the network	Linear
	Ability to accommodate cyclists and compatibility with cycling infrastructure at crossing road ramp intersection	Number of free-flow ramp/cyclist conflict locations	Step
	Ability to accommodate pedestrians at crossing road ramp intersection	Number of free-flow ramp/pedestrian conflict locations	Step
	Collision Risk on ramps/at ramp terminals	Change in collision risk as determined qualitatively (improvement, no change, increased risk)	Step
	Collision Risk on the mainline	Change in collision risk as measured with collision modification factors	Linear
	Compatibility with future transit initiatives	Physical impact on planned/proposed transit initiatives (None / Minor / Major)	Step
	Compatibility with municipal planning goals and objectives	Degree of conformance with 2003 Ottawa Official Plan and Master planning documents (Good / Fair / Poor)	Step
Natural Environment			
Wildlife	Loss of wildlife habitat	Area of upland habitat removed (ha)	Linear
Significant Fauna / Flora	No significant fauna/flora identified within the study area – sub-factor deleted		
Significant Natural Areas	No significant natural areas identified within the study area – sub-factor deleted		
Surface Water / Groundwater	Stormwater Management	Increase in area of impervious surfaces (m^2)	Linear
Fisheries and Aquatic Habitat	Impact on cold water fish habitat	In-water construction required for cold water fisheries crossing (Yes / No)	Dichotomous
	Impact on warm water fish habitat	In-water construction required for warm water fisheries crossing (Yes / No)	Dichotomous
Social and Cultural Environment			
Noise	Effect on noise sensitive receivers	Number of noise sensitive receivers with a noise increase of 0 – 5 dBAs	Linear
		Number of noise sensitive receivers with a noise increase of 5 – 10 dBAs	Linear
		Number of noise sensitive receivers with a noise increase of greater than 10 dBAs	Linear
Air Quality	Net impact on receptors of interest	Change in air quality impacts at receptors of interest relative to the base case for the 2021 horizon year, as determined qualitatively (Good / Fair / Poor)	Step

Table 3.1 Long List of Factors and Sub-Factors

Factor Area/Factor	Sub-Factor	Measure	Utility Function
Heritage Resources	Displacement or disruption of built heritage features	Number of built heritage features displaced or disrupted	Linear
Archaeology	Displacement or disruption of archaeological sites	Number of archaeological sites displaced or disrupted	Linear
Landscaping	Displacement or disruption of landscaped areas	Area of landscaping removed (m^2)	Linear
Emergency Services	Impact on emergency response time	Impact on average emergency response times (Lower / Neutral / Increased)	Step
Land Use and Property			
Agriculture/Soils	Removal of Class 1 – 3 agricultural land	Area of Class 1, 2 or 3 agricultural land removed (ha)	Linear
Commercial/Industrial	Businesses displaced	Number of businesses displaced	Linear
	Access to commercial/industrial land use	Number of businesses with changed entrance	Linear
	Commercial/industrial property required	Area of commercial/industrial property required (m^2)	Linear
Institutional	Institutional uses displaced	Number of institutional uses displaced	Linear
	Access to institutional land uses	Number of institutions with changed entrance	Linear
	Institutional property required	Area of institutional property required (m^2)	Linear
Recreational	Recreational uses displaced	Number of recreational uses displaced	Linear
	Access to recreational land uses	Number of recreational land uses with changed entrance	Linear
	Recreational property required	Area of recreational property required (m^2)	Linear
Greenspace / Open Space	Removal of greenspace/open space	Area of green space and/or open space removed	Linear
Residential	Residences displaced	Number of homes removed	Linear
	Access to residences	Number of homes with changed entrance	Linear
	Residential property required	Area of residential property required (m^2)	Linear
Waste	Impact on potentially contaminated property	Number of potentially contaminated properties required	Linear
Cost			
Construction Cost	Capital construction cost	Relative road construction cost, excluding property and engineering costs (dollars)	Linear

3.3 ALTERNATIVES TO THE UNDERTAKING

3.3.1 GENERATION OF ALTERNATIVES TO THE UNDERTAKING

To resolve the identified problems and the short term (0 to 10 years) to longer term (10 to 20 years) transportation service needs for the Highway 417 corridor within the project limits, the following "Alternatives to" the undertaking were considered:

- Do Nothing
- Alternative Modes – Rail, Water and Air
- Alternative Mode – Bus and Rail Transit
- Alternative Road Solutions
  - Diversion of traffic to other roads
  - Transportation demand management (TDM)
  - Improve existing highway
    - Major widening with general purpose lanes
    - Major widening with high occupancy vehicle (HOV) lanes
    - Strategic widening with general purpose lanes
    - Strategic widening with high occupancy vehicle lanes
  - New provincial highway

3.3.2 INITIAL SCREENING OF ALTERNATIVES

The Project Team completed an initial screening of the alternatives listed above to reduce the list to only include alternatives that could reasonably address the identified transportation problems and opportunities in the study area. The following alternative strategies were screened out by the Project Team as being impractical stand-alone solutions:

- **Alternative Modes - Rail, water and air**. Regular rail, water and air services were considered but were not carried forward because rail, water and air transportation links serve primarily long distance travelers and must be supported locally by transit and road infrastructure. Their ability to address travel demand in the Study Area is therefore limited. In addition, there would be substantial capital investment required to implement any of these services. It is improbable that improvements to these services would be available in the Study Area within the 20-year planning horizon of this study. Furthermore, the implementation of these alternatives would result in significant environmental and property impacts since the construction of additional facilities would need to occur in urban areas. Note that rail transit service is considered under Alternative Modes – Transit.

- **Alternative Road Solutions - Diversion of traffic to other roads**. The diversion of traffic to other roads as a means of accommodating future travel demands was considered but was not carried forward as a stand-alone solution. As the existing municipal road network is currently functioning at or near capacity, the diversion of additional traffic to the municipal road network would necessitate significant improvements, mainly in the form of additional lanes. Recognizing the density of development immediately adjacent to these streets, the impacts would be unacceptable.

- **Alternative Road Solutions - New provincial highway**. A new provincial highway corridor (i.e. Outer Transportation Corridor) was considered but was not carried forward as a stand-alone solution for the Queensway corridor because it does not address the existing and future transportation needs within the Queensway corridor in terms of easy/direct access to services proximal to the Queensway. Furthermore, it is improbable that a new facility could be constructed within the 20-year planning horizon of this study. The Outer Transportation Corridor project is considered a 30-year planning initiative.

3.3.3 DESCRIPTION OF ALTERNATIVES CARRIED FORWARD

The remaining alternatives to the undertaking were judged to be functionally distinct and considered as possibly satisfying the short to longer term provincial objectives except for the Do Nothing alternative which was carried forward for comparison. Each is described below.

- **Do Nothing Alternative**
  The Do Nothing alternative includes no improvements to the transportation system along the Highway 417 corridor beyond projects currently programmed (i.e. those on the capital program or in the environmental assessment process). Under this alternative, the existing configuration of through lanes and interchanges would remain unchanged. Minor geometric improvements could be considered to address operational and safety concerns.

- **Alternative Mode – Transit**
  Transit was considered as a stand-alone alternative to accommodate future travel demands. Expansion of transit (bus, light rail) would be a municipal undertaking. In addition to considering transit as a stand-alone alternative, the target transit share from the Ottawa OP and TMP work was incorporated into the other "Alternatives to" the undertaking carried forward.

  Significant improvements to the existing and planned transit infrastructure, above those identified in the City's *Rapid Transit Expansion Study, 2003* (RTES), would be required to accommodate projected future travel demands for the Queensway corridor. The recommended network from RTES included the planned bus transitway adjacent to the Queensway corridor west of Woodroffe Avenue and future bus and light rail west of Richmond Road. The recommended network on the east side of the City included the existing bus transitway adjacent to the Queensway from the Riverside Drive / Vanier Parkway interchange easterly.

  Under the Alternative Mode - Transit alternative, the existing configuration of through lanes and interchanges on Highway 417 would remain unchanged. Minor geometric improvements could be considered to address operational and safety concerns.

- **Alternative Road Solutions - Transportation Demand Management (TDM) Measures**
  Transportation demand management measures reflect the use of trip reduction techniques or other mechanisms that relocate trips to non-peak period times. Specific measures include the provisions of car-pooling lots, ramp metering and advanced traffic management systems (ATMS) to manage travel demands in the Queensway corridor. Under this alternative, the existing configuration of through lanes and interchanges would remain unchanged. Minor geometric improvements could be considered to address operational and safety concerns.

- **Alternative Road Solutions - Improve Existing Highway – Major Widening and Interchange Modifications**
  This alternative includes major widening to provide additional through lanes throughout the corridor and to upgrade the facility to current design standards, including standard lane, median and shoulder widths. Interchange modifications would be considered to address operational requirements and identified problems. Significant property acquisition would be required throughout the corridor to accommodate these improvements.

- **Alternative Road Solutions - Improve Existing Highway – Strategic Widening and Interchange Modifications**
  This alternative includes strategic widening to provide eight basic through lanes from Highway 416 to Ottawa Road 174; retaining the existing six lanes from Carling Avenue to Metcalfe Street, and strategic widening to provide six basic through lanes from Ottawa Road 174 easterly to Anderson Road. Existing

lane and shoulder widths would generally be maintained. Generally, the existing median width would remain. Interchange modifications would be considered to address operational requirements and identified problems. Limited property acquisition would be required throughout the corridor to accommodate these improvements.

- **Alternative Road Solutions - High Occupancy Vehicles – Major Widening to add HOV Lane**
  Major widening to provide additional through lanes throughout the corridor for high occupancy vehicles (HOV) was considered as an alternative to increase person throughput when compared with general purpose lanes. The HOV lanes would be designated for use by vehicles with two or more occupants. Significant property acquisition would be required throughout the corridor to accommodate the additional HOV lanes, shoulders and the associated buffer separation between the HOV lane and the adjacent general purpose lane.

- **Alternative Road Solutions - High Occupancy Vehicles – Strategic Widening to add HOV Lane**
  Strategic widening to provide high occupancy vehicle lanes throughout the corridor was considered as an alternative to increase person throughput. This alternative would involve the conversion of the existing median lane in each direction where eight lanes currently exist and the addition of through lanes to accommodate high occupancy vehicles for the remaining sections. Existing shoulder widths would remain. No buffer separation between the HOV lane and the adjacent general purpose lane would be provided. Limited property acquisition would be required at various locations in the corridor.

3.3.4 ASSESSMENT OF "ALTERNATIVES TO" THE UNDERTAKING

The evaluation of "Alternatives to" the undertaking was based on a comparative analysis of environmental, engineering and cost factors, which was carried out at a planning level of detail. The following were taken into consideration:

- Ability to solve transportation problems;
- Ability to address transportation opportunities;
- Achievement of goals and objectives;
- Potential net environmental effects in terms of the natural, social and cultural environments, including anticipated mitigation effort;
- Property requirements and comparative impact on land use; and
- Comparative costs.

A discussion of the assessment of the "Alternatives to" the undertaking that were carried forward, follows and is summarized in **Table 3.2** at the end of **Section 3.3.5**.

Do Nothing Alternative
The Do Nothing alternative does not address existing and future transportation problems including safety, operational and capacity concerns. The existing cross section is insufficient to accommodate future travel demand. Driver frustration will continue to increase as traffic volumes rise resulting in greater potential for collisions. The Do Nothing alternative does not address opportunities and does not help achieve the goals and objectives defined for this project.

The Do Nothing alternative would not require the acquisition of additional property and therefore would not directly impact on adjacent land uses. There would be few impacts to the natural, social or cultural environments. There would be increased user costs associated with more frequent disruption due to increased maintenance and due to longer periods of recurring congestion.

Because of the constricted right-of-way for the existing eight-lane section of the study area, the Do Nothing alternative was identified as the recommended "Alternative to" the undertaking between Carling Avenue and Kent Street. The impacts to the social environment resulting from widening in this portion of the corridor were considered unacceptable and not in keeping with the Official Plan of the City. However, interchange modifications for the section between Carling Avenue and Kent Street to address highway operation and safety objectives would still be considered.

The Do Nothing alternative was recommended for the existing 8-lane mainline between Carling Avenue and Kent Street and for the existing 6-lane section from Kent Street to Metcalfe Street. Alternative interchange improvements in this section will be considered.

Since the Do Nothing alternative forms the baseline condition, it will be carried forward for the study area outside of the Carling Avenue to Kent Street section as the benchmark against which other alternatives will be compared.

Alternative Mode – Transit
Transit has the potential to partially accommodate existing and future travel demands and may improve mobility and ease congestion. It is part of an area-wide transportation solution. As noted, the target transit share from the Ottawa OP and TMP was considered as part of all "Alternatives to" the Undertaking. Environmental impacts resulting from transit improvements would vary according to the type, and extent of infrastructure proposed.

Existing transit ridership in the Queensway corridor varies from approximately 16% in the vicinity of Highway 416 to 35% through the downtown core in the peak hour. The *Ottawa 20/20 Transportation Master Plan* has set a target of 25% to 40% peak hour transit usage by 2021, in the vicinity of Highway 416 and for the downtown core, respectively. The overall target for transit usage during the 2021 peak hour in Ottawa is 30%.

The transit mode split required to eliminate the need for additional through lane capacity in the Queensway corridor was calculated at about 40% (in the vicinity of Highway 416) to about 60% (through the downtown core). This level of use would require significantly more transit infrastructure than currently proposed by the City of Ottawa and is unrealistic to achieve within the 20-year planning horizon. The goals and objectives of this project cannot, therefore, be achieved through the implementation of transit measures only.

Accordingly, transit was not carried forward as a stand-alone alternative but was carried forward as a component of all alternatives. Ottawa's target transit modal split, contained in the 2003 OP and TMP documents, was incorporated into the traffic analysis for all alternatives.

Alternative Road Solutions - Transportation Demand Management (TDM) Measures
Transportation demand management and ATMS measures would partially address existing and future travel demands in the Queensway corridor but would have limited opportunity to improve mobility. However, TDM measures can complement other alternative strategies by reducing and/or managing travel demand, particularly during peak periods. The City of Ottawa includes TDM as an essential part of their transportation program. The environmental and property impacts associated with the implementation of TDM measures would be minor since the improvements can primarily be implemented within the existing highway right-of-way. Both the benefits and the costs of this alternative would be low relative to other alternatives. The goals and objectives of this project cannot be achieved through the implementation of TDM and ATMS measures only.

As a result of this assessment, it is recommended that transportation demand management/ATMS measures be carried forward, along with transit, as part of all alternative road solutions.

Subsequent investigation revealed that there is potential demand for a carpool and/or park and ride lot in the vicinity of the Highway 416/Highway 417 interchange; however, there are significant environmental and access issues associated with the public-owned land in this area. Opportunities to provide a carpool facility elsewhere within the Highway 417 corridor, outside of the study limits, will be reviewed by the Ministry in consultation with the City of Ottawa, NCC and OC Transpo. This investigation is documented in the *Transportation Demand Management (TDM) Study Report, April 2004* located in Appendix Q.

Alternative Road Solutions - Improve Existing Highway – Major Widening and Interchange Modifications
Widening of the Queensway by one or more lanes in each direction for the length of the study area would satisfy existing and future travel demand except under certain peak hour conditions. Widening from 6 and 8 lanes to 8 and 10 lanes would effectively address existing and future corridor capacity requirements by improving mobility and easing congestion.

Major widening and interchange modifications would achieve most of the goals and objectives for this project but the associated environmental and property impacts would be significant. Impacts to the natural environment would include the disturbance of fisheries habitat at watercourse crossings and the removal of existing vegetation adjacent to the Queensway corridor. Social impacts would include the removal of homes, social amenities and businesses (greater than 300) adjacent to the Queensway corridor. Property acquisition would be required on both sides of the Queensway throughout the project limits. The acquisition of additional right-of-way to allow for the major widening and interchange modifications would impact on all properties along the corridor with significant consequences for neighbourhoods and the community. The construction cost of this alternative would also be extremely high relative to other alternatives.

While this alternative solves the identified transportation problems for the Queensway corridor, it was not carried forward due to the significant environmental and property impacts.

Alternative Road Solutions - Improve Existing Highway – Strategic Widening and Interchange Modifications
Strategic widening of the Queensway would satisfy most existing and future travel demand except during certain peak hour conditions. It would effectively address existing and future corridor capacity requirements by improving mobility and easing congestion throughout the study section. Strategic widening would achieve the goals and objectives for this project.

Environmental impacts associated with strategic widening would be significantly less than for the major widening alternative. Impacts to the natural environment would include the disturbance of fisheries habitat at some watercourse crossings and limited removal of existing vegetation adjacent to the Queensway corridor. Social impacts would include the removal of 1 home on Concord Street S. west of Nicholas Street and 19 homes adjacent to the Queensway corridor on Westmount Avenue. The removal of the homes on Westmount Avenue is not related to the Queensway widening since no widening is proposed in this area; rather it is necessary for the modification of the Parkdale Road interchange. The widening of the Queensway and the modification to the Parkdale interchange are independent of each other, in other words, one can be done without doing the other. The property acquisition would be limited to strategic locations throughout the project limits. The cost of this alternative would be moderate relative to major widening.

This alternative satisfies the traffic and transportation requirements for the Queensway corridor, while minimizing environmental and property impacts. Therefore, it is recommended that this alternative be carried forward.

Under this alternative, eight basic through lanes (i.e. one additional through lanes in each direction) would be provided between Highway 416 and Carling Avenue and from Metcalfe Street to Ottawa Road 174 and six basic through lanes would be provided from Ottawa Road 174 to east of Walkley Road. In addition, interchange modifications would be considered throughout the corridor to improve highway operations and safety.

Alternative Road Solutions - High Occupancy Vehicles – Major Widening to Add HOV Lane
Major widening of the Queensway to add high occupancy vehicle lanes would satisfy existing and future travel demands. It would provide a high level of service and improve highway operation and safety. However, as noted previously for general major widening, the associated environmental and property impacts would be significant. Impacts to the natural environment would include the disturbance of fisheries habitat at watercourse crossings and the removal of existing vegetation adjacent to the Queensway corridor. Social impacts would include the removal of homes, social amenities and businesses (greater than 300) adjacent to the Queensway corridor. Property acquisition would be required on both sides of the Queensway throughout the project limits. The cost of this alternative would be extremely high relative to other alternatives.

While transportation planning work indicated that there would be a demand for the use of an HOV lane, there would be significant operational problems (access and egress from the lane) without significant additional infrastructure. This would add to the costs, property requirements and environmental impacts. This work is documented in the *HOV Study Report, February 2004* located in Appendix R.

While this alternative satisfies the traffic and transportation requirements for the Queensway corridor, it was not carried forward due to the significant environmental and property impacts.

Alternative Road Solutions - High Occupancy Vehicles – Strategic Widening to Add HOV Lane
Strategic widening of the Queensway to provide high occupancy vehicle lanes would not fully satisfy existing and future travel demands in the corridor. The conversion of one existing through lane to an HOV only lane in each direction where eight basic lanes currently exist would result in increased congestion for the remaining general purpose lanes. Furthermore, the congestion in the general purpose lanes would impede the movement of vehicles in to and out of the HOV lane. The constrained HOV lane operations and the lack of buffer separation between the HOV lane and the adjacent general purpose lane would be expected to result in increased collision potential for the corridor.

While this alternative minimizes environmental and property impacts, it cannot be accommodated with the necessary shoulder, buffer widths and enforcement zones needed for safe and efficient operation. Therefore, it was not carried forward for further evaluation as a viable solution through the study area.

3.3.5 RECOMMENDED "ALTERNATIVES TO" THE UNDERTAKING

On the basis of the discussion presented in **Section 3.3.4** and the Summary of Assessment and Evaluation of "Alternatives to" the Undertaking in **Table 3-2** below, the following "Alternatives to" the undertaking are carried forward for further analysis to address identified transportation problems and opportunities in the Queensway corridor:

- Do Nothing (i.e. no widening) for the existing eight-lane section of the Queensway from Carling Avenue to Kent Street. Improvements at interchange locations will be considered as noted below;
- Improve existing highway – strategic widening and interchange improvements from Highway 416 to Carling Avenue to provide eight basic lanes, from Metcalfe Street to Ottawa Road 174 to provide eight basic lanes and from Ottawa Road 174 to east of Walkley Road to provide six basic lanes; and
- Implement transportation demand management and ATMS measures and improve transit throughout the Queensway corridor to complement other proposed improvements.

The remaining "Alternatives to" the undertaking presented were not considered viable to address identified transportation problems and opportunities in the Queensway corridor and did not achieve the goals and objectives of this project. Hence, they were not carried forward for further evaluation.

Table 3.2 Summary of Assessment and Evaluation of "Alternatives to" the Undertaking

Factor Area / Goals and Objectives	Do Nothing	Alternative Mode - Transit	Transportation Demand Management (including commuter parking lots, ramp metering, Advanced Traffic Management Systems (ATMS)	Improve Existing Highway – General Purpose (GP) Lanes		Improve Existing Highway – High Occupancy Vehicles (HOV)	
				Major Widening & Interchange Improvements with Property Acquisition Throughout	Strategic Widening and Interchange Improvements with Limited Property Acquisition	Major Widening to Add HOV Lane with Property Acquisition Throughout	Strategic Widening to Add HOV Lane, incl. conversion of existing median lane to HOV Lane in existing 8-lane section, Limited Property Acquisition
Traffic and Transportation Ability to solve transportation problems Promote safe, effective and efficient use of the transportation system for the movement of people and goods Provide alternatives to travel	• Does not address existing and future traffic needs • Does not improve mobility or ease congestion • Increased collision potential with increased traffic demand • Reduced efficiency with Do Nothing alternative ×	• Potential to partially address existing and future corridor capacity requirements • May improve mobility or ease congestion (dependant on modal split achieved) • Minor reduction in collision potential • Should be considered as part of area-wide transportation solution • Provides travel choice, efficiency and effectiveness ×	• Potential to partially address existing and future corridor capacity requirements • Limited opportunity to improve mobility and ease congestion • Marginal reduction in collision potential • Should be considered as part of area-wide transportation solution • Provides travel efficiency and effectiveness ✓	• Most effectively addresses existing and future corridor capacity requirements • Improves mobility and eases congestion throughout the study section • Significant reduction in collision potential • Promotes more effective and efficient travel ✓	• Addresses majority of existing and future corridor capacity requirements • Improves mobility and eases congestion where strategic widening improvements made • Reduction in collision potential • Promotes more effective and efficient travel ✓	• High potential to fully address existing and future corridor capacity requirements • Improves mobility and eases congestion throughout the study section • Reduction in collision potential • Promotes more effective and efficient travel ✓	• Potential to address existing and future corridor capacity requirements where highway widened for HOV lanes and HOV lane fully utilized • Improves mobility and reduces congestion where highway widened for HOV lanes and HOV lane fully utilized • Increased collision potential without buffer between HOV and GP Lanes. Speed differential between HOV and GP lanes creates increased potential for more severe collisions • Promotes more effective, efficient travel -
Natural Environment Minimize negative environmental effects and mitigation	• No impacts except reduction in air quality with increased severity and duration of congestion ✓	• Variable impacts (dependant on nature, extent and location of transit infrastructure requirements). -	• Minor impacts related to removal of vegetation with the construction of commuter parking lots, queue jumping lanes and the installation of traffic management systems -	• Significant impacts on watercourses with wider crossings, more vegetation removed for construction, more quantity and quality control needed for runoff from impervious surfaces ×	• Moderate impacts with wider crossings on some watercourses, some vegetation removed in areas of widening and quantity and quality control needed for runoff from impervious surfaces ×	• Significant impacts on watercourses with wider crossings, more vegetation removed for construction, more quantity and quality control needed for runoff ×	• Moderate impacts with wider crossings on some watercourses, some vegetation removed in areas of widening and quantity and quality control needed for runoff from impervious surfaces ×
Social / Cultural Environment Support measures by the City to manage transportation Minimize environmental effects and mitigation	• Increasing delays to emergency services as a result of increasing congestion • Does not support planned growth ×	• Variable impacts (dependant on nature, extent and location of transit infrastructure requirements). • Alone, does not support planned growth -	• Limited social impacts related to the location and extent of any TDM measures • Alone, does not support planned growth -	• Potential impacts on heritage structures adjacent to corridor; • Greater pavement area may result in removal of landscaping significant social impacts • Supports planned growth ×	• Potential impacts on heritage structures adjacent to corridor in areas of widening; • Greater pavement area may result in removal of/less landscaping • Supports planned growth -	• Potential impacts on heritage structures adjacent to corridor; • Greater pavement area may result in removal of/less landscaping significant social impacts • Supports planned growth ×	• Potential impacts on heritage structures adjacent to corridor in areas of widening; • Greater pavement area may result in removal of/less landscaping • Partially supports planned growth -
Land Use and Property Support measures by the City to manage transportation Minimize environmental effects and mitigation	• No property required • No support for City policies ✓	• Variable property required (dependant on nature, extent and location of transit infrastructure requirements) • Partial support for City policies -	• Minor property required, depending on the extent and nature of the TDM measures • Partial support for City policies ✓	• Significant property required (in excess of 300 homes, businesses, institutions, parks, etc.) for highway widening and stormwater management facilities • Not supportive of City policies ×	• Limited property required (about 20 homes) for highway widening and interchange modifications, depending on specific details) • Support for City policies -	• Significant property required (in excess of 300 homes, businesses, institutions, parks, etc.) for highway widening and interchange modifications depending on specific details • Not supportive of City policies ×	• Limited property required (about 20 homes) for highway widening and interchange modifications, depending on specific details) • Support for City policies -
Cost Promote efficient use of the transportation system Analysis of engineering features, construction cost	• Increased maintenance and associated staging costs ✓	• Variable capital cost (dependant on nature, extent and location of transit infrastructure improvements) -	• Low to moderate capital costs related to car pool lots, advanced traffic management systems, etc. ✓	• High capital cost related to full length widening with structure replacements, retaining walls, etc. ×	• Moderate capital cost related to widening in areas of existing 6-lanes only -	• Highest capital cost of road improvement options (HOV buffer zones add to the widening requirements for GPLs) ×	• Moderate capital cost related to widening in areas of existing 6-lanes only and conversion of GPLs to HOV lanes -
RECOMMENDATION	**CARRIED FORWARD** for comparison purposes	NOT CARRIED FORWARD AS A STAND ALONE ALTERNATIVE (Transit usage targets are included in all scenarios)	NOT CARRIED FORWARD AS A STAND ALONE ALTERNATIVE (TDM/ATMS included in all scenarios)	NOT CARRIED FORWARD	**CARRIED FORWARD (includes TDM/ATMS measures and transit usage targets)**	NOT CARRIED FORWARD	NOT CARRIED FORWARD

LEGEND: ✓ = **Good in comparison to other alternatives** - = **neutral in comparison to other alternatives** × = **poor in comparison to other alternatives**

4 EXISTING CONDITIONS

4.1 DOCUMENTATION OF EXISTING ENVIRONMENTAL CONDITIONS

The existing environmental conditions within the study area corridor were documented on the basis of the review of secondary source information and field investigations by environmental specialists. The purpose of the review was to determine the significance/sensitivity of the environmental features found in the study area and to allow for the identification of potential impacts resulting from the proposed highway modifications. The following environmental factors were identified as being applicable to the project:

Natural Environment Factors

- Fisheries and Aquatic Ecosystems
- Terrestrial Ecosystems (Wildlife, Vegetation, Wetlands)
- Surface Water
- Greenways and Open Space Linkages

Social-Economic Environment Factors

- Land Use
- Contaminated Property and Waste Management
- Aesthetics/Landscape Composition
- Highway Noise
- Air Quality

Cultural Environment Factors

- Archaeology
- Built Heritage

The Groundwater environmental factor was not considered to be applicable to this project given the built-up nature of the study area and the fact that the urban area is fully serviced by a municipal water system.

4.1.1 NATURAL ENVIRONMENT

4.1.1.1 Fisheries and Aquatic Ecosystems

A site reconnaissance to investigate fish habitat along Highway 417 within the study area was undertaken on April 25 and 26, 2002, followed by detailed fish inventory and habitat assessment surveys on June 18, 19 and 20, 2002. A study reach of 100 m downstream and 20 m upstream of the highway was established for each watercourse. The comprehensive fisheries report, *Preliminary Fisheries and Aquatic Ecosystem Technical Report, November 2002*, is provided in **Appendix F**.

A number of watercourses were examined within the project limits, including Graham Creek, Pinecrest Creek, Rideau Canal, Rideau River, Green's Creek, Borthwick Creek, Ramsay Creek, Ramsay Creek Tributary, McEwan Creek and McEwan Creek South Branch. The location of each watercourses is illustrated on the drawing provided in **Appendix F**. All watercourses are part of the Ottawa River watershed and were found to support warmwater fish species.

The quality of fish habitats varied widely between the different watercourses. Those found in heavily urbanized catchment areas had the most degraded quality due to wide fluctuations in water flow. These fluctuations in water flow can be attributed to the large quantities of water suddenly flowing through the channel as a result of major storm events, followed by prolonged periods of low flow between rainfalls. These flow fluctuations produce significant erosion and sedimentation problems in the streambeds. As a result, a number of watercourses have been realigned and have had their channels hardened with riprap and gabion baskets. Some smaller watercourses were found to be intermittent during prolonged dry periods.

Watercourses found to provide good quality fish habitat included Pinecrest Creek, Rideau River, Green's Creek and Ramsay Creek. **Table 4.1** provides a summary of the existing fish habitat conditions.

Table 4.1 Summary of Existing Fish Habitat Conditions (Field Work Completed between June 18 and June 20, 2002)

Assessment Site	General Description
Site 2 Graham Creek	Warmwater fish habitat. Species caught: creek chub, bluntnose minnow, fathead minnow, brook stickleback, common white sucker and others. 5 m wide; 0.3 m deep; heavily rip rapped and channelized. Fast water flow during survey period. Watercourse significantly altered within right-of-way. Fish habitat compensation measures including four sets of rock vortex weirs placed on streambed to create pool-riffle areas have been recently implemented to accommodate Transitway. Downstream of weirs a footbridge passes over the stream.
Site 3 Pinecrest Creek	Good quality warmwater fish habitat. Species caught: common white sucker. Special Note: Several other fish species are expected to inhabit this high quality fish habitat but were most likely dispersed downstream during the survey period due to the high flow conditions. 4 m wide; 0.2 m deep; treed banks, limestone, cobble, silt substrates. High water flow conditions and very turbid during survey period. Watercourse passes through a wooded area of the Ottawa Greenbelt. Watercourse shaded by woodlot banks.
Site 4 Rideau Canal	Warmwater fish habitat. Species reported in the 1999 OMNR list: pumpkinseed, brown bullhead, central mudminnow, rock bass, carp and others. Special Note: Since the Rideau Canal and the Rideau River are the same watercourse it is expected that any species found in one watercourse can potentially be found in the other. 30 m wide; 3 m deep; hardened shore, sand, silt substrates, heavily vegetated. High water conditions during survey period. Canal runs through downtown core and is drained each fall for the winter season.
Site 5 Rideau River	Good quality warmwater fish habitat. Species reported in the 1999 OMNR list: northern pike, muskellunge, smallmouth bass, largemouth bass and others. Special Note: Since the Rideau Canal and the Rideau River are the same watercourse it is expected that any species found in one watercourse can potentially be found in the other. 120 m wide; ± 3 m deep; shale, silt, cobble substrates. Steep sloping streambanks with a narrow band of woody riparian vegetation. Fast water flow and large amounts of debris (e.g. logs, branches) observed during survey period.
Site 6 Green's Creek	Good quality warmwater fish habitat. Species caught: longnose dace, pumpkinseed, common white sucker, fathead minnow, creek chub and others. 10 m wide; ± 1 m deep; heavily rip rapped steep banks; gravel, cobble, shale substrates. Fast water flow during survey period. Stream is subject to large volumes of water during major storm events. Watercourse surrounded by semi-rural / industrial land use.
Site 7 Borthwick Creek	Warmwater fish habitat. Tributary of Ramsay Creek. Species caught: creek chub, central mudminnow and brook stickleback. 3 m wide; 0.4 m deep; grassed banks, channelized, silty bottom, some rocks. Fast water flow during survey period.

Table 4.1 Summary of Existing Fish Habitat Conditions (Field Work Completed between June 18 and June 20, 2002)

Assessment Site	General Description
Site 8 Ramsay Creek	Good quality warmwater fish habitat. Species caught: spottail shiner, central mudminnow. Reported in OMNR records of 1995: creek chub, common sucker and others. 5 m wide; 0.6 m deep; banks are heavily rip rapped with silty clay streambed. Turbid water during survey period. Surrounding land use is a mix of rural and industrial. Hydro transmission station and railway in close proximity to the watercourse.
Site 9 Ramsay Creek Tributary	Warmwater fish habitat. Species caught: brook stickleback. 4 m wide; 0.2 m deep; silty muck bottom. Small stream with intermittent water flow.
Site 10 McEwan Creek	Warmwater fish habitat. Significant tributary of Ramsay Creek. Species caught: longnose dace, creek chub and central mudminnow. 5 m wide; 0.3 m deep; stream has been channelized, steep clay banks, with a sandy bottom.
Site 11 McEwan Creek South Branch	Warmwater fish habitat. Species caught: longnose dace, creek chub and central mudminnow. 1.5 m wide; 0.2 m deep; grass banks, substrates are sand and clay.
Site 12 Ramsay Creek	Good quality warmwater fish habitat. Species caught: fathead minnow, spottail shiner, creek chub, brook stickleback and central mudminnow. 2 m wide; 0.8 m deep; the stream is channelized with rip rapped banks and clay and sand substrates. Intermittent water flow.

4.1.1.2 Terrestrial Ecosystems

A reconnaissance field survey was conducted on April 25 and 26, 2002 to determine the nature and extent of botanical and wildlife habitats within the Highway 417 study area, with follow-up detailed assessment surveys conducted on June 17 to 20, 2002.

The natural habitat within the study area, as described in the *Botanical and Wildlife Survey Report, January 2003*, found in **Appendix G**, is either rural agricultural grasslands or highly altered urban/residential. MNR advised that no Areas of Natural and Scientific Interest (ANSIs), evaluated wetlands or other natural features of interest have been identified within the study area. Pinecrest Creek (west of Woodroffe Avenue in the Ottawa Transitway/Parkway open space) is the most significant of the natural habitats. The small forest associated with Pinecrest Creek contains the fewest number of invasive species and the largest number of "rich site" species.

MNR reviewed the National Heritage Information Centre (NHIC) database for species at risk in the general area of the Highway 417 study limits. The Sea-spurrey (*Spergularia marina*), a vascular plant, was the only rare species found within the database in the study area. This plant was last documented in 1976, growing within the median of Highway 417 between Pinecrest and Woodroffe Avenue, a location that has since been paved and a concrete median barrier constructed. The Sea-spurrey is now considered extirpated in Ontario. No other flora species at risk were identified within the footprint of the study area. No regionally or provincially rare species of plants, as described in the Ontario Ministry of Natural Resources Vulnerable, Threatened, Endangered and Extirpated list (OMNR VTEE 1996), were observed. (Note that the Butternut has subsequently been listed as an endangered plant by the Ontario Ministry of Natural Resources).

Wildlife species present in the project area were those species well adapted to living near humans and their urban landscape, as described in the *Botanical and Wildlife Survey Report* found in **Appendix G**. The most commonly noted species of mammal was the groundhog and the raccoon. Canid predators such as red fox and the coyote would also be present in much of this habitat. Similarly, signs of white-tailed deer were observed throughout much of the study area except through the most heavily urbanized location within the city core.

The avifauna habitat present throughout the study area reflected those conditions suitable to birds adapted to either open country or the forest edge. None of the small wooded pockets examined within the area were large enough in area to support breeding populations for birds requiring interior forest habitat.

No regionally or provincially rare species of animals, as described in the OMNR VTEE 1996 list, were observed. Furthermore, the NHIC database had no record of fauna species at risk within the study area.

Several of the riparian zones and forested pockets contain suitable habitats for a range of common herpetofaunal species, however only two species were observed, specifically the midland painted turtle and the eastern garter snake. Of particular note was the lack of frog species observed in the study area. Certain species, such as the common green frog and the leopard frog, normally found in most riverine habitats, were absent. The reasons for this are unknown.

Hampton Park Supplemental Assessment

In response to concerns regarding the recommended alternative at the Island Park Drive Interchange, and more specifically the impact that the technically preferred alternative would have on Hampton Park, MTO commissioned a second natural environment assessment of the Highway 417/Island Park Drive Interchange in May 2005. This review consisted of a site reconnaissance on May 17, 2005 with follow-up visits on July 8 and 15, 2005 to provide a better understanding of both floral and faunal diversity in the site. A copy of the report *Natural Environment Assessment: Island Park Drive Interchange, August 2005* is included in **Appendix H**. The conclusions of that report are reprinted as follows:

The woodland of the proposed interchange development area does not constitute regionally significant vegetation. It appears to maintain a moderate level of significant plant species representation (one Regionally Rare species (Butternut Tree), four regionally uncommon species).

Despite fragmentation of woodland areas to the north, disturbance by formal and informal footpaths, and some invasive weed growth, the natural vegetation retains a relatively high level of ecological integrity vis-à-vis comparable urban natural areas (Muncaster and Brunton 2005). And despite the isolation of this 'island' of natural habitat, habitat fragmentation in the larger park area and the high level of traffic noise from the adjacent freeway, at least one Regionally Significant breeding bird species is maintained here as well.

Overall, Hampton Park, including the potential interchange development area, would likely rate a Moderate level of significance as an Urban Natural Area. This rating does not take into account additional natural environment-related aesthetic and community values, however, such as appreciation of specimen trees, sound and visual buffering, etc.

An interchange design that requires replacement of woodland habitat northward to the existing east-west pathway (as proposed earlier in 2005) would result in the unmitigatable loss of specimen trees (the group of mature Sugar Maples) immediately north of the proposed traffic roundabout. There would also be some reduction in the overall level of ecological integrity of the park woodland habitat, as reflected in a decline in the average Coefficient of Conservation value of the native flora (reduced to 3.69 from 4.14). It is also not clear under this scenario if the Regionally Significant nesting raptors could safely and successfully breed in the somewhat reduced area of suitable habitat with its increased level of vulnerability to vehicle encounters.

Other potentially significant ecological implications of the proposed interchange development are not anticipated, as this site does not have interior forest values which could be compromised, substantial standing water bodies or free-flowing drainage channels, or potential to support significant concentrations of wildlife.

4.1.1.3 Surface Water

The results of the review of existing drainage conditions within the study limits are summarized below, with additional details provided in the *Drainage Report, November 2003*, provided in **Appendix I**.

The major watercourses found in the study area include the Rideau River, Rideau Canal, Graham Creek, Pinecrest Creek and Green's Creek. The topography of the study area is flat to gentle sloping. The Mer Bleu wetland is part of the Green's Creek eastern tributaries.

The study area consists of 46 catchment areas and includes 54 existing drainage structures, excluding the central study area which is serviced by a storm sewer system. Watercourse drainage areas vary in size from 0.6 hectares to 6,500 hectares.

The west portion of the study area, extending from Highway 416 to approximately Woodroffe Avenue, consists primarily of open ditch drainage. Through the central section of the study area, that extends from approximately Woodroffe Avenue to St. Laurent Boulevard, Highway 417 drains to the existing City of Ottawa storm and combined sewer systems. The storm sewer systems contribute to storm water flows collected by the City sewer systems or discharge to the Rideau River, Rideau Canal or the Ottawa River. The east portion of the study area, extending from St. Laurent Boulevard to Anderson Road, consists primarily of open ditch drainage.

4.1.1.4 Greenways and Open Space Linkages

Greenways and open space linkages are linear spaces exhibiting natural environmental and/or landscaped/recreational features that cross or commence at the highway corridor. Major green corridors within the study area that are bisected by the existing Highway 417 right-of-way include:

- Highway 417/416 Interchange Area – a quantity of reforestation, which provides a woodlot presence within the right-of-way, was completed during the construction of this interchange and links the north and south portions of the Greenbelt through the interchange;
- Transit Corridor at Woodroffe Avenue – heavily vegetated both north and south of the highway;
- Island Park Drive Corridor – perimeter of the interchange contains a significant quantity of vegetation;
- Nicholas Street On-Ramp Area – heavily vegetated in the northwest quadrant;
- Rideau River/Riverside Drive Corridor – heavily vegetated north and south of the highway; and
- 417/ OR 174/Aviation Parkway Interchange Area – woodlot presence within the right-of-way as well as to the north and the south of the highway.

Open space linkages adjacent to the Highway 417 corridor include the existing recreational pathway in the vicinity of the Highway 417/416 Interchange, the area of Hampton Park between the baseball diamonds, Island Park Drive/Merivale Road and the Rideau Canal.

4.1.2 SOCIAL-ECONOMIC ENVIRONMENT

4.1.2.1 Existing Land Use

There is a wide range of land uses along Highway 417 from Highway 416 to Anderson Road as described in the *Social, Land Use and Planning Review Report, December 2002*, found in **Appendix J**. The general land use and sites of particular interest are illustrated on the exhibits included in **Appendix J**.

Much of the corridor is designated as General Urban Area in the *City of Ottawa Official Plan, 2003*. Employment Areas are situated in three locations, northeast of the Pinecrest Road interchange, south of Highway 417 between Maitland and Carling Avenues and from east of the Rideau River to south of Innes Road. Mixed use areas are designated in the Preston Street area, from Nicholas Street to the Ottawa Train Station and northeast of St. Laurent Boulevard interchange. The Ottawa Greenbelt is located west of Holly Acres Road in the west and south of Innes Road in the east. Some agricultural lands and natural environment areas are present within the Greenbelt.

Existing land uses are described from west to east below.

Highway 416 easterly to Pinecrest Road/Greenbank Road:
The land south and west of the Highway 417/416 interchange is primarily agricultural while the area immediately north of the freeway, extending to Holly Acres Road, is used for green space and includes a pedestrian/cyclist trail. North of Highway 417 between Holly Acres Road and Richmond Road is the Bayshore community. Immediately adjacent to the freeway is an apartment building, the Bayshore Shopping Mall and the OC Transpo Bayshore station.

North of Highway 417 from Richmond Road to Pinecrest Road, the predominant land use is residential. On the south side of the freeway residential land use extends about half way from Richmond to Greenbank Road with office, industrial and commercial buildings such as Lee Valley Tools adjacent to the freeway for the remainder of the distance.

Pinecrest Road/Greenbank Road to Maitland Avenue:
On the north side of Highway 417 from Pinecrest Road to Woodroffe Avenue, land uses include All Saints Church, industrial/commercial buildings such as Westbourne Electric, Hewlett-Packard, Leon's Home Furnishing Superstore, the OC Transpo Pinecrest Garage, a residential development and open space accommodating the Southwest Transitway and Pinecrest Creek.

On the south side of Highway 417 from Pinecrest Road to Woodroffe Avenue there is major commercial development including the Pinecrest Shopping Centre, IKEA, stand-alone restaurants, the Ottawa Citizen newspaper building and the Baxter Centre. Further east, Queensway Public School backs onto the freeway followed by West End Villa (a seniors' residence), a park with an outdoor pool and then residential development and open space accommodating the Southwest Transitway and Pinecrest Creek.

On the north side of Highway 417 from Woodroffe to Maitland Avenue, the land use is primarily residential with the exception of the Ottawa Adventist Church and School in the northeast corner of the Woodroffe Avenue Interchange. Similarly, the lands on the south side are primarily residential with two schools backing onto the freeway east of Woodroffe Avenue, J. H. Putman Intermediate School and Charlotte Lemieux French Elementary School.

Maitland Avenue to Island Park Drive:
South of Highway 417, land uses are predominantly commercial/industrial including office buildings, the Ottawa Public Works Yard, the Algonquin Careers Academy, car dealerships, hotels, Westgate Shopping Centre and Kingsway United Church.

North of Highway 417, land uses include St. Basil's Church, residential development, a school, office buildings and commercial establishments including Hampton Park shopping centre and several car dealerships. A fire hall combined with an administration building for the Fire Department backs onto Highway 417 west of Kirkwood Avenue. East of Hampton Park Plaza along the north side of Highway 417 is a City park with baseball diamonds and open space.

Island Park Drive to Preston Street:
The land use along the south side of Highway 417 is predominantly residential except for the St. Mathias Anglican Church and Elmdale Park. The CP rail line (O-train corridor) crosses Highway 417 west of Preston Street. Similarly along the north side of the freeway, the land use is mainly residential except for Fisher Park High School and the City of Ottawa Transportation building. A pedestrian bridge crossing over Highway 417 is located near Fisher Park High School.

Preston Street to Rideau Canal:
Along the north side of Highway 417 is mixed use development including a continuing education school and various residential uses as far east as Bronson Avenue. Continuing easterly from Bronson Avenue, land uses include storage/office buildings, a grocery store, a car rental, a car wash, the inter-city bus terminal on Catherine Street, the YMCA and the City of Ottawa police department headquarters at Catherine and Elgin Street. An apartment building complex and a green space are located between Elgin Street and the Rideau Canal.

There is a varied mix of land uses along the south side of Highway 417 in this section including commercial/retail, office buildings, and residential. A residential neighbourhood borders the southern side of Chamberlain Street just south of Highway 417. East of Lyon Street, land use becomes mixed with residential and commercial/retail businesses.

Rideau Canal to Rideau River:
A strip of green space including a pedestrian/cyclist trail borders both sides of the Rideau Canal.

A residential neighbourhood occupies the area north of Highway 417 east of the Rideau Canal. The Sandy Hill Arena is located east of Nicholas Street and the East Transitway, and a residential neighbourhood is located just east of Lees Avenue. North of Highway 417 and west of the Rideau River there is a Municipal Works Yard.

South of Highway 417, land uses consist of a residential neighbourhood with a vegetative buffer zone in some areas. East of the Nicholas Street interchange there is a residential apartment complex, the East Transitway, government office buildings and the former Algonquin College Rideau Campus. The campus has a large parking lot situated just west of the Rideau River.

Rideau River to Innes Road:
A recreational area with a waterfront trail system is located on the east side of the Rideau River. The green space on the south side of the highway extends to the Riverside Drive/Vanier Parkway interchange while the Royal Canadian Mounted Police headquarters dominates the north side of Highway 417.

East of the Vanier Parkway interchange, AAA Baseball Park and a mix of retail commercial/businesses occupy the north side of Highway 417, including a Canadian Tire store and the St. Laurent Shopping Centre and Transitway station. East of St. Laurent Boulevard, land uses include accommodations, retail outlets and office buildings. East of Cyrville Road, an open space area runs along the north side of Highway 417 and continues southeast of Ottawa Road 174. A residential community dominates the lands southeast of Ottawa Road 174 to the easterly crossing of Cyrville Road. A number of "big box" commercial uses occupy the land adjacent to the Innes Road Interchange.

Along the south side of Highway 417 east of the Vanier Parkway interchange, the Ottawa Train Station occupies a large parcel of land. The land use east of the station to the St. Laurent Boulevard interchange is predominantly commercial/industrial except for a residential neighbourhood east of Belfast Road. The land uses southwest of the Highway 417/Ottawa Road 174 split are mainly industrial with a few car dealerships in the northwest quadrant of the Innes Road interchange.

Innes Road to Anderson Road:
Costco, The Brick and a Travelodge Hotel are located southeast of the Innes Road interchange as well as a Public Works yard north of the CP rail line. Highway 417 enters the Greenbelt south of the CP rail line and remains within the Greenbelt, except for a short stretch south of Ridge Road. A mixture of agricultural lands, wooded areas and a few developed uses are located within the Greenbelt east of the highway. In addition, a church, dwelling and barn are found in this area at the end of the cul-de-sac on Ridge Road.

The predominant land use south and west of the Innes Road/Highway 417 Interchange is agricultural with a commercial feed and seed business. The Walkley Road interchange provides an additional access point to Highway 417 for the industrial and residential uses further to the west. There are several rural residences adjacent to the highway on Blake Road and a farm with dwelling and barns fronts Russell Road close to Highway 417. The lands between Russell Road/Ramsayville Road and Anderson Road are mainly agricultural or wooded.

Features of particular interest along this section of highway include: creeks such as Green's Creek, Borthwick Creek, Ramsay Creek and McEwan Creek and the CP and CN rail lines.

4.1.2.2 Contaminated Property and Waste Management

There are numerous sites adjacent to Highway 417 within the project limits with a high probability of contamination as a result of historic or ongoing uses, such as gasoline storage or manufacturing. Furthermore, there is the potential for subsurface contamination within the Highway 417 right-of-way due to the former use of portions of the corridor as a railway corridor.

4.1.2.3 Aesthetics/Landscape Composition

The nature of the Ottawa Queensway as the main road through the Nation's Capital makes it unique in terms of 400 series highways in Ontario. As such, it has received more attention to landscape and other aesthetic details than most other freeways in Ontario. A prime example is the extensive landscape treatment that was undertaken for the Highway 416/417 interchange which sought to blend the interchange into the landscape and to recreate to the greatest extent possible an urban forest while maintaining the functionality of the Queensway. This unique standing has been considered in the development of the Recommended Plan for this project and additional details will be developed in consultation with the NCC and the public as the project moves into the detail design phase in the future (subject to EA approvals).

Landscape elements along Highway 417 within the study area limits were described in the September 2002 report, contained in **Appendix K**. The limits of the study area for Highway 417 extend from Highway 416 at the west end of the urban City of Ottawa, easterly to Anderson Road, situated beyond the current urbanized limits of the City. There are five distinct sections of the roadway:

- Highway 417 within the National Capital Commission's Greenbelt;
- the mid-west, a urban mix of residential, commercial and industrial lands;
- the central section with noise attenuation walls and high rise buildings;
- the mid-east, a more diversified urban combination of landscape, commercial, industrial and civic buildings defining the right-of-way;
- Highway 417 within the eastern section of the Greenbelt.

Location Plan

The terrain varies throughout the corridor, with the roadway elevations generally responding to the adjacent land uses. Common to all sections of the 417 are the major green corridors bisecting the ROW They commence in the west with the 417/416 Interchange; the Woodroffe Avenue transit corridor, the Island Park Drive corridor, Nicholas Street on-ramp, Rideau River and Riverside Drive corridor, and the 417/174/Aviation Parkway Interchange. These locations are significant, providing a green verge to the roadway, and a respite from the urban quality of the views. The Greenbelt frames the study, and provides a contrast and definition to the urban development of the City of Ottawa.

Western Greenbelt Lands

The principle element of the western section of the study area is the National Capital Commission's (N.C.C.) Greenbelt lands. As per the Greenbelt Master Plan, 1996, this section of the Greenbelt is viewed as the entry to the Nation's Capital, and should ensure "a highly visible rural landscape that reinforces the sharp and distinct transition between the Capital's inner urban area and the outlying urban communities of Kanata, Orleans".

The current configuration of the Greenbelt respects this principle. On the north side of the ROW, and on the adjacent Greenbelt lands, there is a combination of landforms and woodlots, with a recreational pathway weaving through the woodlot along the border of the Greenbelt. In contrast, to the south of the highway is a flat terrain, with agricultural fields and hedgerows defining the edges of the ROW and fields. The existing vegetation is a blend of naturalized coniferous and deciduous species.

The predominant built form defining this section is the 416/417 Interchange. The requirements of the 416/417 interchange created a considerable landform and a complex array of ramps and lanes. During the construction of this interchange, a quantity of reforestation has been completed, and increasingly, provides a woodlot presence within the ROW, linking the north and south portions Greenbelt through the interchange.

The ROW is relatively wide, and is defined by chain link fencing with plant material occurring on both sides of the fence, reducing the appearance of the fence and with highway lighting located in the median.

Western Urban Lands

The NCC Greenbelt lands terminates at Richmond Road, and the landscape character of the south side of the ROW between 416 and Richmond Road reflects this rural character. To the north, the termination of the Greenbelt effectively occurs Holly Acres Road, with the City of Ottawa Transitway and station and Bayshore, a regional shopping centre providing the edge of the roadway.

East of the Richmond Road interchange, the land use changes. The ROW extends through a mix of residential, commercial and industrial lands. Noise attenuation fencing occurs intermittently throughout this section, defining the locations of residential homes and schools. The interchanges, Richmond Road, Greenbank Road, the Transitway, Woodroffe Avenue, Maitland Avenue and Carling Avenue all have a combination of turf and trees, of varying densities and ages. The most heavily vegetated locations are the northeast quadrant of Richmond Road Interchange and the Transitway crossing. The alignment remains at grade with the adjacent lands until the Clyde Avenue overpass. At this location, the roadway elevation rises, with embankments separating the 417 from the adjacent lands. The 417 elevations remain high traversing east, with underpasses for Carling Avenue, Kirkwood Avenue and Merivale Road. The grade separation is primarily steeply sloped embankments, with retaining walls occurring at the bridge structures. One extensive section of the retaining wall does occur on the south side of the 417, between the Carling Avenue S.E. on-ramp and Merivale Road underpass. In varying locations within this section, overhead hydro lines parallel the ROW, with a minor quantity of overhead wires crossing the ROW

The ROW has sufficient space to accommodate the current configuration of the lanes with some landscape treatment. The corridor through this section continues to be relatively well-vegetated, primarily deciduous trees and shrubs, occurring both within the ROW and on the adjacent private lands. Urban tolerant shrub material becomes a more dominant element in landscape.

Ottawa Centre

East of Carling Avenue from Island Park Drive to Riverside Drive, the corridor is loosely divided into two portions: the western section with the noise attenuation walls, and the eastern, without the attenuation walls. The common element binding this section is the proximity to the downtown core, and connection to the Peace Tower, the icon representing the federal government.

With the existing lane configuration and noise attenuation walls, the ROW at the west end of this section has been built out. There are limited locations where some existing vegetation occurs within the corridor, however, the trees visible from the corridor primarily occur behind the noise attenuation walls, on private property. Adjacent to the downtown core, the noise attenuation walls break as required to accommodate the on and off ramps. These locations are predominantly turf areas with limited trees and shrubs adjacent to the ramps. The noise attenuation walls terminate prior to Nicholas Street Interchange with the perimeter of the interchange containing a significant quantity of vegetation and the central portion primarily turf. Further east, the Rideau River corridor is wide, and heavily vegetated.

The 417 continues rising over the existing local roadways between Island Park Drive and Main Street. Immediately west of Main Street is Colonel By Drive, the ceremonial route from the Ottawa International Airport to the parliamentary precinct. From Nicholas Street easterly, the 417 corresponds to the adjacent topography, with an overpass for the Rideau River.

Eastern Urban Lands

Through this section, the 417 is primarily at grade, with overpasses developed for local roads. Riverside Drive, Belfast Road and Cyrville Road, St. Laurent Boulevard is the exception, with the underpass, however the terrain is gentle and the use of retaining walls is minimized. The unifying element within this portion of the study site is the adjacent urban development, and the minimal use of noise attenuation walls. The ROW for this section of the 417 contains a rhythm of landforms and vegetation interspersed with commercial/industrial lands. A minor length of wall occurs east of the 417/174 Interchange, protecting the residential lands east of the 417.

Eastern Greenbelt Lands

At the east end of the study area is the eastern limit of the N.C.C.'s Greenbelt lands. Anderson Road, the eastern limit of the project is situated in the center of the Greenbelt, and the adjacent lands are a combination of low-lying marshes and agricultural fields. Within the Greenbelt Master Plan, a visitor/information attraction has been identified at Anderson Road. South of the 417, the Greenbelt has been designated as a "core natural area", with a "valued ecosystem component", and to the north, the lands are identified for continued agricultural use. The 417 with varying median widths and grade separations weave through this section of the landscape,

4.1.2.4 Highway Noise

The assessment of existing sound levels for the study area, completed in 2002, is documented in **Appendix L**. The analysis modeled existing sound levels within the study area and identified residential dwellings with outdoor living spaces with sound levels greater than 55 dBA. The results of the review are summarized below.

The Ministry of Environment Noise Prediction Model, STAMSON version 5.03, was used for this study. This model considers parameters such as existing and projected traffic volumes, types of vehicles (i.e. cars and medium and heavy trucks) and other variables specific to the roadway (e.g. topography, speed limit, presence of attenuation walls).

The study area is primarily an urban environment through the west and central sections with a mix of residential, commercial and institutional uses. In the east end, extending from Cyrville Road to Anderson Road, it is mainly rural with intermittent industrial land uses.

The majority of residences with outdoor living spaces immediately adjacent to the highway have been provided with sound attenuation walls. Where there are sound attenuation walls, existing sound levels adjacent to the freeway right-of-way are between 65 and 70 dBA and reach 55 dBA at distances ranging from about 170 m to 240 m from Highway 417. Where there are no sound attenuation walls, existing sound levels adjacent to the freeway right-of-way range from 60 dBA to 80 dBA between Highway 416 and Ottawa Road 174 and are in the order of 55 dBA at a distance of approximately 500 m from the freeway in non urban areas.

Cross roads along Highway 417 are also a source of noise. Residences located within 225 m of the cross roads would likely experience noise levels greater than 55 dBA. Noise levels would be the greatest within 60 m of the cross roads.

The existing sound level contours, in 5 dBA increments, as well as the location of the existing sound attenuation walls are illustrated on Exhibits 1 to 4 in **Appendix L**.

4.1.2.5 Air Quality

In response to public concerns, MTO undertook a detailed air quality assessment study for the Highway 417 corridor. A copy of the *Air Quality Assessment Report, February 2005*, is provided in **Appendix M** of this report. The methodology for the air quality assessment was developed and refined in consultation with MTO and Environment Canada air quality specialists. The objectives of the study were to:

- Establish existing ambient air quality conditions;
- Predict pollutant levels attributable to vehicular emissions from existing and future traffic volumes along Highway 417;
- For existing and future traffic volumes, compare concentrations of pollutants along Highway 417 to the Ontario Ministry of the Environment (MOE) Ambient Air Quality Criteria (AAQCs) and the Canada Wide Standards and National Ambient Air Quality Objectives (NAAQOs). In general, these guidelines represent desirable or acceptable ambient contaminant levels;
- Compare pollutant levels with and without proposed highway improvements to government guidelines; and
- Evaluate the change in regional airshed levels of $PM_{2.5}$ (particulate matter measuring 2.5 microns or less) and ground level ozone due any change in Highway 417 emissions.

Existing ambient air quality conditions were established by examining five years worth of data on background levels of pollutants, measured at Ottawa's two air quality monitoring stations. This review indicated that existing ambient air quality is relatively good with occasional periods with elevated levels of particulate matter (PM) and ground level ozone.

Pollutant levels along Highway 417 were predicted using the most recent version of MOBILE, the emission model from the US Environmental Protection Agency (EPA) and CAL3QHCR, the EPA dispersion model, both approved for assessments of this type. These models consider the characteristics of the highway and the type, volume and speed of vehicle using it, background air quality and meteorological data. By combining input data, the models can predict "worst case" situations for pollutants.

The following were examined as pollutants of interest for this study:

- Carbon Monoxide (CO);
- Oxides of Nitrogen (NO);
- Volatile Organic Compounds (VOC);
- Formaldehyde;
- Acetaldehyde;
- Benzene;
- 1,3-Butadiene;
- Inhalable Particulate Matter (PM_{10});
- Respirable Particulate matter (PM_{25}).

Twenty-six sensitive receptors of interest were identified, representing daycare facilities, schools, housing for seniors and hospitals located within 250 m of the highway. Pollutant levels were modelled at these 26 locations for existing and future traffic, without and with highway improvements. The modelling results for the sensitive receptors predicted pollutant levels are well below guideline levels for all scenarios for CO, NO_2, acetaldehyde and formaldehyde (guidelines have not been established for total VOCs, benzene and 1,3-butadiene). In no cases did the levels of particulate matter exceed the guidelines; however, there were infrequent periods (estimated at 3 days per year) when modelled background levels alone (without the contribution of Highway 417 traffic) were above the benchmark for $PM_{2.5}$ and PM_{10}. With the contribution of Highway 417 traffic the model was predicted that particulate matter might exceed the benchmark on 4 days per year.

A regional air quality assessment was also undertaken to calculate the various contributors to emissions including Highway 417 traffic to pollutant levels in the Ottawa region. The contribution of Highway 417 was estimated from the modelling done earlier in the air quality study. The overall emissions from all sources in the Ottawa census division were obtained from the emission inventory by Environment Canada. This inventory contains estimates for point sources, area sources and mobile sources (on-road and no-road) throughout Canada. It was based on work done in 1995 including predictions for the future. **Table 4.2** below provides the estimates of the contributions from a variety of sources for 2001.

Table 4.2 Comparison of Highway 417 Emissions to Total Emissions in the Ottawa Census Division Existing (2001) Emissions (tonnes/year)

Emission Source Sector	CO	NO_x	PM_{10}	$PM_{2.5}$	VOC
Industrial Sources	1,308	3,465	8,357	616	8,043
Non-Industrial Fuel Combustion and Other	13,905	1,994	5,070	2,700	10,141
Transportation					
Roads*	100,220	16,447	754	660	10,603
(Highway 417 mainline emissions)**	**(15,954)**	**(2,478)**	**(46)**	**(35)**	**(476)**
(Highway 417 as percentage of total roads)	**(16%)**	**(15%)**	**(6%)**	**(5%)**	**(4%)**
Off-Roads	85,109	9,271	668	615	7,030
Railroad	101	525	13	12	25
Aircraft	1,098	215	43	30	217
Marine	2,596	368	77	67	816
Totals	189,124	26,826	1,555	1,384	18,690
Open Roadway Sources - Dust from All Roads (Paved and Unpaved)	0	0	15,651	3,116	0
Total Emissions in the Ottawa Census Division	**204,337**	**32,285**	**30,633**	**7,816**	**36,874**
Contribution of the Highway 417 emissions to the total emissions in the census division :	**8%**	**8%**	**<1%**	**<1%**	**1%**

4.1.3 CULTURAL ENVIRONMENT

4.1.3.1 Archaeology

The *Stage I Archaeological Assessment Report, August 2002*, and the *Stage II Archaeological Assessment Report, October 2004*, can be found in **Appendix N**.

The Stage I archaeological assessment noted that segments of the Ottawa Valley have received intensive archaeological investigation, and several provincially significant sites have been recorded on islands and shorelines of the Ottawa River. Based on the general proximity of significant archaeological sites, the Stage II archaeological assessment examined the existing Highway 417 right-of-way over the project limits. These investigations found no evidence of archaeological resources within the existing right-of-way of Highway 417, which has been significantly disturbed.

4.1.3.2 Built Heritage

Built heritage resources, such as the old municipal building on Main Street, do exist adjacent to the Highway 417 corridor and were identified during the existing land use review. A detailed study was not undertaken at the initial planning stages until a determination of what potential built heritage resources might be affected by the Technically Preferred Alternative (TPA). The TPA required the removal of 20 homes, 19 on the south side of Westmount and 1 on Concord Street S, and the Ottawa Board of Education building on Bronson Street. None of these buildings was deemed to be culturally significant; a detailed study was not undertaken. Should any of these features be deemed to be significant subsequent to the completion of this study, then a further review would be undertaken during detail design.

4.2 DOCUMENTATION OF EXISTING TRANSPORTATION AND ENGINEERING CONDITIONS

4.2.1 TRAFFIC AND SAFETY

Traffic Data

Traffic data for the Highway 417 mainline was collected in 2000, for ramp in 2000 and 2001 and for intersections between 1999 and 2002. Data on truck volumes was collected between 1997 and 2000.

The number of lanes and existing and forecasted traffic volumes for the existing Queensway configuration were extracted from the *Traffic Operations Report, December 2003* and are provided in **Tables 4.3** and **4.4**. A copy of the report can be found in **Appendix D**.

Table 4.3 Existing Highway 417 Mainline Lanes

Section		Eastbound		Westbound	
From	To	Basic Lanes*	Auxiliary Lanes**	Basic Lanes*	Auxiliary Lanes**
Highway 416	Richmond Road	3	1	3	1
Richmond Road	Pinecrest/Greenbank Road	3	1	3	1
Pinecrest/Greenbank Road	Woodroffe Avenue	3	1	3	1
Woodroffe Avenue	Maitland Avenue	3	1	3	1
Maitland Avenue	Kirkwood Avenue	3	0	3	0
Kirkwood Avenue	Island Park Drive	4	0	4	0
Island Park Drive	Parkdale Avenue	4	0	4	0
Parkdale Avenue	Rochester Street	4	0	4	0
Rochester Street	Bronson Avenue	4	0	4	0
Bronson Avenue	Lyon Street	4	0	4	1
Lyon Street	Kent Street	4	0	4	0
Kent Street	O'Connor Street	3	0	4	0
O'Connor Street	Metcalfe Street	3	0	3	0
Metcalfe Street	Nicholas Street	3	1	3	1
Nicholas Street	Vanier Parkway	3	1	3	1
Vanier Parkway	St. Laurent Boulevard	3	1	3	1
St. Laurent Boulevard	Ottawa Road 174	3	0	3	1
Ottawa Road 174	Innes Road	2	1	2	1
Innes Road	Walkley Road	2	0	2	0
Walkley Road	Anderson Road	2	0	2	0

* Basic lanes are continuous through interchanges.
** A continuous auxiliary lane generally connects the last on-ramp at the upstream interchange to the first off-ramp at the downstream interchange.

Table 4.4 Existing and Forecasted Traffic Volumes on Highway 417 for Existing Queensway Configuration

Location		Annual Average Daily Traffic (AADT)		
From:	**To:**	**2001**	**2011**	**2021**
Highway 416	Richmond Road	93,500	110,500	117,500
Richmond Road	Pinecrest Road	112,500	134,500	145,500
Pinecrest Road	Woodroffe Avenue	122,000	139,500	148,500
Woodroffe Avenue	Maitland Avenue	132,000	148,000	156,000
Maitland Avenue	Carling Avenue	131,500	145,000	152,000
Carling Avenue	Island Park Drive	142,000	154,000	161,000
Island Park Drive	Parkdale Avenue	145,500	156,000	163,000
Parkdale Avenue	Rochester Street	150,500	161,000	164,500
Rochester Street	Bronson Avenue	140,000	144,500	149,500
Bronson Avenue	Lyon Street	139,000	145,000	148,500
Lyon Street	Kent Street	118,500	115,500	118,500
Kent Street	O'Connor Street	117,000	120,000	123,500
O'Connor Street	Metcalfe Street	107,000	112,000	113,000
Metcalfe Street	Nicholas Street	140,000	151,500	157,000
Nicholas Street	Vanier Parkway	150,000	158,000	162,500
Vanier Parkway	St. Laurent Boulevard	123,000	138,500	145,000
St. Laurent Boulevard	Ottawa Road 174	114,000	134,500	146,000
Ottawa Road 174	Innes Road	66,500	85,000	93,000
Innes Road	Walkley Road	52,500	64,000	70,000
Walkley Road	Hunt Club Road Extension	32,000	51,500	62,000
Hunt Club Road Extension	Russell Road	32,000	51,500	52,500

Analysis of count data indicated that, on average, truck traffic comprises approximately 5% of Highway 417 peak period mainline traffic volume between Highway 416 and Ottawa Road 174 and approximately 7% from Ottawa Road 174 easterly. Details regarding ramp and intersection traffic volumes are provided in the Traffic Operations Report in **Appendix D**.

Pedestrian and cyclist volumes drawn from the ramp terminal intersection turning movement counts are summarized in **Table 4.5**. Designated bicycle routes, as indicated on the 2003 Ottawa Cycling Map, are indicated in the table.

Table 4.5 Summary of Existing Pedestrian and Cyclist Volumes

Crossing Roadway	Designated Bicycle Route	Approximate Volumes Through Interchange*			
		a.m. Peak Hour		p.m. Peak Hour	
		Pedestrians	Cyclists	Pedestrians	Cyclists
Holly Acres Road	✓	1	10	1	11
Richmond Road	✓	0	0	1	1
Pinecrest Road/Greenbank Road	✓	47	11	33	14
Woodroffe Avenue		8	10	13	17
Maitland Avenue		16	34	6	10
Carling Avenue		36	6	48	14
Parkdale Avenue		30	19	35	34
Rochester Street		36	25	18	28

Table 4.5 Summary of Existing Pedestrian and Cyclist Volumes

Crossing Roadway	Designated Bicycle Route	Approximate Volumes Through Interchange*			
		a.m. Peak Hour		p.m. Peak Hour	
		Pedestrians	Cyclists	Pedestrians	Cyclists
Bronson Avenue		91	17	115	18
Lyon Street		8	3	6	11
Kent Street		18	7	15	8
O'Connor Street	✓	51	11	28	21
Metcalfe Street		25	10	55	15
Lees Avenue (Hwy 417 EB)	✓	42	68	38	86
Lees Avenue (Hwy 417 WB)		8	8	14	10
Vanier Parkway		2	6	7	9
St. Laurent Boulevard		13	10	29	17
Innes Road	✓	1	16	3	12
Walkley Road	✓	0	1	6	1

* Total of NB/SB or EB/WB pedestrian and cyclist counts across Hwy 417 ramp(s), as applicable; higher volume used where two ramp terminal intersections counted

The data shows significant pedestrian and cyclist activity through the ramp terminal intersections at most of the interchanges in the Study Area. In general, the volumes are higher through the central section of the Study Area and lower at the east and west ends.

Existing Congestion

Travel mobility and congestion are two of the most common criteria used to determine the ease of travel between trip origins and destinations within an area road network. There is an inversely proportional relationship between mobility and congestion. As congestion increases, the free movement of people and goods through the road network is impaired.

Mobility and congestion are issues in some sections of Highway 417 during the existing a.m. and p.m. peak travel periods as there is insufficient capacity to accommodate travel demands. Mobility and congestion will become even greater issues in sections along Highway 417 during future a.m. and p.m. peak travel periods as there is insufficient capacity to accommodate projected travel demands, despite allowing for the achievement of the City of Ottawa's transit mode share of 30%. With no improvements to Highway 417 through the Study Area, traffic volume growth on Highway 417 will be capacity constrained, resulting in lengthening of peak periods, increases in travel delays, and diversion of trips from the Queensway to the local road network.

In order to establish a baseline for comparison, the Project Team used the INTEGRATION model to depict locations of recurring congestion during both the morning and afternoon peak travel period on the Queensway using the most recent 2001 traffic data. The Queensway was modelled in its present condition with no changes in the number of lanes or modifications to interchanges assumed. **Figures 4-1** and **4-2** illustrate those results for the 2001 No-build (existing conditions) scenario.

Safety

The Highway 417 collision history analysis reviewed a total of 3,291 collision records, representing four years of data from 1998-2001 inclusive. This is the total number of reported collisions:

- on the mainline within an interchange (between the on and off ramps);
- on the mainline between interchanges; and

- in the merge and diverge areas of ramps (where the ramps enter and leave the main driving lanes).

Collision rates ranged from 0.2 to 1.6 collisions per million vehicle-kilometres (mvkm) of travel, which is comparable to the MTO freeway mean collision rate of 0.6/mvkm of travel. A detailed review of the 106 locations identified as having higher than expected collision probability was undertaken and possible contributing factors and counter measures were identified. These are documented in the *Traffic Operations Report* in **Appendix D** and were incorporated into the Corridor Analysis Plans.

The evaluation of operational performance using the "Positive Guidance" technique examined a wide range of characteristics of the roadway, traffic and surrounding environment such as alignment, lane and shoulder widths, pavement, signs and markings, illumination, roadside safety, intersection traffic controls and traffic volumes and composition. The results of the review were described in **Section 3.1.3** as part of the identification of problems.

Safety concerns were then used to develop alternative designs during the EA process, as discussed in **Section 5**.

A more detailed description of traffic, safety performance, and transportation modelling undertaken for this study can be found in **Section 3.1** of this TESR.

4.2.2 HIGHWAY GEOMETRICS

The *Existing Conditions Report - Highway Geometrics, 2003*, is provided in **Appendix E**.

Highway 417 was originally planned with a design speed of 112 km/h (70 mph) while a design speed of 120 km/h would be applied if it were constructed today. A design speed of 120 km/h has been used to identify mainline geometric deficiencies in this review. The design speed for interchange ramps varies from 40 km/h to 100 km/h. Direct freeway to freeway ramps have the highest design speeds, while loop ramps in urban areas have the lowest design speeds.

The key existing geometric deficiencies of the Queensway within the study limits are summarized as follows:

- Seven horizontal curves on Highway 417 have radii that are below current standards for a design speed of 120 km/h;
- Seventeen (17) horizontal curves on Highway 417 are either not provided with transition spirals from the tangent portion of the highway to the curved portion of the highway or are provided with spirals that do not meet current standards for 120 km/h;
- One horizontal deflection on Highway 417 exceeds the 0.5° maximum deflection without a horizontal curve;
- Nine horizontal curves on Highway 417 and thirteen curves on various interchange ramps do not provide minimum stopping sight distance for their design speed (the obstruction to sight is typically the median or roadside barrier but in some cases, the obstruction is existing vegetation or noise barrier);
- There are twenty-three (23) freeway ramps where the horizontal curvature is not within the current acceptable range and thirty-one that are within the acceptable range but are not standard;
- There are sixteen (16) crest vertical curves on Highway 417 and ten sag vertical curves that do not meet the requirements for a design speed of 120 km/h;
- Fifteen (15) vertical curves on Highway 417 are shorter than 120 m in length, which is the desired minimum length for a design speed of 120 km/h;
- Twenty-eight (28) freeway deceleration / acceleration lanes are shorter than current design standards;
- At twenty (20) crossing road locations the tapers for leaving or entering the crossing road from a ramp are shorter than current design standards;
- There are twenty-three (23) crossing road intersections at ramp terminals where the existing grade on the crossing road or ramp is greater than desirable;
- Eight crossing road exit terminals are of the incorrect type (e.g. Direct Spiral instead of Direct Taper);
- There are eleven (11) locations where distance between ramps is less than current design standards;
- At five locations, the available weaving length (distance between adjacent on and off-ramps available for traffic to change lanes to get on or off the highway) is less than current design standards;
- Twenty-seven (27) kilometres of freeway have lane widths slightly narrower than current design standards; and
- There are numerous locations where the shoulders are narrower than current standards.

4.2.3 ELECTRICAL

A detailed assessment of the existing electrical systems was undertaken for Highway 417 and the findings are documented in the *Electrical Systems Report – Existing Conditions, 2004* found in **Appendix O**.

The illumination systems along the mainline and interchange ramps are owned and maintained by MTO. The City of Ottawa is responsible for the maintenance of the traffic signals at the intersections of the interchanges within the study limits. **Table 4.6** summarizes the existing conditions of both the Ministry and Municipal electrical systems within the study corridor.

4.2.4 HIGHWAY DRAINAGE/STORMWATER MANAGEMENT

The existing drainage conditions of the highway are documented in the *Drainage Report, Existing Conditions, 2003* and the *Drainage Structures Inventory, 2003* provided in **Appendix I**.

The west portion of the study area, extending from the western study limits to approximately Woodroffe Avenue, consists primarily of open ditch drainage. Through the central section of the study area, from approximately Woodroffe Avenue to St. Laurent Boulevard, Highway 417 drains to existing City of Ottawa storm or combined sewer systems. The storm sewer systems contribute to storm water flows collected by the City sewer systems or discharge to the Rideau River, Rideau Canal or the Ottawa River. The east portion of the study area, extending from St. Laurent Boulevard to the eastern study limit, consists primarily of open ditch drainage.

The study area contains 54 existing drainage structures (49 cross culverts and 5 bridge structures), excluding the central area, which is served by the City's storm sewer system. The only existing stormwater management facility within the study area is a small detention pond in the NE quadrant of the Pinecrest interchange.

Ten of the 49 cross culverts are concrete and the remaining 39 culverts are corrugated steel pipes (CSPs). The concrete culverts are generally in good condition while the majority of the CSP culverts were found to be in fair to poor condition and are nearing the end of their expected service life.

Three locations were identified where components of the existing drainage system do not meet current design requirements:

- The culvert carrying Pinecrest Creek under Highway 417 (Station 20+020 EB/WB) is a rigid twin concrete box culvert measuring 2.4 m high by 5.0 m wide. Although it was concluded that this structure would be submerged under design flow conditions, it does conform with the requirement for minimum freeboard of 1.0 m during a 100 year storm event.
- The culvert carrying the main channel of Green's Creek under Highway 417 (Station 14+580 WB / Station 14+432 EB) consists of a 1.83 m high by 4.88 m wide open footing concrete culvert. This structure does not provide the minimum 1.0 m of soffit clearance required by the *Canadian Highway Bridge Design Code* during the design flood.
- The structure located on Highway 417 just south of McEwan Creek (Station 19+183 EB) is a 600 mm diameter CSP culvert, which does not conform to the MTO standard for a minimum diameter of 800 mm for cross culverts.

No significant flooding problems were identified within the study area.

Integration & Operations Analysis Results
2001 a.m. Peak Period
Highway 417, (Ottawa Queensway)
Preliminary Design Study and Environmental
Assessment from Highway 416 easterly
to Anderson Road
MTO G.W.P 663-93-00

LEGEND

- Existing Interchange (Full Movements)
- Existing Interchange (Full Movements)
- Proposed Interchange

Integration
- Major Congestion*
- Congestion*

Operations Analysis
- LOS F
- LOS E

* Major Congestion = LOS F for > 1.5 hours
Minor Congestion = LOS F for ≤ 1.5 hours

AM EXISTING CONDITIONS

FIGURE 4.1

N.T.S.

Integration & Operations Analysis Results
2001 p.m. Peak Period
Highway 417, (Ottawa Queensway)
Preliminary Design Study and Environmental
Assessment from Highway 416 easterly
to Anderson Road
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LEGEND

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- Existing Interchange (Full Movements)
- Proposed Interchange

Integration
- Major Congestion*
- Congestion*

Operations Analysis
- LOS F
- LOS E

* Major Congestion = LOS F for > 1.5 hours
Minor Congestion = LOS F for ≤ 1.5 hours

N.T.S.

PM EXISTING CONDITIONS

FIGURE 4.2

- in the merge and diverge areas of ramps (where the ramps enter and leave the main driving lanes).

Collision rates ranged from 0.2 to 1.6 collisions per million vehicle-kilometres (mvkm) of travel, which is comparable to the MTO freeway mean collision rate of 0.6/mvkm of travel. A detailed review of the 106 locations identified as having higher than expected collision probability was undertaken and possible contributing factors and counter measures were identified. These are documented in the *Traffic Operations Report* in **Appendix D** and were incorporated into the Corridor Analysis Plans.

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- Seventeen (17) horizontal curves on Highway 417 are either not provided with transition spirals from the tangent portion of the highway to the curved portion of the highway or are provided with spirals that do not meet current standards for 120 km/h;
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4.2.3 ELECTRICAL

A detailed assessment of the existing electrical systems was undertaken for Highway 417 and the findings are documented in the *Electrical Systems Report – Existing Conditions, 2004* found in **Appendix O**.

The illumination systems along the mainline and interchange ramps are owned and maintained by MTO. The City of Ottawa is responsible for the maintenance of the traffic signals at the intersections of the interchanges within the study limits. **Table 4.6** summarizes the existing conditions of both the Ministry and Municipal electrical systems within the study corridor.

4.2.4 HIGHWAY DRAINAGE/STORMWATER MANAGEMENT

The existing drainage conditions of the highway are documented in the *Drainage Report, Existing Conditions, 2003* and the *Drainage Structures Inventory, 2003* provided in **Appendix I**.

The west portion of the study area, extending from the western study limits to approximately Woodroffe Avenue, consists primarily of open ditch drainage. Through the central section of the study area, from approximately Woodroffe Avenue to St. Laurent Boulevard, Highway 417 drains to existing City of Ottawa storm or combined sewer systems. The storm sewer systems contribute to storm water flows collected by the City sewer systems or discharge to the Rideau River, Rideau Canal or the Ottawa River. The east portion of the study area, extending from St. Laurent Boulevard to the eastern study limit, consists primarily of open ditch drainage.

The study area contains 54 existing drainage structures (49 cross culverts and 5 bridge structures), excluding the central area, which is served by the City's storm sewer system. The only existing stormwater management facility within the study area is a small detention pond in the NE quadrant of the Pinecrest interchange.

Ten of the 49 cross culverts are concrete and the remaining 39 culverts are corrugated steel pipes (CSPs). The concrete culverts are generally in good condition while the majority of the CSP culverts were found to be in fair to poor condition and are nearing the end of their expected service life.

Three locations were identified where components of the existing drainage system do not meet current design requirements:

- The culvert carrying Pinecrest Creek under Highway 417 (Station 20+020 EB/WB) is a rigid twin concrete box culvert measuring 2.4 m high by 5.0 m wide. Although it was concluded that this structure would be submerged under design flow conditions, it does conform with the requirement for minimum freeboard of 1.0 m during a 100 year storm event.
- The culvert carrying the main channel of Green's Creek under Highway 417 (Station 14+580 WB / Station 14+432 EB) consists of a 1.83 m high by 4.88 m wide open footing concrete culvert. This structure does not provide the minimum 1.0 m of soffit clearance required by the *Canadian Highway Bridge Design Code* during the design flood.
- The structure located on Highway 417 just south of McEwan Creek (Station 19+183 EB) is a 600 mm diameter CSP culvert, which does not conform to the MTO standard for a minimum diameter of 800 mm for cross culverts.

No significant flooding problems were identified within the study area.

An analysis of the existing storm sewer system was beyond the scope of this project but will be undertaken during detail design.

4.2.5 STRUCTURES (BRIDGES AND CULVERTS)

There are 66 structures located within the study limits as well as numerous locations, particularly in the downtown area, where retaining walls exist in order to minimize the overall footprint of the Queensway. MTO supplied information on the existing condition of these facilities, and noted that all of the bridges and many of the retaining walls will require some form of rehabilitation or replacement within the 20 year planning horizon of this study (2021).

Table 4.7 lists the major bridges and culverts within the study limits. Site numbers refer to the MTO inventory system for structures. No site numbers are available for bridges carrying Highway 417 over transitways built by the City of Ottawa. An overpass is a bridge carrying Highway 417 over another road and an underpass is a bridge carrying Highway 417 under another road.

4.2.6 NOISE WALLS

There are existing noise walls along Highway 417 from Richmond Road to the Rideau River shielding existing residential neighbourhoods. All of the existing noise walls will require rehabilitation and/or replacement during the planning horizon to address their condition and/or to meet current standards. **Table 4.8** lists the locations where existing noise barriers are found. These are also illustrated on the plates in **Appendix A**.

Table 4.6 Summary of the Existing Electrical Systems

Location	Existing System	Age	Condition
Ministry Systems:			
Moodie Drive Interchange to east of Richmond Road Interchange	• Highmast illumination extending east of Moodie Drive Overpass to east of Richmond Road Interchange • Three distribution assemblies • FTMS controller concrete pads, FTMS detector loops, associated ducts and electrical chambers	• Installed in 1991; two poles relocated in 2000 • Retrofitting of raising and lowering equipment for the luminaire carousels in 2002	• Operational; good condition • Meets current Ministry standards with a few exceptions
East of Richmond Road Interchange to west of Woodroffe Avenue Interchange, 3 km	• Conventional illumination includes all ramps at the Greenbank / Pinecrest Road Interchange and the NS-W Ramp and the W-NS Ramp of the Woodroffe Avenue Interchange • One distribution assembly • FTMS controller concrete pads, FTMS detector loops, associated ducts and electrical chambers	• Installed in 1990/1991	• Operational; good condition • Meets current Ministry standards with a few exceptions
Woodroffe Avenue Interchange to west of Maitland Avenue Interchange, 1.3 km	• Conventional illumination • One distribution assembly • FTMS controller concrete pads, FTMS detector loops, associated ducts and electrical chambers	• Installed in 1989 • Installed CCTV camera and controller SE Woodroffe Avenue in 1997	• Operational; good condition • Meets current Ministry standards with a few exceptions
West of Maitland Avenue Interchange to east of Island Park Drive Interchange, 4.6 km	• Conventional illumination including all interchange ramps • Substation kiosks • FTMS detector loops, associated ducts and electrical chambers	• Installed in 1983 • Installed CCTV cameras at Maitland Avenue and Carling Avenue in 1997	• Operational; good condition • Meets current Ministry standards with a few exceptions
East of Island Park Drive Interchange to west of Bronson Avenue Interchange, 2.6 km	• Conventional illumination including ENS-W and W-NS Ramps at Bronson • Substation kiosks • FTMS detector loops, associated ducts and electrical chambers	• Installed in 1984	• Operational; good condition • Meets current Ministry standards with a few exceptions
West of Bronson Avenue Interchange to west of Nicholas Street Interchange, 2.7 km	• Conventional illumination • One distribution assembly • FTMS controller concrete pads, FTMS detector loops, associated ducts and electrical chambers	• Installed in 1986 • Westbound Portable Variable Message Sign (PVMS) installed west of Nicholas Street at the end of the N-W Ramp	• Operational; good condition • Meets current Ministry standards with a few exceptions
West of Nicholas Street Interchange to east of Riverside Drive Interchange	• Conventional illumination • Highmast illumination from west of Riverside Drive, including interchange ramps, to west of Belfast Road • One substation kiosk • FTMS controller concrete pads, FTMS detector loops, associated ducts and electrical chambers	• Installed in 1987	• Operational; good condition • Meets current Ministry standards with a few exceptions
East of Riverside Drive Interchange to west of Cyrville Road	• Conventional illumination from west of Belfast Road to west of Cyrville Road Overpass including the St. Laurent Boulevard interchange • Substation kiosk associated ducts and electrical chambers • CCTV camera is located west of Belfast Road	• Installed in 1986	• Operational; good condition • Meets current Ministry standards with a few exceptions
West of Cyrville Road to East of Innes Road Interchange	• Highmast illumination • Two power distribution kiosks, associated ducts and electrical chambers	• Installed in 1974 • Retrofitting of raising and lowering equipment for the luminaire carousels in 2002	• Operational; good condition • Meets current Ministry standards with a few exceptions
Innes Road Interchange	• Highmast illumination from west of Innes Road Overpass to east of CNR overpass • Power distribution kiosk, associated ducts and electrical chambers	• Installed in 1974 • Installed distribution enclosure in 1993 • Installed equipment for raising and lowering of luminaire carousels in 2002	• Operational; good condition • Meets current Ministry standards with a few exceptions
Walkley Road Interchange	• Conventional decision point illumination located at 417W-EW and 417 E-EW exit ramps at Walkley Road • Electrical embedded work for the CNR and Ramsey Creek Structures include lighting conduits in barrier wall, anchorage assemblies, concrete pads for lighting poles and PVC junction boxes • Supply kiosk	• Installed in 1992/1993	• Operational; good condition • Meets current Ministry standards with a few exceptions
Municipal Systems:			
Traffic Control Signals	• 28 signalized intersections; Owned by MTO, operated/maintained by the City of Ottawa • NEMA type controllers, aluminum poles, concrete-encased ducts	• 3 to 30 years old	• Fair to good condition • Managed by the City of Ottawa
Illumination – Crossing Roadways	• 12 illuminated crossing roadways within interchanges • Systems are owned and maintained by the City of Ottawa	• 10 to 30 years old	• Operational; fair to good condition • Meets City standards
Illumination – Underpass	• 30 underpass illumination systems • Maintained by the City of Ottawa	• 10 to 30 years old • Connected to City of Ottawa supply cabinets in 2003	• Operational; fair to good condition

Table 4.7 List of Structures within Study Limits

Site No	Structure Name(From West to East)	Year Built	Overpass / Underpass	Type of Structure
3-531	Highway 416S - Highway 417W / Highway 417 EB	1989	Underpass	Post-Tensioned
3-539	Highway 417E - Highway 416S Ramp / Highway 417W – Holly Acres Road	1993	Overpass	CIP Post-Tensioned
3-538	Highway 416S - Highway 417E Ramp / Highway 417W – Holly Acres Road	1993	Overpass	CIP- Post-Tensioned
3-532	Highway 417E - Highway 416S Ramp / Highway 417 EB	1989	Underpass	Post-Tensioned
3-534	Highway 416S - Highway 417E Ramp / Holly Acres Road	1989	Overpass	CIP- Post-Tensioned
3-535	Highway 417E - Highway 416S Ramp / Holly Acres Road	1989	Overpass	CIP- Post-Tensioned
3-533	Highway 417E / Holly Acres Road	1989	Overpass	CIP- Post-Tensioned
	Highway 417W / Holly Acres Road (Graham Creek Culvert)		Overpass	
3-039	Highway 417 / Richmond Road	1968	Underpass	Plate Girder
3-040	Highway 417 / Pinecrest Road/Greenbank Road	1960	Underpass	Plate Girder
	Southwest Transitway	1984	Overpass	Voided Slab – Reinforced concrete deck
3-041	Highway 417 / Woodroffe Avenue	1960	Underpass	Plate Girder
3-042	Highway 417 / Maitland Avenue	1960	Underpass	Plate Girder
3-043	Highway 417 / Clyde Avenue	1959	Overpass	Steel Girder
3-044	Highway 417 / Carling Avenue EB	1959	Overpass	Steel Girder
3-045	Highway 417 / Kirkwood Avenue	1959	Overpass	Steel Girder
3-046	Highway 417 / Carling Avenue WB	1959	Overpass	Steel Girder
3-047	Highway 417 / Merivale Road	1960	Overpass	Concrete Rigid Frame
3-048	Highway 417 / Island Park Drive	1961	Overpass	Steel Girder
3-050	Highway 417 / Holland Avenue	1961	Overpass	Concrete Rigid Frame
3-051	Highway 417 / Parkdale Avenue	1961	Overpass	Concrete Rigid Frame
3-052	Highway 417 / Fairmont Avenue	1961	Overpass	Concrete Rigid Frame
3-053	Highway 417 / Bayswater Avenue	1961	Overpass	Concrete Rigid Frame
3-054	Highway 417 / C.P.R.	1962	Overpass	Voided Slab - Rigid Frame
3-055	Highway 417 / Preston Street	1962	Overpass	Concrete Rigid Frame
3-056	Highway 417 / Rochester Street	1962	Overpass	Concrete Rigid Frame
3-057	Highway 417 / Booth Street	1962	Overpass	Concrete Rigid Frame
3-060	Highway 417 / Bronson Avenue	1965	Overpass	Concrete Rigid Frame
3-061	Highway 417 / Percy Street	1962	Overpass	Concrete Rigid Frame
3-062	Highway 417 / Kent Street	1965	Overpass	Concrete Box Girder
3-063	Highway 417 / Bank Street	1962	Overpass	Concrete Rigid Frame
3-064	Highway 417 / O'Connor Street	1965	Overpass	Concrete Rigid Frame
3-065	Highway 417 / Metcalfe Street	1965	Overpass	Concrete Rigid Frame

Table 4.7 List of Structures within Study Limits

Site No	Structure Name(From West to East)	Year Built	Overpass / Underpass	Type of Structure
3-066	Highway 417 / Elgin Street	1965	Overpass	Concrete Rigid Frame
3-067	Highway 417 / Rideau Canal Bridge	1963	Overpass	Prestressed Girder
3-068	Highway 417 / Main Street	1963	Overpass	Concrete Rigid Frame
3-224	Highway 417 / Nicholas Street	1966	Underpass	Plate Girder
	Southeast Transitway	1983	Overpass	Concrete Rigid Frame
3-225	Highway 417 / Lee's Avenue	1966	Underpass	Plate Girder
3-073	Highway 417 / Rideau River (Hurdman Bridge)	1955	Overpass	Concrete Girder
3-069	Highway 417 / Vanier Parkway-Riverside Drive	1959	Underpass	Steel Girder
3-071	Highway 417 / Belfast Road	1959	Underpass	Concrete Girder
3-389	East Transitway (Queensway structure)	1986	Overpass	Rigid Frame
3-072	Highway 417 / St. Laurent Boulevard	1986	Overpass	Concrete Box Girder
3-129	Highway 417 / Cyrville Road Bridge	1958	Underpass	T Beam
3-303	Aviation Parkway Bridge (EB Overpass of Highway 417)	1974	Underpass	Post-Tensioned
3-304	WB Overpass to the Aviation Parkway and to Hwy 417 WB	1974	Overpass	Post-Tensioned
3-304	WB Overpass of Hwy 417 to Aviation Parkway	1974	Underpass	Post-Tensioned
3-314	Highway 417 / Cyrville Road	1974	Underpass	Post-Tensioned
3-305	Highway 417 / Innes Road	1973	Underpass	Post-Tensioned
3-311	Green's Creek Under Highway 417 WBL	1973	Overpass	Prestressed Girder
3-311	Green's Creek Under Highway 417 EBL	1973	Overpass	Prestressed Girder
3-310	Green's Creek Under NB Ramp to Innes Road	1973	Overpass	Prestressed Girder
3-302	C.P.R. / C.N.R. under Highway 417 EB Lanes	1975	Overpass	Prestressed Girder
3-302	C.P.R. / C.N.R. under Highway 417 WB Lanes	1975	Overpass	Prestressed Girder
3-306	Highway 417 / Walkley Road	1975	Underpass	Concrete Box Girder
3-312	Green's Creek Under Walkley Road	1973	Overpass	Steel Plate Culvert
3-313	Green's Creek Under Highway 417 EB (0.4 miles east of Walkley Road)	1973	Overpass	Twin C.S.P.
3-313	Green's Creek Under Highway 417 WB (0.5 miles east of Walkley Road)	1973	Overpass	Twin C.S.P.
3-301	C.N.R. under Highway 417 EBL (2.2 miles east of Innes Road)	1975	Overpass	Prestressed Girder
3-301	C.N.R. under Highway 417 WBL (2.2 miles east of Innes Road)	1975	Overpass	Prestressed Girder
3-315	McEwen Creek, 1.2 miles east of Walkley Road	1971	Overpass	Concrete Box Culvert
3-265	Russell Road/ Highway 417 WB	1973	Overpass	Prestressed Girder
3-265	Russell Road/ Highway 417 EB	1970	Overpass	Prestressed Girder

Table 4.8 List of Existing Noise Walls

Location		Barrier Height (m)	
From:	**To:**	**North Side**	**South Side**
Highway 416	Richmond Road	none	none
Richmond Road	Pinecrest Road	5	5 / none
Pinecrest Road	Woodroffe Avenue	none / 5	none / 5
Woodroffe Avenue	Maitland Avenue	4	4
Maitland Avenue	Carling Avenue	4 / none	none
Carling Avenue	Island Park Drive	none	none
Island Park Drive	Parkdale Avenue	4	4
Parkdale Avenue	Preston Street	5	5
Preston Street	Bronson Avenue	none / 4	none / 4
Bronson Avenue	Lyon Street	none	none / 4
Lyon Street	Kent Street	none	none
Kent Street	Metcalfe Street	none	none
Metcalfe Street	Nicholas Street	none / 4	none / 4
Nicholas Street	Rideau River	4	none
Rideau River	St. Laurent Boulevard	none	none
St. Laurent Boulevard	OR 174	none	none
OR 174	Anderson Road	none	none

Notes: Existing noise wall locations are illustrated on the plates in **Appendix A**.
Noise walls are generally located where residential areas are present adjacent to Highway 417 and may not extend between interchanges as indicated.

4.3 SUMMARY OF EXISTING CONDITIONS

A summary of significant environmentally and engineering features and/or concerns found within the study area is provided below.

4.3.1 Natural Environment

On the basis of the field inventories and the secondary source investigations conducted as part of this study, the natural environmental features within the study area are as follows:

- The presence of one Regionally Rare and four Regionally Uncommon vascular species and a pair of Merlins in Hampton Park;
- 11 watercourses identified as fish habitat (all warm water baitfish habitat); and
- Several areas of vegetation (e.g. woodlot within 417/416 interchange, small forest associated with Pinecrest Creek) and scattered pockets of landscaping throughout the study area primarily situated outside of the existing right-of-way.

Mitigating impacts on these features was important consideration during the generation, assessment and evaluation of relevant alternative designs.

4.3.2 Social-Economic Environment

The urban setting of the study area means that there are many land uses along the freeway corridor that are significant to the social environment. These include residential, institutional (churches, schools), commercial (office buildings, shopping centres, car dealerships, business parks, hotels, etc.), recreational (open space, park land, baseball diamonds) and industrial (Ottawa Works yard, car repair).

Impacts to the access to these land uses during and after construction for vehicles, transit, pedestrians and cyclists will be an important consideration during the environmental assessment process.

4.3.3 Cultural Environment

While the Stage II archaeological assessment revealed that the existing right-of-way and adjacent area are significantly disturbed with no evidence of archaeological resources found, there is potential for the presence of archaeological resources to be found at any undisturbed location beyond the existing right-of-way.

Built heritage resources, such as the old municipal building on Main Street, do exist adjacent to the Highway 417 corridor and were identified during the existing land use review.

4.3.4 Transportation and Engineering

The following transportation and engineering concerns were noted for the study area:

- Insufficient capacity to accommodate existing and projected travel demands for the study corridor;
- Locations of higher than expected collision frequency typically associated with locations of recurring congestion;
- The standards used for the original construction and subsequent modifications to Highway 417 through the study area have resulted in a number of features that are considered sub-standard by today's standards, including mainline horizontal and vertical alignment elements, ramp geometry and lane/shoulder widths; and
- The majority of the existing highway infrastructure is in need of significant rehabilitation and/or replacement over the planning horizon of this study in order to maintain its functionality, including bridges and other structures, culverts, noise barriers and pavement.

These environmental issues and transportation and infrastructure concerns were integral to the generation, assessment and evaluation of alternative designs.

5 ALTERNATIVE DESIGNS

This section presents the generation, assessment and evaluation of the design alternatives for the Highway 417 corridor within the study limits. These represent alternative methods of carrying out the strategic widening and interchange improvements. The inventory and assessment of existing conditions presented in **Section 4** provided the information required for the identification of environmental and engineering issues that would need to be considered in the process of developing the proposed alternatives.

5.1 INTRODUCTION

Alternative methods (or designs) were developed for the Highway 417 mainline widening from Highway 416 to Carling Avenue and from Metcalfe Street to east of Walkley Road and for the majority of the interchange locations throughout the study area.

Alternative designs, which would address or partially address the problems identified in **Section 3** of this TESR, were investigated for each location along the Highway 417 corridor. In some locations there were no viable solutions to address the identified problem(s) without creating new problems or worsening existing problems. The alternative design phase was an iterative process and the list of alternatives was refined throughout this phase of the study with consideration for input received from the public and agencies during the consultation process and with consideration for ongoing technical and environmental analysis.

The process started with the Project Team developing and investigating a number of alternatives. Some alternatives were screened out early in the process, as they had obvious impacts that were out of proportion with their ability to solve problems. At the first PIC's a long list of alternatives was presented to the public annotated with comments explaining the rationale for why some alternatives were being screened out and not carried forward. As a result of this consultation possible new alternatives were identified and suggestions regarding alternatives that should be eliminated were received. Further review and analysis was undertaken. Reasonable alternatives were carried forward for detailed evaluation. During the detailed evaluation, other alternatives were identified and others were screened out in response to input from the Evaluation Team, which consisted of staff from the City, NCC, MTO and the consultant team. In all cases, the "Do Nothing" alternative was carried forward for comparison purposes.

Similarly, the evaluation factors and sub-factors were refined as needed during the process.

As a result of the iterative nature of the process through consultation and analysis, documentation changed over the course of the study. This TESR was written with the benefit of the information available at the conclusion of the study. Earlier documentation found on the project web site and in the TESR appendices may vary slightly from the information provided in this TESR. For example, at the outset of the study, a future interchange at Hunt Club Road was included within this Queensway study. However, as the study progressed, a decision was made to remove that interchange from this study and was the subject of a separate study undertaken by the City of Ottawa. However, early study documentation for this Queensway EA Study refers to the Hunt Club interchange and no attempt to delete this material from this study was undertaken.

5.2 GENERATION OF ALTERNATIVE DESIGNS

The selection of strategic widening as the preferred Alternative to the Undertaking, resulted in the following design alternatives for mainline widening:

- Do Nothing; and
- Strategic Widening (including application of positive guidance measures and ATMS).

Strategic widening, as noted in **Section 3.3.5**, involved mainline widening and interchange improvements from Highway 416 to Carling Avenue to provide eight basic lanes, from Metcalfe Street to Ottawa Road 174 to provide eight basic lanes and from Ottawa Road 174 to east of Walkley Road to provide six basic lanes. The strategic widening alternative also assumed the implementation of transportation demand management and ATMS measures and improvement of transit throughout the Queensway corridor to complement the widening and interchange improvements.

Alternative designs were examined for independent segments of Highway 417 from west to east through the study area as follows:

- Widen to 4 basic lanes per direction from Highway 416 to Carling Avenue;
- Retain existing 4 basic lanes per direction from Carling Avenue to Kent Street;
- Retain existing 3 or 4 basic lanes per direction from Kent Street to Metcalfe Street;
- Widen to 4 basic lanes per direction from Metcalfe Street to Ottawa Road 174; and
- Widen Highway 417 to 3 basic lanes per direction from Ottawa Road 174 to east of Walkley Road.

Alternative designs for interchanges along the length of the corridor were then developed with consideration for the problems and opportunities and the environmental features.

Table 5.1 presents the long list of alternatives that were developed for each interchange location. The initial version of this list and conceptual plans of a number of the alternatives were presented to the public at the first round of public consultation for review and comment. Table 5.1 provides the complete list of alternatives as it developed over time during the study. Plans are referenced where available and they may be found along with the corresponding Assessment and Evaluation Tables in **Appendix P** of this TESR. Note that not all of the alternatives have separate plans. Where the plan reference is blank, plans do not exist because they were not required to describe the alternative.

Table 5.1 Long List of Alternatives

Interchange	Description of Alternative	Reference No. (see Plans in Appendix P)
Highway 416	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on ramps from NB 416 to EB Queensway and from WB Queensway to SB 416	
	Reconfigure/reconstruct Interchange to flatten radii to improve stopping sight distance	
Holly Acres Road	Base Case: Retain existing eastbound off-ramp to Holly Acres	HA-1
	Physically separate (raised median) 416-Holly Acres and 417-Holly Acres Ramps and provide separate signals	HA-2
	Physically separate ramp by realigning/relocating ramp NB 416 to Holly Acres Road to connect directly to Richmond Rd.	
Richmond Rd – North	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on off-ramp	R-N-1
	Realign off-ramp to improve curvature and operations while maintaining current intersection at Richmond Road	R-N-2
Richmond Rd – South	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on loop ramp	R-S-1
	Close Richmond Road on ramps and provide new on ramp from Holly Acres Rd	R-S-2
	Increase ramp radii and/or speed change lane length for N-E ramp	
Greenbank Rd / Pinecrest Rd Reconstruction	Base Case: Improve visibility of traffic signals at Pinecrest/Greenbank off-ramp intersections	
	Reconstruct Pinecrest/Greenbank Ave to improve stopping sight distance over vertical crest curve	
Greenbank Rd / Pinecrest Rd - Widening	Do Nothing – retain existing 4-lane cross section on Greenbank Road/Pinecrest Road between the ramp terminal intersections	GPX-1
	Widen Greenbank Rd / Pinecrest Rd to 6 lanes between the ramp terminal intersections	GPX-2
Greenbank Rd / Pinecrest Rd – North	Base Case: Modify ramps to fit mainline configuration (if required)	GP-N-1
	Increase acceleration lane length for loop ramp	
	Close Pinecrest Road to Queensway westbound ramp and connect to Greenbank northbound to Queensway westbound loop ramp	
Greenbank Rd / Pinecrest Rd – South	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures for Greenbank northbound to Queensway eastbound on-ramp	GP-S-1
	Improve Greenbank northbound to Queensway eastbound on-ramp curvature to improve safety	GP-S-2
Ashley Street Connection	Do Nothing – retain existing Ashley Street connection to EB off-ramp	ASH-1
	Close access from Ashley St to EB off-ramp	ASH-2
Woodroffe Ave. – Widening	Do Nothing – no northbound left turn lane on Woodroffe Avenue for WB on-ramp	W-1
	Widen Woodroffe Avenue to provide northbound left turn lane for WB on-ramp	W-2
Woodroffe Ave – North	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures for both off-ramps	W-N-1
	Remove channelization at Woodroffe Avenue; Join E-N ramp to E-W ramp and separate the two movements with raised median; Modify ramp to fit revised Woodroffe configuration (if required)	W-N-2
	Provide a merge lane (acceleration lane) on Woodroffe Ave. for E-N ramp; Modify E-N ramp to fit revised Woodroffe configuration (if required)	W-N-3
	Realign and join E-N and E-W ramps to provide a 90° crossing road terminal at Woodroffe Ave; Relocate existing bus stop to west side of intersection; Modify ramp to fit revised Woodroffe configuration (if required)	W-N-4
	Reconfigure interchange into Parclo 'A' configuration	
	Reconfigure interchange into Parclo 'B' configuration	W-N-6
	Reconfigure interchange into Parclo 'B' configuration with a transit-only direct ramp on the east side of the bridge	W-N-7
Woodroffe Ave – South	Base Case: Modify ramps to fit mainline configuration (if required)	W-S-1
	Increase radii and/or speed change lane length for eastbound off-ramp to Woodroffe	W-S-2
	Eliminate channelization and reconfigure intersection	W-S-3
Maitland Ave. – Widening	Base Case: Retain existing Maitland Ave cross section over Queensway	M-1
	Widen Maitland Ave over Queensway to accommodate NB left turn lane for traffic destined to WB Queensway – requires widening of Maitland Ave bridge	M-2
Maitland Ave – North	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on loop ramp	M-N-1
	Reconfigure interchange into Parclo 'A' configuration	
	Connect Kilarney Dr. to Ernest Ave and "buttonhook" ramps to this new service road	M-N-3
Maitland Ave – South	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on loop ramp	M-S-1
	Modify signal timing to provide longer SB advance phase	
	Reconfigure interchange into Parclo 'A' configuration	
Carling Ave – North	Base Case: Modify ramps to fit mainline configuration (if required)	C-N-1
	Physically separate WB off-ramp from Carling Ave WB and provide separate signal phasing at intersection; requires widening of Carling Ave and WB off-ramp	C-N-2
	Completely reconstruct entire interchange (various alternatives)	

Table 5.1 Long List of Alternatives

Interchange	Description of Alternative	Reference No. (see Plans in Appendix P)
Carling Ave – South	Base Case: Modify ramps to fit mainline configuration (if required)	C-S-1
	Extend acceleration lane for S-E ramp	C-S-2
	Realign and combine on-ramps	C-S-3
	Completely reconstruct entire interchange (various alternatives)	
Island Park Dr.	Base Case: Modify ramps to fit mainline configuration (if required)	I-1
	Close Island Park WB off-ramp	I-2
	Add deceleration lane for Island Park WB off-ramp	I-3
	Relocate ramp to west side of Island Park Dr. and provide T-intersection at Island Park Dr.	I-4
	Relocate ramp to west side of Island Park Dr. and provide roundabout at Island Park Dr.	I-5
	Relocate ramp to west side of Island Park Dr. and provide roundabout	I-6
	Relocate ramp to west side of Island Park Dr. and provide roundabout incorporating Merivale Road into roundabout	I-7
Parkdale Ave – North	Base Case: Modify ramps to fit mainline configuration (if required)	P-N-1
	Close WB off-ramp	P-N-2
	Increase length of deceleration lane for WB off-ramp	P-N-3
	Realign WB off-ramp to the south	P-N-4
Parkdale Ave – South	Base Case: Modify ramps to fit mainline configuration (if required)	P-S-1
	Increase length of deceleration lane for EB off-ramp	P-S-2
	Widen EB off-ramp to a 2 lane exit in order to provide additional storage	P-S-3
Rochester St.	Provide 3-way stop control (ie. add stop signs on Rochester St)	
	Signalize Rochester St / Raymond St intersection	
Bronson Ave. to Metcalfe St. – Westbound	Base Case: Modify ramps to fit mainline configuration (if required); provide 2-lane forced exit at Metcalfe St. ramp; retain O'Connor St. on-ramp, Lyon St. on-ramp, and Bronson Ave. off-ramp and on-ramp	BM-W-1
	Modify ramps to fit mainline configuration (if required); provide 2-lane forced exit at Metcalfe St. ramp; retain O'Connor St. on-ramp, Lyon St. on-ramp, and Bronson Ave. off-ramp and on-ramp but restrict access to Lyon St. on-ramp during the am peak period and Bronson Ave. off-ramp during the pm peak period through electronic signing and enforcement	BM-W-2
	Provide additional westbound lane west of Metcalfe to eliminate 2-lane forced exit at Metcalfe St. ramp; close Lyon St. on-ramp; retain O'Connor St. on-ramp and Bronson Ave. off-ramp and on-ramp with modifications to fit mainline configuration	BM-W-3
	Provide additional westbound lane west of Metcalfe to eliminate 2-lane forced exit at Metcalfe St. ramp; close O'Connor St. on-ramp and Bronson Ave on-ramp; retain Lyon St. on-ramp and realign Bronson Ave. off-ramp	BM-W-4
	Provide additional westbound lane west of Metcalfe to eliminate 2-lane forced exit at Metcalfe St. ramp; retain O'Connor St. on-ramp and Lyon St. on-ramp; close Bronson Ave on-ramp; realign Bronson Ave. off-ramp	BM-W-5
Bronson Ave. to Metcalfe St. – Eastbound	Base Case: Modify ramps to fit mainline configuration (if required)	BM-E-1
	Lengthen deceleration lane for EB off-ramp at Bronson Ave. and widen ramp to 3 lanes in vicinity of ramp terminal intersection; realign Chamberlain Ave. in vicinity of Bronson Ave.	BM-E-2
	Signalize EB off-ramp and Chamberlain with separate phases	
	Improve traffic flow on Bronson by prohibiting left turns onto Chamberlain Ave and by introducing turn restrictions at other intersections including Bronson/Powell, etc.	
	Close Metcalfe EB on-ramp and move to Bank St.	
Metcalfe St / Nicholas St. – North	Base Case: Modify ramps to fit mainline configuration (if required)	
	Eliminate weave between eastbound Metcalfe on-ramp and Nicholas off-ramp by introducing a bridge to grade separate on-ramp and off-ramp	
Metcalfe St. / Nicholas St. – South	Base Case: Modify ramps to fit mainline configuration (if required)	
	Eliminate weave between eastbound Metcalfe on-ramp and Nicholas off-ramp by introducing a bridge to grade separate on-ramp and off-ramp	
Nicholas St – North	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures for Greenfield connection to WB on-ramp	N-N-1
	Increase curvature for WB on-ramp	N-N-2
Nicholas St – South	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on ramps and improve skid resistance / superelevation	N-S-1
	Realign EB off-ramp to Lees Ave to line up with Chestnut St. and signalize intersection	N-S-2
	Intersection improvements at Lees Ave / EB on-ramp including signalization	
	Extend Nicholas St to intersect with Lees Ave and eliminate loop ramp. Accommodate move from southbound Nicholas to eastbound Queensway via a buttonhook ramp on Lees Ave.	
	Realign EB off-ramp to provide longer deceleration lane and flatter curvature to NB Nicholas	

Table 5.1 Long List of Alternatives

Interchange	Description of Alternative	Reference No. (see Plans in Appendix P)
Vanier Parkway / Riverside Dr. – Widening	Do Nothing – retain existing 4-lane cross section on Riverside Drive/Vanier Parkway	V-1
	Widen Riverside Dr / Vanier Parkway over Queensway to 6 lanes	V-2
Vanier Parkway / Riverside Dr. – North	Base Case: Modify ramps to fit mainline configuration (if required)	V-N-1
	Increase length of acceleration lane for Vanier Parkway northbound to Queensway westbound loop ramp	
Vanier Parkway / Riverside Dr. – South	Base Case: Modify ramps to fit mainline configuration (if required)	V-S-1
	Increase length of acceleration lane for Vanier Parkway southbound to Queensway eastbound loop ramp	
St. Laurent Blvd. – North	Base Case: Modify on-ramps to fit mainline configuration (if required); close WB off-ramp; implement positive guidance measures on loop ramp	S-N-1
	Reconfigure intersection of Labelle St / WB off-ramp to minimize conflicts	
	Provide combined exit ramp to Highway 417 EB and St. Laurent WB off-ramp; preclude access to St. Laurent WB off-ramp from 417 WB	S-N-3
	Close WB off-ramp and accommodate move from Ottawa Rd. 174 via Cyrville Road; preclude access to St. Laurent WB off-ramp from 417 WB	
	Provide combined access from Ottawa Rd. 174 to Aviation Pkwy and Highway 417 EB; preclude access to St. Laurent WB off-ramp from 417 WB	S-N-5
St. Laurent Blvd. – South	Base Case: Modify off-ramp and N-E on-ramp to fit mainline configuration (if required); close S-E on-ramp; modify signalization and intersection geometrics at St. Laurent / EB off-ramp intersection	S-S-1
	Increase ramp curvature for all ramps	
	Realign S-E on-ramp to preclude access to Ottawa Road 174	S-S-3
	Realign and combine N-E and S-E on-ramps to preclude access to Ottawa Road 174; access to 174 EB via new Cyrville Road connection	S-S-4
	Close N-E and S-E on-ramps; access to Ottawa Road 174 EB via new Cyrville Road connection	S-S-5
Aviation Parkway / OR 174	Implement positive guidance measures on loop ramp and SB ramp from Aviation Parkway	
Innes Rd – East	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on WB off-ramp and loop ramp	
	Increase ramp radii and/or speed change lane lengths	
Innes Rd – West	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on all ramps	
	Increase ramp radii and/or speed change lane lengths	
Walkley Rd – East	Signalize WB off-ramp / Walkley Rd intersection	
Walkley Rd – West	Add additional through lanes on Walkley Rd west of Sheffield Rd	
	Construct Hunt Club Road Interchange	
Hunt Club Road (See Section 5.5)	Do Nothing - do not construct new interchange	Removed from this study
	Construct Parclo A-4 configuration interchange	Removed from this study
	Construct Trumpet A configuration interchange	Removed from this study
	Construct Trumpet B configuration interchange	Removed from this study

5.3 CHANGES MADE TO THE LONG LIST FOLLOWING PUBLIC CONSULTATION

As noted previously, following the first round of public consultation, more technical analysis was undertaken to develop the alternative sketches presented in greater detail. This work determined if additional alternatives were required and/or if any of the alternatives should not be carried forward in the evaluation process (i.e. screened out from further consideration prior to detailed evaluation). The analysis took into consideration the comments and concerns provided by the public, as well as supplemental traffic and engineering assessments.

On the basis of the supplementary technical work undertaken and agency and public input, the list of alternatives was revised for the following locations:

- Highway 417 Mainline – Kent Street to Metcalfe Street;
- Richmond Road Interchange;
- Island Park Drive Interchange;
- Metcalfe/Nicholas Street Interchanges; and
- St. Laurent Boulevard Interchange.

Public input and the technical reasons behind changes to the list of alternatives are discussed below.

5.4 MODIFICATIONS TO ALTERNATIVE METHODS BY SECTION

The following sections describe only those sections of the study area where changes to the list of alternatives presented to the public at PIC #1 were made as a result of the follow-up work undertaken and the comments received.

5.4.1 HIGHWAY 417 MAINLINE – KENT STREET TO METCALFE STREET

Highway 417 currently has three basic lanes from Kent Street to Metcalfe Street in the eastbound direction and from Metcalfe Street to O'Connor Street in the westbound direction. Widening of Highway 417 to four basic lanes in each direction through this area was initially under consideration to address identified capacity, operational and safety problems. However, based on further traffic analysis and taking into consideration the social impacts and public comments and concerns, four basic lanes in each direction between Kent/O'Connor Street and Metcalfe Street was not carried forward in the evaluation process. The reasons for this decision were:

- A decision was made to consider a maximum of four basic lanes on Highway 417 in each direction and therefore the highway west of Kent Street and east of Metcalfe Street will not be expanded beyond four lanes in each direction. Within the Kent-Metcalfe section, the volume of traffic exiting and entering Highway 417 in each direction is approximately equivalent to one lane of traffic. This heavy use of the on and off-ramps through the downtown core means that sufficient traffic would not be able to access the section of Highway 417 between Kent/O'Connor Street and Metcalfe Street to justify the provision of four basic lanes through this area. For example, while four lanes of traffic approach Kent Street in the eastbound direction, many vehicles exit at the Kent Street off-ramp and the Metcalfe Street off-ramp, before any traffic can get on using the Metcalfe Street on-ramp. In the westbound direction many vehicles exit at the Metcalfe Street off-ramp. Operational improvements are needed in the O'Connor / Lyon / Bronson area and alternatives are discussed below; however provision of four basic lanes westbound was not carried forward; and
- Widening through the downtown core would result in significant social and land use impacts, particularly if the majority of the existing on and off-ramps were retained. These cannot be justified since the improvements to the performance of the transportation network would not be significant.

5.4.2 RICHMOND ROAD INTERCHANGE – SOUTH SIDE

The short-listed alternatives for the south side of the Richmond Road interchange to address the higher than expected collision frequency on both ramps and geometric issues associated with the tight loop ramp and short acceleration lane included:

- Do nothing;
- Minor modification: Implement positive guidance measures on the existing loop ramp in the southwest quadrant from Richmond Road southbound to Highway 417 eastbound;
- Major modification: Close the loop ramp from Richmond Road southbound to Highway 417 eastbound; provide a new connection to eastbound Highway 417 via Holly Acres Road; and
- Increase ramp radius and/or acceleration lane length for ramp from southbound Richmond Road to eastbound Queensway.

Note that for the purposes of clarity at the Richmond Road and Highway 417 interchange, the directions of travel on Richmond Road in this TESR are described as "southbound" (instead of westbound) and "northbound" (instead of eastbound).

During the development of alternatives for mainline widening to four basic lanes from Highway 416 through the Richmond Road interchange area, an additional alternative was identified for the ramps on the south side of the Richmond Road interchange. This alternative would address the lane balance issues through this area while minimizing impacts to properties. Accordingly, the short-list of alternatives for the south side of the Richmond Road interchange was expanded to include:

- Close both eastbound on-ramps from westbound and eastbound Richmond Road to eastbound Highway 417; provide new connection via Holly Acres Road.

By closing both ramps and providing a single on-ramp to eastbound Highway 417 to handle both movements, the on-ramp would end before the end of the existing ramp from eastbound Richmond Road to the eastbound Queensway, making it unnecessary to widen the highway across the backs of the residential properties adjacent to the Queensway on Queensline Drive.

5.4.3 ISLAND PARK DRIVE INTERCHANGE

The short-listed alternatives at the Island Park Drive Interchange to address the geometric issues associated with the lack of a deceleration lane included:

- Do nothing;
- Close Island Park Drive off-ramp;
- Add deceleration lane for Island Park Drive off-ramp; and
- Relocate Island Park Drive Ramp to west side of Island Park Drive and provide a T-intersection at Island Park Drive.

To improve traffic operations and safety, the short-list of alternatives was expanded to include:

- Relocate Island Park Drive Ramp to west side of Island Park Drive and provide a modern roundabout at Island Park Drive.

5.4.4 METCALFE STREET TO NICHOLAS STREET INTERCHANGES (EASTBOUND)

The short-listed alternatives for the Metcalfe Street and Nicholas Street interchanges to address the safety issues associated with the length of the weaving section and the traffic volumes using this area included:

- Do nothing;
- Minor modifications; and
- Elimination of the weave between the eastbound Metcalfe on-ramp and Nicholas off-ramp by introducing a bridge to grade separate the on-ramp and off-ramp.

The alternative that eliminated the weave between the on-ramp from Metcalfe Street and the off-ramp to Nicholas Street through the introduction of a bridge to grade separate the ramps did address the operational and safety concerns through this area. However, the design of this grade separation had many technical challenges that impacted on its operational feasibility and cost. These included:

- The grades of the roads would need to be designed to provide adequate vertical clearance between the two ramps and the Rideau Canal and local streets, while keeping within a reasonable maximum grade for Ottawa area conditions;
- The Metcalfe on-ramp would need to end before the start of the on-ramp from southbound Nicholas to the eastbound Queensway while providing sufficient parallel length to allow ramp traffic to merge into eastbound traffic safely;
- The horizontal alignment of the Metcalfe on-ramp would need to be designed to avoid impact on the Pretoria Bridge heritage structure over the Rideau Canal while providing sufficient offset between the on-ramp and the off-ramp to provide adequate sight distance through the structures and around retaining walls and slopes to allow vehicles to stop for vehicles queuing ahead.

In addition to the technical challenges, the resulting impacts to the social environment (noise, aesthetics) and adjacent properties particularly on Hawthorne Avenue to the south, Harvey Street to the north and on Main Street (residential, commercial and a community facility) would be significant. Many homes and buildings would be displaced or impacted to a severe degree. Accordingly, the elimination of the weave between on-ramp and off-ramp by introducing a bridge to grade separate these ramps was not carried forward in the evaluation process.

5.4.5 St. Laurent Boulevard Interchange – North Side

The alternatives for the north side of St. Laurent Boulevard interchange were developed to address safety and operational concerns associated with the radii of the on and off-ramps and the presence of Labelle Street intersection. The alternatives for the section of Highway 417 between St. Laurent and the split were developed to address the safety and operational concerns related to the weaving section between the split and St. Laurent Boulevard. These alternatives included:

- Do nothing;
- Minor modifications - Implement positive guidance measures on westbound off-ramp and loop ramp and reconfigure intersection of Labelle Street / westbound off-ramp to minimize conflicts;
- Minor modification - Modify signing to improve notification of lane arrangement for the westbound Queensway;
- Major modification – Prevent movement from Highway 417 westbound to St. Laurent interchange;
- Major modifications - Close the westbound off-ramp and accommodate moves from Ottawa Road 174 via a new ramp from Ottawa Road 174 to Cyrville Road.

Following review of the alternatives and public input, the list of alternatives was expanded to include:

- Close westbound off-ramp to St. Laurent Boulevard and accommodate moves from Ottawa Road 174 via a new ramp from Ottawa Road 174 to the Aviation Parkway.

5.4.6 St. Laurent Boulevard Interchange – South Side

The short-listed alternatives for the south side of the St. Laurent Boulevard Interchange included:

- Do nothing;
- Close the on-ramp from St. Laurent northbound to Highway 417 eastbound; and
- Close both eastbound on-ramps (from St. Laurent northbound and St. Laurent southbound).

The short-list of alternatives was expanded to include:

- Combine eastbound on-ramps to preclude access to Ottawa Road 174; provide access to Ottawa Road 174 via Cyrville Road connection.

5.5 Change to the Proponency for the Proposed Hunt Club Interchange

During the assessment of short-listed alternatives, the Ministry determined that the proposed new interchange at Hunt Club Road would serve municipal needs and, as such, it would be more appropriate for the City of Ottawa to be the proponent for the environmental assessment work at that location. Further work on the proposed interchange was therefore discontinued as part of this study.

The City of Ottawa have since initiated a separate study for the new Hunt Club Road connection and interchange in coordination with other work in the area.

5.6 Summary of Alternatives Carried Forward For Detailed Assessment

Table 5.2 summarizes the alternatives that were carried forward to detailed evaluation and assessment subsequent to the analysis of input received and further environmental and engineering analysis. It also provides a brief rationale explaining why some alternatives were not carried forward for further consideration.

Some of the alternatives carried forward were subsequently screened out or modified at the evaluation meeting based on input from participating agencies and updated analysis. Notations of these changes are also provided in Table 5.2 under the Remarks column.

Table 5.2 Alternatives Carried Forward for Detailed Evaluation and Assessment

Interchange	Long List of Alternatives	Carry Forward	Alt. No.	Remarks
Highway 416	Base Case: Modify ramps to fit mainline configuration (if required); implement positive guidance measures on ramps from NB 416 to EB Queensway and from WB Queensway to SB 416	Ψ	ML-2	
	Reconfigure/reconstruct interchange to flatten radii to improve stopping sight distance	N		Positive guidance measures will achieve similar results with less impacts and at a significantly lower cost
Holly Acres Road	Base Case: Retain existing eastbound off-ramp to Holly Acres Road	Ψ	HA-1	
	Physically separate (raised median) traffic on the 416-Holly Acres ramp and 417-Holly Acres ramp after they merge and provide separate signals	Ψ	HA-2	
	Physically separate ramps by realigning/relocating the ramp from NB 416 to Holly Acres Road to connect directly to Richmond Road	N		Tight horizontal curvature and spacing of ramps will introduce new safety concerns
Richmond Rd – North	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on off-ramp	Ψ	R-N-1	
	Realign off-ramp to improve curvature and operations while maintaining current intersection at Richmond Road	Ψ	R-N-2	
Richmond Rd – South	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on loop ramp	Ψ	R-S-1	
	Close Richmond Road southbound to Queensway eastbound loop ramp and relocated movement to Holly Acres Road	N		With the addition of this new ramp from Holly Acres, it was logical to close both ramps from Richmond Road to address problems and minimize impacts
	Close Richmond Road on ramps and provide new on ramp from Holly Acres Rd	Ψ	R-S-2	
	Increase ramp radii and/or speed change lane length for N-E ramp	N	R-S-3	Significant impact to Graham Creek to address minor problem
Greenbank Rd / Pinecrest Rd Reconstruction	Base Case: Improve visibility of traffic signals at Pinecrest/Greenbank off-ramp intersections	Ψ		Improves driver awareness of intersection; Preliminary Design consideration
	Reconstruct Pinecrest/Greenbank Rd. to improve stopping sight distance over vertical crest curve	N		Requires reconstruction/realignment of entire interchange - significantly more cost and property than other alternatives addressing same concerns such as enhanced signing
Greenbank Rd / Pinecrest Rd Widening	Do Nothing – retain existing 4-lane cross section on Greenbank Road/Pinecrest Road between the ramp terminal intersections	Ψ	GPX-1	
	Widen Greenbank Rd / Pinecrest Rd to 6 lanes between the ramp terminal intersections	N	GPX-2	Would provide limited operational benefits with significant impacts
Greenbank Rd / Pinecrest Rd – North	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	GP-N-1	
	Increase acceleration lane length for loop ramp	N	GP-N-2	Acceleration length is substandard but no apparent operational/safety problems
	Close Pinecrest Road to Queensway westbound ramp and connect to Greenbank northbound to Queensway westbound loop ramp	N	GP-N-3	Would introduce more conflict points to an intersection that already has significant safety concerns
Greenbank Rd / Pinecrest Rd – South	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures for Greenbank northbound to Queensway eastbound on-ramp	Ψ	GP-S-1	
	Improve Greenbank northbound to Queensway eastbound on-ramp curvature to improve safety	Ψ	GP-S-2	
Ashley Street Connection	Do Nothing – retain existing Ashley Street connection to EB off-ramp	Ψ	ASH-1	
	Close access from Ashley St to EB off-ramp	Ψ	ASH-2	
Woodroffe Ave. Widening	Do Nothing – no northbound left turn lane on Woodroffe Avenue for WB on-ramp	Ψ	W-1	
	Widen Woodroffe Avenue to provide northbound left turn lane for WB on-ramp	Ψ	W-2	
Woodroffe Ave – North	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures for both off-ramps	Ψ	W-N-1	
	Remove channelization at Woodroffe Avenue; Join E-N ramp to E-W ramp and separate the two movements with raised median; Modify ramp to fit revised Woodroffe configuration (if required)	Ψ	W-N-2	
	Provide a merge lane (acceleration lane) on Woodroffe Ave. for E-N ramp; Modify E-N ramp to fit revised Woodroffe configuration (if required)	Ψ	W-N-3	
	Realign and join E-N and E-W ramps to provide a 90° crossing road terminal at Woodroffe Ave; Relocate existing bus stop to west side of intersection; Modify ramp to fit revised Woodroffe configuration (if required)	Ψ	W-N-4	
	Reconfigure interchange into Parclo 'A' configuration	N	W-N-5	Significant property requirements in N-E quadrant – significantly more cost and property than other alternatives addressing same concerns
	Reconfigure interchange into Parclo 'B' configuration	Ψ	W-N-6	
	Reconfigure interchange into Parclo 'B' configuration with a transit-only ramp on the east side	Ψ	W-N-7	

Table 5.2 Alternatives Carried Forward for Detailed Evaluation and Assessment

Interchange	Long List of Alternatives	Carry Forward	Alt. No.	Remarks
Woodroffe Ave – South	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	W-S-1	
	Increase radii and/or speed change lane length for eastbound off-ramp to Woodroffe	Ψ	W-S-2	Radius could not be increased without unacceptable impact on Queensway Transit Station
	Eliminate channelization and reconfigure intersection	Ψ	W-S-3	As intersection could function without channelization and City of Ottawa asked that free flow right turns be removed where practical, this alternative moved to base case
Maitland Ave. Widening	Base Case: Retain existing Maitland Ave cross section over Queensway	Ψ	M-1	
	Widen Maitland Ave over Queensway to accommodate NB left turn lane for traffic destined to WB Queensway – requires widening of Maitland Ave bridge	Ψ	M-2	
Maitland Ave – North	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on loop ramp	Ψ	M-N-1	
	Reconfigure interchange into Parclo 'A' configuration	N	M-N-2	Significant property requirements in N-E quadrant (including a church) – the cost and property impacts outweigh benefits
	Connect Kilarney Dr to Ernest Ave and "buttonhook" ramps to this new service road	N	M-N-3	Would introduce significant amount of traffic on residential road and associated safety concerns
Maitland Ave – South	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on loop ramp	Ψ	M-S-1	
	Modify signal timing to provide longer SB advance phase	Ψ	---	Preliminary Design consideration; to City of Ottawa for consultation/resolution
	Reconfigure interchange into Parclo 'A' configuration	N	M-S-2	Significant property requirements in S-W quadrant – significant cost and property impacts outweigh benefits
Carling Ave – North	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	C-N-1	
	Physically separate WB off-ramp from Carling Ave WB and provide separate signal phasing at intersection; requires widening of Carling Ave and WB off-ramp	Ψ	C-N-2	Not feasible with traffic volumes at Kirkwood Avenue and Carling Avenue intersection
	Completely reconstruct entire interchange (various alternatives)	N	C-N-3	Significant impacts to businesses, other properties and high cost, cannot be justified.
Carling Ave – South	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	C-S-1	
	Extend acceleration lane for S-E ramp	Ψ	C-S-2	
	Realign and combine on-ramps	Ψ	C-S-3	
	Completely reconstruct entire interchange (various alternatives)	N	C-S-4	Significantly more cost/staging/constructability concerns than other alternatives addressing same concerns
Island Park Dr.	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	I-1	
	Close Island Park WB off-ramp	Ψ	I-2	
	Add deceleration lane for Island Park WB off-ramp	Ψ	I-3	
	Relocate ramp to west side of Island Park Dr. and provide T-intersection at Island Park Dr.	Ψ	I-4	
	Relocate ramp to west side of Island Park Dr. and provide roundabout at Island Park Dr.	Ψ	I-5	
	Relocate ramp to west side of Island Park Dr. and provide roundabout	Ψ	I-6	Screened out in favour of I-7
	Relocate ramp to west side of Island Park Dr. and provide roundabout incorporating Merivale Road into roundabout	Ψ	I-7	
Parkdale Ave – North	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	P-N-1	
	Close WB off-ramp	Ψ	P-N-2	Unacceptable traffic impacts
	Increase length of deceleration lane for WB off-ramp	Ψ	P-N-3	
	Realign WB off-ramp to the south	Ψ	P-N-4	
Parkdale Ave – South	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	P-S-1	
	Increase length of deceleration lane for EB off-ramp	Ψ	P-S-2	
	Widen EB off-ramp to a 2 lane exit in order to provide additional storage	Ψ	P-S-3	
Rochester St.	Provide 3-way stop control (i.e. add stop signs on Rochester St)	Ψ	---	Preliminary Design consideration; to City of Ottawa for consultation/resolution
	Signalize Rochester St / Raymond St intersection	Ψ	---	This work was completed by the City of Ottawa in Spring 2005.
Bronson Ave. to Metcalfe St. – Westbound	Base Case: Modify ramps to fit mainline configuration (if required); provide 2-lane forced exit at Metcalfe St. ramp; retain O'Connor St. on-ramp, Lyon St. on-ramp, and Bronson Ave. off-ramp and on-ramp	Ψ	BM-W-1	
	Modify ramps to fit mainline configuration (if required); provide 2-lane forced exit at Metcalfe St. ramp; retain O'Connor St. on-ramp, Lyon St. on-ramp, and Bronson Ave. off-ramp and on-ramp but restrict use of Lyon St. on-ramp during the am peak period and Bronson Ave. off-ramp during the pm peak period through electronic signing and enforcement	Ψ	BM-W-2	

Table 5.2 Alternatives Carried Forward for Detailed Evaluation and Assessment

Interchange	Long List of Alternatives	Carry Forward	Alt. No.	Remarks
	Modify ramps to fit mainline configuration (if required). Provide an optional through/exit lane as second ramp lane at Metcalfe St. ramp and terminate it in advance of the O'Connor St. on-ramp. Close the Lyon St on-ramp except during the p.m. peak. Retain O'Connor St. on-ramp and Bronson Ave. off-ramp and on-ramp.	Ψ	BM-W-2M	The Lyon on-ramp is most needed during the p.m. peak to get westbound traffic from downtown onto the Queensway. During this period traffic speeds are generally slower, reducing the risk of high speed collisions on the highway as vehicles weave to enter at Lyon St and exit at Bronson Ave
	Provide additional westbound lane west of Metcalfe to eliminate 2-lane forced exit at Metcalfe St. ramp; close Lyon St. on-ramp; retain O'Connor St. on-ramp and Bronson Ave. off-ramp and on-ramp with modifications to fit mainline configuration	Ψ	BM-W-3	
	Provide additional westbound lane west of Metcalfe to eliminate 2-lane forced exit at Metcalfe St. ramp; close O'Connor St. on-ramp and Bronson Ave on-ramp; retain Lyon St. on-ramp and realign Bronson Ave. off-ramp	Ψ	BM-W-4	Additional traffic analysis revealed unacceptable traffic impacts
	Provide additional westbound lane west of Metcalfe to eliminate 2-lane forced exit at Metcalfe St. ramp; retain O'Connor St. on-ramp and Lyon St. on-ramp; close Bronson Ave on-ramp; realign Bronson Ave. off-ramp	Ψ	BM-W-5	
Bronson Ave. to Metcalfe St. – Eastbound	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	BM-E-1	
	Lengthen deceleration lane for EB off-ramp at Bronson Ave. and widen ramp to 3 lanes in vicinity of ramp terminal intersection; realign Chamberlain Ave. to intersect Bronson Ave. at ramp terminal intersection	Ψ	BM-E-2	
	Signalize EB off-ramp and Chamberlain with separate phases	N	BM-E-3	Insignificant improvement to safety and/or traffic issues with this alternative
	Improve traffic flow on Bronson by prohibiting left turns onto Chamberlain Ave and by introducing turn restrictions at other intersections including Bronson/Powell, etc.	Ψ	---	To City of Ottawa for consultation/resolution
	Close Metcalfe EB on-ramp and move to Bank St.	N	BM-E-4	Significantly more cost/staging/constructability concerns than other alternatives addressing same concerns
Metcalfe St. to Nicholas St. - Westbound	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	OM-N-1	Refer to Alternative BM-W-1
	Eliminate weave between westbound Nicholas on-ramp and Metcalfe off-ramp by introducing a bridge to grade separate on-ramp and off-ramp	N	OM-N-2	Significant property and social impacts, high cost and technical challenges which impact on operational feasibility and cost due to the close spacing of the Metcalfe, Nicholas and Vanier Parkway Interchanges
Metcalfe St. to Nicholas St. – Eastbound	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	OM-S-1	Refer to Alternative BM-E-1
	Eliminate weave between eastbound Metcalfe on-ramp and Nicholas off-ramp by introducing a bridge to grade separate on-ramp and off-ramp	N	OM-S-2	Significant property and social impacts, high cost and technical challenges which impact on operational feasibility and cost due to the close spacing of the Metcalfe, Nicholas and Vanier Parkway Interchanges
Nicholas St – North	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures for Greenfield connection to WB on-ramp	Ψ	N-N-1	
	Increase curvature for WB on-ramp	Ψ	N-N-2	
Nicholas St – South	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on ramps and improve skid resistance / superelevation	Ψ	N-S-1	
	Realign EB off-ramp to Lees Ave to line up with Chestnut St. and signalize intersection	Ψ	N-S-2	
	Improve intersection at Lees Ave / EB on-ramp including signalization	Ψ	---	Preliminary Design consideration; To City of Ottawa for consultation/resolution.
	Extend Nicholas St to intersect with Lees Ave and eliminate loop ramp. Accommodate N-E move from Lees Ave across from Chestnut St.	N	N-S-3	Would significantly increase traffic volumes onto Lees Ave; significant cost for a minor safety concern
	Realign EB off-ramp to provide longer deceleration lane and flatter curvature to NB Nicholas	N	N-S-4	Would require the purchase of all property north of Hawthorne Ave – would have significant property impacts and costs and would not address safety issues associated with EB weave between Metcalfe on-ramp and Nicholas off-ramp
Vanier Parkway / Riverside Dr. Widening	Do Nothing – retain existing 4-lane cross section on Riverside Drive/Vanier Parkway	Ψ	V-1	
	Widen Riverside Dr / Vanier Parkway over Queensway to 6 lanes	Ψ	V-2	To City of Ottawa for consultation/resolution
Vanier Parkway / Riverside Dr. – North	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	V-N-1	
	Increase length of acceleration lane for Vanier Parkway northbound to Queensway westbound loop ramp	N	V-N-2	Requires acceleration lane for the N-W on-ramp to be shifted to the west which further reduces the short weave length between the Vanier Pkwy and Nicholas St. ramps
Vanier Parkway / Riverside Dr. – South	Base Case: Modify ramps to fit mainline configuration (if required)	Ψ	V-S-1	
	Increase length of acceleration lane for Vanier Parkway southbound to Queensway eastbound loop ramp	N	V-S-2	Requires acceleration lane for the S-E on-ramp to be shifted to the east which further reduces the short weave length between the Vanier Pkwy and St. Laurent ramps
St. Laurent Blvd. – North	Base Case: Modify on-ramps to fit mainline configuration (if required); close WB off-ramp; implement positive guidance measures on loop ramp	Ψ	S-N-1	
	Reconfigure intersection of Labelle St / WB off-ramp to minimize conflicts	N	S-N-2	Only minor reconfiguration feasible due to adjacent development; doesn't minimize conflicts

Table 5.2 Alternatives Carried Forward for Detailed Evaluation and Assessment

Interchange	Long List of Alternatives	Carry Forward	Alt. No.	Remarks
	Provide combined exit ramp to Highway 417 EB and St. Laurent WB off-ramp; preclude access to St. Laurent WB off-ramp from 417 WB	Ψ	S-N-3	
	Close WB off-ramp and accommodate move from Ottawa Rd. 174 via Cyrville Road; preclude access to St. Laurent WB off-ramp from 417 WB	N	S-N-4	Entrance for proposed development east of Cyrville Road situated within limits of proposed ramp
	Provide combined access from Ottawa Rd. 174 to Aviation Pkwy and Highway 417 EB; preclude access to St. Laurent WB off-ramp from 417 WB	Ψ	S-N-5	
St. Laurent Blvd. – South	Base Case: Modify off-ramp and N-E on-ramp to fit mainline configuration (if required); close S-E on-ramp; modify signalization and intersection geometrics at St. Laurent / EB off-ramp intersection	Ψ	S-S-1	
	Increase ramp curvature for all ramps	N	S-S-2	Significantly more cost/staging/constructability concerns than other alternatives addressing same concerns
	Realign S-E on-ramp to preclude access to Ottawa Road 174	Ψ	S-S-3	
	Realign and combine N-E and S-E on-ramps to preclude access to Ottawa Road 174; access to 174 EB via new Cyrville Road connection	Ψ	S-S-4	
	Close N-E and S-E on-ramps; access to Ottawa Road 174 EB via new Cyrville Road connection	Ψ	S-S-5	
Aviation Parkway / Ottawa Rd 174	Implement positive guidance measures on loop ramp and SB ramp from Aviation Parkway	Ψ	---	Refer to ML-14
Innes Rd – East	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on WB off-ramp and loop ramp	Ψ	IR-E-1	Preliminary Design consideration
	Increase ramp radii and/or speed change lane lengths	N	IR-E-2	Positive guidance measures will achieve similar results with significantly lower costs
Innes Rd – West	Base Case: Modify ramps to fit mainline configuration (if required); Implement positive guidance measures on all ramps	Ψ	IR-W-1	Refer to ML-15
	Increase ramp radii and/or speed change lane lengths	N	IR-W-2	Positive guidance measures will achieve similar results with significantly lower costs
Walkley Rd – East	Signalize WB off-ramp / Walkley Rd intersection	Ψ	---	Preliminary Design consideration
Walkley Rd – West	Add additional through lanes on Walkley Rd west of Sheffield Rd	Ψ	---	To City of Ottawa for consultation/resolution
	Construct Hunt Club Road Interchange	Ψ	---	Traffic analysis justified need for Hunt Club Interchange (see Hunt Club Road Interchange Alternatives)
Hunt Club Road (see Section 5.5)	Do Nothing - do not construct new interchange	Ψ	H-1	To City of Ottawa
	Construct Parclo A-4 configuration interchange	Ψ	H-2	To City of Ottawa
	Construct Trumpet A configuration interchange	Ψ	H-3	To City of Ottawa
	Construct Trumpet B configuration interchange	Ψ	H-4	To City of Ottawa

5.7 ASSESSMENT OF FACTORS APPLICABLE TO ALTERNATIVE METHODS

A list of the factors and sub-factors that were applicable for each independent group of alternatives is presented in **Table 5.3**.

Some of the components of the table were refined during the evaluation process to better reflect the potential impacts and hence there are some differences between this list and the preliminary long list presented in Table 3.1. The changes were:

- Under Mobility, the effect on existing transit operations was clarified to refer to transit operations on Highway 417 or at ramp terminal intersections;
- The measure for the ability to accommodate pedestrians at crossing road ramp intersections was modified to the number of free flow ramp lanes to cross to better reflect the risk to pedestrians;
- The compatibility with future transit initiatives was clarified to future transit infrastructure;
- The impact on cold water fish habitat was deleted as all fish habitat in the study area was identified as warm water;
- Air quality was moved from social to natural environment to reflect its importance to human health;
- The measures for the effect on noise sensitive receivers were reduced from three to one as the noise study indicated any increased in sound levels would be limited to less than 5 dBA;
- Landscaping was clarified to areas of trees and shrubs;
- The measure for the impact on emergency response was changed to the impact on emergency response level of service;
- A new sub-factor, traffic infiltration was added to the Social and Cultural Environment Factor Area with the measure being impact on safety and pedestrians;
- The measure for the access to commercial/industrial land use was changed to change in access / egress to commercial district / area.

The selection of factors and sub-factors applicable to each group of alternatives was a function of the location and type of alternatives being proposed. For example, the Highway 417 mainline widening has the opportunity to affect many areas of the environment while interchange alternatives may affect only a few areas of the environment. The information presented in Table 5-3 may be generalized as follows:

- For the Highway 417 mainline strategic widening, most factors and sub-factors apply, with the exception of those that are intended to measure interchange or ramp performance.

- For interchange alternatives where no permanent ramp closures are being proposed (i.e. the same movements will be allowed as are possible today), only a few of the factors and sub-factors will generally apply. Under the Transportation factor area, only safety and traffic operations will apply. Natural environment factors will not apply as the areas are already disturbed and no impacts on fisheries, wildlife, etc. are anticipated. Some social environment factors may apply. Changes to noise levels will generally not be a factor where minor modifications to ramps are proposed. Land use and property will only apply where additional right-of-way is required. Cost will be a factor for all groups of alternatives.

- For interchanges where ramp closures are being proposed and changes to travel patterns will result, other factors and sub-factors in addition to those noted above, will also apply. Under the Transportation factor area, the effect on out-of-way travel, as well as safety and traffic operations may be significant. Under the social environment, noise may be an issue. Removal of landscaping may also be an issue in some areas where alternatives realign existing ramps in landscaped areas. These would be in addition to any influence on cycling and pedestrian movements at ramp terminals and along City streets The impact of travel pattern changes on the strategic directions and vision of the City of Ottawa Official Plan and master planning documents may also be a consideration in the evaluation of alternatives. Land use and property will only apply where additional right-of-way is required. Cost will be a factor for all groups of alternatives.

- Subfactors were only used in the evaluation where there was a measurable and/or discernable difference amongst the competing alternatives in that subfactor area.

This list of applicable factors was updated to reflect the actual sub-factors used to differentiate between the alternatives during the evaluation process. In some cases an individual alternative was screened out during the evaluation. As a result some sub-factors were no longer useful in the comparison.

Table 5.3 List of Applicable Factors / Sub-Factors for Each Evaluated Alternative Group

Factor Area / Factor	Sub-Factor	Measure	Alternative Groups																				
			Mainline	Holly Acres Ramps	Richmond– North Side	Richmond– South Side	Pinecrest/Greenbank– South Side	Ashley Connection	Woodroffe Widening	Woodroffe– North Side	Maitland - Widening	Carling– South Side	Island Park Drive	Parkdale– North Side	Parkdale– South Side	Bronson to Metcalfe EB	Metcalfe to Bronson WB	Nicholas– North Side	Nicholas– South Side	St. Laurent /Ottawa Rd 174– EB	St. Laurent /Ottawa Rd 174– WB
1.0 TRAFFIC and TRANSPORTATION																							
Mobility	Person throughput	Change in person throughput on Highway 417 during the peak period for 2021 horizon year (person-km)	✓																				
		Change in person throughput on a network basis during the peak period for 2021 horizon year (person-km)	✓																				
	Vehicle throughput	Change in vehicle throughput on Highway 417 during the peak period for 2021 horizon year (vehicle-km)	✓																				
		Change in vehicle throughput on the network during the peak period for 2021 horizon year (vehicle-km)	✓																				
	Average vehicle travel speed	Average vehicle travel speed on Highway 417 during the peak period for 2021 horizon year (km/h)	✓																	✓			
		Average vehicle travel speed over the network during the peak period for 2021 horizon year (km/h)	✓																				
	Total delay	Total network delay during the peak hour for the 2021 horizon year (person-hours)	✓																				
	Duration and extent of congested conditions	During the peak period for 2021 horizon year, the time when level of service is below "E" and the length of corridor affected (Lane-km-hours)	✓																				
	Effect on existing transit operations (on 417 and/or at intersections)	Change in transit level of service (travel time and route) (improvement, no change, reduction).	✓	✓						✓													
	Interchange operation	Ramp terminal intersection volume to capacity ratio (v/c) in peak period for 2021 horizon year.		✓		✓		✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓		
Accessibility and Safety	Network connectivity (out of way travel)	Increase in travel distance due to a ramp closure or turn prohibitions, etc. (km).				✓		✓					✓	✓			✓			✓	✓		
	Mean travel time to all destinations	Mean travel time needed to complete a trip on the network.	✓																				
	Ability to accommodate cyclists & compatibility with infrastructure at crossing road ramp intersection.	Number of free-flow ramp/cyclist conflict locations.				✓				✓			✓				✓						
	Ability to accommodate pedestrians at crossing road ramp intersection.	Number of free-flow ramp lanes to cross.		✓		✓				✓			✓				✓						

Table 5.3 List of Applicable Factors / Sub-Factors for Each Evaluated Alternative Group

Factor Area / Factor	Sub-Factor	Measure	Alternative Groups																		
			Mainline	Holly Acres Ramps	Richmond– North Side	Richmond– South Side	Pinecrest/Greenbank– South Side	Ashley Connection	Woodroffe Widening	Woodroffe– North Side	Maitland - Widening	Carling– South Side	Island Park Drive	Parkdale– North Side	Parkdale– South Side	Bronson to Metcalfe EB	Metcalfe to Bronson WB	Nicholas– North Side	Nicholas– South Side	St. Laurent /Ottawa Rd 174– EB	St. Laurent /Ottawa Rd 174– WB
	Collision risk on ramps/ at ramp terminals	Change in collision risk as determined qualitatively (improvement, no change, increased risk)		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	
	Collision risk on the mainline	Change in collision risk as measured with collision modification factors	✓																		
	Compatibility with future transit infrastructure	Physical impact on planned/proposed transit initiatives (none / minor / major)	✓		✓					✓											
	Compatibility with municipal planning goals and objectives	Degree of conformance with 2003 Ottawa Official Plan and Master planning documents (good / fair / poor)	✓											✓						✓	✓
2.0 NATURAL ENVIRONMENT																					
Wildlife	Loss of wildlife habitat	Area of upland habitat removed (ha)	✓										✓							✓	✓
Surface Water / Groundwater	Stormwater management	Increase in area of impervious surfaces (m^2)	✓	✓																✓	✓
Fisheries and Aquatic Habitat	Impact on warm water fish habitat	In-water construction required for warm water fisheries crossing (yes / no)	✓			✓														✓	✓
Air Quality	Net impact on sensitive receptors	Change in air quality as determined semi-quantitatively at receptors of interest											✓							✓	
3.0 SOCIAL and CULTURAL ENVIRONMENT																					
Noise	Effect on noise sensitive receivers.	Number of noise sensitive receivers with a noise increase of 0 – 5 dBAs (no noise increased of over 5 dBA were estimated)	✓						✓								✓			✓	
Heritage Resources	Displacement or disruption of built heritage features	Number of built heritage features displaced or disrupted	✓																		
Archaeology	Displacement or disruption of archaeological sites	Number of archaeological sites displaced or disrupted	✓																		
Landscaping	Displacement or disruption of trees and shrubs	Area of trees and shrubs removed (m^2)	✓				✓						✓			✓	✓			✓	✓
Emergency Services	Impact on emergency response time	Impact on average emergency response level of service (Improved / Neutral / Degraded)	✓			✓		✓					✓	✓	✓		✓				✓
Traffic Infiltration	Impact on safety and pedestrians	Neutral / Increased Risk	✓					✓									✓				

Table 5.3 List of Applicable Factors / Sub-Factors for Each Evaluated Alternative Group

Factor Area / Factor	Sub-Factor	Measure	Alternative Groups																			
			Mainline	Holly Acres Ramps	Richmond– North Side	Richmond– South Side	Pinecrest/Greenbank– South Side	Ashley Connection	Woodroffe Widening	Woodroffe– North Side	Maitland - Widening	Carling– South Side	Island Park Drive	Parkdale– North Side	Parkdale–South Side	Bronson to Metcalfe EB	Metcalfe to Bronson WB	Nicholas– North Side	Nicholas– South Side	St. Laurent /Ottawa Rd 174– EB	St. Laurent /Ottawa Rd 174– WB
4.0 LAND USE AND PROPERTY																						
Agriculture/Soils	Removal of Class 1 - 3 agricultural land	Area of Class 1, 2 or 3 agricultural land removed (ha)	✓																			
Commercial / Industrial	Businesses displaced	Number of businesses displaced.	✓														✓				
	Access to commercial/industrial land use	Change in access to commercial land use / district.	✓																	✓	✓
	Commercial/industrial property required	Area of commercial/industrial property required (m^2).	✓					✓	✓			✓					✓				
Institutional	Institutional uses displaced	Number of institutional uses displaced.	✓													✓					
	Access to institutional land uses	Number of institutions with changed entrance.	✓																		
	Institutional property required	Area of institutional property required (m^2)	✓								✓	✓									
Recreational	Recreational uses displaced	Number of recreational uses displaced.	✓																		
	Access to recreational land uses	Number of recreational land uses with changed entrance.	✓																		
	Recreational property required	Area of recreational property required (m^2)	✓										✓								
Greenspace / Open Space	Removal of greenspace/open space	Area of green space and/or open space removed.	✓																		
Residential	Residences displaced	Number of homes removed	✓						✓	✓			✓	✓	✓						
	Access to residences	Number of homes with changed entrance.	✓										✓							✓	
	Residential property required	Area of residential property required (m^2)	✓		✓	✓			✓	✓			✓		✓					✓	
Waste	Impact on potentially contaminated property	Number of potentially contaminated properties required	✓																		
5.0 COST																						
Construction Cost	Capital construction cost	Relative road construction cost, excluding property and engineering costs (dollars)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

5.8 ASSESSMENT OF THE PRELIMINARY DESIGN ALTERNATIVES

The independent alternative groups described in Section 5.5 were assessed and evaluated by a multidisciplinary team including representatives from several City departments including Emergency Services, Traffic and Parking Operations and Planning and Growth Management, as well as representatives from the National Capital Commission and environmental and engineering members of the project team from MTO and the consultants. The evaluation methodology included the following steps:

1. Development of the long list of factors and sub-factors (performance measures).
2. Development of a long list of potential alternatives. The long-list of alternatives consists of all reasonable alternatives that can address the identified deficiencies.
3. Establishment of utility functions.
4. Collection of data/environmental inventories to provide input to the assessment and evaluation.
5. With consideration for each group of alternatives being assessed, screening of the long list to generate a list of relevant factors.
6. Weighting of factors and sub-factors.
7. Rating of alternatives.
8. Sensitivity testing by selecting other weights.
9. Selection of Technically Preferred Alternatives (TPAs).
10. Review by TAC and MTO Senior Management.
11. Review by MTAC, PAC and Public.
12. Preparation of Recommendations and presentation of a Recommended Plan.

A more detailed description of the evaluation methodology is presented in **Appendix P**

Because of the volume of material associated with the number of alternatives examined, interested readers are also directed to **Appendix P** for the drawings and detailed evaluation tables illustrating the alternatives considered. The important factors, refinements made as a result of consultation and the reasons behind the selection of the preferred alternative are summarized in the following sections.

5.8.1 MAINLINE

For the assessment of widening for mainline segments, traffic and transportation sub-factors were dominant, including throughput, travel speed, delay, transit operations and safety. Other factors considered included impacts on noise sensitive receivers, vegetation, stormwater management requirements, property and costs. Because of the nature of the widening within the existing corridor, impacts to the natural environment, land use and property sub-factors were the same for both the do nothing and the widening alternative.

For all strategic highway widening segments, regardless of the weights selected, the widening alternative was preferred over the do nothing alternative. As such, the **following lane arrangement was recommended for the mainline:**

- **Widen to 4 basic lanes per direction from Highway 416 to Carling Avenue;**
- **Retain existing 4 basic lanes per direction from Carling Avenue to Kent Street;**
- **Retain existing 3 or 4 basic lanes per direction from Kent Street to Metcalfe Street;**
- **Widen to 4 basic lanes per direction from Metcalfe Street to Ottawa Road 174; and**
- **Widen Highway 417 to 3 basic lanes per direction from Ottawa Road 174 to east of Walkley Road.**

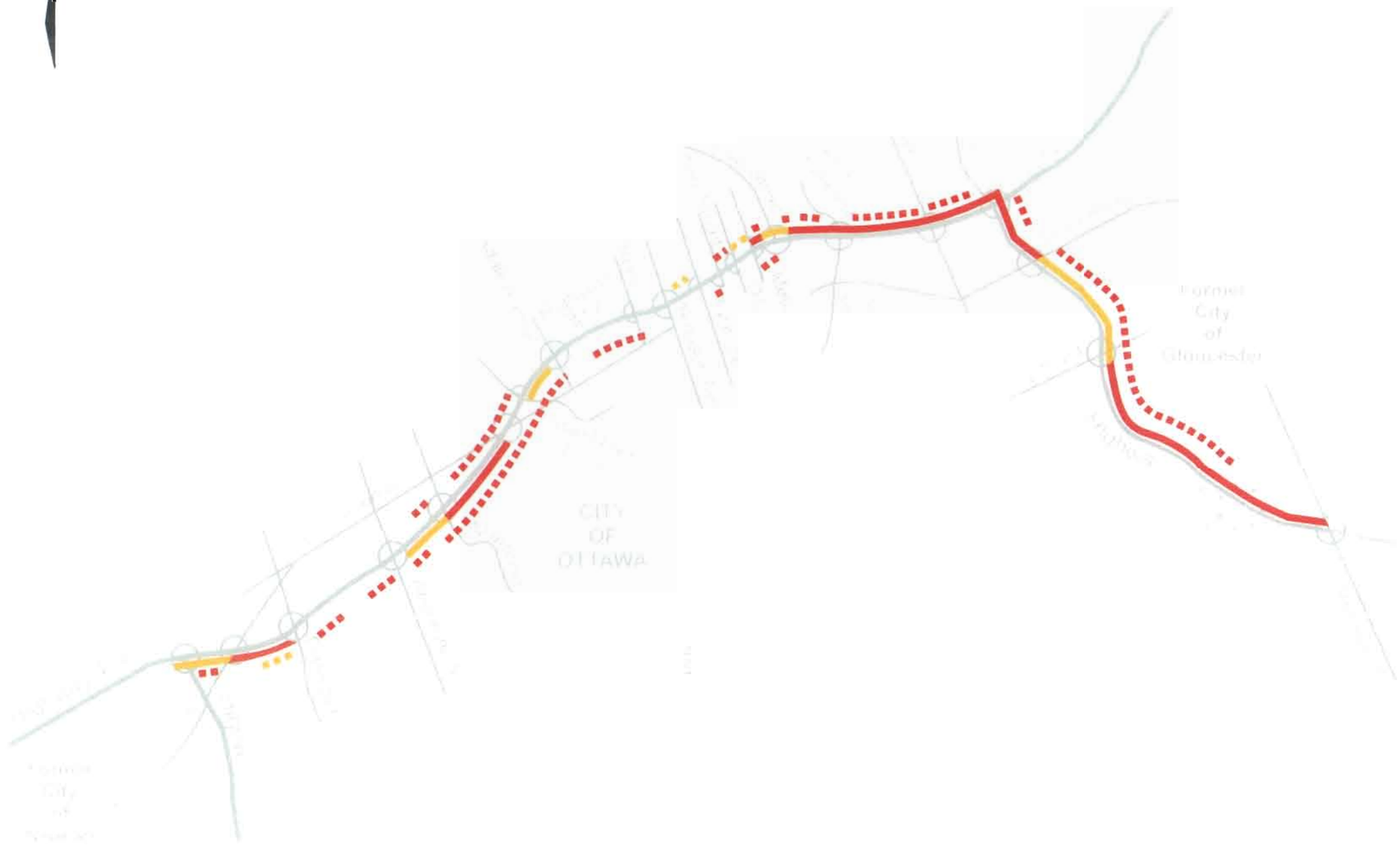
Throughout the study, some members of the public expressed their preference for increased use of transit instead of additional highway lanes. Other members of the public were supportive of the proposed strategic widening. The ability of transit to accommodate the increased travel demand resulting from the growth established in Ottawa's 2003 Official Plan (OP) was examined during the alternatives to the undertaking phase. However, even with the realization of the transit modal split targets set in the OP, the City's travel demand forecasting model predicted the need for additional east-west road capacity. The existing modal split for transit was about 17% in 2001 and the *Ottawa 20/20 Transportation Master Plan, 2003* projects this to grow to 30%. Transit usage therefore represents a growing share of the growing travel demands as population and employment growth projected in the 2003 OP come to fruition. What this means in absolute terms is that the 37,000 transit person-trips in 2001 must increase to 104,000 person-trips by 2021 (representing an increase of 180%) to achieve the target modal split in the afternoon pear hour. Even when this significant growth in transit usage is accounted for, the OP still anticipates that automobile use will increase from about 185,000 person-trips to 240,000 person-trips in the afternoon peak hour, representing a 30% increase.

In general, the impacts associated with strategic widening are low in comparison to the benefits. Property impacts were minimized through the inclusion of retaining walls to contain the widening within the existing right-of-way where possible. As a result, property impacts resulting from the widening include some strips of property and one residential dwelling. Impacts on existing vegetation along the highway will be mitigated through the implementation of a landscaping plan, taking advantage of opportunities to enhance vegetation where possible.

The benefits of the strategic widening extend beyond the limits of the highway. The modelling of travel demand forecasting revealed that increased capacity on Highway 417 will tend to improve conditions on the City's arterial network as many drivers are attracted to a controlled access facility. By providing additional capacity along the existing Highway 417 corridor and focusing impacts there, impacts resulting from provision of additional east-west capacity along other corridors in Ottawa are minimized.

As discussed previously in this TESR, the additional capacity that the widening will provide on the Queensway will gradually be taken up as additional vehicles are attracted to the highway from adjacent roadways. Hence, during the peak a.m. and p.m. travel periods, the Queensway will continue to be congested; however, the extent and duration of the congestion will be significantly less after completion of the proposed widening and operations during non-peak times will be improved. The main benefits of the widening will therefore be realized on the adjacent road network during peak periods and on the Queensway during non-peak hours. The benefits to the Queensway are illustrated in **Figures 5.1 to 5.4** which show the INTEGRATION microsimulation results for Highway 417 in 2021 without (Do Nothing) and with the proposed strategic widening (Widened Queensway).

Integration & Operations Analysis Results
2021 a.m. Peak Period
Highway 417, (Ottawa Queensway)
Preliminary Design Study and Environmental Assessment from Highway 416 easterly to Anderson Road
MTO G.W.P 663-93-00



LEGEND

- Existing Interchange (Full Movements)
- Existing Interchange (Full Movements)
- Proposed Interchange

Integration
- Major Congestion*
- Congestion*

Operations Analysis
- LOS F
- LOS E

* Major Congestion = LOS F for > 1.5 hours
Minor Congestion = LOS F for ≤ 1.5 hours

N.T.S.

DO NOTHING – 2021 AM

FIGURE 5.1

Integration & Operations Analysis Results
2021 p.m. Peak Period
Highway 417, (Ottawa Queensway)
Preliminary Design Study and Environmental
Assessment from Highway 416 easterly
to Anderson Road
MTO G.W.P 663-93-00

LEGEND

- Existing Interchange (Full Movements)
- Existing Interchange (Full Movements)
- Proposed Interchange

Integration
- Major Congestion*
- Congestion*

Operations Analysis
- LOS F
- LOS E

* Major Congestion = LOS F for > 1.5 hours
Minor Congestion = LOS F for ≤ 1.5 hours

DO NOTHING – 2021 PM

FIGURE 5.2

N.T.S.

Integration Simulation Results
2021 a.m. Peak Period
Technically Preferred Alternative
Highway 417, (Ottawa Queensway)
Preliminary Design Study and Environmental
Assessment from Highway 416 easterly
to Anderson Road
MTO G.W.P 663-93-00

WIDENED QUEENSWAY – 2021 AM

FIGURE 5.3

N.T.S.

Integration Simulation Results
2021 p.m. Peak Period
Technically Preferred Alternative
Highway 417, (Ottawa Queensway)
Preliminary Design Study and Environmental
Assessment from Highway 416 easterly
to Anderson Road
MTO G.W.P 663-93-00

WIDENED QUEENSWAY – 2021 PM

FIGURE 5.4

N.T.S.

5.8.2 RAMPS FROM HIGHWAY 416 AND HIGHWAY 417 TO HOLLY ACRES ROAD

The primary concern on the common section of this ramp was a safety issue arising from the short weaving length available from the bullnose where the ramp from Highway 416 and from Highway 417 merge to the Holly Acres Road intersection. The alternative examined was to physically separate the two moves with a raised median and provide separate signal phases at the ramp terminal intersection. The relevant factors for the assessment of alternatives included safety, traffic operations and costs. Because the work required for the alternative to physically separate the ramp traffic from the two highways was contained within the existing right-of-way, potential impacts were minimized.

The ***do nothing alternative was recommended*** as a result of the evaluation. The alternative to separate the two movements would not function adequately at the ramp terminal, leading to other operational and safety problems.

The addition of a new ramp opposite the off-ramp at Holly Acres Road is discussed under Richmond Road South Side (Section 5.8.3.2).

5.8.3 RICHMOND ROAD INTERCHANGE

5.8.3.1 North Side

The primary concern was the curve radius on the E-NS off-ramp. The alternative examined was the realignment of the ramp to improve the radius. The base case was preferred for the north side of the Richmond Road interchange, i.e. modification of the ramps to fit with the widened highway. The relevant factors for the assessment of alternatives included impact on safety, future transit infrastructure, residential property and costs.

The ***do nothing alternative was recommended*** as a result of the evaluation. The improvement to operations that could be provided by the alternative was very minor and was not considered worth the impacts.

5.8.3.2 South Side

The loop ramp from southbound Richmond Road to eastbound Highway 417 would have to be closed to accommodate the proposed Queensway widening under the base case due to the limited distance between the ramp from Highway 416 to Highway 417 and the S-E ramp from northbound Richmond Road to Highway 417. The primary concern was the potential impact on the residences on Queensline Drive that would be required to fit the mainline configuration. The alternative examined was the closure of the existing Richmond Road on-ramps and the provision of a new on-ramp from Holly Acres Road. The relevant factors for the assessment of alternatives included impact on traffic operations, out of way travel, impact on pedestrians and cyclists, emergency response, property required, existing landscaping, impacts to Graham Creek, and costs.

The closure of the existing Richmond Road on-ramps and the construction of a new on-ramp from Holly Acres Road was recommended as it maintained full movements at this interchange serving a regional shopping centre as well as other significant development. The new ramp also had improved safety with fewer pedestrian and cyclist crossings of free-flow ramps.

The City of Ottawa and the public expressed some concerns about potential impacts on traffic operations by requiring northbound drivers to turn left at Holly Acres Road in order to access Highway 417. As a result, the intersection configurations at Richmond Road and Holly Acres Road and at Holly Acres Road and the ramps were reviewed. A double left turn lane was included on northbound Richmond Road and an additional lane on Holly Acres Road was added to receive the left turning traffic. At the request of the City, a transit priority "queue jump" lane was added to northbound Richmond Road and a transit stop was added to the new on-ramp on Holly Acres Road. Additional width will be added along northbound Holly Acres Road, to accommodate cyclists. The decision on the final placement and details of the bike lane will be determined during detailed design.

5.8.4 PINECREST RD/GREENBANK RD INTERCHANGE

5.8.4.1 South Side and Ashley Street Connection

The primary concerns were:

- The alignment of the S-E on-ramp is presently tighter than desirable and has a higher than expected collision frequency;
- The presence of the entrance ramp from Ashley Street to the W-NSE off-ramp does not meet driver expectations and has a negative impact on the operation of the off-ramp; and

For the alignment of the S-E on-ramp, the alternative considered was to improve the alignment. The relevant factors for the assessment of alternatives included impact on safety and vegetation and costs. ***The realignment of the ramp was recommended*** due to the potential for safety improvement with mitigatable impacts and minor costs.

For the Ashley Street connection, the alternative was to close the connection from Ashley Street to the ramp. The relevant factors for the assessment of alternatives included impact on traffic operations, out-of-way travel, safety (pedestrians and vehicles), traffic infiltration and costs. A traffic count on Ashley Street was undertaken to assess the impact of closure on traffic diversion. The do nothing alternative was recommended as a result of the evaluation. The alternative to close Ashley Street would result in unacceptable traffic infiltration within the local residential area as drivers would be forced to use local streets to access Highway 417 or Pinecrest Road. The presence of schools and parks and a significant population of children made this undesirable.

5.8.4.2 Widening

The width of Greenbank Road between the ramp terminal intersections compromises the length available for turning lanes and affects capacity. For the widening of Greenbank/Pinecrest Road, the alternative to the do nothing scenario was to construct six lanes between the ramp terminal intersections to provide for 2 through lanes/direction and full turning lanes for the ramp intersections. The relevant factors for the assessment of alternatives included impact on safety and cost. ***The do nothing alternative was recommended*** as a result of the evaluation. The alternative to widen the road would have no significant improvement in traffic operations because of the existing traffic patterns in the area. The minor safety improvement would not warrant the large capital expenditure required and therefore the do nothing alternative is recommended.

5.8.5 WOODROFFE AVENUE

5.8.5.1 Widening

The primary concern was the restricted sight distance over the crest of the bridge, resulting in a safety issue as northbound vehicles may encounter stopped vehicles in the left lane waiting to turn left but not have sufficient time to stop safely. Widening the bridge to provide a left turn lane over the crest of the bridge would largely eliminate that concern. The relevant factors for the assessment of alternatives included impact on traffic operations, safety, air quality, noise, homes, property and cost.

The widening to provide a left turn lane was recommended as a result of the evaluation. This received general support from the City and public, including the local community association. The improvement was considered warranted to address the safety issue at this location. The property impacts were minimized by widening to the east where one home fronts Woodroffe Avenue. The effects on air quality and noise impacts were determined to be negligible.

5.8.5.2 North Side

The primary concern was the collision experience at the E-N ramp and Woodroffe Avenue. Several alternatives were considered including removal of the existing channelization, provision of a parallel merge lane on northbound Woodroffe, realignment of the E-N ramp and the E-W transit ramp to meet Woodroffe Avenue at 90 degrees and reconfiguration of the interchange to have traffic heading both northbound and southbound on Woodroffe exit Highway 417 on the far side of the bridge (Parclo "B" configuration).

The relevant factors for the assessment of alternatives included impact on public transit, traffic operations, pedestrians and cyclists, safety, air quality, institutional and residential property, homes and costs.

The reconfiguration of the interchange to have traffic heading both northbound and southbound on Woodroffe exit Highway 417 on the far side of the bridge was recommended as a result of the evaluation, with the addition of a "transit-only" ramp that would allow continued operation of the bus service along Highway 417 that exits at Woodroffe Avenue and re-enters the highway (See Plan W-N-7(B) in Appendix N). This was considered essential by the City and therefore the preferred alternative was refined to include this feature. The transit-only ramp was designed to a 50 km/h design speed, recognizing that it would be restricted to use by buses being driven by professional drivers.

The interchange re-configuration addressed the safety issue at the E-N ramp and also eliminated another existing safety issue, the short weaving section on southbound Woodroffe Avenue between the E-S ramp and the N-E ramp. At present, vehicles exiting the westbound Queensway to head south on Woodroffe Avenue are provided with a loop ramp that requires them to yield to southbound Woodroffe drivers, some of whom are changing lanes to enter the eastbound Queensway via the on-ramp. This configuration creates a "weaving" conflict between these two traffic flows and requires pedestrians and cyclists to cross two free flow ramps. This weave results in operational and safety concerns. With the proposed configuration the weave will be eliminated. Traffic exiting the westbound Queensway will be controlled through a signalized intersection before entering Woodroffe Avenue. Additional storage lanes will be provided on the off-ramp approaching the intersection for vehicles exiting the Queensway.

The selection of this alternative also avoided the removal of several homes backing onto Highway 417 east of Woodroffe Avenue that would have had to be removed with the selection of other alternatives. Another advantage of the selected alternative is the improvement of pedestrian and cyclist safety through the removal of free-flow ramps as all traffic is directed through a signalized intersection. The increased delay for vehicles at the signalized ramp terminal intersection was considered an acceptable tradeoff for the improvement of safety. The reduction in institutional property impacts relative to the other alternatives was another benefit of this alternative.

5.8.5.3 South Side

The primary concern on the south side of Woodroffe Avenue was the configuration of the W-NS ramp terminal intersection. The elimination of the right turn channelizations and reconfiguration of the intersection was an alternative considered. The relevant factors for the assessment of alternatives included impact on traffic operations, pedestrians and cyclists and costs.

The reconfiguration to eliminate the free-flow right turn was recommended as a result of the evaluation. During the study, the City and the public requested that free-flow right turns be eliminated wherever possible to improve safety for pedestrians and cyclists. In the case of the south side of Woodroffe Avenue, the intersection could be reconfigured to include two left turn lanes and one right turn lane, maintaining reasonable traffic operations while eliminating the free flow right turns.

5.8.6 MAITLAND AVENUE WIDENING

The primary concern was the short northbound left turn lane at the E-NS ramp terminal intersection. The widening of Maitland Avenue over Highway 417 to provide a longer left turn lane for both directions was considered. The relevant factors for the assessment of alternatives included impact on traffic operations, safety, institutional property and cost.

The widening of Maitland Avenue to provide longer left turn lanes was recommended as a result of the evaluation. This was expected to be a longer term requirement to address future operational needs.

5.8.7 CARLING AVENUE INTERCHANGE

5.8.7.1 North Side

The primary concern was the short weaving length between the E-NSW ramp and Kirkwood Avenue. The addition of a raised median between the ramp and westbound Carling Avenue traffic was considered; however, this alternative was screened out due to unacceptable impacts on traffic operations at the intersection of Carling and Kirkwood Avenues.

During the evaluation process, the team raised a suggestion to provide a raised median separating the westbound left turn to Kirkwood Avenue from the through traffic on Carling Avenue, effectively prohibiting ramp traffic from weaving over to make that left turn. Because this potential solution would be confined to the City right-of-way, it was passed to the City for further consideration. **As a result, the do nothing alternative was recommended** at this location.

The traffic operational and safety problems in the vicinity of Carling and Kirkwood were well known by the public. The need for a solution was expressed by many people during the consultation process.

5.8.7.2 South Side

The primary concern on the south side of the Queensway at Carling Avenue was the configuration of the two on-ramps from eastbound and westbound Carling Avenue to the eastbound Queensway. At the present time, traffic entering the eastbound Queensway from eastbound Carling Avenue has a "lane away" and is not required to merge into other traffic as the fourth lane is added at this point. The length of the on-ramp from westbound Carling to the eastbound Queensway is substandard. With the addition of a fourth mainline lane to the west, both ramps will need to merge into through traffic in the future.

The relevant factors for the assessment of alternatives included impact on safety, commercial property, institutional property and cost.

Providing both ramps with acceleration lane lengths suitable for at least the posted speed limit was recommended as a result of the evaluation. The length of these speed change lanes was controlled by the width of the right-of-way and the presence of the Embassy property east of Island Park Drive.

5.8.8 ISLAND PARK DRIVE INTERCHANGE

The primary concern was the lack of a deceleration lane for the westbound off-ramp at Island Park Drive. A number of alternatives were considered including:

- Do nothing;
- Closure of the ramp;
- Addition of a deceleration lane;

- Replacement of the existing ramp with a loop ramp on the west side of Island Park Drive with a signalized intersection at the ramp terminal;
- Replacement of the existing ramp with a loop ramp on the west side of Island Park Drive with a roundabout at the ramp terminal; and
- Replacement of the existing ramp with a ramp on the west side of Island Park Drive connecting to a new local road between Island Park Drive and the Hampton Park ball diamonds.

At the evaluation team meeting, a refinement of the alternative for a new ramp with a roundabout at the ramp terminal was proposed. It included the reconfiguration of roads to include Merivale Road in the roundabout. The Project Team also noted that this alternative could partially address the westbound problems at Carling/Kirkwood by accommodating some of the traffic that now exits at Carling Avenue and proceeds south on Kirkwood Avenue to access areas south of the Queensway. This alternative was added to the list and evaluated.

The relevant factors for the assessment of alternatives included impact on intersection operations, out of way travel, pedestrian and cyclist safety, vehicle safety, air quality, park land, emergency response time, recreational and residential property, property access and cost.

The replacement of the existing ramp with a loop ramp on the west side of Island Park Drive with a roundabout at the ramp terminal was recommended as the technically preferred alternative in spring 2005. The benefits included better safety and operations as well as the opportunity to provide a link to Merivale Road, thus reducing the pressure on adjacent exits at Carling Avenue and Parkdale Avenue. The impacts included loss of land in Hampton Park.

Public consultation revealed opposition to the plan. A number of meetings with community groups were held and mitigation measures were investigated. Seasonal field investigation then revealed some additional natural environment issues with regard to vegetation and wildlife. During the course of further public consultation, opposition to any disturbance of Hampton Park was again documented. After further review, ***the do nothing alternative was recommended*** to be carried forward to the Recommended Plan.

5.8.9 PARKDALE AVENUE INTERCHANGE

5.8.9.1 North Side

There is a long history of concern with the existing westbound exit to Parkdale Avenue. The configuration of the ramp is such that it enters Westmount Avenue, which is a residential street, shortly after leaving the Queensway thereby mixing relatively high speed traffic exiting the freeway with lower speed local traffic, including pedestrians and cyclists. Over the years, several measures including enhanced signing, special lane marking, have been undertaken to mitigate this conflict with limited success.

A number of alternatives were considered including ramp closure, increased length of deceleration lane and ramp realignment to the south of Westmount Avenue.

The relevant factors for the assessment of alternatives included impact on homes, traffic operations and safety, out of way travel, municipal planning, emergency response time and costs.

The closure of the ramp, preferred by some members of the local community, was not considered acceptable for emergency response and was not in keeping with municipal planning for the area. It would add traffic to adjacent interchanges that are already handling significant volumes of traffic as well as to municipal roads. Further it would encourage traffic to "cut through" neighbourhoods to get to their destinations. Improvements to the deceleration lane would not address the fundamental problem of ramp traffic using Westmount Avenue to reach Parkdale Avenue.

The realignment of the ramp was recommended as a result of the evaluation. While it would require the purchase of 19 residences, it was recognised as the only alternative that would address the problem.

5.8.9.2 South Side

The primary concern on the south side of Parkdale Avenue was the length of the deceleration lane and the tendency of ramp traffic to back up onto Highway 417 during peak periods as traffic volumes increase. The alternatives considered included extension of the deceleration lane and construction of a full two-lane exit ramp.

The relevant factors for the assessment of alternatives included impact on operations and safety, emergency response, residential property and cost.

The issues with a full two-lane ramp included the need to lower existing underground services and the elevation of Holland Avenue, which was recently reconstructed, as well as additional residential property impacts.

The extension of the deceleration lane and the widening of the ramp to two lanes at the bullnose were recommended as a result of the evaluation. This provided the benefits of a two lane exit to a great extent without the additional impacts of the full two-lane exit. Most drivers exiting the eastbound Queensway at Parkdale Avenue are currently using the ramp as if it had a two lane approach, with default left and right turn lanes at the ramp terminal intersection. The preferred alternative formalizes the existing use, providing the appropriate shoulders and clearances.

5.8.10 BRONSON AVENUE TO METCALFE STREET

This downtown section of Highway 417 was considered as a unit to reflect potential impact on adjacent streets should ramps be closed or expanded or new ones proposed.

5.8.10.1 Westbound

The primary concern was the short weaving length between the Lyon Street on-ramp and the Bronson Avenue off-ramp and traffic operations issues involving the ramp terminal intersections and adjacent roadways. There were significant safety concerns with the short weaving section westbound due to the potential for high speed collisions on the mainline.

With the selection of mainline widening to four lanes east of Metcalfe Street and the presence of the existing three-lane section on Highway 417 westbound from Metcalfe Street to O'Connor Street, the alternatives considered were:

1. Base Case: Provide 2-lane forced exit at Metcalfe Street off-ramp; retain O'Connor Street on-ramp, Lyon Street on-ramp and Bronson Avenue off-ramp and on-ramp.

2. Provide 2-lane forced exit at Metcalfe Street off-ramp; retain existing ramps but restrict access to Lyon Street on-ramp during the am peak period and to Bronson Avenue off-ramp during the pm peak period through electronic signing and enforcement.

3. Provide additional westbound lane west of Metcalfe to eliminate 2-lane forced exit at Metcalfe Street ramp; close Lyon Street on-ramp; retain O'Connor Street on-ramp and Bronson Avenue off-ramp and on-ramp with modifications to fit mainline configuration.

4. Provide additional westbound lane west of Metcalfe to eliminate 2-lane forced exit at Metcalfe Street ramp; close O'Connor Street on-ramp and Bronson Avenue on-ramp; retain Lyon Street on-ramp and realign Bronson Avenue off-ramp.

5. Provide additional westbound lane west of Metcalfe to eliminate 2-lane forced exit at Metcalfe Street ramp; retain O'Connor Street on-ramp and Lyon Street on-ramp; close Bronson Avenue on-ramp; realign Bronson Avenue off-ramp.

The relevant factors for the assessment of alternatives included impact on safety and operations, pedestrian and cyclist safety, out of way travel, traffic infiltration, noise, landscaped areas, emergency response time, businesses and commercial property.

Alternative 4 listed above was screened out at the start of the evaluation due to the significant reduction in capacity for traffic wishing to enter Highway 417 when two of the existing three ramps are closed. Alternative 2, the time of day closure, was changed to allow full movement during the am peak.

The City was concerned with the impact on City streets with the closure of any existing ramps. Additional traffic analysis was undertaken to assess impacts. After considerable debate, assessment of impacts and consideration of possible mitigation measures, Alternative 2 was again modified such that the westbound on-ramp at Lyon Street would only be open during the p.m. peak period and closed at all other times of day. The rationale for this decision was to have the ramp active during the time when mainline speeds were most likely slower and when the need for more ramp capacity was the greatest (i.e. during the p.m. peak). At all other times of day the on-ramps at O'Connor Street and Bronson Avenue and the adjacent intersections are better able to cope with additional traffic demands. Hence, ***the closure of the Lyon Street on-ramp during all hours of the day except the PM peak hours was carried forward.***

5.8.10.2 Eastbound

The primary concern eastbound through the downtown was the queuing of existing traffic onto the eastbound mainline lanes during peak periods. The existing jog for traffic exiting at Bronson Avenue and continuing easterly exacerbates traffic operations in the section of Bronson Avenue between the ramp and Chamberlain Avenue. Extension of the deceleration lane and improvement of the ramp terminal intersection to remove the existing jog to Chamberlain Avenue was considered.

The relevant factors for the assessment of alternatives included impact on safety and operations, landscaping, institutional property and cost.

Extension of the deceleration lane and removal of the Ottawa Board of Education (OBE) maintenance building to eliminate the existing jog to Chamberlain Avenue was recommended as a result of the evaluation. Removal of the OBE building allows for the creation of a four-legged intersection at the ramp terminal to eliminate the jog. The potential for safety and operational improvements was considered significant.

Both City staff and members of the public expressed concerns about the proposed new intersection and mitigation measures were considered. One concern was the short storage distance available between Catherine Street and the proposed new intersection with Chamberlain Avenue for cars wanting to turn left. The rigid frame bridge carrying Highway 417 over Bronson Avenue would need to be completely replaced in order to provide more lanes on Bronson Avenue while maintaining sidewalks on both sides of Bronson. There is limited right-of-way on either side of Highway 417 to permit traffic to be maintained during any bridge replacement. Given this, City staff recommended that the southbound left turn be banned at the ramp terminal intersection. Instead, southbound traffic wishing to proceed easterly would be required to drive through the ramp terminal intersection and turn left at the existing Chamberlain (at Imperial Avenue) intersection with Bronson Avenue. From there, they would merge into the new section of Chamberlain Avenue. This concept was incorporated into the alternative for the final round of consultation. There was considerable discussion about this part of the plan during public consultation, although there was almost unanimous support for the elimination of the jogged intersection. The final configuration of the intersection at Bronson/Imperial is independent from the modifications at Bronson ramp terminal /Chamberlain intersection and will be dealt with in consultation with the City and local residents during the final design stage.

Local residents expressed concern about the potential for higher traffic speeds along Chamberlain Avenue and the associated safety risk for children walking to and from school. This concern was shared with the City for consideration as part of their area traffic management program, in coordination with other traffic studies being undertaken in the Glebe.

The Project Team did not believe that the reconfiguration of the intersection at Bronson/Chamberlain would have any significant affect on this existing problem because of the proximity of traffic signals and stop signs to the Bronson intersection. As a result of the foregoing, ***the alternative to re-align the ramp terminal intersection through the Ottawa Board of Education Building was recommended.***

5.8.11 NICHOLAS STREET INTERCHANGE

5.8.11.1 North Side

The primary concern was the radius of the ramp from southbound Nicholas to the westbound Highway 417. A larger radius was considered for this ramp.

The relevant factors for the assessment of alternatives included impact on safety and costs. At the evaluation meeting, potential impact on noise sensitive receivers was also discussed since the larger radius would bring the ramp somewhat closer to homes west of the interchange. Also of concern was the fact that by increasing the radius of the ramp, the on-ramp bullnose would have to be shifted westerly thereby shortening an already short weaving length between traffic entering the westbound Queensway from Nicholas Street and traffic exiting the Queensway at Metcalfe Street.

The base case, modify ramps to suit the proposed widening, was recommended as a result of the evaluation. The improvement in safety on the ramp was not considered significant in comparison to the trade-off on the weaving length and costs, based on the collision history and site conditions.

5.8.11.2 South Side

The primary concern on the south side of Nicholas Street was the radius of the ramp from eastbound Highway 417 to Lees Avenue and future traffic operations at the ramp terminal intersection. A minor realignment of the ramp to increase the radius and line up with Chestnut Street to permit future signalization of the intersection was considered and provided a slight increase in the weaving distance provided between traffic entering the eastbound Queensway at Metcalfe Street and traffic exiting the Queensway at Nicholas Street.

The relevant factors for the assessment of alternatives included impact on safety and operations and costs.

Realignment of the ramp was recommended as a result of the evaluation. Several residents along Chestnut Street and in the local neighbourhood expressed concern that ramp traffic would cut through their neighbourhood in order to avoid the Lees Avenue and Main Street intersection when heading for southbound Main Street. The Project Team did not consider this scenario to be likely, since Lees Avenue provides a more attractive route for traffic heading to Main Street. However, if a traffic infiltration problem materializes, then in consultation with the City, it could be addressed by signage to prohibit movements with appropriate enforcement.

5.8.12 VANIER PARKWAY/RIVERSIDE DRIVE INTERCHANGE

The primary concern was traffic operations on the Vanier Parkway. The City was concerned about operations at the intersection of Coventry Road and Vanier Parkway and suggested a two lane entrance to the westbound Queensway. This was not feasible given the short distance between the Vanier Parkway and Nicholas Street. Widening of the Vanier Parkway between the ramp terminals was also reviewed but screened out as it would not address the traffic issues.

The base case, modification of ramps to suit the proposed widening of Highway 417, was recommended.

5.8.13 St. Laurent Blvd/Ottawa Rd 174 Interchange

The segment from St. Laurent Boulevard to Ottawa Road 174, including the Aviation Parkway was examined as a unit due to the proximity of the interchanges.

5.8.13.1 Westbound

The primary concern was the short weaving distance provided for traffic exiting westbound Highway 417 at St. Laurent Boulevard and traffic from O.R. 174 wishing to continue westbound on Highway 417. Two alternatives were considered, in addition to the base case:

- Provide a combined ramp from O.R. 174 to Highway 417 EB (existing loop ramp) and to St. Laurent Boulevard (direct ramp along north side of westbound Highway 417); preclude access to St. Laurent Boulevard from Highway 417 WB;
- Provide combined access from Ottawa Road 174 to the Aviation Parkway (new direct ramp) and Highway 417 EB (existing loop ramp); preclude access to St. Laurent Boulevard from Highway 417 WB.

The relevant factors for the assessment of alternatives included impact on traffic safety and operations, areas of trees and shrubs, warm water fish habitat, emergency response level of service, access to commercial district, greenspace and cost.

Preclusion of access from Highway 417 westbound to St. Laurent Boulevard was a common feature of the two alternatives to the base case. This affects an estimated one third of the westbound traffic currently exiting to St. Laurent Boulevard. The alternative routes for this traffic would be via the Aviation Parkway to Ogilvie Road to St. Laurent Boulevard, via Innes Road to St. Laurent Boulevard or via Vanier Parkway to Coventry Road to St. Laurent Boulevard.

A combined ramp from O.R. 174 to St. Laurent Boulevard and from O.R. 174 to Highway 417 eastbound was recommended as a result of the evaluation. This alternative minimizes the impacts on the adjacent road network. It addresses existing safety and operational problems associated with the existing weaving section and the Labelle Street intersection. This configuration also provides sufficient storage length along the ramp to allow the intersection of the exit ramp and Labelle Street to be signalized.

The problems created by the current lane configuration were well recognized by the public and agencies. Generally the public was supportive of the proposed change; however, some people who will be required to change their route were concerned. The City was supportive of the possible addition of signals to the intersection of the exit ramp and Labelle Street but were concerned about possible impacts on traffic signal operation at other locations such as Ogilvie Road and St. Laurent Boulevard due to the change to the network, however these impacts could be mitigated with revisions to signal timings.

5.8.13.2 Eastbound

The primary concern was the short weaving distance for traffic entering Highway 417 at the St. Laurent Boulevard ramps wishing to continue eastbound to O.R. 174. The alternatives considered were:

- Base case – modify ramps to suit widened highway and close S-E ramp;
- Realign S-E ramp to preclude access to O.R. 174 (provide new ramp to Cyrville Road and from Cyrville Road to O.R. 174 eastbound);
- Realign and combine N-E and S-E on-ramps to preclude access to O.R. 174 (provide new ramp to Cyrville Road and from Cyrville Road to O.R. 174 eastbound);
- Close N-E and S-E on-ramps (access to O.R. 174 via Innes Road, Ogilvie Road and/or new Cyrville Road connection).

The relevant factors for the assessment of alternatives included impact on Highway 417 vehicle speeds, traffic operations and safety, network connectivity, warm water fish habitat, noise and air quality, residential access and residential property, egress from commercial district and cost.

The base case was recommended as a result of the evaluation. The impacts on Cyrville Road, egress from the St. Laurent commercial district and the out-of-way travel were significant concerns with the other alternatives. ***The base case partially addresses the safety concern on the mainline by closing the S-E ramp***, which has the shortest weaving length and the greatest collision risk associated with it. It also has the lowest traffic volume, indicating that the impact of closure would be least for this ramp.

Following the evaluation process, OC Transpo noted the importance of the S-E ramp to their operations, specifically getting buses from the garage to Orleans early in the morning for peak period service. They estimated significant cost resulting from the closure of this ramp due to the additional time required to use alternative routes. The retention of this ramp for transit-only use was recommended as part of the recommended plan as a mitigation measure. The entrance to the ramp from northbound St. Laurent Boulevard was modified to minimize the potential for use by other vehicles.

The problems associated with this location were well recognized by the public and agencies. The MTO will continue to work with the City to resolve traffic issues in this area.

5.9 Selection of the Technically Preferred Design Alternative (TPA)

5.9.1 Sensitivity Testing

The assessment and evaluation process for the selection of preferred alternatives recognized that the determination of weights to be applied to factor areas and factors is a matter of personal and professional judgment. Accordingly, it was essential to conduct sensitivity testing to determine the effect of changing the assigned weights. Sensitivity-testing was undertaken to determine if the result would have changed if different weights were used. This results in greater confidence in the selection process and the results.

Initial weights were be based on input from the evaluation team. Other weighting scenarios were based on input from MTAC and PAC. Questionnaires focused on establishing the relative weights that MTAC and PAC participants feel should be given to each environmental attribute were utilized during the second round of consultation activities. This provided the evaluation team with an understanding of community values with respect to the relative importance of each environmental factor.

Prior to carrying out the final selection of the TPA, the Project Team actively solicited input from members of PAC on the evaluation factors to the used and the relative weights to be applied for each factor. A limited number of responses were received and were included in the sensitivity analysis that was undertaken to test the rigour of the conclusions. In all cases, the weights identified by PAC members fell within the range of weights used by the evaluation team and therefore did not change the alternatives selected and at each location the selection of the TPA was rigorous. Further details on the evaluation methodology used are described in Section 3.2 of this TESR.

Based on the evaluation undertaken and the sensitivity testing completed using weights provided by the evaluation team as well as members of the Public Advisory Committee, the alternatives noted in **Table 5.4** were confirmed as technically preferred at each location:

Table 5.4 Summary of Technically Preferred Alternatives

Location	Preferred Alternative
Mainline	
Highway 416 to Carling Avenue	Widen to four basic lanes per direction
Carling Avenue to Metcalfe Street	Maintain existing number of lanes
Metcalfe Street to Nicholas Street	Widen to four basic lanes per direction
Nicholas Street to Ottawa Road 174	Widen to four basic lanes per direction
Ottawa Road 174 to Anderson Road	Widen to three basic lanes per direction
Interchanges*	
Holly Acres Road/Highway 416	Retain existing eastbound exit ramp configuration at Holly Acres Road
Richmond Road Interchange North Side	Modify ramps to fit mainline configuration; implement positive guidance measures on WB off-ramp
Richmond Road Interchange South Side	Close Richmond Road EB on-ramps; provide new EB on-ramp from Holly Acres Road
Pinecrest / Greenbank Road Interchange South Side	Modify S-E on-ramp curvature to improve safety
Pinecrest /Greenbank Road – Ashley Street	Retain existing Ashley Street connection to EB off-ramp
Woodroffe Avenue Widening	Widen Woodroffe Avenue to provide NB left turn lane for WB on-ramp
Woodroffe Avenue Interchange North Side	Reconfigure interchange into Parclo B configuration (combining the exit to northbound and southbound into one loop ramp on west side); provide direct transit ramp connection on east side)
Maitland Avenue Widening	Widen Maitland Avenue to provide NB left turn lane for WB on-ramp
Carling Avenue Interchange South Side	Extend acceleration lane for N/S-E and S-E on-ramps
Island Park Drive	Do nothing
Parkdale Avenue Interchange North Side	Realign WB off-ramp to the south
Parkdale Avenue Interchange South Side	Increase length of deceleration lane for EB off-ramp and formalize the two-lane approach to Parkdale Avenue
Bronson Avenue to Metcalfe Street WB	Provide lane drop on 417 west of Metcalfe St. ramp; retain O'Connor Street on-ramp; close Lyon St. on-ramp except during the p.m. peak; retain Bronson Avenue off-ramp and on-ramp
Bronson Avenue to Metcalfe Street EB	Lengthen deceleration for EB off-ramp at Bronson Avenue and widen ramp to 3 lanes approaching the ramp terminal intersection; realign Chamberlain Avenue
Nicholas Street Interchange North Side	Modify ramps to fit mainline configuration
Nicholas Street Interchange South Side	Realign EB off-ramp to Lees Avenue to line up with Chestnut Street
St. Laurent Boulevard Interchange North Side	Provide combined exit ramp to Highway 417 EB and St. Laurent WB off-ramp; preclude access to St. Laurent WB off-ramp from Highway 417 WB
St. Laurent Boulevard Interchange South Side	Modify EB off-ramp and N-E on-ramp to fit mainline configuration; close S-E ramp for general purpose traffic

* At all interchanges where mainline widening is proposed, the technically preferred alternative includes modifying the ramps to fit the mainline configuration.

6 DETAILED DESCRIPTION OF THE RECOMMENDED PLAN

6.1 MAJOR FEATURES OF THE RECOMMENDED PLAN

Following the technical evaluation and full consultation with the public (PIC #3), adjacent property owners, MTAC, PAC, City of Ottawa TC, and other interested agencies on the Technically Preferred Alternative, refinements were made and a Recommended Plan was carried forward

The Recommended Plan for the rehabilitation of Highway 417 from Highway 416 to Anderson Road is shown in **Appendix A, Plates 1 to 39**. In addition, typical highway cross-sections showing existing and post-rehabilitation (future) conditions are provided on **Plates 40 and 41**.

The major features of the Recommended Plan are as follows:

- Widen Highway 417 to four mainline lanes in each direction from Highway 416 to Carling Avenue and from Metcalfe Street to OR 174;
- Retain the existing number of mainline lanes from Carling Avenue to Metcalfe Street;
- Widen Highway 417 to three lanes in each direction from OR 174 to east of Walkley Road;
- Retain the basic horizontal and vertical Highway 417 mainline geometry throughout;
- Modify the interchanges at Richmond Road, Greenbank Road, Woodroffe Avenue, Carling Avenue, Parkdale Avenue, Bronson Avenue, Lyon Street, Nicholas Street and St. Laurent Boulevard to improve safety and traffic operations;
- Revise/enhance drainage system to accommodate proposed widening;
- Rehabilitate pavement, bridges and the illumination system as required;
- Expand and enhance the existing Advance Traffic Management System including additional pavement loop detectors, cameras, changeable message signs and queue end warning devices;
- Provide landscaping to replace displaced existing landscaping, to enhance existing plant materials, and to mitigate/improve aesthetics throughout the study limits; and
- Upgrade noise walls to current standards.

In accordance with the *Geometric Design Standards for Ontario Highways (GDSOH)*, the Queensway improvements will be designed for a design speed of 120 km/h, wherever possible. The design speed for a highway is generally set 20 km/h above the posted speed limit. The *GDSOH* also recommends that a design speed of 120 km/h be used for traffic detours required during the construction staging. In areas with significant constraints, the design speed may be reduced to 100 km/h to minimize impacts. In these cases, the posted speed on the highway is generally reduced during operation of the detours. The following design criteria will be met, where possible:

Table 6.1 Preliminary Design Criteria

Highway 417	Final Condition	During Construction
Lane width	3.5 m	3.5 m
Median shoulder width	As existing (min.) 3.0 m (max.)	1.0 m minimum
Outside shoulder width	As existing (min.) 3.0 m (max.)	1.0 m minimum
City Streets		
Lane width	As existing 3.35 m – 3.66 m	3.0 m – 3.66 m
Sidewalk width	As existing 1.8 m – 3.84 m.	Minimum 1.5m, as existing or closed

6.1.1 MAINLINE WIDENING

As noted above, mainline widening is proposed as follows:

- Highway 416 to Carling Avenue – Add 1 lane per direction;
- Carling Avenue to Metcalfe Street – No widening proposed;
- Metcalfe Street to Ottawa Road 174 (the Split) – Add 1 lane per direction;
- Ottawa Road 174 to east of Walkley Road – Add 1 lane per direction.

6.1.1.1 Highway 416 to Carling Avenue (Plates 1 – 14: Appendix A)

The addition of the new lane in each direction will be accomplished as follows:

- Add the new lane to the outside of the existing right hand lane in both directions;
- Eliminate existing continuous auxiliary lanes between interchanges. These lanes will become the new through lanes and new off and on-ramps will be added;
- Limit the amount of property required by using retaining walls wherever possible. Low height retaining walls have been specified extensively within this section. See Plates in Appendix A for locations;
- Construct small retaining walls beneath the bridges at Pinecrest/Greenbank and Woodroffe to provide for the additional lane;
- Reconstruct the existing drainage system to accommodate runoff from the widened pavement;
- Reconstruct the existing Queensway Transitway Station to accommodate an additional lane per direction. This will be accomplished by minor reductions in shoulder/offset widths and a minor reduction in the pedestrian platform. All current pedestrian and bus movements will be retained;
- Utilize the widened Highway 417 platform built under the *Bridge Rehabilitations EA Study – G.W.P. 4058-01-00 – From Maitland Avenue to just east of Island Park Drive* to accommodate the additional lane. No further platform widening is required within these limits (Plates 11 – 14; Appendix A). The environmental impacts, concerns and proposed mitigation measures associated with this work, including the property acquisition requirements and the landscaping treatments, were addressed as part of the Bridge Rehabilitations Class EA Study.

6.1.1.2 Carling Avenue to Metcalfe Street (Plates 15 to 20: Appendix A)

No widening is proposed within these limits except for a minor widening on the north side just west of the Metcalfe Street off-ramp. This is required in order to improve the transition from the 4 lane section to the east of Metcalfe to the 3 lane section west of Metcalfe. The Metcalfe Street Bridge will have to be widened by 4m on the north side only and this will require a slight lowering of the profile on Metcalfe Street in order to maintain appropriate vertical clearance between the underside of the bridge and Metcalfe Street.

6.1.1.3 Metcalfe Street to Ottawa Road 174 (the Split) (Plates 21 to 29: Appendix A)

Widening by one lane per direction within these limits will be accomplished in a similar manner to the Highway 416 to Carling Avenue section as described above. In addition, the following measures will be undertaken:

- Widen the bridge over Elgin Street by up to 8.5 m on the north side only. It appears that adequate vertical clearance exists so that Elgin Street will not have to be lowered to maintain vertical clearance between the bottom of the widened bridge and Elgin Street;
- Widen the Rideau Canal Bridge by 6.1 m on the north side only. This will be accomplished in consultation with Parks Canada to ensure that impacts to the Canal and surrounding lands are minimized

both during and after construction. There will be no impact to Queen Elizabeth Driveway or Colonel By Drive as a result of this widening;

- Incorporate a retaining wall on the south side between Colonel By Drive and Main Street to minimize impacts to the green space located in this area;
- Widen the Main Street Bridge by up to 3.3 m on both sides. Main Street will have to be lowered by up to 0.3 m on the north side to maintain vertical clearance between the underside of the widened bridge and Main Street;
- A new retaining wall will be added on the north side from Concord Street North to the Rideau Canal to limit property impacts;
- The existing piers of the Nicholas Street underpass will have to be relocated in order to provide enough horizontal clearance beneath the bridge to fit in the additional mainline lanes. During construction, minor traffic impacts are expected but the bridge will remain open to traffic. Minor shifts in the Queensway lanes will also be required for the construction but no lane closures are anticipated;
- The existing bridge over the Southeast Transitway will have to be widened by up to 3.3 m on the north side and up to 5.1 m on the south side. The Transitway operations will be largely unaffected by these works and any closures to erect new beams would occur in off-peak hours in consultation with OC Transpo;
- The existing Lees Avenue Bridge will have to be replaced in order to provide for the widened Queensway. A new bridge will be built slightly to the east of the existing bridge. This bridge will be built in two halves in order to keep the new bridge as close as possible to the existing bridge. The east face of the new bridge will be about 11 m east of the present bridge. One traffic lane per direction and a single sidewalk on one side will be maintained at all times during construction. Lane widths will be reduced during construction;
- The Rideau River Bridge will be widened on both sides. The maximum widening on the north side will be up to 3.65 m and on the south side up to 6.1 m to accommodate the EB off-ramp to Vanier Parkway. In-water work will be required in order to widen the bridge piers. Alternatives to widen the bridge without the need to widen the piers were investigated but rejected for technical reasons;
- The St. Laurent Avenue underpass will be widened on both sides. The maximum widening on the north side will be 2.4 m and 1.1 m on the south side;
- The existing Cyrville Road Bridge located just east of St. Laurent Boulevard will be replaced in order to accommodate a widened Highway 417. The new bridge will be built in the same location as the existing bridge and will be constructed in stages in order to maintain traffic during construction. One traffic lane per direction and a single sidewalk will be maintained at all times during construction. Lane width restrictions will be required during the construction period.

6.1.1.4 Ottawa Road 174 to east of Walkley Road (Plates 30 to 39; Appendix A)

Widening of one lane per direction will be accomplished by adding lanes to the median. The transition from widening to the outside of Highway 417 west of OR 174 to widening to the inside of Highway 417 will occur through the horizontal curves located within the interchange. Most of the bridges are of sufficient width to accommodate the additional lane without further widening except for the CNR bridges located east of Walkley Road. The eastbound bridge will be widened by up to 3.2 m and the existing westbound bridge will be widened by up to 4.6 m. Both bridges will be widened on the median side only. Within these limits, several culverts will require lengthening within the median. Fisheries compensation requirements will be negotiated with the Ministry of Natural Resources and/or Department of Fisheries and Oceans as required during detail design. Preliminary compensation strategies were proposed as part of this study. The new lanes will terminate approximately 2 km east of Walkley Road in the vicinity of a potential future Hunt Club Road interchange. That interchange is part of a separate Environmental Assessment Study by the City of Ottawa.

6.1.2 INTERCHANGES

In order to accommodate the proposed widening, modifications will be required to the ramps at most interchanges within the limits of the proposed widening (Highway 416 to Carling Avenue and from Metcalfe Street to east of Walkley Road). In most cases, these modifications are minor and are restricted to several hundred metres of ramp as it joins or leaves the Highway 417 mainline lanes. These modifications are generally minor; however, as outlined in Section 6.1.8, there are several isolated areas where small strips of property will be required. At some interchanges, more significant modifications are proposed to improve safety and traffic operations. This work is described below. Plans of the proposed works are located in **Appendix A** of this TESR.

6.1.2.1 Richmond Road Interchange (Plates 2 – 4; Appendix A)

In order to accommodate an additional eastbound lane on Highway 417 east of Richmond Road, it is proposed to close both of the current eastbound on-ramps from Richmond Road and replace them with a new eastbound on-ramp accessed from Holly Acres Road. This will eliminate the need to acquire property from the residential properties that abut the Queensway on Queensline Drive. This new single lane ramp will be constructed opposite the existing off-ramp to Holly Acres Road from Highway 416 and Highway 417 eastbound. The ramp terminal intersection will accommodate a transit priority lane and bus stop on the north side of the new on-ramp. A culvert extension of approximately 16 m long wide will be required to carry the new ramp over Graham Creek. In addition, improvements will be required to the intersection of Holly Acres Road and Richmond Road to accommodate the changed traffic patterns. The existing southbound right hand lane that presently exits at the N-E ramp at Richmond Road will be extended to Holly Acres Road where it will become a right turn lane. An additional lane will be added on Holly Acres Road which will become the right turn lane to the new eastbound on-ramp. For northbound Richmond Road traffic, the left turn lane to Holly Acres Road will be lengthened and a second left turn lane will be added to accommodate the increased number of left turns at this intersection. A northbound bus priority lane will be added to improve transit operations along Richmond Road. All of the noted work will be accomplished within the existing municipal and Ministry rights-of-way. Therefore, no additional property is required.

6.1.2.2 Pinecrest/Greenbank Road Interchange (Plates 5 – 6; Appendix A)

Modifications to the ramps on the south side are minor. The Ashley Street connection will be maintained.

On the north side, in the northwest quadrant, the existing ramp from southbound Pinecrest to the westbound Queensway will be closed and replaced with a new ramp in the same quadrant. This new ramp is required to accommodate the future West Transitway and provides for a greater weaving distance between the Pinecrest westbound on-ramp and the off-ramp at Richmond Road. On the south side, the ramp in the southeast quadrant, from northbound Greenbank to the eastbound Queensway will be slightly realigned to improve safety. There are no property impacts associated with these recommendations.

6.1.2.3 Woodroffe Avenue Interchange (Plates 8 – 9; Appendix A)

On the south side, the existing free flow right turn from the eastbound off-ramp to southbound Woodroffe will be removed to improve pedestrian and cycling operations and will be replaced with a "T" intersection.

On the north side, the existing westbound off-ramp will be closed to general traffic and modified for use by transit vehicles only. Westbound traffic exiting Highway 417 at Woodroffe Avenue will use a loop ramp (E-NS) on the west side of Woodroffe Avenue regardless of the direction they are headed on Woodroffe. A signalized intersection at the end of the E-NS ramp will control traffic entering Woodroffe Avenue. Drivers wishing to head north on Woodroffe, will make a left turn and drivers heading south will make a right turn. The removal of the existing free-flow entries from the ramps to Woodroffe Avenue will improve pedestrian and cyclist safety. The Woodroffe Avenue bridge will be widened by 4.3 m on the east side in order to add a new northbound left turn lane to facilitate left turns and improve safety for northbound Woodroffe traffic.

6.1.2.4 Maitland Avenue Interchange (Plate 10 – 11: Appendix A)

Modifications to the ramps at Maitland Avenue are minor. The existing northbound left turn lane on Maitland Avenue will be lengthened to accommodate projected increased traffic demands. This will require a widening of the existing bridge on the east side by 5.4 m.

6.1.2.5 Parkdale Avenue (Plates 15 – 16: Appendix A)

The EB off-ramp will be lengthened by about 200 m to provide additional storage on the ramp. This will require a widening of the Holland Avenue Overpass by up to 3.2m on the south side only. The ramp will be slightly widened as it approaches its intersection with Parkdale to formalize left and right turn lane delineation. Retaining walls will be used to limit the construction works to within the boundaries of the existing Highway 417 right-of-way.

On the north side of the Queensway, the existing westbound off ramp will be realigned to the south by approximately 15 m. This will require the displacement of the 19 homes located on the south side of Westmount Avenue. The homes on the north side of Westmount Avenue will not be affected. The new ramp will be separated from Westmount Avenue by a landscaped buffer, which will include a new noise barrier. The ramp will intersect Parkdale Avenue just south of the existing Westmount Avenue intersection opposite the existing westbound on-ramp. The existing Westmount Avenue intersection will be converted to a right out only, since it is too close to the new ramp intersection to function as a full intersection.

6.1.2.6 Bronson Avenue (Plates 18 – 19: Appendix A)

There are no changes proposed to the Bronson Interchange on the north side.

On the south side, the eastbound off-ramp will be lengthened by about 300 m to allow for increased storage on the ramp. This will necessitate a widening of the Booth Street Overpass by up to 3.5 m on the south side only. This recommendation will reduce the incidence of drivers stopping in the right lane of the Queensway as they wait to travel through the ramp terminal intersection. The existing Ottawa Board of Education building on the east side of Bronson Avenue opposite the off-ramp will be removed. Chamberlain Avenue will be realigned to the north to line up opposite the ramp, thereby eliminating the jog for motorists exiting the eastbound Queensway at Bronson who wish to travel eastbound on Chamberlain Avenue. This change will improve the efficiency and operation of the intersection.

Ongoing discussions with the City of Ottawa and the Glebe Community Association must occur during final design to decide on the operation of the Bronson/Chamberlain/Imperial Avenue intersection. The recommended plan would prohibit the southbound left turn from Bronson Avenue to Chamberlain at its relocated position with the left turn accommodated at its present location at Imperial Avenue. There was considerable discussion about this part of the plan at the final round of public consultation even though there was almost unanimous support for the elimination of the "jogged" intersection. The final configuration of the intersection at Bronson/Imperial is independent from the modifications at the Bronson/Chamberlain intersection and will be dealt with in consultation with the City and local residents during the final design stage and is independent of this EA.

6.1.2.7 Lyon Street Interchange (Plate 19: Appendix A)

The westbound on-ramp from Lyon Street will be closed except for the p.m. peak travel period. The existing ramp is too close to the existing off-ramp to Bronson Avenue resulting in safety concerns, particularly when travel speeds on the Queensway are high. The speed differential between slow moving ramp traffic and high speed Queensway traffic cannot be safely accommodated in the short distance between the on and off ramps. However, during the p.m. peak travel period, speeds on the Queensway are generally lower, reducing the risk of severe collisions. During this period the alternative routes for downtown traffic to the westbound Queensway (O'Connor, Catherine, Bronson) are congested and so opening the Lyon Street on-ramp to traffic during this time period will avoid significant degradation of traffic operations and safety along other routes.

6.1.2.8 Nicholas Street Interchange (Plates 21 – 23: Appendix A)

Modifications at this interchange are minor. The primary concern was the radius of the ramp from eastbound Highway 417 to Lees Avenue and future traffic operations at the ramp terminal intersection. A minor realignment of the ramp to increase the radius will improve the safety of the ramp and line it up with Chestnut Street to facilitate future signalization of the intersection. It will also provide a slight increase in the weaving distance between traffic entering the eastbound Queensway from Metcalfe Street and traffic exiting the Queensway at Nicholas Street. The ramp intersection with Lees Avenue will move approximately 40 m to the east to line up with Chestnut Street. Signalization of the new intersection is not presently warranted.

6.1.2.9 St. Laurent Boulevard Interchange (Plates 27 – 29 : Appendix A)

On the south side, the existing S-E ramp will be closed to general traffic. It will be retained for OC Transpo and emergency vehicle use only, with minor modifications. This ramp has a relatively low traffic volume, but has a very high collision history owing to the short distance between the ramp and the split to OR 174.

On the north side, the movement from Highway 417 to St. Laurent Boulevard will be eliminated through the introduction of a concrete barrier located between the Highway 417 mainline and the St. Laurent off-ramp. Traffic wishing to access St. Laurent Boulevard from Highway 417 westbound can access via Innes Road or continue on the Aviation Parkway to Ogilvie Road. The westbound off-ramp will be extended to the east and will be accessed from OR 174 at a combined Highway 417 eastbound/St. Laurent Boulevard ramp. This revision, in conjunction with the proposed mainline widening will result in the two westbound lanes from OR 174 continuing beyond St. Laurent Boulevard. At present, one of these lanes is forced off at St. Laurent Boulevard while the other continues to the west.

6.1.3 Advanced Traffic Management Systems (ATMS)

The existing Highway 417 ATMS system consists of a number of cameras generally located on private buildings located adjacent to the Queensway, and a series of traffic loops buried in the pavement to detect vehicle flow. The loops and cameras are linked to the MTO control centre located at the MTO Office on Tremblay Road. In recent years, a number of small portable ground-mounted changeable message signs have been installed to give motorists real time traffic information. As part of this project, this system will be significantly enhanced as follows:

- General expansion of the coverage of the existing system to extend as far west as Highway 7 and to Anderson Road in the east and on Highway 416 to south of Hunt Club Road;
- Adding new cameras located on MTO property to improve visual coverage of the highway;
- Enhancement to the communications systems;
- Installation of permanent overhead changeable message signs to improve communications to the driver;
- Installation of additional portable message signs;
- Adding new pavement detectors to enhance the system operation; and
- Installation of queue end warning devices along the Queensway to advise motorists of stopped vehicles in the lane ahead of them but which may be obscured from their view by the median barrier.

Details on the proposed changeable message signs are presented in the Table 6.2 and are subject to revision during the final design phase.

Table 6.2 Proposed Changeable Message Signs

FUNCTION	EASTBOUND					WESTBOUND			
	416 NB S. of Hunt Club	417 EB at Moodie	417 EB W. of Woodroffe	417 EB W. of Nicholas	417 EB at Belfast (1)	174 WB at Blair (2)	417 WB S. of Innis	417 WB at Belfast	417 WB at Loretta
SIGN TYPE	Roadside	Overhead	Overhead	Roadside	Overhead	Overhead	Overhead	Roadside	Overhead
1. MTO NETWORK MANAGEMENT • In advance of freeway/freeway I/C		✓			✓	✓	✓		✓ (3)
2. INCIDENT MANAGEMENT • Queue end warning and blockage information along corridor	✓	✓	✓	✓	✓	✓	✓	✓	✓
3. CONGESTION MANAGEMENT • Queue end warning, extent of congestion and travel time information along corridor		✓	✓	✓		✓	✓	✓	✓
4. WORK ZONE MANAGEMENT • Advance information, queue end warning and lane management	✓	✓	✓			✓	✓		
5. AMBER ALERT/EMERGENCY MANAGEMENT • Priority system-wide messaging	✓	✓	✓	✓	✓	✓	✓	✓	✓

NOTES:

1. Conditional upon City of Ottawa capability to provide RR 174 Traffic Monitoring.
2. Subject to co-ordination with City of Ottawa.
3. Capability to provide information on major events/closures on Hwy 416 and west portion of Hwy 417.

6.1.4 DRAINAGE

The Highway 417 right-of-way within the study limits is currently drained by a median storm sewer system from Richmond Road to OR 174. In some areas, this closed drainage system exists on the side(s) as well as in the median in order to limit the footprint of the highway and its impacts on adjacent lands. In other areas, primarily outside of the downtown area, the drainage on the outside is accomplished by open roadside ditches. East of OR 174, drainage is accomplished by roadside ditches outletting into natural watercourses. In general, the existing drainage concept will be retained and the additional runoff created by the increase in pavement area necessitated by the recommend widening, will be managed within the Highway 417 right-of-way to limit the post construction flows to be equal to preconstruction flows. This will be accomplished through the use of underground storage using oversized pipes with outlet controls to manage flows or revisions to roadside ditches.

6.1.5 ILLUMINATION

In general, the existing illumination concept will be retained. The existing high mast illumination system in the east end will be extended to east of Walkley Road during the planning horizon of this project. The conventional illumination system in the balance of the corridor provides an appropriate level of service and will generally be retained. Selective replacement of lighting system components will be required for maintenance purposes over the course of the planning horizon and some relocation will be required in order to accommodate changes to ramps at interchanges as well as traffic staging during construction.

6.1.6 BRIDGES

During the planning horizon of this study (2021), all of the existing bridges will require some form of rehabilitation to maintain their functionality. Typically, these bridge rehabilitations will be included with other adjacent work on the mainline or interchanges in order to minimize the overall impact to the public. In addition to rehabilitation, the following bridges will require more extensive work to accommodate the Recommended Design: (Note: impacts to the bridges from east of Maitland Avenue to Island Park Drive were addressed in the separate EA prepared for the *Bridge Rehabilitations Study; G.W.P. 4058-01-00.*)

- Woodroffe Avenue – widening to add 1 additional NB turning lane;
- Maitland Avenue – widening to add 1 additional NB turning lane;
- Holland Avenue – widening on south side to accommodate and extension to the EB Parkdale off-ramp;
- Metcalfe Street – widening on the north side to accommodate runout of widening to the east;
- Elgin Street – widening on the north side to accommodate mainline widening;
- Rideau Canal – widening on the north side to accommodate mainline widening;
- Main Street – widening on both sides to accommodate mainline widening;
- Nicholas Street – modifications to bridge piers to accommodate mainline widening;
- Southeast Transitway – widening on both sides to accommodate mainline widening;
- Lees Avenue – bridge replacement to accommodate mainline widening;
- Rideau River – widening on both sides to accommodate mainline widening;
- St. Laurent Blvd. – widening on both sides to accommodate mainline widening;
- Cyrville Road just east of St. Laurent – bridge replacement to accommodate mainline widening; and
- CP Railway - 2 bridges – widening on median side to accommodate mainline widening.

In addition to the noted bridges, many of the existing retaining wall will require rehabilitation/replacement during the planning horizon of this EA. The locations and extent of this work will be determined during the detail design phase.

6.1.7 CONSTRUCTION STAGING

The work described in this report will be constructed in a series of construction contracts. Discrete packages of work will be developed that can be implemented independently of each other and that can be staged over several years. The following factors will be considered in developing these proposed packages of work:

- Priority of need;
- System continuity and lane balance; and
- The ability to combine works into logical packages so that traffic impacts are minimized for all users; and
- Opportunities for grouping work.

The decision to not widen the Queensway from Carling to Metcalfe will have construction staging consequences during the rehabilitation of the Queensway Overpass Bridges in the downtown area. Within the planning horizon of this study, all of the bridges will require some form of rehabilitative construction to keep them functional. In order to accomplish this, the bridge deck area must be exposed for extended durations of time to carry out the rehabilitation work. In all cases, this will result in significant impacts to Queensway and local traffic as traffic that would otherwise use the Queensway seeks alternative routes when the Queensway lanes are reduced to carry out the construction. Several options will be considered during the detail design of these bridge repairs. These include:

- Closures of one lane per direction for a complete construction season;
- Full directional closures for several weekends during the course of several construction seasons; and
- Partial closures on weekends/nights during the course of one or more construction seasons.

The actual approach will be determined during detailed design in consultation with the City of Ottawa, OPP, Emergency Services, the NCC, and the general public. The selected approach will be determined by the condition of

each bridge at the time of construction and this information will not be known until detail design activities, including detailed bridge condition surveys, are undertaken in the future. Traffic Management Plans will be developed in order to best manage traffic disruptions and to communicate the lane closures and/or restrictions to the public. Contract incentives/disincentives for early construction completion will be considered at the final design stage in order to minimize overall impacts.

6.1.8 PROPERTY REQUIREMENTS

Property requirements fall into two categories: outright property purchase to accommodate highway improvements, or Temporary Limited Interest (TLI), which is property that is only required for the duration of the road construction activities to facilitate the construction operations. TLI properties are rehabilitated and returned to their original owner at the completion of the construction period.

Property requirements are illustrated on the Recommended Plans in **Appendix A.** Retaining walls have been incorporated extensively into the design to minimize properties impacts. In general, permanent property impacts involve narrow strips or triangles of land (depth from 1 m to 10 m) from landscaped or vegetated fringes of properties along Highway 417 except for Westmount Avenue where the existing 19 homes on the south side are required in order to build the new ramp. In some cases, the impact includes a portion of the parking area for a building. The land uses affected include residential (Westmount Avenue and Concord Street), commercial (businesses, retail), institutional (church, municipal facilities) and recreational (open space). No property accesses are affected by the proposed property acquisition.

Property is required in the following locations. The requirements shown in Table 6.3 assume that the property required to construct the West Transitway has/will be acquired by the City of Ottawa.

Table 6.3 Property Requirements

Location	Description	Permanent	Temporary Limited Interest
Pinecrest Shopping Centre	10 m wide x 100 m long strip along Baxter Road east of the restaurant and bank		X
Charlotte Lemieux School area	Up to 10 m wide and 500 m long strip	X	
Charlotte Lemieux School area	1500 m long by 10 m wide strip		X
Killarney Drive	2 residential properties affected – a strip ranging from 0 m to 5 m wide	X	
Woodward Drive	Strip ranging in width from 0 to 7 m approximately 130 m long – two commercial properties affected	X	
Holland Ave – south east quadrant	Small triangle 20 m long and 7 m deep	X	
Westmount Avenue	All properties on south side of Westmount Avenue abutting Highway 417 (19 homes)	X	
Orangeville Street	Strip about 35 m long and 5 m wide on north side of Orangeville Street between Lebreton Street South and Bell Street South	X	
Chamberlain/Bronson	Ottawa Carleton Board of Education Building and surrounding lands	X	
Hawthorne/Concord Street South	Strip of intuitional land about 100 m long and up to 7 m wide and garage	X	
East of Nicholas Street	South side – strips of land up to 300 m long and 10 m wide	X	
Hurdman Road	Small triangle about 60 m long and up to 3 m deep		X
Tremblay Road	Strip of municipal land on south side of Queensway between East Transitway – up to 250 m long and 3 m wide		X
Cyrville Road	Block of land along Cyrville on north side of Queensway	X	

The areas disturbed as a result of construction will be restored in consultation with affected property owners.

6.1.9 PROPOSED ROAD CLOSURES

There are no proposed permanent road closures as part of the recommendations of this plan.

Ramp closures are described in Section 6.1.2 and include closure of the Lyon Street on-ramp during most hours of the day and the permanent closure of the ramp from northbound St. Laurent to Highway 417 eastbound for general purpose traffic. The ramps on the south side of Richmond Road will be closed but the moves will be accommodated on a new ramp.

6.2 ENVIRONMENTAL ISSUES AND COMMITMENTS

Areas of environmental sensitivity or concern associated with the Recommended Design, as well as proposed mitigation measures are described in the following sections.

6.2.1 NATURAL ENVIRONMENT

6.2.1.1 Fisheries and Aquatic Ecosystems

The Recommended Design will require the extension of three culverts as well as extensions to bridge piers to accommodate widening of the Queensway over the Rideau River and Rideau Canal bridges (6 piers in total). These modifications may result in a harmful alteration, disturbance or destruction of fish habitat (a "HADD") and may require compensation in accordance with the *DFO Fish Habitat Conservation and Protection Guidelines for Attaining No Net Loss*. Following is a description of the anticipated impacts and preliminary proposed mitigation. Site specific mitigation measures will be finalized during detailed design and documented in the Design and Construction Report.

Mitigation during construction will include:

- Restricted timing for in-stream works (July 1 through March 15);
- Use of cofferdams and/or flow diversions to allow in-water work to be completed in the dry;
- Temporary pumping of stream flows to avoid interference with downstream flows (if appropriate);
- Restriction of activities adjacent to all watercourses (i.e. storage of materials, refueling and excess material placement); and
- Prevention of sediment and debris from entering watercourses through the use of silt fencing, check dams and other standard debris capture devices.

If it is confirmed that there will be a harmful alteration, disturbance or destruction of fish habitat (HADD) at the crossings of Graham Creek, the Rideau Canal and/or the Rideau River, a fisheries compensation plan will need to be developed during detail design and submitted to DFO for approval and Federal Fisheries Act authorization secured for the proposed work.

Culvert extensions are necessary for 1.2 m diameter CSPs under the northbound (westbound) lanes of Highway 417 (at approximately survey chainage 18+700) and under the southbound (eastbound) lanes (at approximate survey chainage 18+575). These culverts convey ditch drainage from the west side and across the median to the east side of the highway during storm events. There is no fish habitat associated with these culverts. Extensions to the northbound inlet (approximately 16 m) and southbound outlet (approximately 4 m) are proposed to permit highway widening. Shrub plantings at disturbed culvert ends and the use of a native species seed mix should adequately mitigate impacts of the local removal of ground cover.

At Graham Creek (16+500) a 16 m extension is proposed to the open footing box culvert. This culvert can be extended with the existing open footing design; thus, the streambed can be maintained in its existing state. A potential 80 m^2 of aquatic habitat (5 m wide channel by 16 m extension) may be impacted. Should a HADD be identified here, substrate enhancements over disturbed areas of the streambed and native, indigenous shrub plantings on disturbed areas of streambank should provide adequate compensation for disruption of aquatic habitats as a result of the construction.

Pier extensions ranging from 4 to 5 m upstream and 3.6 m downstream are proposed for the four existing in-water piers supporting the Rideau River bridge, resulting in the loss of approximately 122 m^2 of river bed (4 piers by 4.5 m average extension by 3.75 m wide plus 4 piers by 3.6 m extension by 3.75 m wide). In order to compensate for this loss of fish habitat it is recommended that a 1 m wide band of 75-300 mm diameter river stone be placed entirely around each of the four extended piers, thus providing approximately 310 m^2 of enhanced streambed habitat.

Use of river stone around the two 6 m pier extensions on the downstream (north) side of the Rideau Canal bridge will provide approximately 146 m^2 of enhanced streambed habitat in compensation for an estimated loss of 45 m^2 of canal bed.

6.2.1.2 Terrestrial Ecosystems

The Recommended Design requires the removal of small amounts of vegetation at the edge of several landscaped areas that provide wildlife habitat, as well as the removal of several mature trees. Since the vegetation removal requirements are relatively minor, the resulting impact to wildlife habitat will be also minor. Mitigation measures will include tree protection for those trees to remain and tree replacement where feasible, where mature trees are to be removed. A preliminary landscape master plan was developed to mitigate for the loss of existing vegetation in areas disturbed by construction as described in **Section 6.2.2.4**.

6.2.1.3 Surface Water

The Recommended Design will not alter the main surface water flows within the study area. However, the increased pavement area in several locations will result in increased runoff. In order to minimize impacts on the watercourses and receiving systems, underground detention is proposed to reduce the runoff to pre-construction rates. The use of underground storage instead of stormwater ponds is required because the developed nature of the lands adjacent to the Queensway does not provide opportunity for appropriate pond sites. Further details are provided in the *Stormwater Management Report* located in **Appendix I.**

6.2.1.4 Greenways and Open Space Linkages

The Recommended Design requires the removal of limited amounts of vegetation to accommodate the mainline and interchange modifications. While the removal of vegetation will alter the limit of the existing greenways and open space linkages, it will not alter the continuity, function and presence of these features. No mitigation is warranted or proposed.

6.2.2 SOCIAL-ECONOMIC ENVIRONMENT

6.2.2.1 Land Use

The Recommended Design requires permanent property acquisition at the following locations:

- Strip in southeast quadrant of the Woodroffe Avenue interchange to accommodate the mainline widening and the associated realignment of S-E on-ramp (required land is vacant; abuts school site);
- Strip in northwest quadrant of Maitland Avenue interchange to accommodate the mainline widening and the associated realignment of the N/S-W on-ramp (required land is residential);
- Strip on south side of Highway 417 west of Parkdale Avenue to accommodate the extension of the Parkdale Avenue W-N/S off-ramp (required land is vacant; minor impacts to two residential properties);
- Northeast quadrant of the Parkdale Avenue interchange for the realignment of the Parkdale Avenue E-N/S off-ramp (required land is occupied; displacement of 19 homes);
- Strip about 35m long and 5m wide on north side of Orangeville Street between Lebreton Street South and Bell Street South to accommodate the modifications to the Bronson Avenue W-N/S off-ramp (required land is vacant);
- Southeast quadrant of the Bronson Avenue Interchange to accommodate a new connecting roadway from Bronson Avenue to Chamberlain Avenue (required land is occupied; displacement of Ottawa Board of Education maintenance building);
- Southwest quadrant of Nicholas Street Interchange to accommodate the mainline widening and the associated realignment of the W-N/S off-ramp (required land is occupied, displacement of one home on Concord Street and an outbuilding); and
- North side of Highway 417, at Cyrville Road, to accommodate the modifications to the St. Laurent Boulevard westbound off-ramp and the associated new structure at Cyrville Road (required land is vacant).

The economic impacts of the property acquisition are negligible since no businesses are adversely affected by the property requirements. The minor strip requirements will not adversely affect the current use of the commercial properties. The Ottawa Board of Education building on Bronson/Chamberlain is presently used to house maintenance facilities. The OBE also operates a satellite maintenance facility elsewhere and are currently considering their options in the medium and long term to consolidate their maintenance operations.

The removal of 19 homes on Westmount Avenue and one home on Concord Avenue is significant. The Ministry will seek to purchase these homes at fair market value in accordance with current land acquisition procedures. The privilege of expropriation will only be used as a last resort should negotiations for an amicable purchase not be successful. In most cases, the Ministry has historically avoided expropriation.

The property requirements are illustrated on the Recommended Design Plans provided in **Appendix A**.

6.2.2.2 Traffic Management Plan

A Traffic Management Plan will be developed in detail design and will address issues raised in the areas of Community/Recreation, Commercial/Industrial, Traffic Operations, Pedestrians and Cyclists and Emergency Services. It will include provisions to maintain access to the existing land uses in the areas affected by construction activities. In addition, the plan will consider the needs of pedestrians, cyclists and vehicles throughout the construction period and the need to maintain and provide for pedestrian and cyclist passage, whenever possible.

The contract documents will identify times on Highway 417 and the crossing roads when lane reductions are permissible. In general three lanes in each direction will be maintained on Highway 417 except for low volume periods. The exception to this will be during the rehabilitation of the "downtown" bridges when the number of lanes on the Queensway may be reduced for extended periods of time. (See Section 6.1.6 for further details) The times for lane reductions on City streets will be developed in consultation with City staff.

An Advanced Traffic Management System will be implemented in advance of construction where possible to facilitate travel on Highway 417 by providing warning of incidents and closures through incident detection and changeable message signs.

6.2.2.3 Contaminated Property and Waste Management

The proposed work is largely contained with the existing highway right-of-way. However, the Recommended Design does require the acquisition of property at several locations. Prior to property acquisition, a Phase 1 Environmental Site Assessment (ESA) should be completed for each property to determine the potential for soil contamination. Additional work will be undertaken as needed in accordance with established procedures.

6.2.2.4 Aesthetics/Landscape Composition

The Recommended Design for Highway 417 in the study area minimizes impacts on the adjacent lands. The roadway widening occurs primarily within the current right-of-way, with some modifications beyond the right-of-way at some interchanges. As a result, there will be minimal impacts on the existing landscape outside of the right-of-way. Within the right-of-way, there will be visible changes to the landscaped areas, as the additional lanes and ramp modifications will cause impacts throughout the majority of the corridor where widening will be undertaken, from Highway 416 to Island Park Drive and from Metcalfe Street to east of Walkley Road.

A detailed landscape plan was developed to address these impacts. The foundation of the landscape design is to protect where feasible, replace where space and location permits, and enhance the remaining areas. To achieve this, the principles for the mitigation recommendations are:

1. Complete the grading beyond the asphalt road works to the limit of the right-of-way to integrate the residual lands into a cohesive design. Where ramps are removed, the grading will eliminate the visual appearance of the ramp and create a unified topography. Where new ramps are required, the grading will be designed to ensure the ramps are integrated within the adjacent landscape.

2. Wherever feasible, the existing vegetation within the right-of-way will be protected throughout construction. Grading will be reviewed to ensure the maximum quantity of existing plant material is retained. Where construction occurs in close proximity to plant material, additional care will be specified. For shrub planting, dependant upon species, close cutting of the material, prior to commencement of work, should reduce the conflict with the construction, and allow the material to regenerate post-construction. For trees and the remaining shrubs, comprehensive maintenance including root pruning, watering, fertilizing pre, during and post construction, will reduce the impacts. Equally important will be maximizing offset of construction from the base of the trees, and restricting vehicular parking to outside of the limits of disturbance.

3. Any proposed plant material is required to be tolerant of the tough urban conditions found within the right-of-way. The proposed planting should occur to compensate for loss of vegetation during construction, and include all affected areas, both within the right-of-way, and on adjacent lands used as Temporary Limited Interest to facilitate the construction.

4. Retaining walls will be located along the base of slopes so that a generally shallow-sloped (10-20%) planting area can be established along the top of the wall and another at the base of the wall. In areas where there is room, terraced planting will be used as a more aesthetically interesting alternative. Terraces also have the added benefit of visually reducing the height of the retaining walls.

5. Several strategies or retaining wall types have been developed for the various conditions along this stretch of the Queensway including:

A. Standard MTO Wall:
A practical solution where adjacent land uses are industrial and/or potential visibility of the wall is low.

B. Terraced Planting:
This is an aesthetically interesting alternative to the standard MTO wall where space is sufficient. Good on south facing slopes because it reduces slopes and minimizes surface run-off. These walls have been used on slopes steeper than 1:1 sometimes approaching ½:1.

C. Precast Crib Walls:
This option combines the utility of a precast retaining wall system with the softening effect of plant material. This unique wall design accommodates plant material throughout the wall face.

D. Green Vertical Walls:
Where space is limited and public visibility is high, this option provides the benefits of a standard retaining wall and the attractiveness of an architectural element. Climbing vines can be planted at the base of the wall.

The retaining wall choices relate to the extent of the slope and the height of the wall required, but more critically they relate to the adjacent land uses. For example, where land uses are more industrial oriented, the standard MTO wall with planting on top of and at the base of the wall is sufficient. However, in areas where adjacent land uses are highly visible to the public, such as at the Rideau Canal, it is proposed that the more visually appealing options occur, either precast crib walls, green concrete walls or, where there's sufficient space, terracing.

During the detailed design phase, further analysis for the exact location of the various retaining walls will be required. Proximity to Highway 417, potential loading requirements, both on the highway, and the adjacent shoulders, sub-soil conditions and constraints, structural and height limitations for the retaining wall will impact the final configuration and wall type.

A preliminary landscape master plan has been developed to mitigate for the loss of existing vegetation in areas disturbed by construction and is included in **Appendix K**.

The preliminary landscape master plan for the corridor includes areas of landscape replacement all along the corridor where existing vegetation will be disturbed and space exists to re-plant within the right-of-way. In addition, the landscape master plan includes areas of vegetation enhancement as compensation for vegetation that cannot be replaced in the vicinity of the removals due to insufficient space for successful planting.

In areas where retaining walls are easily visible to the public, such as the Rideau Canal, Harvey Street, Parkdale Avenue and Hawthorne Avenue, a variety of treatments to incorporate landscaping into the design of retaining walls will be investigated during Detail Design to improve the aesthetics of the corridor. In addition to the use of vegetation at retaining walls to improve aesthetics, architectural details will be incorporated into the design of retaining walls and at abutment and wing wall locations where widening is planned.

6.2.2.5 Noise

For the Recommended Design, forty (40) representative receiver sites adjacent to the proposed freeway modifications were modelled to assess the impact on Noise Sensitive Areas along Highway 417 within the study limits. A noise mitigation table was prepared for each segment of the freeway, indicating the proposed modifications and noise impacts. In addition a field review of the existing barriers was completed to determine their condition and need for replacement. The results of the assessment are summarized below, with additional details provided in the *Noise Report for Recommended Plan* in **Appendix L**.

Based on the noise analysis, residential properties adjacent to the proposed alignment/widening of Highway 417 are predicted to have sound level increases of less than 5 dBA as a result of the roadway modifications (refer to **Table 4** in the Noise Report in **Appendix L**). Increases of this magnitude do not warrant consideration of noise mitigation following the Ministry's *Directive A-1, MTO/MOE Noise Protocol* and the MTO *Noise Manual*.

The only area that requires further investigation at the detail design stage is the southeast quadrant of the Bronson Avenue interchange. There are four or five existing residences on Imperial Avenue (receiver site location 3) that will experience noise level increases greater than 5 dBA as a result of the removal of the Board of Education building. The removal of this building will eliminate the positive benefits the building offers for shielding residents from the freeway traffic noise. Therefore, construction of a new barrier on the south side freeway shoulder at Bronson Avenue will be included in the detail design.

All other barriers are recommended to be replaced to the Ministry's current design standard at the time of construction if they are impacted by construction or if they are replaced at the end of their service life.

Retrofit Noise Barriers

Independent of this EA Study, MTO evaluated areas along the Queensway for construction of noise barriers under their separate retrofit program. This program considers areas experiencing high sound levels that are not triggered for attenuation by any specific project. The recommendations of this parallel investigation are documented in two separate stand alone reports included in **Appendix L**. The conclusions of those studies were that the following locations should be added to the Ministry's Retrofit List as Candidate Sites. Eventual construction will be considered according to their placement or relative ranking on the Retrofit List:

- A barrier on the north side of Highway 417 covering the area from Bronson Avenue to Lyon Street; and
- On the south side from east of Preston Street westerly to the existing Parkdale Avenue noise barrier and also a series of noise barriers running from Elgin Street westerly towards Glendale Avenue.

Construction Noise

The Recommended Design recognizes that all reconstruction/rehabilitation projects generate noise during construction activities. MTO has standard contract provisions that are intended to minimize the level of noise generated through the control of construction practices. These standard provisions will be incorporated into the contract documents for this project. MTO will also consult with the public during detail design and will provide contact information during construction so that specific noise complaints can be addressed.

6.2.2.6 Air Quality

As noted in Air Quality Existing Conditions, total of twenty-six (26) sensitive receptor sites were identified along the study corridor, representing daycare facilities, schools, housing for seniors, and hospitals located within 250 metres of the highway. Dispersion modelling analysis was used on these sites to predict levels of pollutants associated with vehicular emissions. The most common contaminants associated with vehicular emissions that are harmful to human health include: carbon monoxide (CO), nitrogen dioxide (NO_2), respirable particulate matter ($PM_{2.5}$), inhalable particulate matter (PM_{10}), and volatile organic compounds (VOCs) (e.g. formaldehyde, acetaldehyde, 1,3-butadiene, benzene).

The modelling indicated that air quality associated with emissions from motor vehicles is expected to improve in the future due to the continuing reductions in vehicular emissions resulting from stricter regulations. Concentration levels for the "Build" scenario were higher than for the "No-Build" scenario, since the increase in highway capacity provided under the Build scenario is expected to result in an increase in traffic volumes on Highway 417 with a corresponding reduction in auto use on adjacent streets. The analysis revealed that concentration levels of contaminants would be below applicable government guidelines for all modelled scenarios. Comparisons were based on the maximum predicted concentration plus the 5-year (1997-2001) averaged 90th percentile background concentration at the 26 sensitive receptors.

An increase in air pollutants within a local area can have an impact on air quality at a regional scale. Vehicular emissions contribute to poor air quality as, during certain weather conditions, the pollutants slowly react in the atmosphere to produce smog. Results of the regional air quality assessment concluded that the proposed modifications to Highway 417 would have an unnoticeable and insignificant impact on smog pollutants. The *Air Quality Report* is located in **Appendix M** of this TESR.

Table 6.4 provides estimates of the contributions from a variety of sources for 2021 with improvements as per the Recommended Plan. A similar table providing existing (2001) estimates was given in Table 4.2 Existing Conditions, Air Quality.

Table 6.4 Comparison of Highway 417 Emissions to Total Emissions Future (2021) Emissions (tonnes/year) with Queensway widened as per Recommended Plan)

Emission Source Sector	CO	NO_x	PM_{10}	$PM_{2.5}$	VOC
Industrial Sources	1,557	2,259	12,840	825	10,846
Non-Industrial Fuel Combustion and Other	20,133	2,321	7,727	3,820	14,385
Transportation					
Roads*	23,821	1,918	211	120	2,544
(Highway 417 mainline emissions)**	**(8,520)**	**(507)**	**(23)**	**(11)**	**(146)**
(Highway 417 as percentage of total roads)	**(36%)**	**(26%)**	**(11%)**	**(9%)**	**(6%)**
Off-Roads	116,979	10,004	574	529	4,628
Railroad	79	458	11	10	21
Aircraft	1,498	837	81	57	327
Marine	2,930	366	74	65	915
Totals	145,307	13,583	951	781	8,434
Open Roadway Sources - Dust from All Roads (Paved and Unpaved)	0	0	26,251	5,226	0
Total Emissions in the Ottawa Census Division	**766,997**	**18,163**	**47,770**	**10,651**	**33,665**
Contribution of the Highway 417 emissions to the total emissions in the census division:	**5%**	**3%**	**<1%**	**<1%**	**<1%**

The contribution of highway widening to any pollutant is projected to be very small. The effect of the Highway 417 widening on regional concentrations of ground level ozone and secondary $PM_{2.5}$ is estimated to be less than 0.1%.

6.2.3 CULTURAL ENVIRONMENT

6.2.3.1 Archaeology and Built Heritage

No impact on archaeological or built heritage resources is anticipated. In the event that deeply buried archaeological deposits are discovered in the course of construction, the Cultural Programs Branch, Ontario Ministry of Culture, should be notified immediately. In the event human remains are encountered, the Cultural Programs Branch, Ontario Ministry of Culture, and the Registrar of the Cemeteries Regulation Section of the Ontario Ministry of Consumer and Business Services should be notified immediately. Standard contract provisions will be included in the contract documents to address the issue of deeply buried resources.

6.3 FUTURE CONSULTATION

The consultation program undertaken during the study, involving the public, municipal governments and federal, provincial and municipal agencies will be continued during detail design.

Future consultation requirements with external agencies will include:

- City of Ottawa: Liaison regarding stormwater management, landscaping plans, intersection details, staging of construction, etc.;
- National Capital Commission: Liaison regarding landscaping plans;
- Canadian Environmental Assessment Agency for coordination of process to obtain a decision under CEAA;
- Department of Fisheries and Oceans: Approval required for fisheries compensation plan to be prepared during detail design; and
- Parks Canada: Liaison regarding impacts at Rideau Canal.

6.4 NEXT STEPS

Following the public review of the Transportation Environmental Study Report (TESR) and the receipt of environmental clearance, MTO may proceed to detail design as outlined in the *Class EA for Provincial Transportation Facilities, 2000.* A decision is also required under CEAA.

It is unlikely that the works described in this TESR, should they receive approval, would be constructed as a single construction project. As such, the Ministry will develop an implementation strategy for immediate, medium and longer terms which will address the highest priory sections within this corridor. For the mainline, the proposed widening would commence from the downtown and work outwards so that the completed works could be seamlessly integrated into the Queensway network. Work will be bundled so that disruption to travellers, businesses, and residents is minimized. Some of the works proposed for the interchanges is independent of the mainline widening and could be constructed when priorities and funding allows. Wherever possible, efforts will be made to coordinate the work with the City of Ottawa to minimize overall disruption. Following EA approval and the development of the implementation plan, detail design activities would commence including property acquisition.

Detail design and construction activities will include the following:

- Complete drawings and tender documents for each contract identified including:
  - Structural design;
  - Cross-section details;
  - Construction staging;
  - Illumination, traffic signals and safety infrastructure;
  - Project-specific standards;
  - Calculation of quantities;
  - Resolution of major utility conflicts; and
  - Final property requirements.
- Prepare a Design and Construction Report (DCR) for each contract documenting:
  - Project overview;
  - Consultation process;
  - Environmental factors;
  - Existing conditions;
  - Environmental issues and commitments;
  - Significant environmental features, effects and proposed mitigation;
  - Commitments to further work;
  - Monitoring; and
  - Construction provisions.
- Notify the public and provide the Design and Construction Report (DCR) for a 30 day public review near the end of detail design;
- Tender and award contract(s);
- Undertake construction; and
- Monitor projects for environmental provisions and commitments:
  - Monitoring of environmental objectives during construction including individual measures and issues (e.g. noise and vibration, erosion and sedimentation control, waste handling and materials/equipment storage);
  - Monitoring of overall effectiveness of control measures; and
  - Ongoing identification of areas of potential concern.

6.5 SUMMARY OF ENVIRONMENTAL EFFECTS, PROPOSED MITIGATION AND COMMITMENTS TO FUTURE WORK

Table 6.5 provides a summary of the potential direct and indirect environmental effects associated with the Recommended Plan, mitigation measures proposed to prevent, lessen or remedy potential detrimental environmental effects and a description of the commitments to future work.

Table 6.5 Summary of Environmental Effects, Proposed Mitigation and Commitments to Future Work

I.D.#	Issue/Concern Potential Effects	Responsible Agencies	I.D. #	Mitigation/Protection/ Monitoring
1.0	Fisheries and Aquatic Ecosystems • Impact on fish habitat at culvert extension/pier extension locations identified as fish habitat. • Impact on fish habitat due to sediment and debris entry into watercourses.	Department of Fisheries and Oceans	1.1	• Habitat improvements to be determined at the detail design phase. Typical measures to be considered include: embedment of culverts, use of natural stream substrate or other suitable river stone material in culvert bottom, placement of riparian plantings at disturbed areas at culvert ends and placement of 300 mm thickness of river stone around pier extensions.
			1.2	• Restrict timing of in-stream works.
			1.3	• Prepare fisheries compensation plan during Detailed Design and submit to DFO for approval; secure Federal Fisheries Act authorization during Detailed Design.
			1.4	• Prevent sediment and debris from entering watercourse through the use of silt fencing, check dams and other suitable debris capture devices.
			1.5	• Restrict activities adjacent to watercourses (i.e. storage of materials, refuelling, excess materials placement).
			1.6	• Monitor construction activities. Monitor environmental protection measures and implementation of the fisheries compensation plan.
2.0	Terrestrial Ecosystems • Impact on wildlife habitats due to removal of vegetation at the edge of forested areas.	Ministry of Natural Resources	2.1	• Minimize vegetation removal; provide protection for those trees to remain.
			2.2	• Replace vegetation where feasible (refer to landscape concept plan).
3.0	Surface Water / Stormwater Management • Increased runoff resulting from increased pavement platform.	City of Ottawa, Ministry of Transportation	3.1	• Reduce runoff to pre-construction rates by using underground detention.
4.0	Land Use • Property acquisition required (including homes on Westmont Avenue and Concord Street). • Traffic delays / access restrictions during construction. • Impact on emergency service routes/access. • Restricted pedestrian/cyclist passage at the Queensway.	City of Ottawa, Ministry of Transportation	4.1	• Compensation for property acquisition will be negotiated through the property acquisition process.
			4.2	• Prepare Traffic Management Plan during Detailed Design.
			4.3	• Maintain existing number of lanes on Queensway at most times during construction except for minor reductions during off-peak travel times. Preclude lane restrictions during peak travel times.
			4.4	• Implement elements of an Advanced Traffic Management System including changeable message signs and incident detection.
			4.5	• Maintain access to businesses and other properties throughout construction.
			4.6	• Ensure ongoing communication with emergency services during construction.
			4.7	• Free flow channelizations at ramp terminals removed, where possible, to better accommodate pedestrians/cyclists.
			4.8	• Accommodate the needs of pedestrians and cyclists during construction. Do not close adjacent crossings at the same time during construction. Provide alternative route and advance warning during temporary closures.
5.0	Contaminated Property / Waste Management • Encroachment onto potentially contaminated properties.	Ministry of Environment, Ministry of Transportation	5.1	• Undertake Environmental Site Assessment for properties to be acquired during Detailed Design.

Table 6.5 Summary of Environmental Effects, Proposed Mitigation and Commitments to Future Work

I.D.#	Issue/Concern Potential Effects	Responsible Agencies	I.D. #	Mitigation/Protection/ Monitoring
6.0	Aesthetics/Landscape Composition • Loss of vegetation to accommodate Recommended Design. • Effect on visual landscape and scenic resources available to motorists. • Effect on adjacent dwellers sensitive to views of facility.	City of Ottawa, National Capital Commission, Ministry of Transportation	6.1	• Minimize vegetation removal; provide protection for those trees to remain.
			6.2	• Replace vegetation where feasible (refer to landscape concept plan).
			6.3	• Enhance aesthetic design of bridges and retaining walls, where appropriate, to minimize visual intrusion.
			6.4	• Provide visual screening and aesthetic enhancement through landscape design (refer to landscape concept plan).
			6.5	• Develop final landscape plan during detail design, in consultation with the City and NCC, and present to the public at that time.
7.0	Noise • Increase in noise levels adjacent for highway as a result of proposed highway modifications. • Noise from construction equipment and vehicles during construction	City of Ottawa, Ministry of Transportation	7.1	No further action required. Mitigation not required since the increase in noise levels is less than 5 dBA for the proposed road modifications relative to the future noise levels without the road modifications
			7.2	• Require contractor to maintain equipment in an operating condition that prevents unnecessary noise, including but not limited to non-defective muffler systems, properly secured components and the lubrication of moving parts.
			7.3	• Restrict idling of equipment to the minimum necessary to perform the specified work.
8.0	Air Quality • Potential detrimental impact on air quality (increased smog/pollutants).	Ministry of Environment Environment Canada Health Canada	8.1	• No further action required. Mitigation not required since concentration levels of contaminants predicted to be below applicable government guidelines for the Recommended Design. Furthermore, results of regional air quality assessment concluded that the proposed modifications to Highway 417 would have an unnoticeable and insignificant impact on smog pollutants.
9.0	Archaeology • Stage 1 and Stage 2 assessments did not indicate any concerns for significant pre-contact or historic archaeological sites.	Ministry of Culture	9.1	• Include contract provisions that require that the Ministry of Culture be notified immediately if deeply buried archaeological remains are encountered during construction.

LIST OF REFERENCES

1. Class Environmental Assessment for Provincial Transportation Facilities, 2000, MTO
2. Ottawa 20/20 – Transportation Master Plan, A Supporting Plan of the Official Plan, September 2003, City of Ottawa
3. City of Ottawa Official Plan, May 2003, City of Ottawa
4. A Protocol for Dealing with Noise Concerns During the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments, MOE
5. Highway Capacity Manual, 2000, AASHTO
6. Statement of Environmental Values, MTO
7. Shape the Future: Eastern Ontario Smart Growth Panel Final Report, 2003, MTO
8. Eastern Ontario Strategic Transportation Directions, MTO
9. Rapid Transit Expansion Study, City of Ottawa
10. Fish Habitat Conservation and Protection Guidelines for Attaining No Net Loss, DFO

Acts:

Ontario Environmental Assessment Act
Canadian Environmental Assessment Act

Species at Risk Databases:

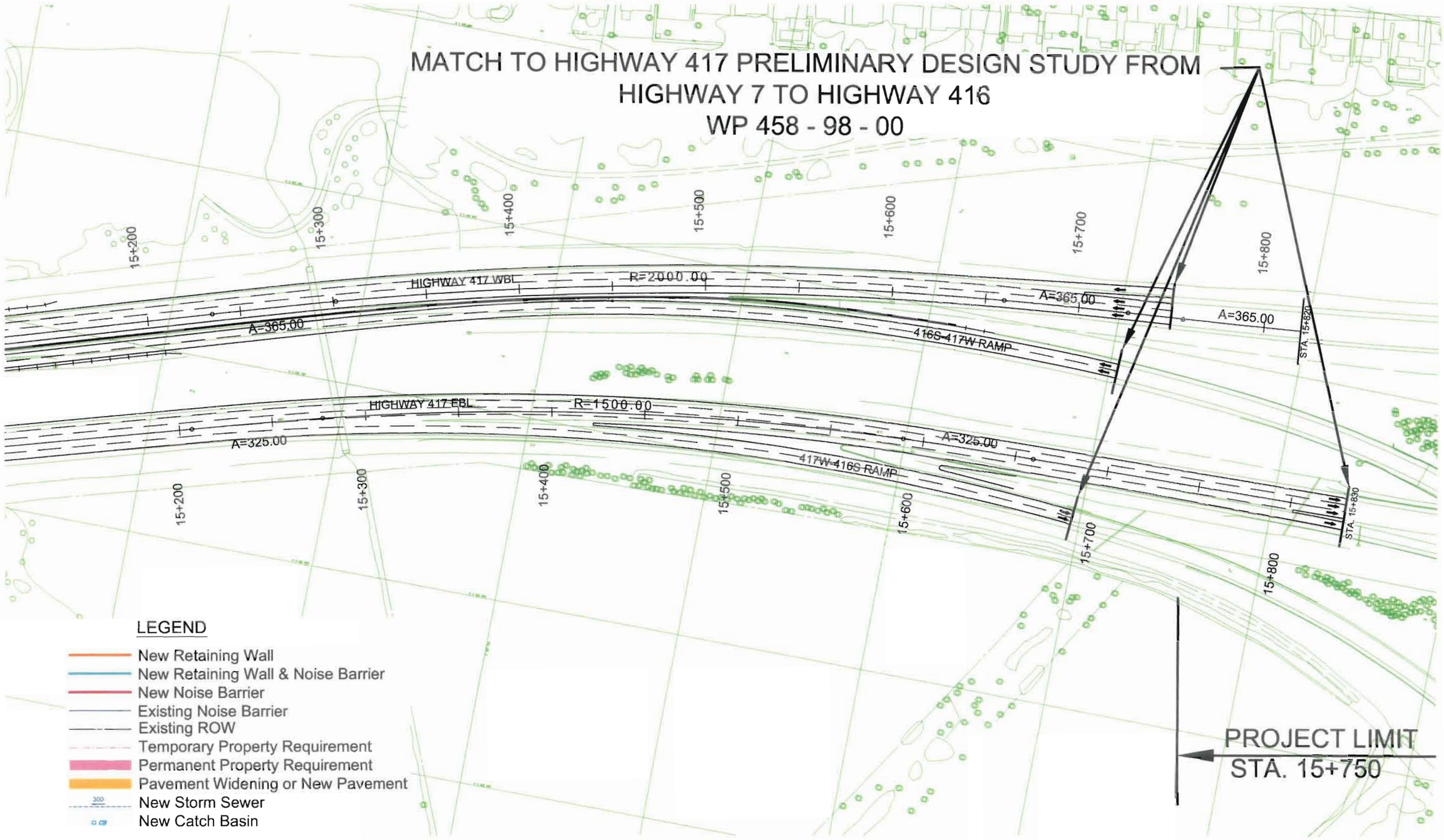
National Heritage Information Centre Species at Risk database
Vulnerable Threatened, Endangered and Extirpated List, 1996 Ministry of Natural Resources

Note:
Other references not detailed in this list included the reports prepared for this study that are provided in the Appendices as well as numerous Engineering Manuals, MTO Directives and Policies

APPENDIX A
Plates

Plates 1-39: Recommended Design Plan
Plates 40-41: Typical Cross-sections

MATCH TO HIGHWAY 417 PRELIMINARY DESIGN STUDY FROM HIGHWAY 7 TO HIGHWAY 416
WP 458 - 98 - 00



LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 15+150 TO STA. 15+830 (EB)
STA. 15+150 TO STA. 15+820 (WB)

PLATE

1

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STA. 15+820

15+900

16+000

16+100

16+200

16+300

16+400

16+500

R=2000.00

HIGHWAY 417 WBL

A=365.00

A=300.00

R=1600.00

STA. 16+560

NEW CONCRETE BARRIER

NEW RETAINING WALL

R=900.00

STA. 16+570

STA. 15+810

A=230.00

A=230.00

A=230.00

R=900.00

HIGHWAY 417 EBL

R= 110

CULVERT EXTENSION

OUTLET #1

Graham Creek

15+900

16+000

417W-NS RAMP

16+100

16+200

417E-416S RAMP

16+300

16+400

416S-417E RAMP

NEW CULVERT

TRANSIT PRIORITY LANE

HOLLY ACRES ROAD

417W-416S RAMP

416S - 417W RAMP

MATCH EXISTING

416S-NS RAMP

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin
- New Concrete Barrier

Ontario

MTO

DH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 15+810 TO STA. 16+570 (EB)
STA. 15+820 TO STA. 16+560 (WB)

PLATE

2

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin
- New Concrete Barrier

IDGE CRES.

BAYSHORE COMMUNITY CENTRE

BAYSHORE SHOPPING CENTRE

BAYSH

16+600

BAYSHORE STATION

16+700

16+800

16+900

FUTURE WEST TRANSITWAY (BY OTHERS)

TRANSITWAY STATION

NEW CONCRETE BARRIER

N-W RAMP

RICHMOND ROAD

17+000

17+100

S-W RAMP

TO BE CLOSED WHEN FUTURE TRANSITWAY CONSTRUCTED

E-W N/S RAMP

PULFORD CR.

17+300

BUF

17+200

OUTLET #2

MATCH EXISTING

C.V.R=100
R=115

STA. 16+560

R=1600.00

A=300.00

HIGHWAY 417 WBL

R=757.00

A=222.74

HIGHWAY 417 EBL

R=900.00

STA. 16+570

OUTLET #1A

R= 1500

MATCH EXISTING

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

RAMP CLOSURES TO BE RESTORED TO PERVIOUS AREA. GRADE TO MATCH EXISTING GROUND.

RAMP CLOSED

RAMP CLOSURES TO BE RESTORED TO PERVIOUS AREA. GRADE TO MATCH EXISTING GROUND.

S-E RAMP

MATCH EXISTING

STA. 17+310

QUEENSLINE

NEW NOISE BARRIER

EXISTING NOISE BARRIER

NEW RETAINING WALL

am Creek

Graham Creek

EXISTING CULVERT TO BE REMOVED

RAMP CLOSED

N-E RAMP

MOHAWK CR.

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 16+570 TO STA. 17+310 (EB)
STA. 16+560 TO STA. 17+310 (WB)

PLATE

3

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin
- New Concrete Barrier

EXISTING CULVERT TO BE REMOVED

Graham Creek

HOLLY ACRES ROAD

N-E RAMP

RAMP CLOSED

NEW CONCRETE BARRIER

RAMP CLOSURES TO BE RESTORED TO PERVIOUS AREA. GRADE TO MATCH EXISTING GROUND.

HIGHWAY 417 WBL

HIGHWAY 417 EBL

MATCH EXISTING

RICHMOND ROAD

NANAIMO DR.

S-E RAMP

RAMP CLOSED

TRANSIT PRIORITY LANE

MOHAWK CR.

EXISTING NOISE BARRIER

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
RICHMOND ROAD-HOLLY ACRES ROAD INTERSECTION

PLATE 4

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- 300 New Storm Sewer
- New Catch Basin

NEW RETAINING WALL & NOISE BARRIER

NEW NOISE BARRIER

EXISTING NOISE BARRIER

PULFORD CR.

BURGESS AVENUE

17+400 WBL CL
=17+396.925 MEDIAN CL
17+400

BELLFIELD ST.

ALENMEDE CR.

BARWELL AVENUE

ALENMEDE CR.

17+500

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

17+600

17+700

17+800

17+900

RAMSEY CR.

18+000

DUMAURIER AVENUE

STA. 17+310

STA. 17+310

R= 750

R= 2550

FUTURE WEST TRANSITWAY (BY OTHERS)

STA. 18+050

HIGHWAY 417 WBL

HIGHWAY 417 EBL

R=873.19

R=130
EX.R=145

R= 1250

17+400 EBL CL
=17+395.942 MEDIAN CL

DR.

NEW NOISE BARRIER

1150

NEW RETAINING WALL & NOISE BARRIER

1140

1130

NEW RETAINING WALL

1120

LEE VALLEY TOOLS

1100

1080

1070

NEW RETAINING WALL

ASHLEY ST.

MORRISON DR.

Ontario

TYH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 17+310 TO STA. 18+050

PLATE

5

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RAMP CLOSED

EXISTING NOISE BARRIER

NEW RETAINING WALL & NOISE BARRIER

DUMAURIER STATION

FUTURE WEST TRANSITWAY (BY OTHERS)

ALL SAINTS CHURCH
1061 PINECREST

2740 QUEENSVIEW

WEST BOURNE ELECTRIC

FUTURE CONSTRUCTION

2680 QUEENSVIEW

HEWLETT-PACKARD

NEW RETAINING WALL

2700 QUEENSVIEW

2670 QUEENSVIEW

IER AVENUE

N-W RAMP

S-W RAMP

E-NS RAMP

PINECREST ROAD

NEW RETAINING WALL

SCL 250m

SCL 535m

SCL 400m

HIGHWAY 417 WBL

HIGHWAY 417 EBL

OUTLET #5

OUTLET #4(CULVERT)
(900X58.6CSP)

N-E RAMP

S-E RAMP

W-NS RAMP

GREENBANK ROAD

IRIS ST.

CHAPTER'S BOOK STORE

PINECREST SHOPPING CENTRE (IKEA)

NEW RETAINING WALL

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

Ontario

MTH engineers architects planners

SCALE

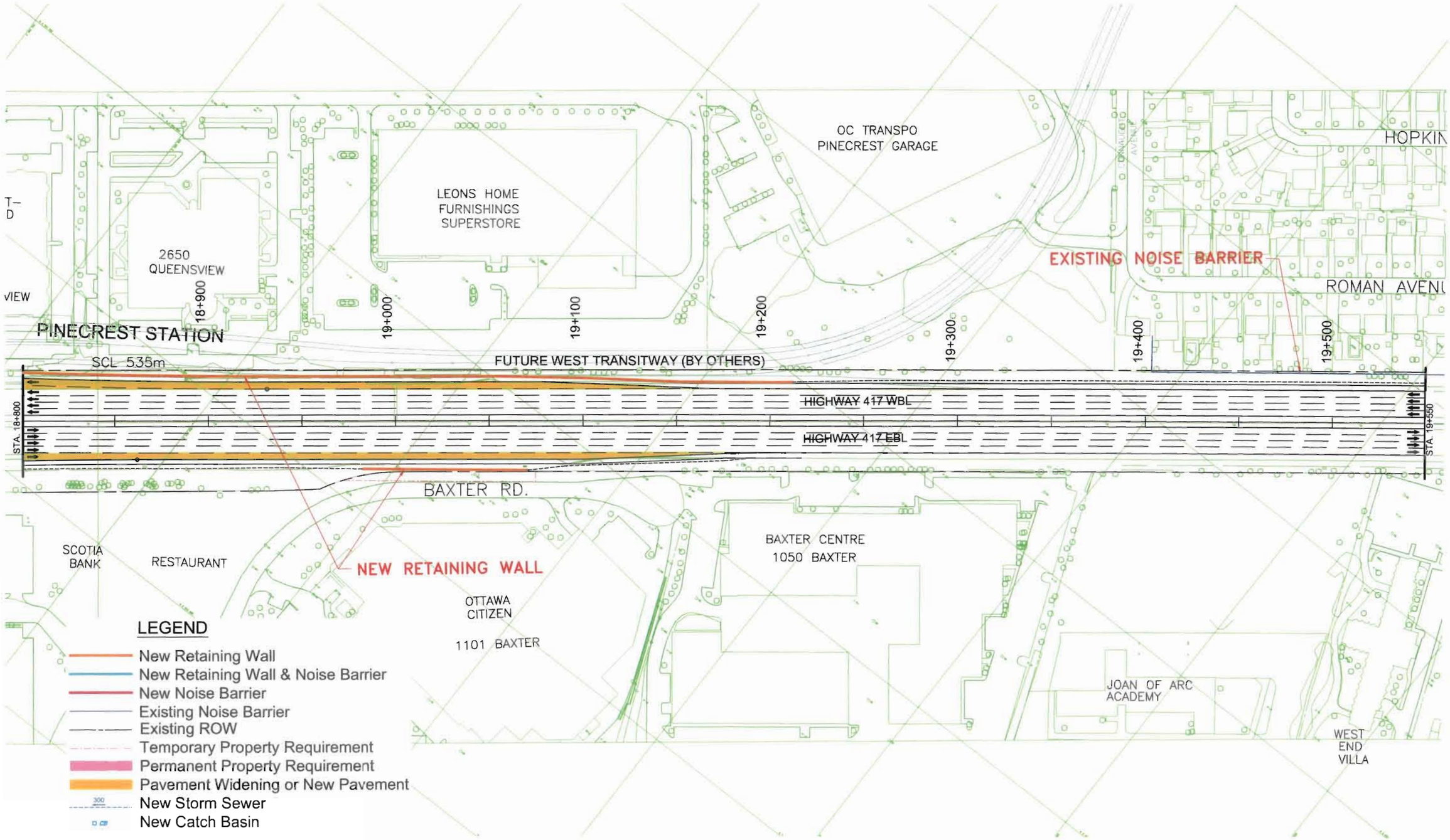
20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 18+050 TO STA. 18+800

PLATE 6



Ontario

MTH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 18+800 TO STA. 19+550

PLATE
7

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin
- New Concrete Barrier

PKINS

VENUE

HINDLEY ST.

SOUTHWEST TRANSITWAY

TO BE CLOSED WHEN FUTURE TRANSITWAY CONSTRUCTED

BUS ONLY (ACCESS TO SOUTHWEST TRANSITWAY)

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

19+600 19+700 19+800 19+900 20+000 20+100 20+200

OUTLET #6 OUTLET #6A OUTLET #6B OUTLET #7

SCL 500m R= 4000

NS-W RAMP R=90 EX.R=118

STA. 19+550

HIGHWAY 417 ~~WBL~~

HIGHWAY 417 E~~BL~~

STA. 20+300

BUS ONLY

SCL 345m R= 1800

QUEENSWAY STATION

R=120 WENS RAMP R=50

NEW CONCRETE BARRIER

EXISTING NOISE BARRIER

KINGSLEY RD. GATEWAY RD. MAYBANK ST. PARKWAY DR. Pinecrest Creek SOUTHWEST TRANSITWAY

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Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 19+550 TO STA. 20+300

PLATE

8

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

REMBRANDT RD.
WOODROFFE AVENUE
OTTAWA CHRISTIAN SCHOOL
FAIRLAWN AVENUE
BENJAMIN AVENUE
QUEENSGROVE RD.
OTTAWA ADVENTIST CHURCH & SCHOOL
N-W RAMP
R= 94
R= 36
R= 70
S-W RAMP
BUS STOP
BUS ONLY
R=61
EX.R=70
E-S RAMP
R=70
NEW RETAINING WALL
20+400
20+500
20+600
20+700
20+800
20+900
21+000
E-N RAMP
R=50
SCL 335m
R= 1250
HIGHWAY 417 WBL
HIGHWAY 417 EBL
STA. 20+300
STA. 21+050
N-E RAMP
R= 1500
SCL 400m
R= 4000
SCL 500m
S-E RAMP
R= 84
MATCH EXISTING
EX.R=50
R=50
R=85
NEW NOISE BARRIER
BRIDGE WIDENING
NEW RETAINING WALL
& NOISE BARRIER
NEW RETAINING WALL
NEW RETAINING WALL
EXISTING NOISE BARRIER
SCHOOL
BEL-AIR DR.

Ontario

engineers architects planners

SCALE
20M 0 40M
Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 20+300 TO STA. 21+050

PLATE
9

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BENJAMIN AVENUE

HARE AVENUE

MUSKOKA AVENUE

MOONEY AVENUE

CASTLEWOOD AVENUE

KILLEEN AVENUE

KILLARNEY DR.

EXISTING NOISE BARRIER

NEW NOISE BARRIER

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

OUTLET #8

21+100

21+200

21+300

21+400

21+500

21+600

21+700

STA. 21+050

STA. 21+800

SCL 500m

R= 4000

HIGHWAY 417 WBL

R=698.55

HIGHWAY 417 EBL

SOUTHAMPTON CR.

SAVOY PL.

RIDDELL AVENUE S.

NEW RETAINING WALL

J.H. PUTMAN INTERMEDIATE SCHOOL

GARFIELD AVENUE

GARFIELD AVENUE

BEL-AIR DR.

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

Ontario

MTO

DH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 21+050 TO STA. 21+800

PLATE 10

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- New Travel Lane
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

RETROFIT NOISE BARRIER

CULVERT EXTENSION

BRIDGE WIDENING

EXISTING NOISE BARRIER

MAITLAND AVENUE

MATCH EXISTING

REX AVENUE

DENISON CR.

BROADVIEW AVENUE

ERNEST AVENUE

ST BASIL'S CHURCH

NS-W RAMP

W-NS RAMP

NS-E RAMP

HIGHWAY 417 WBL

HIGHWAY 417 EBL

STA. 21+800

STA. 22+550

21+900

22+000

22+100

22+200

22+300

22+400

22+500

SCL 345m

SCL 500m

R= 2000

R= 1100

R= 4000

R= 71

R=50

R=56

R=82

EX.R=54.5

EX.R=66

EX.R=50

EX.R=44

EX.R=70

EX.R=82

1745

1741

1749

1755

1733

1725 EMS TECHNOLOGIES

1683

CITY OF OTTAWA YARD

1701

1767 – 1773

1777

HERTZ

1837 WOODWARD

LIMIT OF W.P. 4058-01-00 CLASS EA STUDY

NOTES:
1. RETAINING WALLS WITHIN W.P. 4058-01-00 LIMITS TO BE CONSTRUCTED UNDER W.P. 4058-01-00
2. PROPERTY REQUIRED WITHIN W.P. 4058-01-00 LIMITS TO BE PURCHASED UNDER W.P. 4058-01-00

Ontario

DH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 21+800 TO STA. 22+550

PLATE 11

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- New Travel Lane
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

BOYD AVENUE
CAMPBELL AVENUE
DOBBIE ST.
TILE CENTRE
CHURCHILL AVENUE N.
COREL
22+600
22+700
22+800
22+900
23+000
23+100
23+200
STA. 22+550
STA. 23+300
HIGHWAY 417 WBL
HIGHWAY 417 EBL
SCL 345m
R= 3000
SCL 345m
CLYDE AVENUE
LAPERRIERE AVENUE
BELLEVUE AVENUE
CHURCHILL AVENUE S.
LADY ELLEN PL.

LIMIT OF THE W.P. 4058-01-00 CLASS EA STUDY

NOTES:
1. RETAINING WALLS WITHIN W.P. 4058-01-00 LIMITS TO BE CONSTRUCTED UNDER W.P. 4058-01-00
2. PROPERTY REQUIRED WITHIN W.P. 4058-01-00 LIMITS TO BE PURCHASED UNDER W.P. 4058-01-00

Ontario

DH engineers architects planners

SCALE
20M 0 40M
Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 22+550 TO STA. 23+300

PLATE
12

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- New Travel Lane
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

CARLING AVENUE
SAIGON CT.
ACURA
HAMPTON PARK SHOPPING CENTRE
CAPITAL DODGE
CARLING AVENUE
MATCH EXISTING
ENS-W RAMP
FIRE HALL
KIRKWOOD AVENUE
MATCH EXISTING
SCL 500m
23+400
23+500
23+600
23+700
23+800
23+900
24+000
R= 3000
R= 150
R=
HIGHWAY 417 WBL
HIGHWAY 417 EBL
STA. 23+300
STA. 24+050
R= 280
W-ENS RAMP
MATCH EXISTING
NS-E RAMP
R= 150
MATCH EXISTING
1550 CARLING
ALGONQUIN CAREERS ACADEMY
CAMPBELL FORD
KIRKWOOD AVENUE
EMBASSY WEST HOTEL
CARLING AVENUE EB
TRAVELODGE HOTEL
PL.

LIMIT OF THE W.P. 4058-01-00 CLASS EA STUDY

NOTES:
1. RETAINING WALLS WITHIN W.P. 4058-01-00 LIMITS TO BE CONSTRUCTED UNDER W.P. 4058-01-00
2. PROPERTY REQUIRED WITHIN W.P. 4058-01-00 LIMITS TO BE PURCHASED UNDER W.P. 4058-01-00

Ontario

DH engineers architects planners

SCALE
20M 0 40M
Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 23+300 TO STA. 24+050

PLATE
13

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- New Travel Lane
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

24+100
24+200
24+300
24+400
24+500
24+600
24+700
R= 550
E-WNS RAMP
SCL 345m
R= 1375
HIGHWAY 417 WBL
R=2556.00
HIGHWAY 417 EBL
STA. 24+050
R= 2000
SCL 300m
R= 1000
S-E RAMP
R=65
CARLING AVENUE WB
MATCH EXISTING
1335 CARLING ROYAL LE PAGE
WESTGATE SHOPPING CENTRE
E-N RAMP
ISLAND PARK DRIVE
EDINA ST.
ISLAND PARK CR.
MATCH EXISTING
STA. 24+800
KINGSWAY UNITED CHURCH
ISLAND PARK DRIVE
EXISTING NOISE BARRIER
MERIVALE ROAD
LIMIT OF THE W.P. 4058-01-00 CLASS EA STUDY

NOTES:
1. RETAINING WALLS WITHIN W.P. 4058-01-00 LIMITS TO BE CONSTRUCTED UNDER W.P. 4058-01-00
2. PROPERTY REQUIRED WITHIN W.P. 4058-01-00 LIMITS TO BE PURCHASED UNDER W.P. 4058-01-00

Ontario

DH engineers architects planners

SCALE
20M 0 40M
Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 24+050 TO STA. 24+800

PLATE
14

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GENEVA ST.
CLARENDON AVENUE
HELENA ST.
FARADAY ST.
HARMER AVENUE N.
FISHER PARK
FISHER PARK SCHOOL
HINTON AVENUE N.
EXISTING NOISE BARRIER
24+900
25+000
25+100
25+200
25+300
25+400
25+500
HIGHWAY 417 WBL
HIGHWAY 417 EBL
R=10480.15
R=698.55
NS-W RAMP
STA. 24+800
STA. 25+550
MATCH EXISTING
SCL 345m
R= 465
R= 350
W-NS RAMP
RUSKIN ST.
FAIRFAX AVENUE
HARMER AVENUE S.
KENILWORTH ST.
HURON AVENUE S.
HOLLAND AVENUE
HINTON AVENUE S.
BRIDGE WIDENING
HAMILTON AVENUE
SHERWOOD DR.
NEW RETAINING WALL & NOISE BARRIER
NEW NOISE BARRIER

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 24+800 TO STA. 25+550

PLATE
15

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NOTE:
HOMES ON SOUTH SIDE OF WESTMOUNT AVENUE WILL BE REMOVED.

NEW E-NS RAMP

NEW NOISE BARRIER

NEW RETAINING WALL & NOISE BARRIER

EXISTING NOISE BARRIER

RAMP CLOSED

RETROFIT NOISE BARRIER

HAMILTON AVENUE N.

SIMS AVENUE

WESTMOUNT AVENUE

BEVERLY AVENUE

ROSEMOUNT AVENUE

SHERBROOKE AVENUE

MELROSE AVENUE

ST. FRANCIS ST.

EDGAR ST.

E-NS RAMP

NS-E RAMP

25+600

25+700

25+800

25+900

26+000

26+100

26+200

STA. 25+550

STA. 26+300

R=698.55

R= 3200

SCL 345m

R=3492.76

MATCH EXISTING

ST. MATTHIAS ANGLICAN CHURCH

PARKDALE AVENUE

WARWICK PL.

HERWOOD DR.

REID AVENUE

KINNEAR ST.

FAIRMONT AVENUE

YOUNG

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

Ontario

MTH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 25+550 TO STA. 26+300

PLATE 16

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IRVING AVENUE
SPADINA AVENUE
BAYSWATER AVENUE
BREEZEHILL AVENUE N.
LORETTA AVENUE N.
CITY OF OTTAWA TRANSPORTATION 175 LORETTA N
ST. ANTHONY ST.
PRESTON ST
26+400
26+500
26+600
26+700
26+800
26+900
27+000
R=3492.76
HIGHWAY 417 WBL
HIGHWAY 417 EBL
STA. 26+300
STA. 27+050
YOUNG ST.
BREEZEHILL AVENUE S.
LORETTA AVENUE S.
CHAMPAGNE AVENUE S.
RAILWAY ST.
CPR
RETROFIT NOISE BARRIER
EXISTING NOISE BARRIER

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- 300 New Storm Sewer
- New Catch Basin

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 26+300 TO STA. 27+050

PLATE 17

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MINISTRY OF TRANSPORTATION, ONTARIO

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

RETROFIT NOISE BARRIER

SCHOOL

PRESTON ST

ROCHESTER STREET

EXISTING NOISE BARRIER

27+100

27+200

27+300

27+400

27+500

27+600

27+700

BOOTH ST

LEBRETON ST. N.

BELL ST. N.

ARLINGTON AVENUE

ARLINGTON AVENUE

BRONSON AVENUE

RAYMOND ST

ENS-W RAMP

ENS-W RAMP

HIGHWAY 417 WBL

HIGHWAY 417 EBL

R=3492.76

R=3492.98

R=2328.50

STA. 27+050

STA. 27+800

MATCH EXISTING

W-ENS RAMP

W-NS RAMP

R= 400

R= 250

ORANGEVILLE ST

SCL 345m

BRIDGE WIDENING

BOOTH ST

LEBRETON ST. S.

NEW RETAINING WALL & NOISE BARRIER

PLYMOUTH ST.

BELL ST. S.

CAMBRIDGE ST. S.

RETROFIT NOISE BARRIER

NEW NOISE BARRIER

NEW RETAINING WALL & NOISE BARRIER

FINAL OPERATION OF THIS INTERSECTION TO BE DETERMINED BY CITY OF OTTAWA

Ontario

UMA engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 27+050 TO STA. 27+800

PLATE

18

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

RETROFIT NOISE BARRIER

RAMP METERING (RAMP TO BE OPEN IN PM PEAK HOURS ONLY)

ARLINGTON AVENUE

BAY ST.

LYON STREET

INTER-CITY BUS TERMINAL

BRONSON AVENUE

CATHERINE ST

PERCY ST

27+900

28+000

28+100

28+200

28+300

28+400

28+500

SECURMAX STORAGE

424

370

BELL MOB.

320 R.S. CANADA

300 TANNIS FOOD

ENTERPRISE CAR RENTAL 280

270 CAR WASH KENT BOWLING

E-WNS RAMP

EN-W RAMP

W-N RAMP

STA. 27+800

STA. 28+550

R=3493.01

R= 800

OTTAWA BOARD OF EDUCATION

CHAMBERLAIN AVENUE

GLENDALE AVENUE

IMPERIAL AVENUE

NEW NOISE BARRIER

BUILDING TO BE REMOVED

EXISTING NOISE BARRIER

RETROFIT NOISE BARRIER

FINAL OPERATION OF THIS INTERSECTION TO BE DETERMINED BY CITY OF OTTAWA

FOR SITE RESTORATION DETAILS SEE LANDSCAPE PLAN PLATE L6

Ontario

DH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 27+800 TO STA. 28+550

PLATE 19

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ARGYLE AVENUE

YMCA

O'CONNOR ST

METCALFE ST

BRIDGE WIDENING

CATHERINE ST.

KENT STREET

240 CATHERINE

BANK STREET

REGIONAL 200 CATHERINE

28+600

28+700

28+800

28+900

29+000

29+100

29+200

MATCH EXISTING

MATCH EXISTING

E-W/S RAMP

R=5000

EN-W RAMP

R=3493.01

R=3479.97

HIGHWAY 417 WBL

HIGHWAY 417 EBL

STA. 28+550

STA. 29+300

W-ENS RAMP

WS-E RAMP

ISABELLA ST.

THE PALLISADES RESIDENCE

SHOPPING CENTRE

PRETORIA AVENUE

RETROFIT NOISE BARRIER

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- 300 New Storm Sewer
- New Catch Basin

Ontario

DH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 28+550 TO STA. 29+300

PLATE

20

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EXISTING NOISE BARRIER

BRIDGE WIDENING

NEW RETAINING WALL & NOISE BARRIER

NEW RETAINING WALL

NEW RETAINING WALL

ELGIN ST

QUEEN ELIZABETH DRIVEWAY

RIDEAU CANAL

COLONEL BY DRIVE

ECHO DR.

GREENFIELD AVENUE

HAVELOCK ST.

CONCORD ST. N.

MAIN STREET

HARVEY ST.

NEW NOISE BARRIER

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

29+400

29+500

29+600

29+700

29+800

29+900

30+000

SCL 460m

OUTLET #21

OUTLET #22

OUTLET #23

OUTLET #19

STA. 29+300

STA. 30+050

R=3479.97

R= 2317

R=1420.00

R= 3500

R= 3500

HIGHWAY 417 WBL

HIGHWAY 417 EBL

EXISTING

MATCH

BUILDING TO BE REMOVED

HOME TO BE REMOVED

RETROFIT NOISE BARRIER

PRETORIA BRIDGE

NEW RETAINING WALL & NOISE BARRIER

BRIDGE WIDENING

NEW RETAINING WALL & NOISE BARRIER

HAWTHORNE AVENUE

HAWTHORNE AVENUE

GRAHAM AVENUE

MAIN STREET

CONCORD ST. S.

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- 300 New Storm Sewer
- New Catch Basin

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 29+300 TO STA. 30+050

PLATE

21

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin
- New Concrete Barrier

EXISTING NOISE BARRIER

NEW CONCRETE BARRIER

NEW W-S RAMP

RAMP CLOSED

SANDY HILL ARENA

KING EDWARD AVENUE

ROBINSON AVENUE

NICHOLAS STREET

E-N RAMP

N-W RAMP

N-E RAMP

S-E RAMP

W-S RAMP

HIGHWAY 417 WBE

HIGHWAY 417 EBE

MATCH EXISTING

OUTLET #24 (1067CP)

OUTLET #25 (525CP)

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

RAMP CLOSURES TO BE RESTORED TO PERVIOUS AREA, GRADE TO MATCH EXISTING GROUND.

HAWTHORNE AVENUE

CONCORD ST. S

LEES AVENUE

CHESTNUT ST.

SOUTHEAST TRANSITWAY

CONCO

STA. 30+050

STA. 30+450

30+100

30+200

30+300

30+400

R= 3350

A=222.00

R=646.81

R=621

EX.R=90

R=55

EX.R=75

R=90

EX.R=60

R=105

EX.R=50

R=50

R=70

EX.R=45

R=45

EX.R=35

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 30+050 TO STA. 30+450

PLATE 22

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin
- New Concrete Barrier

SANDY HILL ARENA

EDWARD AVENUE

REMOVE EXISTING BRIDGE

EXISTING NOISE BARRIER

NEW RETAINING WALL & NOISE BARRIER

NEW RETAINING WALL

BRIDGE WIDENING

ROBINSON AVENUE

LEES AVENUE

HURDMAN RD.

HIGHWAY 417 WBL
A-222.00

HIGHWAY 417 EBL

SCL 400m

R=126

MATCH EXISTING

R=740

R=55

R=200

R=73

30+500

30+600

30+700

30+800

30+900

31+000

31+100

STA. 30+450

R= 2104

R=646.81

R=582.13

A-210.61

STA. 31+200

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

SOUTHEAST TRANSITWAY

BRIDGE WIDENING

NEW CONCRETE BARRIER

NEW BRIDGE

NEW RETAINING WALL

ALGONQUIN COLLEGE RIDEAU CAMPUS

OUTLET #26 (1050CP)

BRIDGE WIDENING

RIDEAU RIVER

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 30+450 TO STA. 31+200

PLATE

23

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- 300 New Storm Sewer
- New Catch Basin
- New Concrete Barrier

NEW CONCRETE BARRIER

RAMP CLOSURES TO BE RESTORED TO PERVIOUS AREA. GRADE TO MATCH EXISTING GROUND.

RAMP CLOSED

RIDEAU RIVER

BRIDGE WIDENING

RCMP HEADQUARTERS

STA BACK: 31+220
STA AHEAD: 10+000

OUTLET #28 (686CP)

OUTLET #27 (915CP)

STA 31+200

10+100

10+200

10+300

MATCH EXISTING

10+400

10+500

10+600

10+700

R= 1100

R= 3004

HIGHWAY 417 WBL

HIGHWAY 417 EBL

A-206.36

SCL 300m

SCL 400m

R=698.55

N-W RAMP

VANIER PARKWAY

S-W RAMP

R= 62

MATCH EXISTING

E-NS RAMP

EX.R=60

R=70

R= 375

A-188.38

A-206.36

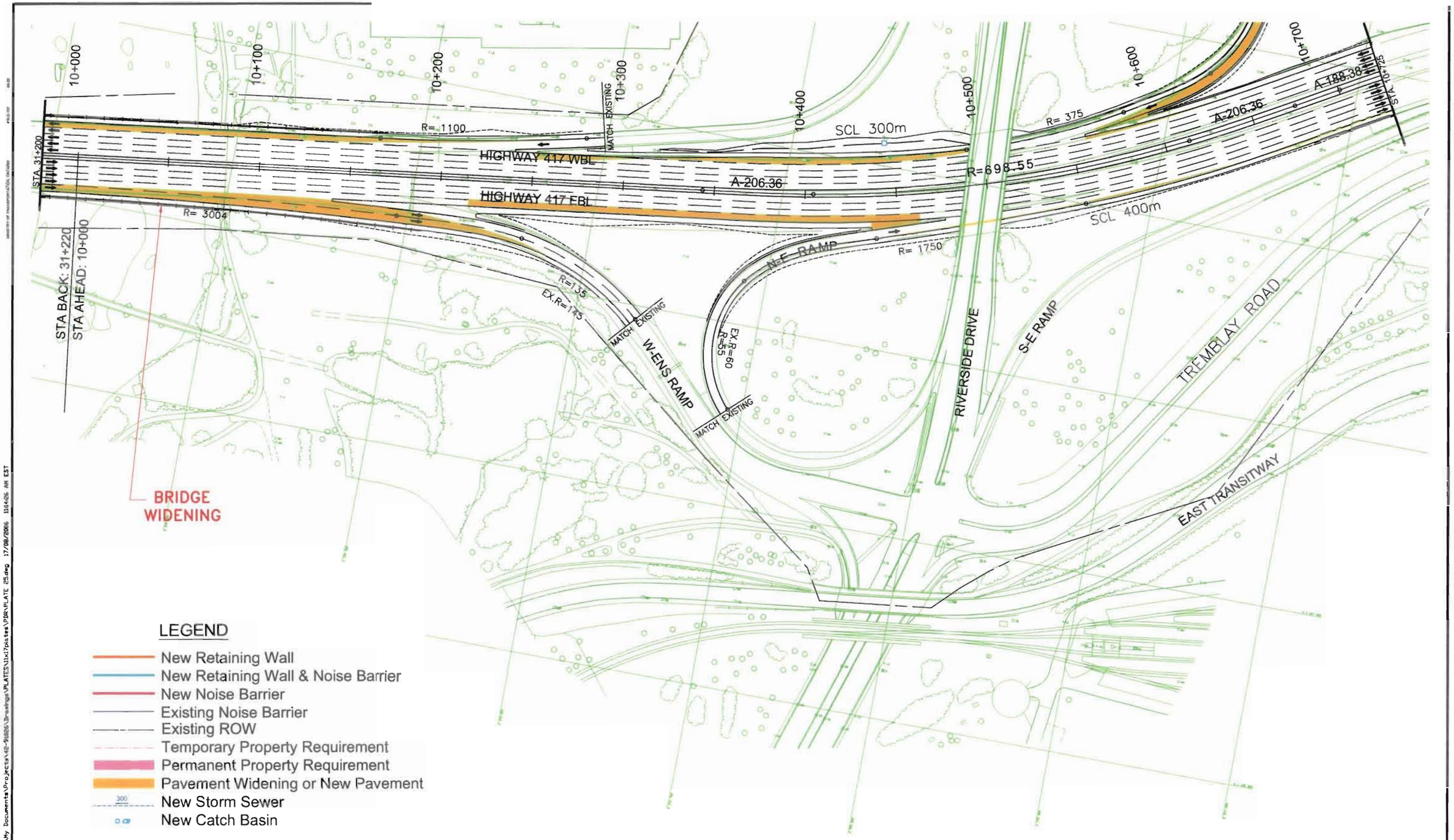
STA 10+725

NE RAMP

R= 1750

Ontario DTH engineers architects planners	SCALE 20M 0 40M Horizontal		HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT G.W.P. 663-93-00	RECOMMENDED PLAN STA. 31+200 TO STA. 10+725	PLATE 24

D:\Documents and Settings\All Users\My Documents\Projects\42-91026\Drawings\PLATES\11x17plates\PBRPLATE 24.dwg 17/08/2006 11:09:57 AM EST



LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- 300 New Storm Sewer
- New Catch Basin

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 31+200 TO STA. 10+725

PLATE 25

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NEW RETAINING WALL

JETFORM PARK

'S RAMP

10+800

MATCH EXISTING

R= 1000

10+900

11+000

11+100

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

Outlet #30 (825 CP)

11+200

BELFAST ROAD

11+300

11+400

R=582.13

A-188.38

A-188.38

STA. 10+725

MATCH EXISTING

R= 550

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

STA. 11+475

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

TREMBLAY RD.

OTTAWA TRAIN STATION

NEW RETAINING WALL

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

Ontario

DTH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 10+725 TO STA. 11+475

PLATE
26

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NEW RETAINING WALL

BRIDGE WIDENING

NEW RETAINING WALL

ST. LAURENT SHOPPING CENTRE

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

11+500 11+600 11+700 11+800 11+900 12+000 12+100 12+200

STA. 11+475

R= 4000

R= 4000

R= 4005

N-W RAMP

MATCH EXISTING

SCL 345m

R= 1000

Outlet #32

S-W RAMP

STA. 12+225

EAST TRANSITWAY

EX.R=150
R=190

W-N'S RAMP

R= 600

N-E RAMP

EX.R=40
R=40

MATCH EXISTING

EX.R=90

MATCH EXISTING

NEW RETAINING WALL

NEW CONCRETE BARRIER

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin
- New Concrete Barrier

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 11+475 TO STA. 12+225

PLATE

27

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin
- New Concrete Barrier

LEMIEUX ST.

LABELLE ST.

NEW RETAINING WALL

BRIDGE WIDENING

NEW RETAINING WALL

NEW CONCRETE BARRIER

S-W RAMP

MATCH EXISTING

12+300

EX. R=40

R=39

MATCH EXISTING

EX. R=100

R=100

E-N STRAMP

12+400

12+500

12+600

12+700

12+800

12+900

R= 1000

R= 1758

EAST TRANSITWAY

R= 1500

STA. 12+225

HIGHWAY 417 WBL

HIGHWAY 417 EBL

HIGHWAY 417 WBL

R=1746.38

HIGHWAY 417 EBL

STA. 12+975

R= 600

ST. LAURENT BOULEVARD

S-E RAMP

R= 1500

R= 72

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

RAMP TO BE CLOSED. EMERGENCY VEHICLES AND BUSES ONLY

ACCESS CONTROL DETAILS TO BE DETERMINED IN DETAIL DESIGN

TRIOLE ST.

MICHAEL ST.

Ontario

DH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 12+225 TO STA. 12+975

PLATE 28

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin
- New Concrete Barrier

NEW CONCRETE BARRIER

NEW BRIDGE

PROPOSED SUBSURFACE STORMWATER MANAGEMENT FACILITY (TO BE CONFIRMED DURING DETAIL DESIGN)

EAST TRANSITWAY

417E-N RAMP

174E-417E RAMP

Outlet #35 (CULVERT)

Outlet #34

CYRVILLE ROAD

N-417E RAMP

174E-417W RAMP

417W-174E RAMP

OTTAWA ROAD 174

MATCH EXISTING

STA. 12+975

STA. 13+375 MATCH EXISTING

STA. 13+530

R=1746.38

R= 1775

R= 330

R=1003.84

R=698.57

R=498.97

A-302.78

A-272.99

A-261.61

A-263.82

Ex.R=66

R=66

13+000

13+044.28

13+100

13+200

13+300

13+400

13+500

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 12+975 TO STA. 13+375 (EB)
STA. 12+975 TO STA. 13+530 (WB)

PLATE 29

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417W-174ERAMP

417E-174E RAMP

HIGHWAY 417 WBL

HIGHWAY 417 EBL

R=498.97

R=498.97

R=698.57

13+600

13+700

13+800

13+900

14+000

14+100

14+200

14+250

13+500

13+400

MATCH EXISTING

Outlet #36

Outlet #36A

A-261.61

A-261.61

STA. 14+275

STA. 14+175

STA. 13+530

STA. 13+375

TRANSITION FROM WIDENING ON THE OUTSIDE TO INSIDE

N-417E RAMP

CYRVILLE ROAD

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

Ontario

MTH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 13+375 TO STA. 14+175 (EB)
STA. 13+530 TO STA. 14+275 (WB)

PLATE

30

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

HIGHWAY 417 WBL
HIGHWAY 417 EBL
E-417W RAMP
E-417E RAMP
W-417W RAMP
W-417E RAMP
417E-EW RAMP
417W-EW RAMP
INNES ROAD
STA. 14+275
STA. 14+175
STA. 15+050
STA. 14+950
Outlet #37 (DITCH)
Outlet #38 (CULVERT)
Outlet #40 (CULVERT)
14+200
14+300
14+400
14+500
14+600
14+700
14+800
14+900
15+000

Ontario

DH engineers architects planners

SCALE
20M 0 40M
Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 14+175 TO STA. 14+950 (EB)
STA. 14+275 TO STA. 15+050 (WB)

PLATE
31

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INNES ROAD

W-417W RAMP

417E-EW RAMP

Outlet #40 (CULVERT)

Outlet #41 (into Green's Creek)

Outlet #42 (MEDIAN)

Outlet #43 (DITCH)

Outlet #48A (EBL DITCH)

GREEN'S CREEK

HIGHWAY 417 WBL

HIGHWAY 417 EBL

STA. 15+050

STA. 14+950

STA. 15+800

STA. 15+725

R=635.06

R=672.85

R=619.93

R=582.14

A=295.14

A=303.79

A=291.60

A=282.57

15+000

15+100

15+200

15+300

15+400

15+500

15+600

15+700

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

Ontario

DH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 14+950 TO STA. 15+725 (EB)
STA. 15+050 TO STA. 15+800 (WB)

PLATE 32

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15+900
16+000
16+100
16+200
16+300
16+400
16+500

R=619.93
A=291.60
A=326.29
R=1164.28
STA. 15+800
STA. 15+725
STA. 16+525
HIGHWAY 417 WBL
R=582.14
A=282.57
HIGHWAY 417 EBL
A=331.54
R=1202.07
STA. 16+400

15+800
15+900
16+000
16+100
16+200
16+300

Outlet
#46 (EBL DITCH)

LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- 300 New Storm Sewer
- New Catch Basin

Ontario

DTAH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 15+725 TO STA. 16+400 (EB)
STA. 15+800 TO STA. 16+525 (WB)

PLATE
33

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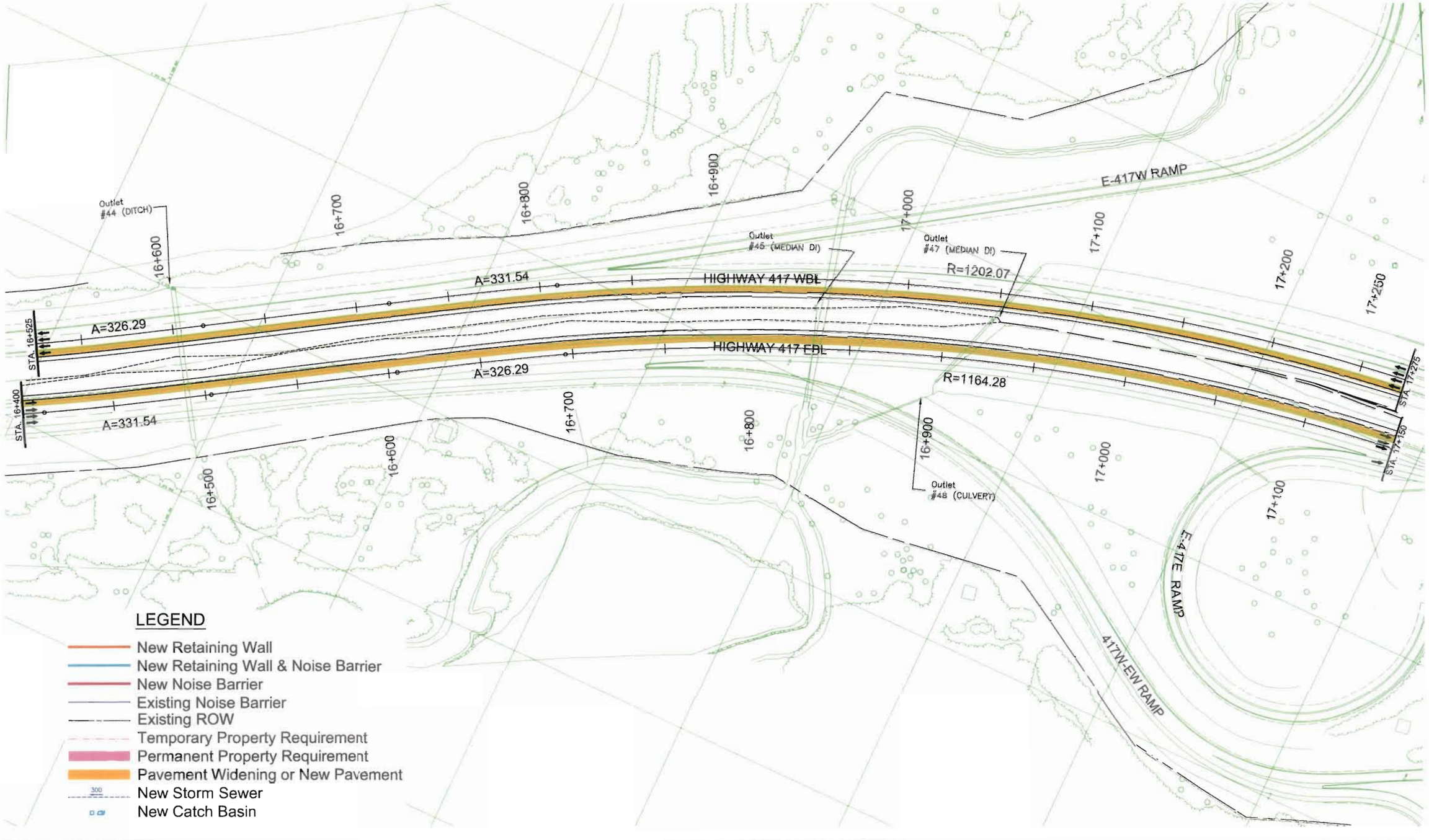

Ontario

DTAH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 16+400 TO STA. 17+150 (EB)
STA. 16+525 TO STA. 17+275 (WB)

PLATE

34

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

W-417 W RAMP

417E-EW RAMP

WALKLEY ROAD

HIGHWAY 417 WBL

HIGHWAY 417 EBL

W-417E RAMP

RAMSAY CREEK

STA. 17+275

STA. 17+975

STA. 17+150

STA. 17+850

R=1202.07

A=331.54

A=399.62

R=1746.41

R=1164.28

A=326.29

A=326.29

R=1164.28

Outlet
#50 (WBL DITCH)

Outlet
#49 (CULVERT)

17+150 17+200 17+300 17+400 17+500 17+600 17+700 17+800 17+900

17+150 17+200 17+300 17+400 17+500 17+600 17+700 17+800

Ontario

DH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 17+150 TO STA. 17+850 (EB)
STA. 17+275 TO STA. 17+975 (WB)

PLATE

35

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LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin

RAMSAY CREEK

STA. 17+975

18+000 18+100 18+200 18+300 18+400 18+500 18+600

R=1746.41

HIGHWAY 417 WBL

Outlet #50A (CULVERT EXT)

CULVERT EXTENSION

BRIDGE WIDENING

STA. 17+850

17+900 18+000 18+100 18+200 18+300 18+400 18+500

HIGHWAY 417 EBL

R=1164.28

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

PRELIMINARY DESIGN PLAN
STA. 17+850 TO STA. 18+600 (EB)
STA. 17+975 TO STA. 18+675 (WB)

PLATE 36

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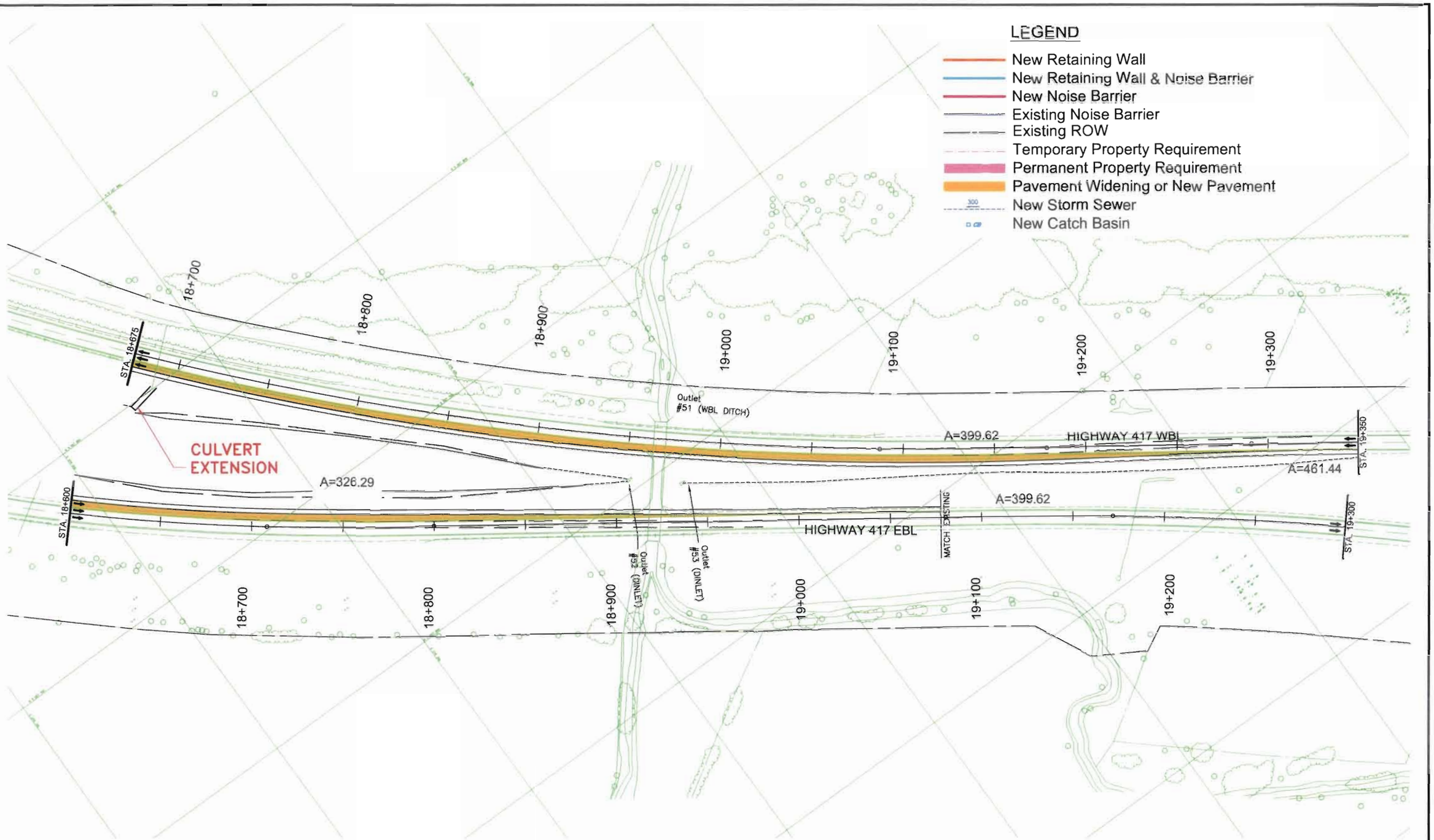

Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 18+600 TO STA. 19+300 (EB)
STA. 18+675 TO STA. 19+350 (WB)

PLATE

37

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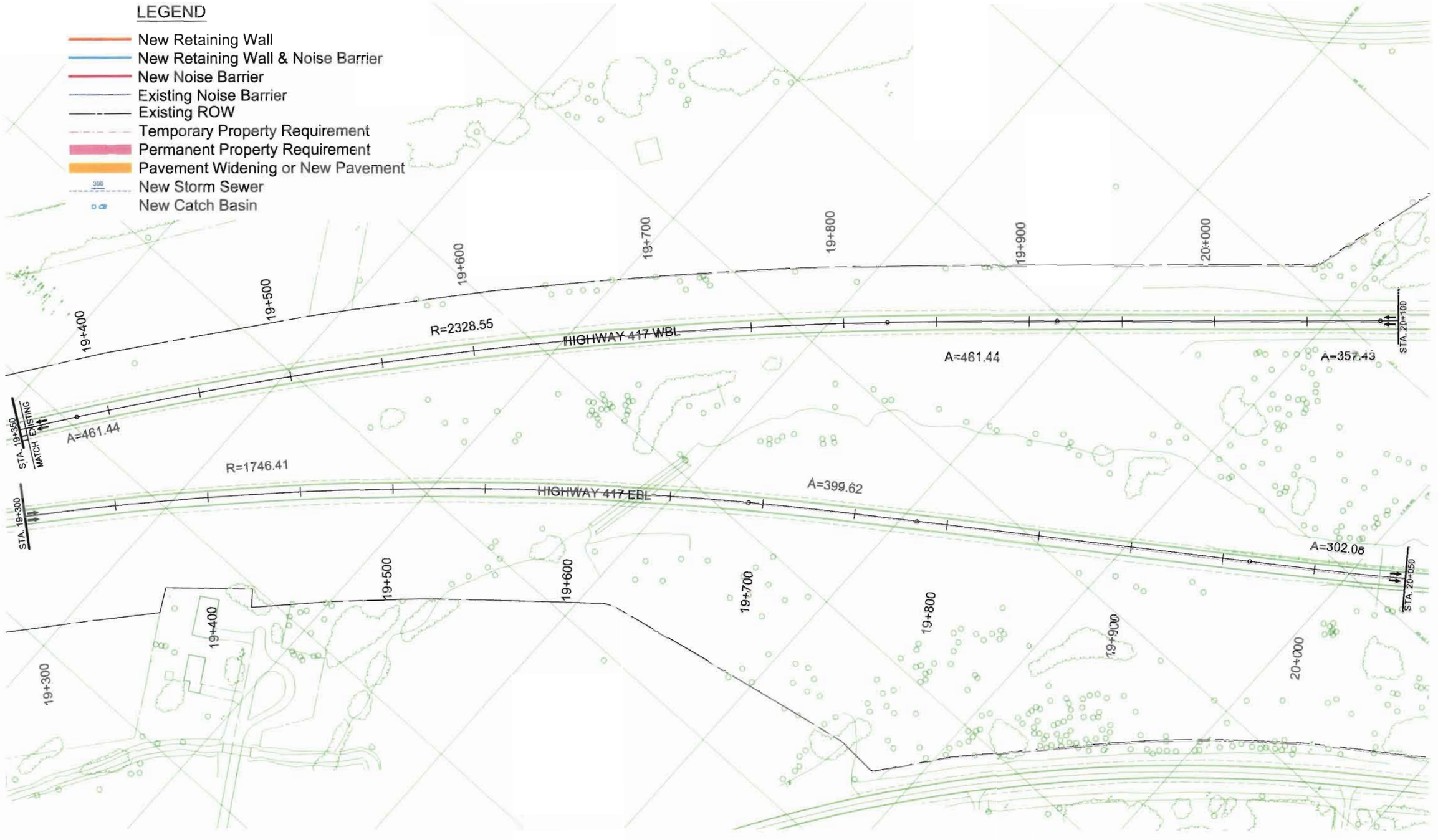
LEGEND

- New Retaining Wall
- New Retaining Wall & Noise Barrier
- New Noise Barrier
- Existing Noise Barrier
- Existing ROW
- Temporary Property Requirement
- Permanent Property Requirement
- Pavement Widening or New Pavement
- New Storm Sewer
- New Catch Basin



Ontario

engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 19+300 TO STA. 20+050 (EB)
STA. 19+350 TO STA. 20+100 (WB)

PLATE

38

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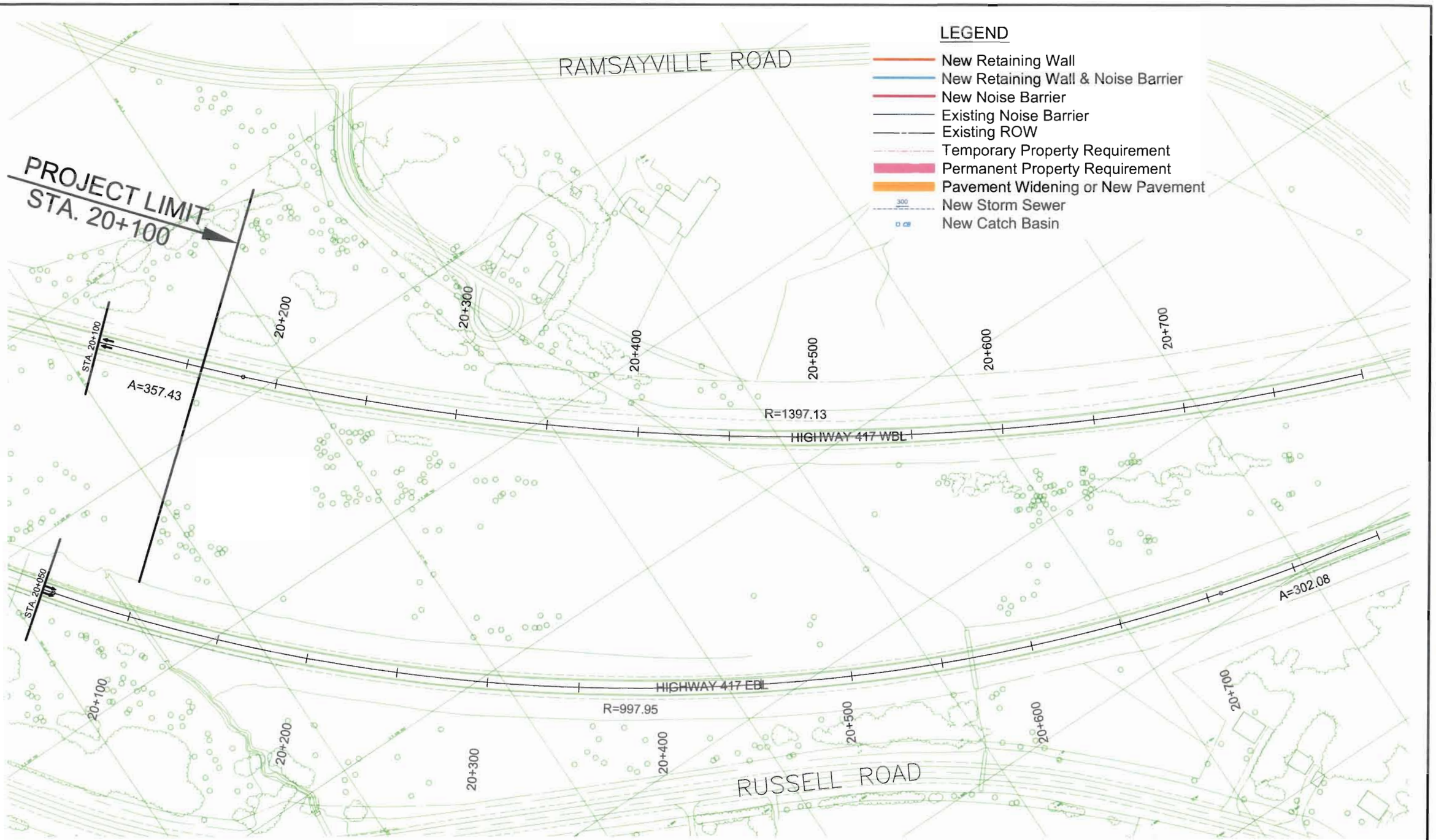

Ontario

DH engineers architects planners

SCALE

20M 0 40M

Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

RECOMMENDED PLAN
STA. 20+050 TO STA. 20+800 (EB)
STA. 20+100 TO STA. 20+800 (WB)

PLATE

39

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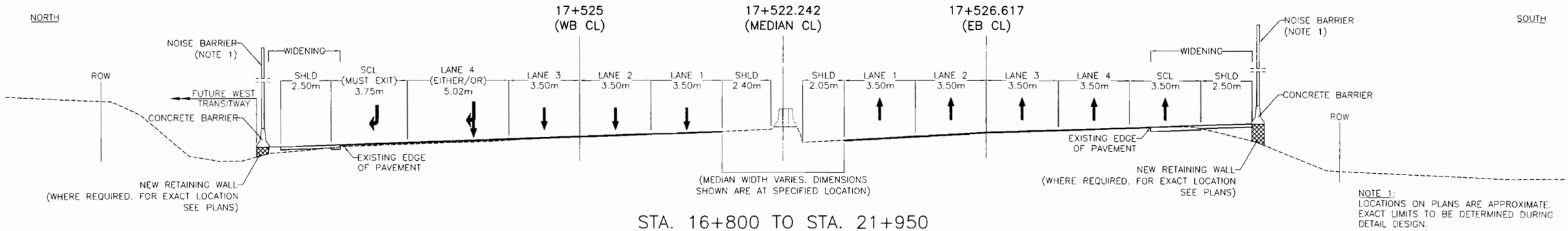
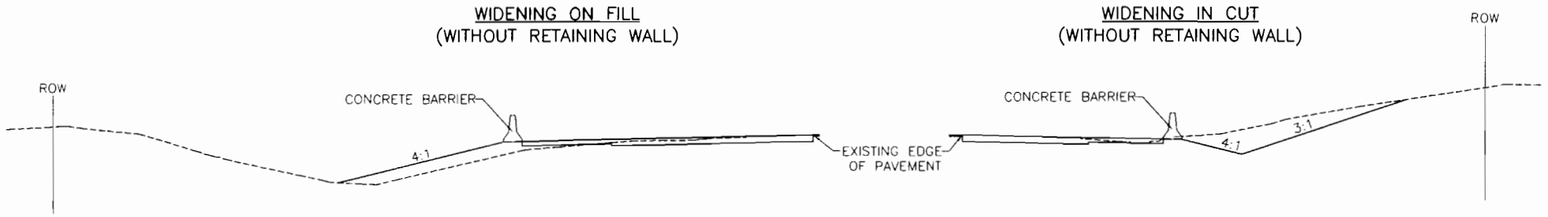
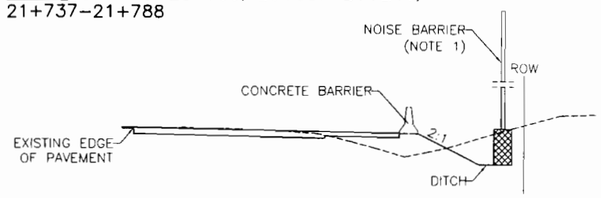
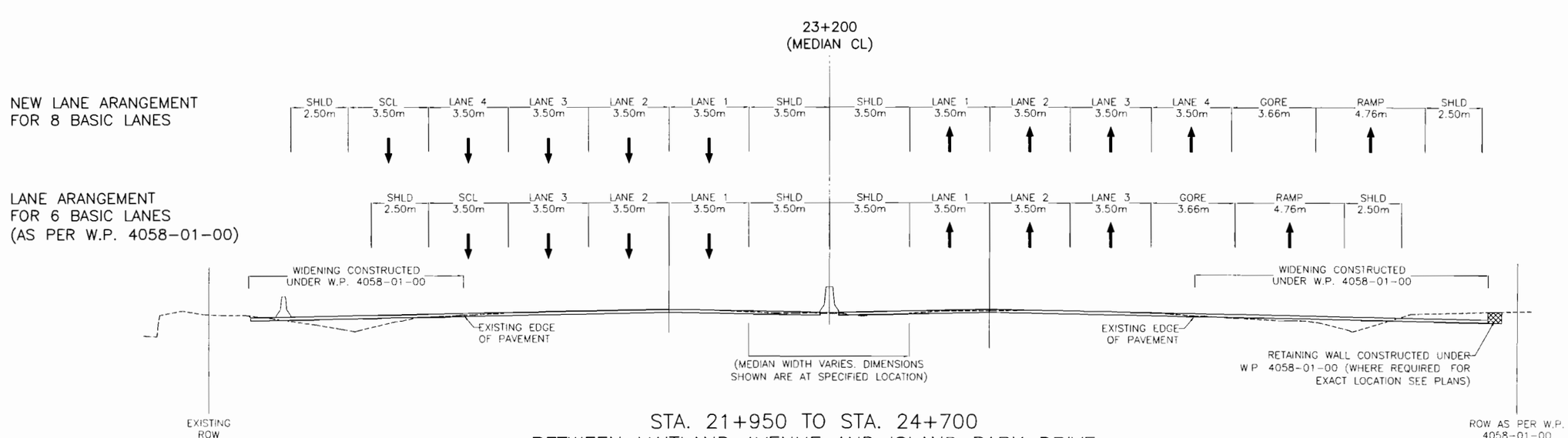


STA. 16+800 TO STA. 21+950
BETWEEN RICHMOND ROAD AND MAITLAND AVENUE
(SECTION SHOWN REPRESENTS SPECIFIED LOCATION)

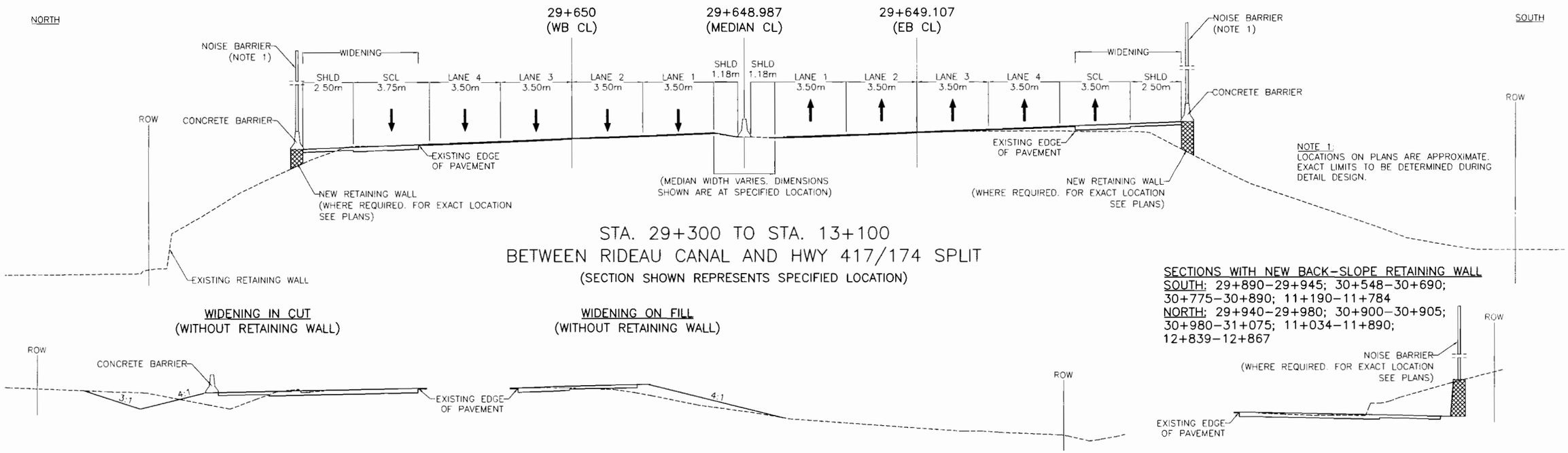






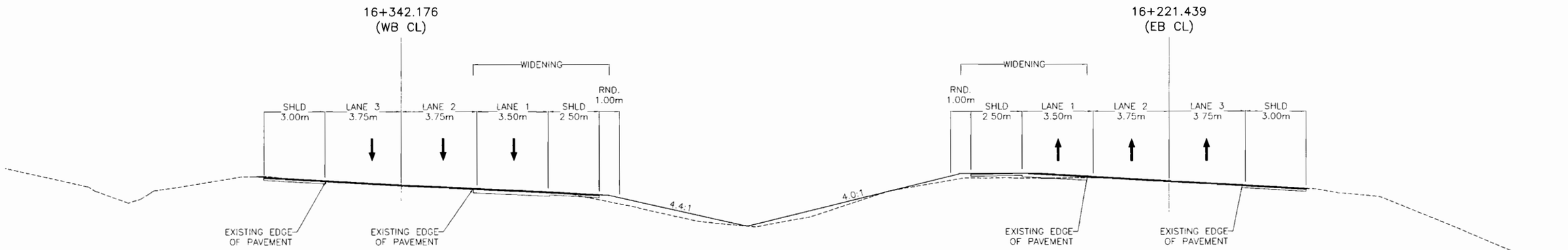
STA. 21+950 TO STA. 24+700
BETWEEN MAITLAND AVENUE AND ISLAND PARK DRIVE
(SECTION SHOWN REPRESENTS SPECIFIED LOCATION)

Ontario engineers architects planners	SCALE 2M 0 4M Horizontal		HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT G.W.P. 663-93-00	TYPICAL SECTIONS	PLATE 40



STA. 29+300 TO STA. 13+100
BETWEEN RIDEAU CANAL AND HWY 417/174 SPLIT
(SECTION SHOWN REPRESENTS SPECIFIED LOCATION)

SECTIONS WITH NEW BACK-SLOPE RETAINING WALL
SOUTH: 29+890-29+945; 30+548-30+690; 30+775-30+890; 11+190-11+784
NORTH: 29+940-29+980; 30+900-30+905; 30+980-31+075; 11+034-11+890; 12+839-12+867



STA. 13+100 TO STA. 19+400
BETWEEN HWY 417/174 SPLIT AND EAST OF WALKLEY ROAD
(SECTION SHOWN REPRESENTS SPECIFIED LOCATION)

Ontario

TSH engineers architects planners

SCALE
2M 0 4M
Horizontal

HIGHWAY 417, FROM HIGHWAY 416 TO ANDERSON ROAD
PRELIMINARY DESIGN STUDY AND ENVIRONMENTAL ASSESSMENT
G.W.P. 663-93-00

TYPICAL SECTIONS

PLATE
41

MINISTRY OF TRANSPORTATION, ONTARIO
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APPENDIX B
Consultation Documentation

Project Notices
Correspondence
Meeting Notes
PIC Summary Reports

APPENDIX C
Project Description Report Under the Canadian Environmental Assessment Act

APPENDIX D
Summary of Freeway Mainline Traffic Analysis Results
Traffic Operations Report

APPENDIX E
Existing Conditions Report – Highway Geometrics

APPENDIX F
Preliminary Fisheries and Aquatic Ecosystem Technical Report

APPENDIX G
Botanical and Wildlife Survey Report

APPENDIX H
Natural Environment Assessment: Island Park Drive Interchange

APPENDIX I
Drainage Report, Existing Conditions
Drainage Structures Inventory Report

APPENDIX J
Social, Land Use and Planning Review Report

APPENDIX K
Landscape Documentation

APPENDIX L
Existing Noise Conditions Report
Noise Report for Recommended Plan
Centretown Noise Study

APPENDIX M
Air Quality Assessment Report

APPENDIX N
Stage I Archaeological Assessment Report
Stage II Archaeological Assessment Report

APPENDIX O
Electrical System Report – Existing Conditions

APPENDIX P
Evaluation Methodology
Preliminary Alternatives Report
Alternative Plates
Assessment and Evaluation Tables

APPENDIX Q
Transportation Demand Management (TDM) Study Report

APPENDIX R
High Occupancy Vehicle (HOV) Report