CITY OF KINGSTON THIRD CROSSING OF THE CATARAQUI RIVER
ENVIRONMENTAL ASSESSMENT

ENVIRONMENTAL STUDY REPORT UNDER THE ONTARIO MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT FRAMEWORK

April 16, 2012

VOLUME 1 – MAIN REPORT

JLR 23446-02
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J. L. Richards & Associates Limited

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0.0 PROJECT SUMMARY

0.1 Project Proponent

The project proponent is the City of Kingston (City). Contact information is as follows:

City of Kingston
216 Ontario Street
Kingston, Ontario K7L 2Z3
Mr. Mark Van Buren, P.Eng.
Director, Engineering Department
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Fax: (613) 542-7880
E-mail: mvanburen@cityofkingston.ca
Website: www.cityofkingston.ca

0.2 Project Title

The project is referred to as the ‘City of Kingston Third Crossing of the Cataraqui River Harmonized Environmental Assessment’.

0.3 Project Location

As shown on Drawing PS-1, the Environmental Assessment (EA) study area is within the City, extending along the shoreline and lands adjoining the Cataraqui River from the LaSalle Causeway-Highway 2 crossing in the south to the Highway 401 crossing in the north. The Highway 401 crossing is roughly 6 kilometres (km) north of the LaSalle Causeway-Highway 2 crossing. Additional main road networks in the EA study area include John Counter Boulevard and Montreal Street west of the Cataraqui River shoreline as well as Kingston Road 15 and Gore Road east of the Cataraqui River shoreline. The Cataraqui River forms part of the Rideau Canal, a designated United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site, National Historic Site, Canadian Heritage River and Federally regulated navigable waterway. The Federally regulated navigable waterway within the EA study area extends northward from the LaSalle Causeway.

As shown on Drawing PS-2, the project site location is a corridor extending from John Counter Boulevard on the west shore to Gore Road on the east shore. The Universal Transverse Mercator (UTM) coordinates, taken near the mid-point of this corridor, is generally UTM 18T 382402 metres (m) E. 4901531 metres N (+/-).

0.4 Problem Description

The purpose of the EA study is to evaluate the need for and the feasibility of implementing additional transportation capacity across the Cataraqui River in the City. Two major east-west transportation crossings of the Cataraqui River currently exist within the City’s urban limits. One crossing is the LaSalle Causeway-Highway 2 corridor, which crosses the Cataraqui River in the southern portion of the EA study area at the confluence of the Cataraqui River and Lake Ontario. The LaSalle Causeway is comprised of a two-lane cross section and a series of structures (fixed truss, rigid frame structure and Bascule Lift Bridge, the latter of which is raised to accommodate recreational boat traffic). It is under the jurisdiction of Public Works & Government Services Canada. With an existing traffic volume in the order of 1,000 to 1,100 vehicles per hour in each direction during the PM peak hour, the LaSalle Causeway is currently operating below the City’s target Level of Service (LOS) D policy. This is based on an average estimated capacity of 900 vehicles per hour, per lane, which is further reflective of existing network conditions along the LaSalle Causeway-Highway 2 corridor. Based on urban growth and related travel volume demand forecasts, the LaSalle Causeway is expected to reach an average of 1,260 vehicles per hour, per lane, during the PM peak hour by 2019. This is 40 percent greater than its existing average estimated capacity. If left unaddressed, these volumes would cause local traffic to divert north to use the Highway 401 crossing, thereby leading to further out of way travel, additional delays and potential local-regional traffic conflicts on Highway 401.

The second crossing is the Highway 401 corridor, which crosses the Cataraqui River approximately 6 km north of the LaSalle Causeway. Highway 401 is owned by the Province of Ontario through the Ministry of Transportation Ontario (MTO). It is a four-lane Freeway that extends through the City and is the primary inter-city freeway, with local interchanges at Joyceville Road, Kingston Road 15, Montreal Street, Division Street, Sir John A. Macdonald Boulevard, Sydenham Road, and Highway 38. The Highway 401 crossing capacity is estimated to be approximately 1,500 to 2,000 vehicles per hour, per lane (for a total two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration). The MTO is currently widening Highway 401 from four to six lanes west of Sydenham Road to west of Montreal Street as part of a broader provincial strategy to ultimately twin Highway 401 from the City of Windsor to the Quebec border in response to traffic volume growth and traffic collision incidents. The forecasted 2019 PM peak hour demand for the Highway 401 crossing is estimated to be roughly 2,400 vehicles per hour for eastbound travel and 2,500 vehicles per hour for westbound travel. As the trigger for recommending roadway solutions for the Highway 401 crossing is 5,400 vehicles per hour, there would appear to be capacity to accommodate additional local (or short distance) City traffic crossing the Cataraqui River using Highway 401.

1 Note ‘Level Of Service’ (LOS) is a measure of the mobility of traffic and the resulting level of congestion determined by vehicle delay. A volume-to-capacity ratio associated with LOS is measured based on traffic counts (or the ‘volume’) and the ability of the road to carry traffic (or the ‘capacity’). Generally, LOS is measured between LOS A and LOS F where LOS A involves free flow traffic operations at average travel speeds and LOS F involves gridlock conditions. LOS B, C, D and E are incremental measures between LOS A and LOS F. The City generally applies LOS D for future design purposes at peak hour traffic volume levels, which is commonly used in similarly sized Canadian cities.

2 Based on the ‘Traffic Operations Study For The LaSalle Causeway Corridor’ (July 2011), the capacity of the LaSalle Causeway is impacted primarily by the signalized intersections at each end of the crossing, namely, the Highway 2-Kingston Road 15 intersection to the east and the Barrack Street-Ontario Street intersection to the west.
401. However, the primary function of Highway 401 is to accommodate regional (or long distance) traffic. Traffic operations related to local traffic needs are fundamentally different than regional traffic needs. These differences can result in compromised efficiency and safety for both local and regional traffic, which is inconsistent with effective transportation engineering practice. In addition, based on the trip demand lines of vehicles that favour crossing the Cataraqui River via the LaSalle Causeway to the south, diverting local traffic 6 km north to use the Highway 401 crossing would also lead to further out of way travel and additional delays.

The context within which this EA study is to respond to this problem is equally important, as highlighted below:

1. The Cataraqui River, which has a water depth averaging 1.2 m except at the buoyed channel and the southern portion of the Inner Harbour. Water levels are primarily defined by the water levels in Lake Ontario. The Cataraqui River is a slow moving glide with flow velocities ranging from negligible up to 0.4 metres/second (m/s). Winter ice cover is variable. It is typically established from December to late April and melts in place due to the low water flow velocities.

2. Most of the winds are from due south and due west, caused mainly by the effects of Lake Ontario. But high winds can be experienced from any direction, in that 100 year wind speeds are roughly 20 m/s [or 72 kilometres/hour (km/hr)] from either the south or north.

3. The Cataraqui River forms part of the Rideau Canal, one of the most significant heritage properties in the EA study area. Originally built between 1826 and 1832, the canal is a UNESCO World Heritage Site (designated in 2007), National Historic Site (designated in 1925), Canadian Heritage River (designated in 2000) and Federally regulated navigable waterway (which is officially closed to watercraft from Thanksgiving to Victoria Day). Within the EA study area, the designated site of the canal (for all three designations) begins at Belle Island and follows the high-water marks on either shore, north to and beyond the limits of the EA study area. The inscribed property of the UNESCO World Heritage Site includes the Rideau Canal National Historic Site as well as the Fort Henry and the Kingston fortifications (Fort Frederick and the Murney, Shoal and Cathcart Martello Towers) National Historic Sites in the southern portion of the EA study area. The canal is owned, managed and regulated by Parks Canada according to management plans and guidelines that conserve its heritage values.

4. There are 71 other heritage properties within the EA study area. The southern portion of the EA study area from the LaSalle Causeway up to Belle Island contains 64 of the 71 heritage properties. In addition, in certain cases, heritage protection also extends beyond the boundaries of the heritage property to include the consideration of visual impacts from proposed developments on the heritage property (both to and from the heritage property) or between related heritage properties. Within the EA study area these views are identified by Parks Canada in its World Heritage Site and/or National Historic Site management documents, the Barriefield Conservation District Plan, municipal designations, and the City’s Official Plan. As noted below, there are 9 of these views within the EA study area, 7 of which are in its southern portion:

   a) From the LaSalle Causeway up to Belle Island:
      (i) views between the Kingston Fortifications and between each fortification and Kingston Harbour;
      (ii) views from the Barriefield Village Conservation District towards the Cataraqui River, St. Lawrence River, Fort Henry and downtown Kingston;
      (iii) views of St. Mark’s Church in Barriefield Village;
      (iv) views from the Woolen Mill to City Hall and the Cataraqui River;
      (v) views from Barrack Street and Queen Street to the Inner Harbour;
      (vi) views of the City Hall cupola from the LaSalle Causeway and Royal Military College (RMC); and
      (vii) views across the Inner Harbour; and

   b) From Belle Island to the Highway 401 crossing:
      (i) views of the Rideau Canal from the municipally designated site of the Pittsburgh Branch of the Kingston Frontenac Public Library (Gore Road Library); and
      (ii) all development overlooking the Rideau Canal.

5. The EA study area contains the following main natural heritage features:

   a) The Greater Cataraqui Marsh, which is a Provincially Significant Wetland and Provincially Significant Coastal Wetland and is the most significant ecological system on the landscape [based on the Ontario Wetland Evaluation System (OWES), its visible cattail portion in the northern portion of the EA study area has higher ecological diversity (more plant and animal species) and greater potential for pollution/erosion/flood control than the southern portion];

   b) The visible cattail portion of the Greater Cataraqui Marsh and the buffering woodlands are a Significant Area of Natural and Scientific Interest;
c) Most of the identified significant and contributory woodlands within the EA study area are in narrow, fragmented strips, except for areas mainly along the visible cattail portion of the Greater Cataraqui Marsh as well as on Belle Park and Belle Island; and

d) The Cataraqui River and shoreland areas provide significant habitat to a wide range of terrestrial and aquatic wildlife species, including feeding areas for migratory waterfowl, 206 bird species (at least 21 of which are dependent on the marsh for nesting habitat), at least 26 sport and forage fish species that use the river system for spawning, nursing and rearing and 16 amphibian and reptile species (note there are 30 listed terrestrial and aquatic wildlife and plant ‘species at risk’ within the EA study area).

6. There are 37 registered archaeological sites within and adjacent to the EA study area and an undetermined number of areas that are in process of being investigated. Significant archaeological resources are present on both sides of the LaSalle Causeway. The area between the LaSalle Causeway and Belle Island also contains 14 registered shipwrecks and intact archaeological resources relating to City urbanization. In addition, sites of significant First Nations heritage are located on Belle Island and to the north of Belle Island on the west side of the Cataraqui River. An archaeological site is also proximate to the east shore of the Cataraqui River and the Gore Road right-of-way. Since a large percentage of the EA study area remains essentially unaltered, all indicators point to virtually the whole EA study area exhibiting high archaeological potential.

7. Historically, the lands on the west side of the Cataraqui River from the LaSalle Causeway to just north of John Counter Boulevard were more heavily industrialized than in other portions of the EA study area. Consequently, areas having the highest densities of potential environmental impact include portions of the downtown and surrounding area, the shoreland segments north of the downtown along Montreal Street and John Counter Boulevard, the southwest portion of the Inner Harbour as well as Belle Park and its vicinity.

8. The EA study area is generally characterized by shallow limestone bedrock. Where overburden is present, it consists mostly of post-glacial silts and clays. The elevation of the Cataraqui River is at roughly 74.5 m. The bedrock at either shoreline is at elevation 73 m which dips to elevations that vary from 36 m to 55 m within the Cataraqui River. This ‘bedrock valley’ is made up of clay soils and organic deposits.

9. Watercraft navigation is an important feature of the EA study area, typified by the Inner Harbour and Outer Harbour, the HMCS Cataraqui Facility immediately north of the LaSalle Causeway, the marinas and rowing clubs and the rowing lanes which run adjacent to the Rideau Canal’s navigable channel.

10. There are major infrastructure works within the Cataraqui River, including a buried sewage forcemain and watermain that extends from River Street on the west side of the Cataraqui River southward to James Street on the east side as well as three Hydro One marine electrical cables (3-phase 44 kV line) that cross the Cataraqui River in the John Counter Boulevard-Gore Road area. In addition, a future east-west watermain, which is required to improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (in east Kingston) in order to improve the redundancy in the municipal water system on the east side of the Cataraqui River, is also envisioned being installed across the Cataraqui River.

11. The lower Cataraqui section of the Rideau Canal south from Highway 401 to the northern entrance of Kingston’s Inner Harbour near Belle Island is a rare example of the waterway where the natural environment was not altered during canal construction. Over the intervening 178 years, the extensive wetlands of the Great Cataraqui Marsh, as well as the river valley’s sloped physiography and forested landscapes adjacent to the navigation channel proceeding south from Highway 401, have remained largely intact. The area defined by the northern entrance of the Inner Harbour near Belle Island provides a transition between the natural character of the Cataraqui River to the north and the more urbanized environment of the City to the south, east and west.

0.5 Preferred Solution

The implementation of additional transportation capacity across the Cataraqui River must satisfy both the Federal and Provincial EA frameworks in recognition of the following:

1. In regards to the Federal EA framework as per the ‘Canadian Environmental Assessment Act’ (CEA Act):
   a) The riverbed throughout the EA study area is owned by the Federal Government, resulting in various Federal approval requirements; and
   b) Prospective project implementation activities will involve a future request by the City for Federal financial assistance.

2. In regards to the Provincial EA framework as per the ‘Ontario Environmental Assessment Act’ (OEA Act), the Ontario Municipal Class EA planning process developed by the Municipal Engineers Association (October 2000, as amended in 2007) is an approved decision-making process for various projects undertaken by municipalities related to road, water, wastewater and transit facilities. The Ontario Municipal Class EA process comprises five general phases that allow for the development and evaluation of alternative solutions in facilitating a project through to construction. This EA study is following the Schedule ‘C’ framework of the Ontario Municipal Class EA.
As a result of harmonization of the Federal and Provincial EA frameworks as per the 'Canada-Ontario Agreement on Environmental Assessment Cooperation' (November 2004), the evaluation, consultation and decision-making process for this EA study is summarized through this Environmental Study Report (Report).

As per City requirements, this EA study has proceeded in two stages. Stage 1, which was completed in late May 2010, focused on Phases 1 and 2 of the Ontario Municipal Class EA framework, namely, the evaluation of the need for and the feasibility of implementing additional transportation capacity across the Cataraqui River (or ‘Phase 1’) and the assessment of the following alternative solutions (or ‘Phase 2’):

1. **Retain the status quo or ‘do nothing’**. This means no facilities would be constructed to provide additional transportation capacity across the Cataraqui River and the problem would remain and/or an opportunity would not be addressed. This option is not considered a viable alternative solution since:
   a) The LaSalle Causeway is operating at capacity and is expected to experience increased congestion during peak traffic periods as population and employment growth continues; and
   b) Focusing solely on active transportation (cycling and walking) and public transit, though laudable, would not be able to address the entire capacity on the LaSalle Causeway over the immediate-to-long-term, based on the following current and projected conditions:
      (i) the projected 2019 traffic congestion on the LaSalle Causeway takes into account the existing modal shares for active transportation (14 percent) and public transit (5 percent);
      (ii) though Kingston Transit expects the introduction of 2 new express bus routes serving the east and west sides of the City to increase the modal share for public transit from 5 percent to 6 percent by 2019, even at a simulated 9 percent public transit modal share by 2029, the LaSalle Causeway is still projected to operate below the City’s target LOS D; and
      (iii) significantly increasing the modal shares for active transportation and public transit over-and-above current projections would be very difficult to achieve within the next 15 to 20 years, given the size of the City in relation to the major infrastructure investment and aggressive policy approach that would be required.

Thus, if left unaddressed, projected traffic volumes and resulting congestion on the LaSalle Causeway would cause local traffic to divert north to use the Highway 401 crossing, thereby leading to further out of way travel, additional delays and potential local-regional traffic conflicts on Highway 401.

2. **Increase the capacity of the LaSalle Causeway**. This alternative solution involves three possible sub-options, namely:
   a) The widening of the Bascule Lift Portion of the LaSalle Causeway, which is considered non-viable due to the fill and additional loads from the expanded structure, which could overstress the clay and organic soils within the Cataraqui River, thereby causing differential settlement patterns between the existing structure and the expanded structure; and
   b) Based on the 2011 ‘Traffic Operations Study For The LaSalle Causeway Corridor’ prepared by HDR/iTrans:
      i. the widening of Highway 2 to accommodate an extra lane (either for a through lane or an extended eastbound lane) between Duty Drive and Kingston Road 15, which is considered non-viable due to capital cost, property acquisition requirements and the impact on the Barriefield Rock Cut; or
      ii. a series of short-to-medium term improvements to the LaSalle Causeway corridor, which generally involve: transportation demand management measures; traffic signal optimizations; adaptive traffic controls; storage lane extensions; constructing a new Canadian Forces Base (CFB) Kingston access road connection to Gore Road; public transit service enhancements; and replacing the traffic signal at the Highway 2-Kingston Road 15 intersection with a roundabout.

Traffic modelling concluded that the City’s target of LOS D on the corridor could be maintained until at least 2020 with the implementation of the improvements highlighted in point 2.b.ii above. As such, the recommended improvements are considered a viable interim solution and are further reflective of the 2005 Provincial Policy Statement (PPS) which states that the use of existing infrastructure should be optimized, wherever feasible, before consideration is given to developing new infrastructure. Still, the recommended improvements may not be able to solely reduce congestion and accommodate future traffic volume demand over the long-term. The future monitoring of traffic conditions by the City would confirm the viability of this scenario.

3. **Increase the capacity of Highway 401 from Montreal Street to Kingston Road 15**. Despite its current capacity and expansion program from four to six lanes, the Highway 401 crossing is not considered a viable alternative solution, given its primary role as an inter-city freeway, the trip demand lines of vehicles that favour crossing the Cataraqui River via the LaSalle Causeway to the south and the related out of way travel and additional delays that would result from diverting local traffic 6 km north to use the Highway 401 crossing.
4. **Implement a new crossing at a location between the LaSalle Causeway and Highway 401 by either a tunnel or bridge.** As shown on Drawing PS-3, in order to evaluate this alternative solution, the EA study area was subdivided into six corridor areas with nine possible crossing alignment options based on potential connections to existing roads. The corridor areas were evaluated based on technical feasibility, transportation effectiveness and potential social, cultural, environmental and financial impacts. Area 2 and Area 4 on Drawing PS-3 were then short-listed for further assessment. An evaluation matrix consisting of forty-eight criteria was developed and applied to Area 2 and Area 4. Based on this exercise:

a) A tunnel is not considered a viable alternative solution, given that:

i. a tunnel through rock is not feasible due to vertical profile constraints, as the rock elevation is roughly 20 m to 40 m below the riverbed and the acceptable geometric design criteria of a 6 percent slope or less to match the existing elevation and intersections cannot be achieved;

ii. a tunnel could only be realistically built using a cut and cover technique which would require:

   (a) construction to be carried out in about 100 m sections inside a 25 m wide cofferdam area that would be dredged and dewatered to a depth of approximately 12 m below the water surface (this would be repeated until the entire tunnel was constructed);

   (b) the east section to either:

      (i) parallel Kingston Road 15 between the river's edge and the Gore Road Library and connect with Kingston Road 15 at a new 'T' intersection only 350 m north of the Gore Road intersection, which is not ideal from a transportation perspective; or

      (ii) spiral around the Gore Road Library and through the Kingston Road 15-Gore Road intersection, resulting in vehicular traffic detouring to permit construction;

   (c) as noted above, substantial dredging of the riverbed and dewatering as well as excavations at both the west and east shores, resulting in severe environmental impacts;

   (d) boat traffic detouring to permit tunnel construction across the Rideau Canal’s navigable channel; and

   (e) a four-lane tunnel scenario (two lanes in each direction) at the outset, given the design and construction challenges and impacts, resulting in a prohibitive capital cost estimated in the range of $350 million to $450 million;

iii. the transportation of dangerous goods may not be allowed through the tunnel for public safety reasons; and

iv. neither cyclists nor pedestrians would be allowed through the tunnel, also for public safety reasons.

b) The preferred alternative solution, as shown on Drawing PS-4, is a bridge crossing at the John Counter Boulevard-Gore Road alignment, which:

i. by providing a mid-central arterial road corridor through the City, offers opportunities to improve urban transportation network connectivity in order to:

   (a) relieve existing and future traffic congestion;

   (b) enhance the delivery of municipal services such as public transit and utility infrastructure;

   (c) promote walking and cycling as viable alternative modes of transportation; and

   (d) accommodate planned future residential and employment growth on the east and west sides of the Cataraqui River; and

ii. by being within the Rideau Canal and proximate to its southern boundary at Belle Island, offers opportunities to enhance the City’s historic association with, and the values of, the canal through the use of state-of-the art and sustainable design practices.
At the May 25, 2010 City of Kingston Council meeting, Council approved the ‘City of Kingston Third Crossing of the Cataraqui River Harmonized Environmental Assessment Stage 1 Summary Report’ (Stage 1 Summary Report) and authorized that this EA study proceed to completion, or Stage 2. Stage 2 is addressing Phase 3 and Phase 4 of the Ontario Municipal Class EA process, namely:

1. Assessing and identifying a preferred bridge crossing design at the John Counter Boulevard-Gore Road alignment (the project site location), including the identification of potential impacts, the development of mitigation measures as well as capital and maintenance costs (or ‘Phase 3’).

2. Finalizing approval of this Report that documents the decision-making process during Stage 1 and Stage 2 of this EA study (or ‘Phase 4’).

Note that Project Implementation, which would involve detailed design and project construction activities (or ‘Phase 5’) of the Ontario Municipal Class EA process, is beyond the scope of this EA study.

The outcome of Stage 2 of this EA study is a preferred design solution at the project site location, the main components and structures of which are highlighted below:

1. The shore-to-shore distance is roughly 1,150 m at the project site location and has water depths ranging from about 1.5 m over the majority of the section to approximately 4.5 m at the Rideau Canal’s navigable channel.

2. The ‘Canadian Highway Bridge Design Code’ (CHBDC) requires a design life for new bridges of at least 75 years. New bridges having similar shore-to-shore characteristics to those within the project site location typically have a design life of at least 100 years. It is anticipated that the bridge at the project site location, in terms of its proposed structural elements and materials, intended function and maintenance requirements in relation to the geographical setting, would have a design life exceeding 100 or even 120 years.

3. As shown on Drawing PS-5, the bridge alignment is a constant gradual s-curve that lands north of the Point St. Mark residential neighbourhood located on the south side of Gore Road on the east shore. This alignment offers opportunities for:
   a) Reduced potential noise and visual impacts on Point St. Mark;
   b) ‘Softer landscaping’ along the Gore Road right-of-way on the east shore; and
   c) A more organic reflection of the bridge within the context of its transitional location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west.

4. As shown on Drawings PS-4, PS-6 and PS-7, the preferred design solution was selected out of the following three alternative bridge concepts:
   a) A ‘Tube’ concept, which:
      i. uses rounded/smooth steel truss work that forms a tube around the bridge for additional structural support;
      ii. uses 11 piers at 100 m spans with a 120 m span over the Rideau Canal’s navigable channel and adjacent rowing lanes;
      iii. would be the first bridge of its kind in the world for vehicular use;
      iv. is considered avant garde due to its shape, aesthetics, robustness (less deflection and vibration) and lighter weight (it uses a third less structural steel and concrete compared to a conventional bridge with the same spans); and
      v. was not selected as the preferred design solution due to technical issues raised with the EA study’s Technical Advisory Committee and related lack of public support (maintenance costs, too enclosed, driver view and user safety impacts from potential ‘shadow-flicker’, restricted views of the water, inability to widen the bridge in the future);
   b) A ‘Box Girder’ concept, which:
      i. uses 23 piers at 50 m spans;
      ii. has a 65 m span over the Rideau Canal’s navigable channel, which would exclude the adjacent rowing lanes; and
      iii. was not selected as the preferred design solution due to its perceived conventional, plain design by both the public and the EA study’s Technical Advisory Committee, particularly given the Rideau Canal context, and its inability to span over both the Rideau Canal’s navigable channel and adjacent rowing lanes without negatively impacting span-length-to-girder-depth proportions; and
   c) An ‘Arch With V-Piers’ concept, which is the preferred design solution, in that it:
      i. provides two structural supports for the bridge girders but only one in-river foundation for each pier, which reduces associated in-water disturbances and capital costs;
ii. uses up to 13 piers at 83 m spans [for a total in-water pier footprint of 0.07 hectares (ha)], which further minimizes visual impacts by maintaining appropriate span-length-to-girder-depth proportions;

iii. initially incorporated a 100 m arch span over the Rideau Canal’s navigable channel and adjacent rowing lanes (for a total 131 m distance pier-to-pier) which, based on recent consultations with the Kingston Rowing Club and noted below, has subsequently been increased to show a proposed 150 m distance pier-to-pier over the navigable channel and existing seven lane rowing course (four lanes on the west side of the channel and three lanes on the east side of the channel);

iv. provides an arch over the Rideau Canal’s navigable channel to showcase the bridge as a 21st Century ‘gateway’ to/from the Inner Harbour and Rideau Canal; and

v. was preferred by the public and its advantages were generally recognized by the EA study’s Technical Advisory Committee.

5. The CHBDC requires the bridge deck to have a minimum 1 m vertical clearance above the design high water level, which is at 76.3 m elevation at the project site location. With this in mind and as also shown on Drawings PS-4, PS-6 and PS-7, the bridge clearance above the water exceeds this CHBDC requirement as follows:

a) It is 3 m along most of its westerly portion (or at 78.8 m elevation) to both accommodate existing topographic conditions on the west shore and mitigate visual impacts, in that its silhouette would be below existing tree lines when viewed from the water and on land;

b) It then gradually rises to 14 m over the Rideau Canal’s navigable channel (or at 90 m elevation) near the east shore and adjacent rowing lanes, which also exceeds the minimum 6.7 m Federally regulated navigable requirement for the canal, thereby ensuring continued through-navigation and enjoyment of both the canal and the City’s unique heritage and cultural character; and

c) It then descends to 12 m (or at 88 m elevation) at the east shore to tie into existing elevations and topographic features.

6. As also shown on Drawing PS-5, a 22.9 m wide bridge deck is ultimately proposed that is comprised of the following:

   a) A four-lane vehicular roadway (two 3.5 m wide lanes for westbound travel and two 3.5 m wide lanes for eastbound travel) with a 1.8 m wide median, based on traffic demand forecasts and various planned road network improvement scenarios in proximity to the project site location;

   b) A 3.6 m wide multi-use trail provided on the south side of the bridge for active transportation;

   c) A 1.5 m wide commuter cycling lane provided on both sides of the bridge; and

   d) A 0.5 m wide area for a barrier separating the multi-use trail and commuter cycling lane on the south side of the bridge.

A series of observation look-out/interpretive areas (or ‘Belvederes’) are also provided along the south side of the bridge to maximize opportunities for bridge users to both enjoy views of and learn about the Rideau Canal, Belle Island and the Greater Cataraqui Marsh.

7. As also shown on Drawing PS-5 and reflective of the 2005 PPS which states that infrastructure should meet current and projected needs and be provided in a coordinated, efficient and cost-effective manner, an alternative staged approach to the development of an ultimate four-lane bridge could be viable. This option would involve constructing an initial three-lane bridge and a substructure that could accommodate widening to four lanes in the future. Under this scenario, the centre lane would operate as a reversible lane serving the peak direction of travel. This scenario is expected to operate at the acceptable LOS D in both directions under PM peak hour conditions at the 2019 and 2029 horizon years. However, while the two lanes available for westbound travel are projected to have reserve capacity, the one dedicated eastbound lane during the PM peak hour is expected to approach capacity in 2019 and would be at capacity by 2029. At this point, the bridge deck would need to be widened from three lanes to four lanes. The widening would be applied in equal proportions to the north and south sides of the bridge deck and could be done directly from the bridge deck itself, as the required substructure would already be in place. The future monitoring of traffic conditions by the City would confirm the viability of this scenario.

8. In regards to utility infrastructure:

   a) As per the City’s 2007 ‘Master Plan for Water Supply for the City of Kingston Urban Area’, Utilities Kingston has requested that an east-west watermain be incorporated in the bridge design, as it is required to:

      i. improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (located northeast of the project site location); and

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4 Note it could be feasible to reduce the number of bridge piers from 13 to 11 piers. It is recommended that this matter be reviewed and confirmed during the detailed design stage prior to the construction phase of the project.
ii. improve the redundancy in the municipal water system on the east side of the Cataraqui River; and

b) That the three existing Hydro One marine electrical cables (3-phase 44 kV line) that cross the Cataraqui River in the project location area be attached and concealed as part of the bridge deck, as requested by Hydro One Networks Inc.

9. The following three alternatives were considered for in-water bridge construction:

a) A temporary earth berm, which:
   i. would involve infilling an area with earth material and capping it with gravel to provide a temporary roadway from both riverbanks up to the Rideau Canal’s navigable channel;
   ii. would require culverts to accommodate water flows in the Cataraqui River;
   iii. would be removed after the bridge is built; and
   iv. was not selected as the preferred in-water bridge construction solution as it:
      (a) would result in two in-water disturbances during its installation and removal, for which a set of mitigation measures for each activity would be needed; and
      (b) would require the east-west watermain to be masked or screened underneath the permanent bridge deck, which in turn would:
         (i) impact efforts in achieving a context sensitive bridge design; and
         (ii) require the watermain to have expansion joints, heat tracing and insulation jacket equipment, all of which would require regular maintenance and servicing within a confined space entry scenario;

b) A temporary work bridge, which:
   i. would be built adjacent to the permanent bridge using a series of temporary piles;
   ii. would be removed after the bridge is built, with the temporary piles either being removed entirely or cut below the top of the riverbed and left in place; and
   iii. was not selected as the preferred in-water bridge construction solution as it:
      (a) would add an additional 8 percent to 12 percent in capital costs to the project;
      (b) would result in two in-water disturbances during its installation and removal, for which a set of mitigation measures for each activity would be needed; and
      (c) would require the east-west watermain to be masked or screened underneath the permanent bridge deck, similar to the temporary earth berm option; and

c) Dredging, which as shown on Drawing PS-8:
   i. would involve excavating a channel 1.4 m to 1.8 m below the existing river mud line from and for construction barges;
   ii. the excavated channel would be left in place after the bridge is built; and
   iii. is the preferred in-water bridge construction solution as:
      (a) dredging would require only one in-water disturbance and one related set of mitigation measures as part of its installation;
      (b) the excavated channel could represent a mitigation measure in response to potential project effects, in that it would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more;
      (c) dredging would reduce capital costs in the range of 8 percent to 12 percent in comparison to the temporary work bridge option; and
      (d) as noted above, dredging could accommodate the east-west watermain within the excavated channel, which in turn would:
         i. provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain underneath the permanent bridge deck; and
         ii. preclude the need to install and maintain expansion joints, heat tracing and insulation jacket equipment.
10. As shown on Drawing PS-9, roadway and landscape improvements for the west side lands include:
   a) For westbound travel:
      i. two 3.5 m wide vehicular lanes are shown on John Counter Boulevard along with a 3.25 m wide by 20 m long left-turn bay at the Village On The River apartment access on the south side of John Counter Boulevard and shared through/right-turn access into the River Park subdivision on the north side of John Counter Boulevard; and
      ii. a 3.25 m wide by 60 m long left-turn bay and a right-turn bay are shown at Montreal Street;
   b) For eastbound travel, two 3.5 m wide vehicular lanes are shown on John Counter Boulevard along with a 3.25 m wide by 20 m long left-turn bay at the River Park subdivision access and shared through/right-turn access into the Village On The River apartments;
   c) Provisions for a median barrier separating the westbound and eastbound vehicular lanes;
   d) Two shoreland observation look-out/interpretive areas are shown on the north and south sides of the bridge to maximize opportunities for those on-land to both enjoy views of and learn about the Rideau Canal, Belle Island and the Greater Cataraqui Marsh;
   e) The 3.6 m wide multi-use trail and 1.5 m wide commuter cycling lane on the south side of the bridge are shown continuing along the south side of John Counter Boulevard to Montreal Street and connecting with the existing Elliott Avenue Parkette recreational trail on-land by a 3.6 m wide multi-use trail;
   f) The 1.5 m wide commuter cycling lane on the north side of the bridge is shown continuing along the north side of John Counter Boulevard to Montreal Street and also connecting with the existing Elliott Avenue Parkette on-land by a 3.6 m wide multi-use trail under the bridge; and
   g) A sidewalk is shown on the north side of John Counter Boulevard extending from the multi-use trail access to Montreal Street.

11. As shown on Drawing PS-10, roadway and landscape improvements for the east side lands include:
   a) For westbound travel, two 3.5 m wide vehicular lanes are shown on Gore Road along with a 3.25 m wide by 20 m long left-turn bay at Point St. Mark Drive and a right turn option at the Gore Road Library;
   b) For eastbound travel, two 3.5 m wide vehicular lanes are shown on Gore Road along with:
      i. a 3.25 m wide by 60 m long left-turn bay, through lane/left-turn lane and right-turn lane option east of Point St. Mark Drive at Kingston Road 15;
      ii. a 3.25 m wide by 20 m long left-turn bay at the Gore Road Library; and
      iii. a right-turn option at Point St. Mark Drive;
   c) Provisions for a median barrier separating the westbound and eastbound vehicular lanes;
   d) The 3.6 m wide multi-use trail on the south side of the bridge is shown:
      i. continuing along the south side of Gore Road west of Point St. Mark Drive and connecting to the existing trail into Point St. Mark; and
      ii. extending under the bridge to connect with the trail network on the Gore Road Library property;
   e) A 1.5 m commuter cycling lane is proposed on both sides of Gore Road;
   f) The existing 1.5 m wide sidewalk would remain on the south side of Gore Road east of Point St. Mark Drive to Kingston Road 15;
   g) In regards to the Gore Road Library property:
      i. a proposed on-land observation look-out/interpretive area is shown to maximize opportunities for those on-land to both enjoy views of and learn about the Gore Road Library, Rideau Canal, Belle Island and the Greater Cataraqui Marsh; and
      ii. as the proposed roadway improvements would impact a portion of the traditional dry stone wall, it is proposed that the affected portion of this wall be realigned (as shown conceptually on Drawing PS-10) and incorporated into the landscape improvements to mitigate associated cultural heritage impacts; and
   h) The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River, which are incorporated into the landscape design as a ‘naturalized’ feature.
12. Based on projected traffic volumes and patterns, it is proposed that:
   a) The following intersections would be signalized:
      i. John Counter Boulevard – Montreal Street;
      ii. Gore Road – Point St. Mark Drive – Gore Road Library; and
      iii. Gore Road – Kingston Road 15; and
   b) The Ascot Lane access onto John Counter Boulevard would have stop sign controls.

13. Stormwater collection and management would include on-shore treatment (for sediment removal) and release in accordance with regulatory requirements. Catchbasins along the curb lines would collect the stormwater which would then be piped to a stormwater management facility (either above grade or underground) on-land, where the release rate of the water would be limited to pre-development conditions.

14. As shown on Drawing PS-11, four sound attenuation barriers are recommended at the following locations to reduce the predicted sound levels from the project at noise-sensitive areas:
   a) Adjacent to the River Park subdivision along the north side of John Counter Boulevard:
      i. a 3 m high by 110 m long wall and/or berm extending west from the John Counter Boulevard-Ascot Lane intersection; and
      ii. a 3 m high by 96 m long wall and/or berm extending east from the John Counter Boulevard-Ascot Lane intersection; and
   b) Adjacent to the Point St. Mark subdivision along the south side of Gore Road:
      i. a 3 m high by 410 m long wall extending west from the Gore Road-Point St. Mark intersection onto the south side of the bridge deck and ending proximate to the Rideau Canal’s navigable channel; and
      ii. a 2.4 m high by 96 m long wall extending east from the Gore Road-Point St. Mark intersection and ending proximate to the Gore Road-Kingston Road 15 intersection.

15. Based on recent consultations with the Kingston Rowing Club and as shown on Drawing PS-12, the initially proposed 131 m distance pier-to-pier over the Rideau Canal’s navigable channel has been subsequently increased to a proposed 150 m distance pier-to-pier to provide unencumbered through-navigation for the existing seven-lane rowing course. Proposed design features include:
   a) A 9.4 m horizontal clearance from the abutting pier on the west side of the course;
   b) An 8 m horizontal clearance from the abutting pier on the east side of the course; and
   c) A 13.5 m wide rowing lane on either side of the navigable channel to provide an additional 2.5 m clearance from the channel itself.

The 150 m distance pier-to-pier would also provide flexibility to optimize the pier locations further during the project implementation phase in response to more specific rowing course and navigable channel configurations and characteristics north and south of the bridge corridor.

16. The preliminary opinion of probable capital cost for the project (in 2011 dollars and excluding applicable taxes) ranges from:
   a) $114 million to $120 million for the two-lane bridge scenario;
   b) $145 million to $179 million for the three-lane bridge / four-lane bridge substructure scenario; and
   c) $161 million to $196 million for the four-lane bridge scenario, which would have to be reviewed further during the project implementation phase if the proposed 150 m distance pier-to-pier design is pursued to fully accommodate the rowing course.

17. The preliminary opinion of probable maintenance cost for the project (in 2011 dollars and excluding applicable taxes) is estimated to be up to $4,000 per lane km, or from $25,000 for the two-lane bridge configuration, to $30,000 for the three-lane bridge / four-lane bridge substructure configuration, to $35,000 for the four-lane bridge configuration.
0.6 Project Implementation Schedule

Project Implementation (or ‘Phase 5’) as part of the Ontario Municipal Class EA process is beyond the current scope of this EA study. Upon approval of this EA study, the EA will have a ‘shelf-life’ of ten years, commencing from when the Project Implementation phase is formally engaged by the City. Subject to budgetary approvals, it is anticipated that the schedule for the construction and operation phases associated with Project Implementation would generally be as follows:

1. Detail Design and Approvals Phase: 2 to 3 years
2. Construction Phase (including preliminary and detail design): 2 to 3 years
3. Operation Phase: 100 + years

Given the projected design life of the project, determining a schedule for the decommissioning phase of the project is premature at this time, though it is anticipated it would take up to two years to complete.

0.7 Potential Project – Environmental Interactions

The potential environmental interactions associated with the construction, operation and decommissioning phases of the project are identified in Table PS-1 below. Additional information regarding the construction, operation and decommissioning phases of the project is provided in Section 5 of this Report.

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<th>Soil and Groundwater</th>
<th>Surface Water Systems</th>
<th>Vegetation</th>
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<th>Aquatic Habitat</th>
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<th>Local Community</th>
<th>Roads and Road Traffic</th>
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(●) Potential Negative Impact (-) Limited or No Impact (o) Potential Positive Impact
0.8 Mitigation Measures

There are two important tools that will be administered by the City during future project phases to mitigate potential adverse environmental effects. The first tool deals with the preparation and implementation of a Cultural-Natural Heritage Protection Plan (C-NHPP) in advance of each phase of the project. The C-NHPP will be written in industry-accepted specification format and contain best management practices, including the recommended mitigation measures contained in this Report, namely:

1. As part of the project construction phase:
   a) Ensuring all construction equipment:
      i. is maintained in good working condition through regular maintenance and inspections;
      ii. includes industry-standard emissions treatment and noise-suppression systems that meet applicable Provincial guidelines current at that time; and
      iii. operate and re-fuel only in designated areas;
   b) Employing dust suppression techniques such as watering on construction access roads and sweeping at construction site entrances;
   c) Installing:
      i. ditches along temporary roadways to direct surface drainage to temporary treatment ponds or permanent facilities; and
      ii. permanent stormwater drainage and management facilities to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements;
   d) Using local aggregates for site preparation and construction activities, subject to availability;
   e) Conducting analyses of sediments in advance of and following excavation activities both onshore and in-water in order to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage and agency notification) and excavated material disposal to an approved landfill facility are mobilized in accordance with regulatory requirements;
   f) In advance of shoreland excavation works, installing sediment fencing along the riverbanks to prevent sediment movement and erosion outside of the work area;
   g) Ensuring shoreland excavation works meet applicable Provincial blasting vibration guidelines current at that time;
   h) Installing silt fencing for spoil stockpiling or fill materials and ensuring such areas are at least 30 m off-shore;
   i) Ensuring spill kits are located on-site and storing construction materials and debris as well as fuel, lubricants and other hazardous materials in designated areas away from high-traffic areas and the Cataraqui River;
   j) Purging the ballasts of all in-water vessels, should they originate from outside the Great Lakes system, in order to minimize the risk of introducing invasive species into the Cataraqui River;
   k) Suspending in-water construction activities during periods of heavy rain and high wind events;
   l) Minimizing the removal of shoreline and riparian vegetation as this could represent an opportunity for the continuance of existing ecosystem features and functions;
   m) In advance of in-water removal of aquatic vegetation or substrate, installing silt curtains and/or turbidity barriers around in-water work areas and ensuring such measures remain in place until the sediments within the affected area have settled;
   n) Regularly monitoring:
      i. shoreline erosion and sediment control measures and ensuring such measures are not removed until the terrestrial vegetation is re-established as part of the landscape improvement works; and
      ii. river water quality north and south of the project site location for turbidity, suspended soils, nutrients and contaminants.
   o) Conducting advance inspections in areas slated for site preparation and construction activities in order to assess the presence of sensitive vegetation and tree species as well as wildlife species and the feasibility of relocating affected species to other hospitable environments and/or establishing buffers to protect affected species and to restrict access;
p) Scheduling site preparation and construction activities:
   i. to avoid sensitive areas as well as breeding/spawning seasons and over-wintering periods for wildlife (from March 15 to July 15 for fish; Spring and Fall for migratory waterfowl; from May to late September and the Fall-Winter months for the Eastern Milke Snake; between early August and late September for turtle species), unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts; and
   ii. in consultation with:
      (a) the Kingston Rowing Club and Queens Rowing Club to avoid impacts to the local rowing community as much as possible; and
      (b) Parks Canada, Department of Fisheries & Oceans and Transport Canada to ensure the Rideau Canal’s navigable channel remains open and the arch span bridge section installation in particular occurs during when the channel is officially closed to watercraft (from Thanksgiving to Victoria Day);

q) In advance of site preparation activities and in consultation with the appropriate Provincial and Federal agencies, preparing a Natural Environment Enhancement Plan that includes measures related to wetland restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or baking), stabilizing and rehabilitating the shoreline shallows and re-vegetating the east and west side lands in direct response to the detail bridge design and construction program;

r) In regards to the Gore Road Library property:
   i. documenting the condition of historic structures in advance of site preparation works and during construction activities to ensure that any adverse effects are promptly addressed;
   ii. ensuring that the historic structures are protected from direct impact by vehicles during site preparation and construction activities;
   iii. assessing the condition of trees and plantings along the southern boundary of the property and avoiding or relocating those specimens having historical significance to other suitable locations on the property, as feasible and appropriate;
   iv. despite efforts to avoid the impact on the dry stone wall:
      (a) relocating as little of the wall as possible in order to facilitate the widening of Gore Road and to meet safety and traffic requirements in road construction;
      (b) documenting the section of the wall to be relocated, both for historical purposes and to facilitate site reconstruction;
      (c) ensuring the relocated section of the wall is reconstructed by a qualified heritage stonemason and that it is rebuilt as a continuation of the existing wall, but at right angles and heading eastward on a parallel to Gore Road (the latter as per the request of representatives of the Kingston Heritage Advisory Committee); and
      (d) assessing the condition of the remaining wall by a qualified heritage stonemason; and
   v. preparing and implementing an Interpretation Plan that both documents and presents the known history of the property in situ;

s) In advance of site preparation works, removing and documenting archeological site BbGc-127 through archaeological excavation in order to mitigate the risk of the site being damaged during the project construction phase;

t) Conducting periodic monitoring of excavated materials to minimize potential impacts on previously undocumented archaeological resources;

u) Ensuring proper in situ conservation or excavation and removal measures as well as notification protocols are in place regarding the discovery of previously undocumented cultural heritage and archaeological resources;

v) In the event that human remains are encountered, immediately notifying the Kingston Police, OMTC, the Cemeteries Registrar of the Ontario Ministry of Government and Consumer Services and the City’s Heritage Planner;

w) Sorting construction debris for recycle or disposal for hauling off-site by licensed operators to approved facilities;

x) Using licensed personnel to:
   i. handle hazardous materials; and
   ii. provide regular pump-out and haulage services of temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment;
y) Ensuring proper on-site construction signage and controls are installed for designated areas and traffic lanes to ensure safe and efficient circulation on-land and in-water;

z) Establishing a remote off-site facility for construction labour force parking complete with scheduled shuttle service to and from the project site location as well as encouraging the construction labour force to carpool to and from the project site location;

aa) Unless otherwise necessary, undertaking site preparation and construction activities during daylight hours in accordance with the City’s Noise By-Law and to avoid potential effects of noise and artificial light on the natural environment;

bb) Implementing the preferred design, which as noted above, incorporates additional elements as potential mitigation measures; and

c) Employing detailed protocols for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures.

2. As part of the project operation phase:

a) Ensuring all maintenance equipment is in good working condition through regular maintenance and inspections;

b) Continuing to regularly monitor:

i. shoreline erosion and sediment control measures and ensuring such measures are not removed until the terrestrial vegetation is re-established as part of the landscape improvement works; and

ii. Cataraqui River water quality north and south of the project site location for turbidity, suspended soils, nutrients and contaminants;

c) Maintaining and monitoring those works that are included in the Natural Environment Enhancement Plan;

d) Implementing dust suppression measures as part of maintenance activities;

e) Using only non-chlorinated de-icing agents on the bridge deck;

f) Ensuring the stormwater drainage and management facilities are in good working condition through regular maintenance and inspections;

g) Suspending in-water maintenance activities during periods of heavy rain and high wind events;

h) Conducting advance inspections in areas slated for maintenance activities in order to assess the presence of sensitive vegetation and tree species as well as wildlife species and the feasibility of relocating affected species to other hospitable environments and/or establishing buffers to protect affected species and to restrict access;

i) Ensuring that the historic structures are protected from direct impact by maintenance equipment;

j) Scheduling maintenance activities to avoid sensitive areas as well as breeding/spawning seasons and over-wintering periods for wildlife (from March 15 to July 15 for fish; Spring and Fall for migratory waterfowl; from May to late September and the Fall-Winter months for the Eastern Mikel Snake; between early August and late September for turtle species), unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts;

k) Monitoring future traffic conditions by the City in order to:

i. confirm the future viability of the initial three-lane bridge scenario, should it be pursued;

ii. optimize the coordination of traffic signals to maximize efficient traffic flows; and

iii. address the potential issue of short-cutting through residential neighbourhoods on the west and east side lands through such means as:

(a) monitoring signal timings to optimize traffic flow on the main public roads;

(b) building out curb radii to restrict vehicular turns into residential areas;

(c) installing speed bumps on residential roads to slow down traffic;

(d) creating restrictions within the residential road system such as one-way streets, restricted turns and dead end roads; and/or

(e) installing traffic signage restricting vehicular turns into residential areas either at all times or during certain times of the day; and

l) Preparing and employing an Operations and Maintenance (O & M) Manual that contains detailed protocols for employees/contractors regarding stormwater management system and
maintenance equipment inspections and maintenance procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures.

3. Similar mitigation measures used during the project construction phase would be employed as part of the project decommissioning phase. If and when decommissioning and rehabilitation are required at the project site location, it is anticipated that such works would take up to two years to complete. Such works would also be assessed as part of a Decommissioning Plan (DP), which would further be subject to EA regulations current at that time.

The second tool deals with the preparation and implementation of a Community Action Plan (CAP) that will be in place from the start of the construction phase and extend into the operation phase of the project. The CAP will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.

0.9 Public Consultation

The project team has employed a partnership model to facilitate effective, open, and meaningful consultation activities for this EA study, both internally and with international, national, provincial, and local stakeholders, including First Nations communities. Critical components of this model are outlined below.

0.9.1 Mission Statement, Vision, and Guiding Principles

The project team prepared a ‘Mission Statement, Vision and Guiding Principles’ for use and reference throughout this EA study. It is summarized below in Table PS-2.

| A. Mission Statement | 1. To complete an EA that evaluates the need and feasibility for a new crossing of the Rideau Canal and Cataraqui River in the City within a framework that:
|                       | a) builds trust, support, and consensus among international, national, provincial, First Nations, local interests and homeowner associations;
|                       | b) protects and enhances the cultural and natural heritage integrity of the Rideau Canal as a designated UNESCO World Heritage Site, National Historic Site, Canadian Heritage River and Federally regulated navigable waterway;
|                       | c) evaluates the functionality and compatibility of alternative solutions on the basis of social, cultural, economic, and environmental sustainability; and
|                       | d) respects Kingston's unique heritage and cultural character, including the customs and traditions integral to the distinctive cultures of First Nations communities and other cultures that make up our community.

| B. Vision | 1. Through innovative planning, design, and consultation, the EA process for evaluating the need and feasibility for a new crossing of the Cataraqui River will display community leadership that reinforces the City's proud historic association with the Rideau Canal and its goal of becoming Canada's most sustainable City.
### Table PS-2: Mission Statement, Vision and Guiding Principles

#### C1. Scenic, Cultural and Natural Heritage Integrity

1. We respect the role of the Rideau Canal and Cataraqui River as:
   a) a cultural heritage and natural symbol of Canada's identity;
   b) a valuable tourism and recreational resource; and
   c) a valuable testimony of First Nations and early European settlements and cultures.

2. We recognize the traditional role of the Rideau Canal and Cataraqui River as a fully functional navigable historic waterway in both promoting public education and nurturing the appreciation of its scenic, cultural heritage, and natural heritage value.

3. We value the ongoing efforts of private landowners, stakeholder groups, government agencies, and public and private sector partnerships in protecting and enhancing the scenic, cultural heritage, and natural heritage character of the Rideau Canal and Cataraqui River.

4. We recognize that the sustainable design and development of the shoreline and lands adjoining the Rideau Canal and the Cataraqui River is achieved through respect of its scenic, cultural heritage, and natural heritage landscape.

#### C2. Healthy Community

1. We recognize that efficient transportation linkages guide the future development of the City of Kingston and contribute to the quality of community life.

2. We appreciate that the development of effective alternative solutions needs to incorporate, promote and respect:
   a) private and public transportation use;
   b) sustainable transportation options such as cycling and walking;
   c) the principles of universal accessibility; and
   d) remaining cultural heritage artifacts from First Nations and early European settlements.

3. We recognize that the evaluation of effective alternative solutions needs to be based on:
   a) a full set of social, cultural, economic, and environmental factors;
   b) mitigation measures that are state-of-the-art and sustainable; and
   c) the preservation of cultural and heritage resources.

#### C3. Public and Agency Engagement

1. We acknowledge that international, national, provincial, and local interests and concerns shall be considered and addressed in an equitable manner.

2. We recognize that goals are realized when local knowledge and experience promotes understanding of project issues and solutions in an atmosphere of mutual respect and trust.
### Mission Statement, Vision and Guiding Principles

#### C3. Public and Agency Engagement

3. We are committed to a process in which support and consensus is established and nurtured through open and innovative public and agency consultation activities.

4. We welcome differences of opinion and competing interests as opportunities to ensure all project issues will be considered and addressed.

#### C4. Effective Implementation

1. We recognize that evaluating and developing alternatives at the same time will allow stakeholder and project team partners to better understand the issues from the outset and develop proactive solutions.

2. We appreciate that through effective graphic design of alternatives, the concepts will be better understood by stakeholders and help to generate feedback.

3. We recognize that our sense of accomplishment is achieved by providing clear and comprehensive documents that show how project decisions have been made.

#### C5. Project Teamwork

1. We are committed to providing professional services with a strong community-based presence that reflects professional pride, personal commitment, and mutual respect.

2. We acknowledge that project milestones are met by establishing realistic task objectives, strategic personnel assignments, proactive risk management, and effective schedule control.

### 0.9.2 Environmental Scan

Since consultation is a key element of the EA process, a comprehensive Consultation Plan was developed to facilitate agency, public stakeholder, and First Nations input throughout the project. As a precursor to the development of the Consultation Plan, approximately 25 interviews were undertaken with key stakeholders including, but not limited to: local residents; businesses; community groups; City staff and elected officials; and environmental groups and agencies. Commonly referred to as an 'Environmental Scan', this process identified potential community concerns and expectations about the project in general and the planned consultation activities in particular. In addition to identifying concerns, the environmental scan provided an opportunity to identify appropriate community representatives for the Public Liaison Committee, an important component of the Consultation Plan.

### 0.9.3 Consultation Plan

Based on the Environmental Scan, the Consultation Plan was finalized. It reflects the extensive interest and scrutiny to which this project will be subjected. Consultation to date has been facilitated through:


2. Maintaining a comprehensive agency, stakeholder group, and contact list.

3. Preparing regular project status updates such as newsletters and information handouts distributed by mail and/or E-mail.

4. Maintaining an up-to-date project website at www.cityofkingston.ca/thirdcrossing.

5. Vetting decision-making and project activities through a Technical Advisory Committee.

6. Engaging the community and facilitating consultation activities through a Public Liaison Committee.


8. Specific consultations:
   a) During Stage 1 of this EA study with:
      i. Parks Canada on November 23, 2009 and February 8, 2010 to discuss the potential impacts of an additional crossing of the Cataraqui River on the Rideau Canal south of the Kingston Mills Lock Station; and
ii. CFB Kingston on November 23, 2009 to provide an overview of the project and discuss CFB Kingston’s long-term strategic plans; and

b) During Stage 2 of this EA study with:

i. Parks Canada on September 16, 2010 which involved a boat tour of the EA study area and discussions on First Nations history in the area as well as preliminary bridge design and viewscape considerations; and

ii. the Kingston Rowing Club on August 16, 2010 as well as March 28, April 5 and April 9, 2012 to discuss rowing needs in the Cataraqui River.

9. Facilitating five Public Information Centres at the following key project milestones:

a) During Stage 1 of this EA study:

i. on April 23, 2009 to introduce the project;

ii. on November 28, 2009 to discuss project issues in small working groups; and

iii. on March 3, 2010 to present the preferred solution; and

b) During Stage 2 of this EA study:

i. on March 31, 2011 to present and receive feedback on the three preliminary bridge concepts; and

ii. on March 1, 2012 to provide details on the projected traffic volumes, flows and origin-destination patterns on the recommended bridge design solution and how these traffic patterns will affect the downtown and adjacent neighbourhoods as well as an EA process recap to provide a basis for the Stage 2 analyses and recommendations.

0.9.4 Project Committees

As shown in Table PS-3, project tasks, including decision making and consultation activities, were facilitated through four committees:

1. A Senior Management Committee to oversee the overall project direction.

2. A Technical Advisory Committee (TAC) to provide technical guidance and act as a sounding board for technical decision making on EA study alternatives, including the Stage 1 corridor area evaluation matrix and the Stage 2 preliminary bridge concepts.
<table>
<thead>
<tr>
<th>Committee</th>
<th>Committee Structure</th>
<th>Committee Roles and Responsibilities</th>
<th>Meetings to Date</th>
</tr>
</thead>
</table>
| Senior Management Committee | • Senior City Staff  
• Senior Project Team Members | • Project Oversight and Administration  
• Manage Project Budget and Schedule  
• Issue/Risk Management and Mitigation | • Various  
• Various |
| Technical Advisory Committee | • Various City Departments  
• Senior Project Team Members  
• Canadian Environmental Assessment Agency  
• CFB Kingston  
• Cataraqui Region Conservation Authority (CRCA)  
• Department of Fisheries and Oceans  
• Parks Canada  
• Ministry of Transportation Ontario | • Technical Guidance on EA Study Alternatives  
• Vetting Technical Decision-Making  
• Assistance in Identifying Approval Requirements | • March 9, 2009  
• September 16, 2009  
• November 4, 2009  
• January 27, 2010  
• February 10, 2010  
• February 23, 2010  
• October 18, 2010  
• January 20, 2011  
• May 26, 2011  
• July 28, 2011 |
| First Nations Consultations Sub-Committee | • Senior City Staff  
• Senior Project Team Members  
• Special Advisors | • Led by the City  
• Represents City and Project Team  
• Maintain a Link With First Nations | • Various  
• Various |
| Public Liaison Committee | • Senior City Staff  
• Senior Project Team Members  
• Community representatives from both sides of the Cataraqui River | • Provide Input on Public Consultation Activities  
• Review Consultation Reports  
• Attend Public Information Centres | • June 4, 2009  
• August 24, 2009  
• October 14, 2009  
• January 27, 2010  
• February 25, 2010  
• October 18, 2010  
• January 19, 2011  
• March 2, 2011  
• May 25, 2011  
• February 16, 2012 |
3. A First Nations Consultations Sub-Committee to facilitate consultation with the following First Nations communities having an interest within the EA study area:
   a) Ardoch Algonquin First Nation;
   b) Mississaugas of Alderville First Nation;
   c) Mohawk Nation Council of Chiefs;
   d) Tyendinaga Mohawk Territory;
   e) Shabot Obadjiwan First Nation;
   f) Huron-Wendat Nation;
   g) Algonquins of Ontario;
   h) Algonquins of Pikwàkanagàn; and
   i) Mohawk Council of Akwesasne.

4. A Public Liaison Committee to provide guidance and input for public consultation activities.

   **0.9.5 Public Consultation Sessions**

   As previously noted, the official Notice of Commencement to initiate the EA study was issued on March 3, 2009. There have since been five public consultation sessions. Three sessions were held during Stage 1 of this EA study and two sessions were held during Stage 2.

   **.1 Stage 1 – Public Information Centre No. 1 (April 23, 2009)**

   The first Public Information Centre was held at the LaSalle Secondary School on April 23, 2009 to introduce the EA study. The Public Information Centre was organized to allow attendees to review display panels and an information handout and discuss project issues with City staff and project team members. EA study topics on the display panels included:

   1. Welcome and Introduction.
   2. Study Area.
   3. Background Information.
   4. Importance of the Rideau Canal.

   Discussions lasted 20 minutes per topic. Participants were then asked to move to another table to discuss one of the other topic areas. The facilitators took notes and briefed each new group about the previous discussions. In so doing, these conversations linked and built on each other as people moved between groups, generating new ideas and insights about EA study issues.

   Of the 102 pre-registered participants, 51 attended the Cataraqui Crossing Café. However, 22 non-registered participants arrived at the event and participated in the session, for a total of 73 participants.

   **.2 Stage 1 – Cataraqui Crossing Café (November 28, 2009)**

   The Cataraqui Crossing Café took place at LaSalle Secondary School on November 28, 2009. This half-day event was organized to reach out to the community using an innovative, yet simple methodology for hosting conversations about EA study issues. Using the World Café methodology, the Cataraqui Crossing Café encouraged small group discussions on EA study issues in an informal setting. Each group had a trained facilitator who used issue-specific questions to engage group dialogue on the following EA study topics:

   1. Existing and Future Transportation Needs.
   2. Cultural Heritage Issues.
   5. Terrestrial and Marine Archaeological Issues.
   6. An Open Forum for Other EA Study Issues.

   Of the 152 responses to an on-line survey.

74 people attended this session and a total of 33 comment sheets were received. In addition, there were 152 responses to an on-line survey.
.3 Stage 1 – Public Information Centre No. 2 (March 3, 2010)

A second Public Information Centre was held on March 3, 2010 to present an overview of EA study activities and findings to date, a summary of the evaluation process for the consideration of the EA alternative solutions and the preferred EA solution, including the preliminary opinion of probable cost. The format consisted of a formal presentation followed by a Question and Answer period. A copy of the presentation material was available to all attendees as an Information Handout. Signed attendance at this event was 73.

.4 Stage 2 – Public Information Centre No. 3 (March 31, 2011)

A third Public Information Centre was held on March 31, 2011, to review the three alternative bridge concepts and information about the EA study as well as learn more about the EA process. The format consisted of both an information session and formal presentation format. Display panels were located around the hall in two stations. The display panels provided information on the following topics:

1. The EA Study Purpose and Process.
3. The Preliminary Bridge Alignment and Configuration.
5. The In-Water Bridge Construction Options.
6. The Preliminary Road and Landscape Concepts.

As residents arrived, they were asked to sign in and were then given a comment sheet and information package that contained the display panels. Signed attendance at this event was 178.

.5 Stage 2 – Public Information Centre No. 4 (March 1, 2012)

A fourth Public Information Centre was held on March 1, 2012, to review information on the projected traffic volumes, flows and origin-destination patterns on the recommended bridge design solution and how these traffic patterns will affect the downtown and adjacent neighbourhoods as well as an EA process recap to provide a basis for the Stage 2 analyses and recommendations. The format consisted of both an information session and formal presentation and question-and-answer format. Display panels were located around the hall. The display panels provided information on the following topics:

1. The EA Study Area, Purpose and Process.
2. The EA Problem Focusing on Existing and Projected Traffic Conditions.
3. The EA Study Area Conditions.
4. The EA Alternative Solutions and the Preferred Solution.
5. The Bridge Concepts from Various Vantage Points.
6. The In-Water Bridge Construction Options.
7. The Preferred Road and Landscape Concept.
8. The Preferred Bridge Concept and In-Water Bridge Construction Option.

As residents arrived, they were asked to sign in and were then given a comment sheet and information package that contained the display panels. Signed attendance at this event was 89.

0.9.6 First Nations Consultations

The Canadian constitutional framework takes into account that the First Nations of Canada were here first as sovereign peoples who were never conquered. Further, the ‘Crown’, which is made up of the Federal and Provincial levels of government, has an obligation, based on its own inherent honour, to consult on matters affecting Aboriginal interests raised by First Nations. In 2010, the Supreme Court of Canada in the Rio Tinto ruling confirmed that the purpose of consultation with First Nations was not only based on the honour of the Crown but also, because of that honour, related to the onerous demands of the trial process. Accordingly, it has been established that consultations must be undertaken with the awareness not only of the constitutional fiduciary duty of the Crown to protect Aboriginal interests but also that the process stand as a surrogate for a full court process. As such, the ‘Duty to Consult’ is a means to ensure First Nations’ interests and rights are identified and respected. It also helps the Crown to make better more durable decisions and strengthen its relationships with the First Nations of Canada.

Procedural aspects of First Nations consultation processes are often delegated to the project proponent. The project proponent is typically best-suited to speak to technical and environmental aspects of the project and where appropriate, is best-placed to address concerns raised by First Nations communities. As the project proponent for this EA study, the City has been delegated the procedural aspects of First Nations consultation.
First Nations history in the region of Kingston is complex, in that the establishment of a European presence occurs far earlier here as compared to most other cities in Ontario. As such, the City has sought to be recognized as a municipality which takes the Duty to Consult with First Nations communities as a serious obligation. This is due in no small part to the City’s interest in understanding the rich and complex historic and continuing experience of First Nations as part of its overall cultural awareness. Consistent with this commitment, the City undertook consultations with the following First Nations communities as part of this EA study:

1. Ardoch Algonquin First Nation.
4. Tyendinaga Mohawk Territory.
5. Shabot Obaadjiwan First Nation.
8. Algonquins of Pikwàkanagàn.

The following key meetings and communications have been held to date:

1. During Stage 1 of this EA study:
   a) a meeting with Chief James Marsden, Mississaugas of Alderville First Nation, on September 10, 2009;
   b) a general mailing sent on February 1, 2010 to the First Nations noted above providing an EA study update;
   c) a meeting with Chief James Marsden and Councilor David Mowat, Mississaugas of Alderville First Nation, on February 10, 2010; and
   d) a meeting with Co-Chief Mareille Lapointe, Ardoch Algonquin First Nation, on March 16, 2010.

2. During Stage 2 of this EA study:
   a) a meeting with Chief James Marsden, Mississaugas of Alderville First Nation, on June 15, 2010;
   b) a meeting with Mr. Paul Williams, Mohawk Nation Council of Chiefs, on September 9, 2010;
   c) a general mailing sent on November 5, 2010 to the First Nations noted above providing a copy of the Stage 1 Summary Report to City Council and an EA study update;
   d) a letter, dated December 2, 2010 from Ms. Elizabeth F. Nanticoke (Acting Director, Department of Environment, Mohawk Council of Akwesasne) to Mr. Alan McLeod (Senior Legal Counsel, City), requesting that the Mohawks of Bay of Quinte – Tyendinaga be considered the point of contact for the EA study (as part of co-ordinated approach to consultations);
   e) a meeting with Co-Chief Mareille Lapointe, Ardoch Algonquin First Nation, on December 9, 2010;
   f) a meeting with Chief James Marsden, Mississaugas of Alderville First Nation, on January 31, 2011 during which a number of opportunities for extending consultations were identified regarding:
      i. archeological monitoring;
      ii. the review of archeological studies; and
      iii. the review and comments on design, native plantings and the ecological effects of the project;
   g) a meeting with Mr. Paul Williams, Mohawk Nation Council of Chiefs, on February 23, 2011;
   h) a general mailing sent on March 21, 2011 to the First Nations noted above providing information on the January 20, 2011 TAC meeting agenda, Public Information Centre No. 3 public notice, archaeological assessment report on the east side lands and an EA study update;
   i) a mailing sent on April 15, 2011 to the Office of the Algonquins of Ontario providing a copy of the Stage 1 Summary Report to City Council, January 20, 2011 TAC meeting agenda, Public Information Centre No. 3 public notice, archaeological assessment report on the east side lands and an EA study update;
   j) a general mailing sent on August 17, 2011 to the First Nations noted above providing information on the July 28, 2011 TAC meeting and the First Nations consultation process to date as well as an EA study update;
k) a meeting with Mr. Paul Williams, Mohawk Nation Council of Chiefs, on September 6, 2011 to discuss a preliminary report on the EA study submitted on behalf of the Mohawk Nation Council of Chiefs to the City (the project team prepared responses to the recommendations in the preliminary report and submitted them to the Mohawk Nation Council of Chiefs on September 29, 2011);

l) a general mailing sent on December 15, 2011 and February 16, 2012 to the First Nations noted above providing a copy of the preliminary report on the EA study submitted on behalf of the Mohawk Nation Council of Chiefs to the City, information on the First Nations consultation process to date as well as an EA study update;

m) a letter, dated February 23, 2012 from Mr. Alan McLeod (Senior Legal Counsel, City) to Ms. Melanie Paradis (Director of Lands, Resources and Consultation, Métis Nation of Ontario) confirming the verbal notification from the Métis Nation of Ontario to the City that the EA study area is not within its consultation area; and

n) a meeting with Chief James Marsden and Councilor David Mowat, Mississaugas of Alderville First Nation, and Parks Canada on March 22, 2012.

0.9.7 Main Concerns

As outlined above in the EA study’s ‘Mission Statement, Vision and Guiding Principles’, the project team welcomed differences of opinion and competing interests as opportunities to ensure all project issues were considered and addressed. This acknowledgement was in recognition of the rich history, complexity and magnitude of this project, including its associated potential positive and negative social, cultural, economic and environmental impacts. The main concerns that were raised during this EA study can be summarized into the following main themes:

1. **Is a new bridge needed if Highway 401 is expanded?** With an existing traffic volume during the PM peak hour of 1,260 vehicles per hour per lane for eastbound travel and 1,252 vehicles per hour per lane for westbound travel, the Highway 401 crossing has ample capacity to accommodate additional traffic (based on its current two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration). Its current widening from four to six lanes west of Sydenham Road to west of Montreal Street means that the Highway 401 crossing will also be able to handle even more traffic in the future.

   However, two issues need to be considered. The first is that the primary function of Highway 401 is to accommodate regional (or long distance) traffic. Traffic operations related to local traffic needs are fundamentally different than regional traffic needs. These differences can result in compromised efficiency and safety for both local and regional traffic. This is inconsistent with effective transportation engineering practice. The second issue relates to the strong demand for trips crossing the Cataraqui River via the LaSalle Causeway in both the southern and northern portions of the City’s urban limits. The Highway 401 crossing is 6 km north of the LaSalle Causeway. Diverting traffic to the Highway 401 crossing would lead to further out of way travel and additional travel delays. As noted earlier, traffic infiltration through the adjacent road network could then also be expected to occur as drivers seek less congested routes to reach their destinations.

   Thus, increasing the capacity of Highway 401 would not address the EA Problem Statement for this EA study and is not considered a viable alternative solution.

Based on preliminary assessments, the Express Routes are expected to increase transit ridership in the City and result in a 1 percent increase in the overall City-wide transit mode share, or from 5 percent today to 6 percent by 2019. This 1 percent modal share increase for transit is expected to generate 1,049 new transit trips during the PM peak hour, which represents a reduction of 384 vehicle trips City-wide. But this increase would have a marginal impact on the capacity deficiency on the LaSalle Causeway-Highway 2 corridor. Based on the 2009 Kingston Transportation Master Plan Update, with a simulated 9 percent transit mode share by 2029, the projected decrease in traffic volume on the LaSalle Causeway would only amount to 0.6 percent (a decrease from 2,699 vehicles per hour in 2019 to 2,682 vehicles per hour in 2029). As such, despite these projected and simulated increases in the transit mode share, the projected traffic volumes on the LaSalle Causeway would still result in the corridor operating below the City’s target LOS D. It should also be noted that significantly increasing the modal shares for public transit over-and-above current projections or simulations would be very difficult to achieve within the next 15 to 20 years, given the size of the City in relation to the major infrastructure investment and aggressive policy approach that would be required.

Thus, focusing solely on optimizing public transit, though laudable, would not be sufficient to address the entire capacity deficiency on the LaSalle Causeway-Highway 2 corridor over the immediate-to-long-term.
3. **Is a new bridge needed if improvements are made to the LaSalle Causeway-Highway 2 corridor?** Studies predating this EA study concluded that potential improvements along the LaSalle Causeway-Highway 2 corridor (channelization, signal timing and phasing, lane additions) and optimizing public transit use could enhance operations along the corridor but would not be able to solely address corridor deficiencies over the long-term. The studies also cautioned that expanding the capacity of the LaSalle Causeway could result in increased traffic congestion in the downtown core unless major changes to the surrounding intersections and street networks were effected.

However, the need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is duly noted. The 2011 HDR/iTrans report on the LaSalle-Causeway-Highway 2 corridor undertaken subsequent to Stage 1 of this EA study also reaffirmed that existing conditions would continue to negatively affect the LOS along this corridor. The report outlines a preferred strategy to address existing and future deficiencies along the corridor. These improvements were then modelled relative to current and projected eastbound travel times on the LaSalle Causeway-Highway 2 corridor during the PM peak hour. The modelling concluded that the City’s target of LOS D on the corridor could be maintained until at least 2020 with the implementation of the improvements. But it is also acknowledged that the improvements may not be able to solely reduce congestion and accommodate future traffic volume demand on the LaSalle Causeway-Highway 2 corridor over the long-term.

Thus, making improvements to the LaSalle Causeway-Highway 2 corridor may address the EA Problem Statement for this EA study over the short-to-medium-term but may not be able to do so over the long-term. The future monitoring of traffic conditions by the City would confirm the viability of this scenario.

4. **If a new bridge is needed, where should it be located?** The EA study area was subdivided into six corridor areas and crossing options were developed based on potential connections to existing infrastructure. The six corridor areas were then short-listed for further assessment. A bridge at the John Counter Boulevard-Gore Road alignment option is the recommended preferred solution as it represents an opportunity, subject to best management practices and mitigation measures, to:

   a) Serve as a 21st Century ‘gateway’ to/from the Inner Harbour and canal;

   b) Provide a direct mid east-west connection to existing road infrastructure on either shore and thereby provide an effective and efficient link in addressing the travel demand patterns to/from the downtown and/or to/from John Counter Boulevard and beyond to other parts of the City;

   c) Tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area;

   d) Enhance emergency response services, in that the City’s 2010 ‘Master Fire Plan’ recommends that a new fire substation be built at Elliott Avenue and Division Street in 2013-2014 in strategic response to the transportation network improvements that could result from installing both a bridge at this location along with the future Wellington Street Extension;

   e) As per the 2007 ‘Master Plan for Water Supply for the City of Kingston Urban Area’, facilitate the installation of an east-west watermain across the Cataraqui River that:

      i. is required to improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (located northeast of Area 4) in order to improve the redundancy in the municipal water system on the east side of the Cataraqui River; and

      ii. has been requested by Utilities Kingston as the preferred location for this infrastructure;

   f) Further enhance the City’s express bus route strategy as well as active travel and commuter cycling networks by providing a direct mid east-west urban transportation corridor; and

   g) Based on discussions with CFB Kingston personnel:

      i. tie into the CFB Kingston’s intentions to explore implementation of a new access directly from Gore Road to provide an alternative route for its workforce;

      ii. improve access from CFB Kingston to the VIA Rail Station which is used regularly by military personnel travelling to other centres;

      iii. serve as an alternate route to the Kingston Airport which could add benefits to CFB Kingston’s operations in the long term; and

      iv. not be subject to potential lockdown situations as it is not directly adjacent to CFB Kingston.

5. **If a new bridge is needed, how many vehicular lanes are required to accommodate future traffic conditions?** In 2011, AECOM reviewed the Kingston Transportation Master Plan (KTMP) Travel Demand Forecast Model specifically to test nine capital works upgrading scenarios and forecast the resulting travel demand on the bridge at the project site location. The forecasted 2019 PM peak hour traffic demand applied to the nine scenarios indicate the need for a four-lane bridge
would be triggered by 2029 to 2034. Scenario ‘I’ (4-Lane Bridge, John Counter Boulevard Widening and new CFB Kingston Access to Gore Road) is the only scenario that would achieve LOS D across the network. Scenario ‘I’ would also be able to reduce traffic infiltration through the adjacent road network by a combined total of 6 percent which is the highest reduction in comparison to the other scenarios.

6. **If a new bridge is needed, can it be designed, built and/or used so that it is appropriate to and compatible with adjacent land uses?** A bridge at the project site location would have a noticeable presence on the landscape. As such, design measures will be a critical piece of the broader package of mitigation measures required during the project implementation phase to either reduce or eliminate potential negative project impacts. These include:

   a) The preferred ‘Arch With V-Piers’ bridge design which, by providing two structural supports for the bridge girders but only one in-river foundation for each pier, could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore;

   b) The constant gradual s-curve of the bridge alignment that lands north of the Point St. Mark residential neighbourhood, which offers opportunities for:

      i. reduced potential noise and visual impacts on the Point St. Mark community; and

      ii. ‘softer landscaping’ along the Gore Road right-of-way on the east shore;

   c) The implementation of sound attenuation barriers to reduce the predicted sound levels from the project at noise-sensitive areas;

   d) The bridge deck components, which contribute to providing a more direct mid east-west connection to existing infrastructure on either shore and would be able to tie into the northern terminus of the future Wellington Street Extension;

   e) The observation look-out/interpretive nodes and public realm areas, which serve to maximize opportunities to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh;

   f) The use of context sensitive directional and intermittent lighting and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts on the surrounding environment;

   g) The identified roadway improvement works and their resulting effects on traffic flows, which should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated; and

   h) The preparation and implementation of the Community Action Plan (CAP) which will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.

7. **If a new bridge is needed, can it be designed, built and/or used so that it can be expanded to accommodate future traffic conditions?** The 2030 to 2034 trigger for a four-lane bridge would impact the viability of moving forward with a two-lane bridge with a substructure to accommodate its widening to four lanes in the future. The reason for this is that there would be a diminishing return on the initial capital investment, as the need for bridge twinning (with the two-lane bridge scenario) or widening (with the two-lane bridge-four-lane-substructure scenario) could be triggered shortly after the two-lane bridge would be built. However, neither scenario should be ruled out completely at this time. The future monitoring of traffic conditions by the City, particularly if the aforementioned improvements to the LaSalle Causeway-Highway 2 corridor are implemented, could confirm the viability of either scenario or even delay the timeline for engaging the Project Implementation Phase of the Class EA process for the bridge itself.

In addition, based on AECOM’s review of the City’s Travel Demand Forecast Model, another alternative staged approach to the development of an ultimate four-lane bridge could be viable. This option would involve constructing an initial three-lane bridge and a substructure that could accommodate widening to four lanes in the future. Under this scenario, the centre lane would operate as a reversible lane serving the peak direction of travel. The centre lane and dedicated westbound lane would accommodate westbound travel during the PM peak hour. Assuming the peak direction would be reversed during the AM peak hour, the centre lane and dedicated eastbound lane would then accommodate eastbound travel during the AM peak hour. The initial three-lane bridge is expected to operate at the acceptable LOS D in both directions under PM peak hour conditions at the 2019 and 2029 horizon years. However, while the two lanes available for westbound travel are projected to have reserve capacity, the one dedicated eastbound lane during the PM peak hour is expected to approach capacity in 2019 and would be at capacity by 2029. At this point, the bridge deck would need to be widened from three lanes to four lanes. The widening would be applied in equal proportions to the north and south sides of the bridge deck and could be done directly from the bridge deck itself, as the required substructure would already be in place. This approach would also be viable for the two-lane-bridge-four-lane-substructure scenario mentioned above.
If a new bridge is needed, can it be designed, built and/or used so that it can, at a minimum, conserve the heritage values of the Rideau Canal? A part of the ‘Vision’ outlined in the ‘Bridge Design Objectives’ focuses on the use of innovative bridge planning and design to reinforce the City’s proud historic association with the Rideau Canal. As noted above, a bridge at the project site location would have a noticeable presence on the landscape. The lower Cataraqui section of the Rideau Canal south from Highway 401 to the northern entrance of Kingston’s Inner Harbour near Belle Island is a rare example of the waterway where the natural environment was not altered during canal construction. Over the intervening 178 years, the extensive wetlands of the Great Cataraqui Marsh, as well as the river valley’s sloped physiography and forested landscapes adjacent to the navigation channel proceeding south from Highway 401 have remained largely intact. As such, design and mitigation measures will be critical during the project implementation phase to either reduce or eliminate potential negative project impacts on the natural and cultural heritage elements of the terrestrial and marine environments. These include:

a) The preferred ‘Arch With V-Piers’ bridge design which:
   i. by providing two structural supports for the bridge girders but only one in-river foundation for each pier, could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore; and
   ii. is able to span over the Rideau Canal’s navigable channel and adjacent rowing lanes, while the arch over the canal’s navigable channel highlights the bridge as a 21st Century ‘gateway’ to/from the Inner Harbour and canal;

b) The constant gradual s-curve of the bridge alignment that lands north of the Point St. Mark residential neighbourhood, which offers opportunities for:
   i. a more organic reflection of the bridge within the context of its ‘transitional’ location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west; and
   ii. a more expanded viewscape experience for bridge users, in that open views would be provided of the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west;

c) The bridge clearance above the water, which exceeds the Rideau Canal’s Federally regulated navigable requirement and could also mitigate visual impacts, in that its silhouette would be below the tree line when viewed:
   i. on the water from the north by the north shore of Belle Island and Belle Park;
   ii. on the water from the south by the visible cattail portion of the Greater Cataraqui Marsh that begins to emerge in the background; and
   iii. to the east from both water and land on the west side by the existing topography of the east side lands.

It should also be noted that the restorative landscape improvements on the west side lands provide an opportunity for the bridge to be below the ‘future’ tree line in this area when viewed from both the water and land on the east side.

d) The observation look-out/interpretive nodes and public realm areas, which serve to maximize opportunities to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh;

e) The use of context sensitive:
   i. barriers and railings on the bridge and public realm areas and their potential to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities of the Rideau Canal, Belle Island, Belle Park and the marsh; and
   ii. directional and intermittent lighting and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts on the surrounding environment;

f) The use of dredging (and not backfilling the excavated channel after the bridge is built), which could:
   i. represent a mitigation measure in response to potential project effects, in that the excavated channel would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more; and
   ii. provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain if it was installed underneath the permanent bridge deck;

g) The preparation and implementation of a Natural Environment Enhancement Plan that includes detailed design measures related to wetland or aquatic restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows and re-vegetating and re-foresting the east and west side lands; and
h) As highlighted earlier, the use of best management practices and mitigation measures during the project implementation phase.

9. If a new bridge is needed, can it be designed, built and/or used so that it is appropriate to and compatible with watercraft navigation? The proposed bridge clearance above the water is 14 m over the Rideau Canal’s navigable channel and adjacent rowing lanes. This exceeds the 6.7 m Federally regulated navigable requirement for the canal.

In addition, the proposed 100 m arch span over the canal’s navigable channel (for a total 131 m distance pier-to-pier) was originally considered to be sufficient to span the existing rowing course which runs in parallel to the channel from the Point St. Mark residential neighbourhood north for 2,000 m. However, the initial 131 m distance pier-to-pier has subsequently been increased to a proposed 150 m distance pier-to-pier. This increase reflects recent consultations with the Kingston Rowing Club, during which the project team was advised that the rowing course is seven lanes wide. Four rowing lanes are on the west side of the channel and three lanes are on the east side, though only the rowing lanes directly abutting either side of the channel are marked. Club staff indicated that an 11 m wide rowing lane width is presumed for each lane across the full course, which accommodates the rowing shells, prevents collisions and complies with Olympic requirements. As such, concerns were expressed that the initial 131 m distance pier-to-pier would encumber the rowing course and not provide adequate horizontal and vertical clearance between the rowers and abutting piers, given:

a) The channel is at roughly a 30 degree angle to the bridge;

b) The minimum 6.7 m Federally regulated navigable requirement for the canal;

c) The CRCA design ‘high’ water level requirement of 76.3 m; and

d) The 1H:1.2V rising slope of the v-piers above the water does not accommodate full vertical clearance from the waterline to the underside of the bridge deck.

Based on these recent consultations, the project team has determined that it would be feasible to increase the pier-to-pier distance to 150 m in order to provide unencumbered through-navigation for the existing rowing course. Proposed design features include:

a) A 9.4 m horizontal clearance from the abutting pier on the west side of the course;

b) An 8 m horizontal clearance from the abutting pier on the east side of the course; and

c) A 13.5 m wide rowing lane on either side of the navigable channel to provide an additional 2.5 m clearance from the channel itself.

The 150 m distance pier-to-pier would also provide flexibility to optimize the pier locations further during the project implementation phase in response to more specific rowing course and navigable channel configurations and characteristics north and south of the bridge corridor. It should be noted that the preliminary opinion of probable cost for the four-lane bridge scenario cited in this Report would have to be reviewed further during the project implementation phase if the proposed 150 m distance pier-to-pier design is pursued to fully accommodate the rowing course.

10. If a new bridge is needed, can it be designed, built and/or used so that it demonstrates respect for the customs and traditions integral to the distinctive cultures of First Nations communities? As noted above, the City has sought to be recognized as a municipality which takes the Duty to Consult with First Nations communities as a serious obligation. This is due in no small part to the City’s interest in understanding the rich and complex historic and continuing experience of First Nations as part of its overall cultural awareness. Consistent with this commitment, the City endeavoured to undertake consultations either though meetings or regular mailings with local First Nations communities as part of this EA study. Feedback from local First Nations communities has been limited due to the following:

a) First Nations and Aboriginal community leadership have stated that they lack resources to respond to all requests for consultation made of them, especially in light of their own resource demands for the administration of their own communities; and

b) Each First Nation has its own history and traditions which are understood and practiced to different degrees. This difference is related to the size and resources available to each community, their distance in time and geography from their connection to the Lower Cataraqui River Valley, as well as their own understanding of their heritage in the region, which has been dislocated because of the intervention of Canadian settlement and governance.

It is recognized by the City that its own commitment to consult with local First Nations communities, as demonstrated in the trust that has grown out of previous consultations on other initiatives, will continue as part of the implementation phase for this project.

11. How can the capital costs from a new bridge be recovered by the City of Kingston? There are four project delivery models, namely Design-Bid-Build, Design-Build, Public-Private Partnership and Alliance. Confirming the preferred delivery model is outside this EA framework and is best addressed during the early stages of the Project Implementation phase to reflect the City’s cost recovery model and business strategy to secure funding and manage control of the project design, construction and risk. It should be noted that a significant portion of the City’s direct costs (the net cost after funding) would be recovered through Development Charges collected from new developments. It is recommended that the City develop a Business Plan in order to fund and finance the project during the early stages of the Project Implementation phase and to identify the preferred project delivery model.
0.10 Conclusion

Alternative solutions were assessed to determine the need for and the feasibility of implementing additional transportation capacity across the Cataraqui River. Based on this assessment, the recommended preferred solution is the ‘Arch With V-Piers’ bridge crossing at the John Counter Boulevard-Gore Road alignment. This Report has also assessed the impact of this project and has concluded that it will be Low to Minimal for the following reasons:

1. The ‘Arch With V-Piers’ concept provides two structural supports for the bridge girders but only one in-river foundation for each pier. This could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore. To further benefit viewscape considerations and reduce associated in-water disturbances, it could be feasible to reduce the number of piers from 13 double v-piers to 11 double v-piers and still maintain appropriate span-length-to-girder-depth proportions.

2. It is able to span over the Rideau Canal’s navigable channel and adjacent rowing lanes, while the arch over the canal’s navigable channel highlights the bridge as a 21st Century ‘gateway’ to/from the Inner Harbour and canal.

3. The bridge alignment, as a constant gradual s-curve that lands north of the Point St. Mark residential neighbourhood, offers opportunities for:
   a) Reduced potential noise and visual impacts on the Point St. Mark community;
   b) ‘Softer landscaping’ along the Gore Road right-of-way on the east shore;
   c) A more organic reflection of the bridge within the context of its ‘transitional’ location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west; and
   d) A more expanded viewscape experience for bridge users, in that open views would be provided of the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west.

4. The bridge clearance above the water accommodates existing topographic conditions on both shorelines and exceeds the Rideau Canal’s Federally regulated navigable requirement. It also mitigates visual impacts, in that its silhouette would be below the tree line when viewed:
   a) On the water from the north by the north shore of Belle Island and Belle Park; b) On the water from the south by the visible cattail portion of the Greater Cataraqui Marsh that begins to emerge in the background; and c) To the east from both water and land on the west side by the existing topography of the east side lands.

   It should also be noted that the restorative landscape improvements on the west side lands provide an opportunity for the bridge to be below the ‘future’ tree line in this area when viewed from both the water and land on the east side.

5. The bridge deck components contribute to providing a more direct mid east-west connection to existing road infrastructure on either shore and would be able to tie into the northern terminus of the future Wellington Street Extension. This could further serve to direct traffic south to the downtown area and accommodate CFB Kingston’s future growth plans.

6. The observation look-out/interpretive areas along the south side of the bridge deck maximize opportunities for bridge users to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.

7. The use of context sensitive:
   a) Barriers and railings on the bridge and their potential to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and
   b) Directional and intermittent lighting on the bridge and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts from the bridge on the surrounding environment.

8. The need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is recognized in an initial bridge configuration design that could consist of a three lane, centre lane reversible, cross section that can be widened in response to future traffic monitoring and related conditions.

9. Based on the capacity analysis done for this EA study, the identified roadway improvement works should maintain the flow of traffic along this critical mid east-west arterial corridor at an acceptable LOS D over the long-term. In addition, it offers opportunities to further enhance emergency services in the City and the City’s express bus transit strategy. This analysis has also demonstrated that these improvements and their resulting effects on traffic flows should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated.
10. The active travel and commuter cycling provisions on the bridge serve to connect with and thereby enhance existing non-automotive networks on both sides of the Cataraqui River.

11. The landscape improvements represent an opportunity for a degree of ecological restoration on the west side lands and ecological compensation on the east side lands by creating/re-creating naturalized landscapes.

12. In the public realm areas, the use of context sensitive:
   a) Barriers and railings serve to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and
   b) Directional and intermittent lighting serve to address public and traffic safety requirements, accentuate public realms and mitigate light impacts on the surrounding environment.

13. The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River further accentuate the public realm as a ‘naturalized’ feature.

14. The implementation of sound attenuation barriers further reduces the predicted sound levels from the project at noise-sensitive areas.

15. The use of dredging (and not backfilling the excavated channel after the bridge is built) as the preferred temporary in-water bridge construction access option provides the opportunity to:
   a) Introduce a mitigation measure in response to potential project effects, in that the excavated channel would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more;
   b) Reduce capital costs in the range of 8 percent to 12 percent in comparison to the temporary work bridge option; and
   c) Accommodate Utilities Kingston’s east-west watermain within the dredged channel, which:
      i. has been requested by Utilities Kingston as the preferred location for this infrastructure;
      ii. would provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain underneath the permanent bridge deck; and
      iii. offers a more sustainable design solution, in that the need for expansion joints, heat tracing and insulation jacket equipment as well as related maintenance and servicing would not be required.

17. In light of the relatively shallow waters (ranging from 1.5 m over the majority of the section to approximately 4.5 m at the Rideau Canal’s navigable channel) and low water flow velocities (ranging from negligible up to 0.4 m/s), the hydraulic modeling results show that the double v-piers would generate only minor impacts on water levels [the most significant increase is up to 4 millimetres (mm) in the vicinity of the piers] and flow-generated velocities [less than 3 centimetres/second (cm/s), also in the vicinity of the piers]. As such, it is similarly expected that the dredged channel, and the associated removal of aquatic vegetation that is required to accommodate it, would not have any significant influence on water levels or flow-generated velocities.

18. The best management practices and mitigation measures are means to reduce or eliminate potential adverse environmental effects from the project. In particular, the preparation and implementation of the Natural Environment Enhancement Plan during the project implementation phase will include further detailed measures related to wetland restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows as well as re-vegetating/re-foresting the east and west side lands in direct response to the detail bridge design and construction program.

This Report can be used to satisfy both the Provincial and Federal EA frameworks. Upon City Council’s review and approval of this Report under the Class EA planning process, a formal ‘Notice of Completion’ will be issued by the City. The public and review agencies will have thirty days to request a ‘Part II Order’ from the Ontario Minister of Environment. This is an appeal provision whereby a person or party with outstanding concerns may request the Ontario Minister of Environment to make an order requiring the City to comply with Part II of the OEA Act before proceeding any further with the Schedule C Class EA phase of the project. If no request for a Part II Order is received, the Schedule C Class EA phase of the project will be complete. The City will then seek Federal approval of the EA pursuant to the CEA Act. Following Federal EA approval, the City will be in a position to then initiate project implementation (detail design, final approvals and construction) within the next ten years without having to revisit the findings and recommendations identified through the Schedule C Class EA. This will enable the City to facilitate long-term planning and budget programming including the on-going collection of Development Charges and the pursuit of financial assistance from upper levels of government.
1.0 INTRODUCTION AND BACKGROUND

On January 20, 2009, the City of Kingston (City) retained a team led by J. L. Richards & Associates Limited to initiate an Environmental Assessment (EA) to evaluate the need for and the feasibility of implementing additional transportation capacity across the Cataraqui River. The Cataraqui River forms part of the Rideau Canal, a designated United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site, National Historic Site, Canadian Heritage River and Federally regulated navigable waterway. The undertaking of this EA study represents an opportunity to improve the following existing conditions:

1. The relief of existing and future traffic congestion through improved road network connectivity and traffic flows.

2. The enhancement of the City’s historic association with, and the heritage values of, the Rideau Canal through the use of state-of-the-art and sustainable design practices.

3. The ability to accommodate current and planned growth and development programs through improved east-west road network connectivity.

4. The enhancement of public transit services and alternative modes of transportation (walking and cycling) by creating new east-west routes.

5. The enhancement of municipal services to the eastern portion of the City.

1.1 EA Study Background

Two major east-west transportation crossings of the Cataraqui River currently exist within the City’s urban limits. One crossing is the LaSalle Causeway-Highway 2 corridor, which crosses the Cataraqui River at the southerly confluence of the Cataraqui River and Lake Ontario. The LaSalle Causeway is comprised of a two-lane cross section and a series of structures (fixed truss, rigid frame structure and Bascule Lift Bridge). It is under the jurisdiction of Public Works & Government Services Canada. Existing network conditions pertinent to the LaSalle Causeway-Highway 2 corridor include: i) the signalized intersections at the Highway 2-Kingston Road 15 intersection to the east and the Barrack Street-Ontario Street intersection to the west; ii) the egress movement from the discharge of vehicles from the Wolfe Island Ferry at the Barrack Street-Ontario Street intersection; and iii) the Bascule Lift Bridge portion of the LaSalle Causeway that is raised to accommodate recreational boat traffic. Based on the City’s Level of Service (LOS) policy, the LaSalle Causeway has an average estimated capacity of 900 vehicles per hour, per lane (or LOS D). The second crossing is the Highway 401 corridor, which crosses the Cataraqui River approximately 6 kilometres (km) north of the LaSalle Causeway. Highway 401 is owned by the Province of Ontario through the Ministry of Transportation Ontario (MTO). It is a four-lane Freeway that extends through the City and is the primary inter-city freeway, with local interchanges at Joyceville Road, Kingston Road 15, Montreal Street, Division Street, Sir John A. Macdonald Boulevard, Sydneyham Road, and Highway 38. The Highway 401 crossing capacity is estimated to be approximately 1,500 to 2,000 vehicles per hour, per lane (for a total two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration). The MTO is currently widening Highway 401 from four to six lanes west of Sydneyham Road to west of Montreal Street as part of a broader provincial strategy to ultimately twin Highway 401 from the City of Windsor to the Quebec border in response to traffic volume growth and traffic collision incidents.

Studies predating this EA study have indicated an eventual need for an additional crossing of the Cataraqui River in order to: a) relieve traffic congestion on the LaSalle Causeway during peak hour traffic demand and/or during a Highway 401 detour event; b) support planned urban growth on the east and west sides of the Cataraqui River; and c) provide opportunities to enhance emergency response capabilities and other municipal services. Highlights of these studies include:

1. The ‘Transportation Study: Bridge Crossings of the Cataraqui River’, completed by Totten Sims Hubicki Associates (TSH) in 1992 concluded that the LaSalle Causeway was either operating at or exceeding its capacity and that there was a need for a new four-lane bridge crossing at the John Counter Boulevard-Gore Road alignment to satisfy both the 1992 and future 2011 crossing demand. This study further concluded that:

a) Expanding the capacity of the LaSalle Causeway would only result in increased traffic congestion in the downtown core unless major changes to the surrounding intersections and street networks were put in place;

b) Potential short-term operational improvements at the intersections at Barrack Street-Ontario Street and the Highway 2-Fort Henry access (channelization, signal timing and phasing,  

Note ‘Level Of Service’ (LOS) is a measure of the mobility of traffic and the resulting level of congestion determined by vehicle delay. A volume-to-capacity ratio associated with LOS is measured based on traffic counts (or the ‘volume’) and the ability of the road to carry traffic (or the ‘capacity’). Generally, LOS is measured between LOS A and LOS F where LOS A involves free flow traffic operations at average travel speeds and LOS F involves gridlock conditions. LOS B, C, D and E are incremental measures between LOS A and LOS F. The City generally applies LOS D for future design purposes at peak hour traffic volume levels, which is commonly used in similarly sized Canadian cities.
lane additions) could improve operations but would not significantly increase river crossing capacity on the LaSalle Causeway over the long-term due to the following:

i. Improving the Barrack Street-Ontario Street intersection by widening the north approach to the intersection to provide additional storage could reduce vehicle queues and re-allocate green time at this intersection but there would continue to be periods that vehicle queues would block the access to Place D’Armes; and

ii. While reconstructing the Highway 2-Fort Henry access intersection and widening the Highway 2 eastbound lane from one to two lanes between the intersection and Kingston Road 15 would increase capacity on the west approach to the intersection, the constraints at the Barrack Street-Ontario Street intersection would continue to impact the capacity of the LaSalle Causeway; and

A tunnel option at the John Counter Boulevard-Gore Road alignment would not be viable, mainly because of the significant environmental impacts resulting from construction and because the horizontal and vertical alignment between the east shore of the Cataraqui River and the Kingston Road 15-Gore Road intersection cannot be implemented to respect acceptable geometric design criteria of a 6 percent slope or less to match the existing elevation at the intersection.

2. The 'Kingston Transportation Master Plan' (KTMP), completed by Dillon Consulting Ltd. in 2004, outlines the City’s strategic direction for the development of its transportation networks, programs and priorities to 2026. The KTMP reviewed the need for and location of additional transportation capacity across the Cataraqui River. It determined that the existing LaSalle Causeway was operating at capacity and that the Highway 401 crossing had capacity to accommodate additional traffic. The 2004 KTMP reaffirmed the limitations cited in the 1992 TSH study associated with expanding the capacity of the LaSalle Causeway. It further concluded that:

a) Diverting traffic from the LaSalle Causeway to the Highway 401 crossing was an impractical alternative solution, based on the trip demand lines of vehicles that favour crossing the Cataraqui River via the LaSalle Causeway to the south and the 6 km travel distance between these two crossings;

b) Focusing on transportation demand management measures as tools to optimize the future transportation system as well as strategies to increase walking, cycling and public transit use could form part of the solution but would be insufficient on their own to significantly increase river crossing capacity on the LaSalle Causeway; and

c) A new 2-lane bridge crossing is needed to satisfy 2026 crossing demand and that the John Counter Boulevard-Gore Road crossing alignment represented the most optimum mid-City wide corridor location.

3. The 2004 KTMP was updated in accordance with the ‘Ontario Municipal Act’ in 2009 by AECOM as part of the City’s ‘Development Charges Background Study’. With a traffic volume in the order of 1,000 to 1,100 vehicles per hour in each direction during the PM peak hour, the 2009 KTMP Update has determined that the existing LaSalle Causeway was continuing to operate at or exceeding its capacity. In addition, forecasted 2019 PM peak hour demand for the LaSalle Causeway is projected to increase to 1,319 vehicles per hour for eastbound travel and 1,192 vehicles per hour for westbound travel. This is in response to projected 9 percent population growth and 11 percent employment growth in the City by 2019. As a result, the 2009 KTMP Update has reaffirmed the need for a new 2-lane bridge at the John Counter Boulevard-Gore Road crossing alignment, but has concluded that it would be required to satisfy the anticipated 2019 PM peak hour traffic demand, which is seven years earlier than what was recommended in the 2004 KTMP. The 2009 KTMP Update also reaffirms the other conclusions in the previous transportation studies noted above.

4. Consistent with the 2004 KTMP, the travel demand forecasting component of the ‘Wellington Street Extension Class C Environmental Assessment’ prepared by Morrison Hershfield in 2006 concluded that there would be a future automotive travel deficiency in the north-south roadway capacity from the existing section of Wellington Street at Bay Street to John Counter Boulevard. This deficiency was based on projected growth in the north-south travel demand of between 30 percent and 40 percent from 2001 to 2026. It was further projected that a new north-south corridor in this area, commonly referred to as the ‘Wellington Street Extension’, would accommodate upwards of 800 vehicles per hour in each direction. While road capacity was the main consideration in this EA study, other related issues that needed to be addressed in the area were:

a) High traffic volumes on local residential streets such as Rideau Street which would likely worsen in light of future urban growth and intensification efforts in the downtown;

b) Spill-over effects of traffic congestion on Division Street, a key public transit corridor, which would negatively impact public transit service in the area;

c) The lack of cycling facilities to support the increased use of cycling as a travel mode; and

d) The lack of an attractive tourist route into the downtown.

After considering a range of both travel mode and roadway capacity alternatives, this EA study concluded that strategies focusing on increasing walking, cycling and public transit use could
address part, but not the entire future capacity deficiency issue in the area. It further reaffirmed the recommendations in the 2004 KTMP that a new roadway link should be provided between John Counter Boulevard and Montreal Street-Railway Street and between Montreal Street and Bay Street, mostly as two-lane urban arterials, except in the immediate area of Montreal Street where a four-lane cross-section should be provided to improve intersection operations. This project, in conjunction with the John Counter Boulevard-Gore Road bridge crossing alignment, could also then further improve network connectivity and traffic flows. The preferred alignment for the Wellington Street Extension is generally shown on Drawing 1.1.

5. In 2006, the City initiated the ‘Master Fire Plan’ which was completed in 2010. The planning process consisted of ten steps designed to identify fire service gaps or risks and develop strategies to address the gaps and properly manage the risks. Station No. 3, which is located on Gore Road near Kingston Road 15 on the east side of the Cataraqui River, is a volunteer station and has the support from the career staff located in the downtown core stations for all reported structure fires. The ‘Master Fire Plan’ concluded that traffic congestion on the LaSalle Causeway and the operation of the Bascule Lift Bridge portion of the LaSalle Causeway for boat traffic is negatively impacting existing emergency response agencies due to the limited access to resources located in the core area when career staff from the downtown core stations are required to be assigned to support the volunteer staff in the east side of the City in a timely manner. Three recommendations relevant to this EA study are cited as a means to enhance emergency response capabilities, namely:

a) That a bridge be built at the John Counter Boulevard-Gore Road alignment at a time and cost to be determined by City Council;

b) That lights and/or a radio link be installed on the LaSalle Causeway to provide more open travel routes for emergency vehicles until the bridge at the John Counter Boulevard-Gore Road alignment is in place; and

c) That a new fire substation be built at Elliott Avenue and Division Street in 2013-2014 in strategic response to the transportation network improvements resulting from the potential installation of both the bridge at the John Counter Boulevard-Gore Road alignment and the Wellington Street Extension.¹

6. The ‘Master Plan for Water Supply for the City of Kingston Urban Area’ was completed by Simcoe Engineering Group Ltd. for Utilities Kingston in 2007. It outlines future requirements in the City’s drinking water treatment facilities and water distribution works to satisfy current and projected drinking water demands, including the provision of adequate fire hydrant flows and pressures, to 2026. Based on this study, which assessed a range of alternatives, the recommended option was to install an east-west watermain across the Cataraqui River in order to improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (in east Kingston). This infrastructure is needed to improve the redundancy in the municipal water system on the east side of the Cataraqui River. In recognition of the 2004 KTMP, it envisions this infrastructure being incorporated into future bridge crossing design considerations at the John Counter Boulevard-Gore Road alignment.

1.2 EA Study Area

The EA study area is illustrated on Drawing 1.1. It extends along the shoreline and lands adjoining the Cataraqui River from the LaSalle Causeway-Highway 2 corridor in the south, to Highway 401 in the north. Other main roadways within the study area include John Counter Boulevard and Montreal Street west of the Cataraqui River, as well as Kingston Road 15 and Gore Road east of the Cataraqui River.

1.3 EA Study Process

1.3.1 Provincial and Federal EA Frameworks

The implementation of additional transportation capacity across the Cataraqui River must satisfy both the Provincial and Federal EA frameworks. It should be noted that the Federal and Provincial Governments executed the ‘Canada-Ontario Agreement on Environmental Assessment Cooperation’ on November 1, 2004. Its purpose is to facilitate inter-jurisdictional cooperation and coordination of Federal and Provincial EA requirements. This agreement acknowledges that their respective authorizing statutes and regulations are to be met, while avoiding unnecessary duplication, delays and uncertainty that could arise from separate EA’s for the same project. As a result, the evaluation, consultation, and decision-making process can be summarized through a single set of documents.

Additional information on the Provincial and Federal EA frameworks is outlined below.

.1 Provincial Environmental Assessment Act Process

The Ontario Class Environmental Assessment (Class EA) planning process developed by the Municipal Engineers Association (October 2000, as amended in 2007) is a decision-making process approved under the ‘Ontario Environmental Assessment Act’ (OEA Act) for various projects undertaken by municipalities related to road, water, wastewater and transit facilities. Since projects can vary in terms of scope, complexity, and environmental impact, the Class EA process identifies three levels of planning activities through separate schedules, namely:

¹ Note Elliott Avenue is an east-west collector road that intersects with John Counter Boulevard (and the future Wellington Street Extension) just west of Montreal Street (outside the EA study area).
1. **Schedule A/A+.** This generally includes normal or emergency operational and maintenance activities. The environmental effects of these activities are usually minimal and, therefore, these projects are pre-approved and can proceed directly to implementation. As part of the 2007 amendments to the Class EA planning process, Schedule A+ projects were introduced, which are pre-approved and can proceed to implementation (similar to Schedule A projects), but require prior public notification.

2. **Schedule B.** This generally includes improvements and minor expansions to existing facilities. There is the potential for some adverse environmental impacts with Schedule B projects. Therefore, the proponent is required to proceed through a screening process including consultation with those who may be affected.

3. **Schedule C.** This generally includes the construction of new facilities and major expansions to existing facilities. Schedule C projects must be planned through the full Class EA planning process.

The potential implementation of additional transportation capacity across the Cataraqui River falls under Schedule C of the Class EA planning process, given its potential scope, complexity, effects and cost.

The main elements of the Class EA planning process comprise five phases, as shown in detail on Drawing 1.2 and applied to this EA study in summary form in Table 1.1 below (note the references to the ‘Why’, ‘Where’, ‘How’ and ‘When’ in Table 1.1 is provided to illustrate the principle focus of decision-making activities during each phase).

<table>
<thead>
<tr>
<th>Table 1.1</th>
<th>Schedule C Class EA Planning and EA Study Processes</th>
</tr>
</thead>
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<tr>
<td>PHASE 1 (‘WHY’)</td>
<td>PHASE 2 (‘WHERE’)</td>
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<tr>
<td>Main Activity</td>
<td>Problem Statement or Opportunity</td>
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<tr>
<td>Consultation Requirements</td>
<td>Optional</td>
</tr>
<tr>
<td>EA Study Terms of Reference</td>
<td>Stage 1</td>
</tr>
</tbody>
</table>

As highlighted on Table 1.1, the Class EA planning process involves:

1. Consultation with the general public and agencies potentially affected by the proposed project.
2. Identification of a Problem Statement or Opportunity (the ‘Why’ as per Phase 1).
3. Consideration of a reasonable range of alternative solutions (the ‘Where’ as per Phase 2) and alternative design concepts (the ‘How’ as per Phase 3).
4. A systematic evaluation of alternatives to determine their advantages and disadvantages and their net environmental effects, with mitigation measures where necessary.
5. Documentation of the planning process in an Environmental Study Report to allow ‘traceability’ of the decision-making process and consultation activities (the ‘Report’ as per Phase 4).

Note Project Implementation, which involves detailed design and project construction activities (the ‘When’ as per Phase 5), is beyond the scope of this EA study.

As also reflected in Table 1.1, pursuant to City requirements, this EA study was completed in two stages. This allowed the City to reconsider both its resource commitments and the recommended results at the end of Stage 1. Stage 1 focused on Phase 1 (identifying the problem or opportunity) and Phase 2 (considering the alternative solutions highlighted earlier) of the Class EA planning process and recommended a bridge crossing at the John Counter Boulevard-Gore Road alignment as the preferred solution. At this project site location, the Cataraqui River forms part of the Rideau Canal, which is owned by the Federal government and managed and regulated by Parks Canada.

At the May 25, 2010 City of Kingston Council meeting, Council approved the ‘City of Kingston Third Crossing of the Cataraqui River Environmental Assessment Stage 1 Summary Report’ (Stage 1 Summary Report) and authorized that the project proceed to completion, or Stage 2. Stage 2 is addressing Phase 3 (assessing alternative bridge design solutions and identifying/assessing the preferred bridge design solution at the John Counter Boulevard-Gore Road alignment) and Phase 4 [finalizing approval of this Screening Report / Environmental Study Report (Report)] of the Class EA planning process.

### 2 Canadian Environmental Assessment Act Process

The Federal EA process is normally coordinated by the Canadian Environmental Assessment Agency (CEAA), the agency responsible for administering the Federal EA process under the ‘Canadian Environmental Assessment Act’ (CEA Act). There are four possible types of EA’s under the Federal framework, namely: a) screenings; b) comprehensive studies; c) mediations; and d) review panels. The majority of projects are assessed through screenings.
Discussions about this EA study were initiated with the CEAA in March, 2009. It was determined that the Federal EA process under the CEA Act would be triggered should City Council authorize that this EA study proceed to completion, or Stage 2. This was due to the following:

1. The riverbed throughout the EA study area is owned by the Federal Government.
2. A number of licenses, permits or approvals listed in the Federal ‘Law List Regulations’ would be required from various Federal authorities before project implementation could proceed.
3. Completing a Federal EA would be a pre-requisite for the City in seeking Federal financial assistance for implementing the project.

The CEAA advised that it would formally initiate the Federal EA process once a Project Description was submitted as part of commencing Stage 2 of this EA study. Since City Council authorized that Stage 2 of this EA study proceed at its May 25, 2010 meeting, an initial Project Description was submitted to the CEAA on July 29, 2010 for posting on the CEAA website registry. It was also circulated to Federal authorities to confirm the Federal EA triggers highlighted above and the composition of the Federal review team (FRT) to engage in the Federal EA process. The respective roles within the FRT are noted below:

1. ‘Responsible Authorities’ (RA’s) which are Federal authorities required to ensure that a Federal EA of a project is conducted.
2. Expert ‘Federal Authorities’ (FA’s) which are Federal authorities having specialist or expert information that may assist RA’s with the Federal EA of the project.
3. ‘Federal EA Coordinator’ (FEAC) which is the Federal authority responsible for coordinating the review activities of RA’s and FA’s.
4. ‘Other’, which are Federal authorities that confirm no interest or role in the project at this time.

1.3.2 EA Study Committees

As shown in Table 1.2, decision making and consultation activities during this EA study have been facilitated through the following four committees:

1. A Senior Management Committee to oversee the overall project direction.
2. A Technical Advisory Committee to provide technical guidance and act as a sounding board for technical decision making on EA study alternative solutions and designs as well as the preferred solution and design.
3. A First Nations Consultation Sub-Committee to facilitate consultations with First Nations communities having an interest within the EA study area.
4. A Public Liaison Committee to provide guidance and input for public consultation activities.

These committees are part of a comprehensive consultation plan that has been implemented to facilitate input from the public and various agencies during this EA study. Additional consultation has been facilitated through:

2. Maintaining a comprehensive agency, stakeholder group, and contact list.
3. Preparing regular project status updates such as newsletters and information handouts distributed by mail and/or E-mail.
4. Maintaining an up-to-date project website at www.cityofkingston.ca/thirdcrossing.
5. Specific consultations:

a) During Stage 1 of this EA study with:
   i. Parks Canada on November 23, 2009 and February 8, 2010 to discuss the potential impacts of an additional crossing of the Cataraqui River on the Rideau Canal south of the Kingston Mills Lock Station; and
   ii. Canadian Forces Base (CFB) Kingston on November 23, 2009 to provide an overview of the project and discuss CFB Kingston’s long-term strategic plans; and

b) During Stage 2 of this EA study with:
   i. Parks Canada on September 16, 2010 which involved a boat tour of the EA study area and discussions on First Nations history in the area as well as preliminary bridge design and viewscape considerations; and
   ii. the Kingston Rowing Club on August 16, 2010 as well as March 28, April 5 and April 9, 2012 to discuss rowing needs in the Cataraqui River.
Table 1.2
Role and Responsibilities of Various Committees

<table>
<thead>
<tr>
<th>Committee</th>
<th>Committee Structure</th>
<th>Committee Roles and Responsibilities</th>
<th>Meetings to Date</th>
</tr>
</thead>
</table>
| Senior Management Committee | • Senior City Staff  
   • Senior Project Team Members | • Project Oversight and Administration  
   • Manage Project Budget and Schedule  
   • Issue/Risk Management and Mitigation | Various  
   Various |
| Technical Advisory Committee | • Various City Departments  
   • Senior Project Team Members  
   • Canadian Environmental Assessment Agency  
   • CFB Kingston  
   • Cataraqui Region Conservation Authority (CRCA)  
   • Department of Fisheries and Oceans  
   • Parks Canada  
   • Ministry of Transportation Ontario | • Technical Guidance on EA Study Alternatives  
   • Vetting Technical Decision-Making  
   • Assistance in Identifying Approval Requirements |  
   March 9, 2009  
   September 16, 2009  
   November 4, 2009  
   January 27, 2010  
   February 10, 2010  
   February 23, 2010  
   October 18, 2010  
   January 20, 2011  
   May 26, 2011  
   July 28, 2011 |
| First Nations Consultations Sub-Committee | • Senior City Staff  
   • Senior Project Team Members  
   • Special Advisors | • Led by the City  
   • Represents City and Project Team  
   • Maintain a Link With First Nations | Various  
   Various |
| Public Liaison Committee | • Senior City Staff  
   • Senior Project Team Members  
   • Community representatives from both sides of the Cataraqui River | • Provide Input on Public Consultation Activities  
   • Review Consultation Reports  
   • Attend Public Information Centres |  
   June 4, 2009  
   August 24, 2009  
   October 14, 2009  
   January 27, 2010  
   February 25, 2010  
   October 18, 2010  
   January 19, 2011  
   March 2, 2011  
   May 25, 2011  
   February 16, 2012 |
6. Facilitating five Public Information Centres to date at the following key project milestones:

   a) During Stage 1 of this EA study:
      i. on April 23, 2009 to introduce the project;
      ii. on November 28, 2009 to discuss project issues in small working groups; and
      iii. on March 3, 2010 to present the preferred solution; and
   b) During Stage 2 of this EA study:
      i. on March 31, 2011 to present and receive feedback on the three preliminary bridge concepts; and
      ii. on March 1, 2012 to provide details on the projected traffic volumes, flows and origin-destination patterns on the recommended bridge design solution and how these traffic patterns will affect the downtown and adjacent neighbourhoods as well as an EA process recap to provide a basis for the Stage 2 analyses and recommendations.

7. Preparing a ‘Mission Statement, Vision and Guiding Principles’ for use and reference throughout this EA study, which is summarized below in Table 1.3.

### Table 1.3
Mission Statement, Vision and Guiding Principles

| A. Mission Statement | c) evaluates the functionality and compatibility of alternative solutions on the basis of social, cultural, economic, and environmental sustainability; and  
<table>
<thead>
<tr>
<th></th>
<th>d) respects Kingston's unique heritage and cultural character, including the customs and traditions integral to the distinctive cultures of First Nations communities and other cultures that make up our community.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Vision</td>
<td>1. Through innovative planning, design, and consultation, the EA process for evaluating the need and feasibility for a new crossing of the Cataraqui River will display community leadership that reinforces the City's proud historic association with the Rideau Canal and its goal of becoming Canada's most sustainable City.</td>
</tr>
</tbody>
</table>
| C. Guiding Principles | 1. We respect the role of the Rideau Canal and Cataraqui River as:  
|                       | a) a cultural heritage and natural symbol of Canada's identity;  
|                       | b) a valuable tourism and recreational resource; and  
|                       | c) a valuable testimony of First Nations and early European settlements and cultures.  
|                       | 2. We recognize the traditional role of the Rideau Canal and Cataraqui River as a fully functional navigable historic waterway in both promoting public education and nurturing the appreciation of its scenic, cultural heritage, and natural heritage value. |

Table 1.3
Mission Statement, Vision and Guiding Principles

| A. Mission Statement | 1. To complete an EA that evaluates the need and feasibility for a new crossing of the Rideau Canal and Cataraqui River in the City within a framework that:  
|                       | a) builds trust, support, and consensus among international, national, provincial, First Nations, local interests and homeowner associations;  
|                       | b) protects and enhances the cultural and natural heritage integrity of the Rideau Canal as a designated UNESCO World Heritage Site, National Historic Site, Canadian Heritage River and Federally regulated navigable waterway; |
| C1. Scenic, Cultural and Natural Heritage Integrity | 1. We respect the role of the Rideau Canal and Cataraqui River as:  
|                       | a) a cultural heritage and natural symbol of Canada's identity;  
|                       | b) a valuable tourism and recreational resource; and  
|                       | c) a valuable testimony of First Nations and early European settlements and cultures. |
|                       | 2. We recognize the traditional role of the Rideau Canal and Cataraqui River as a fully functional navigable historic waterway in both promoting public education and nurturing the appreciation of its scenic, cultural heritage, and natural heritage value. |
### Table 1.3 Mission Statement, Vision and Guiding Principles

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3. We value the ongoing efforts of private landowners, stakeholder groups, government agencies, and public and private sector partnerships in protecting and enhancing the scenic, cultural heritage, and natural heritage character of the Rideau Canal and Cataraqui River.</td>
<td>1. We recognize that efficient transportation linkages guide the future development of the City of Kingston and contribute to the quality of community life.</td>
<td>1. We acknowledge that international, national, provincial, and local interests and concerns shall be considered and addressed in an equitable manner.</td>
<td>1. We recognize that evaluating and developing alternatives at the same time will allow stakeholder and project team partners to better understand the issues from the outset and develop proactive solutions.</td>
<td>1. We are committed to providing professional services with a strong community-based presence that reflects professional pride, personal commitment, and mutual respect.</td>
</tr>
<tr>
<td>4. We recognize that the sustainable design and development of the shoreline and lands adjoining the Rideau Canal and the Cataraqui River is achieved through respect of its scenic, cultural heritage, and natural heritage landscape.</td>
<td>2. We appreciate that the development of effective alternative solutions needs to incorporate, promote and respect:</td>
<td>2. We recognize that goals are realized when local knowledge and experience promotes understanding of project issues and solutions in an atmosphere of mutual respect and trust.</td>
<td>2. We appreciate that through effective graphic design of alternatives, the concepts will be better understood by stakeholders and help to generate feedback.</td>
<td>2. We acknowledge that project milestones are met by establishing realistic task objectives, strategic personnel assignments, proactive risk management, and effective schedule control.</td>
</tr>
<tr>
<td></td>
<td>a) private and public transportation use;</td>
<td>3. We are committed to a process in which support and consensus is established and nurtured through open and innovative public and agency consultation activities.</td>
<td>3. We recognize that our sense of accomplishment is achieved by providing clear and comprehensive documents that show how project decisions have been made.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) sustainable transportation options such as cycling and walking;</td>
<td>4. We welcome differences of opinion and competing interests as opportunities to ensure all project issues will be considered and addressed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) the principles of universal accessibility; and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) remaining cultural heritage artifacts from First Nations and early European settlements.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. We recognize that the evaluation of effective alternative solutions needs to be based on:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) a full set of social, cultural, economic, and environmental factors;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) mitigation measures that are state-of-the-art and sustainable; and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) the preservation of cultural and heritage resources.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.3.3 Government, Agency and First Nations Involvement

As highlighted above, the consultation plan that has been engaged since the EA study commenced in March, 2009 has been critical in facilitating ongoing input from various government departments and agencies and First Nations communities. This input reflects their respective stakeholder roles in this EA study, given its potential scope, complexity, effects and capital cost implications. This is discussed further below.

.1 Provincial, Municipal and Agency Involvement

The respective roles and involvement of Provincial and Municipal authorities and agencies in this EA study are highlighted in Table 1.4 below.

Table 1.4

<table>
<thead>
<tr>
<th>Authority / Agency</th>
<th>Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Environment</td>
<td>1. The project is proceeding as a Schedule C undertaking in accordance with Ontario Municipal Class EA requirements;</td>
</tr>
<tr>
<td></td>
<td>2. Review the potential impacts and mitigation measures of the project on the aquatic and natural environment; and</td>
</tr>
<tr>
<td></td>
<td>3. Collaborate with the proponent on related Provincial approval requirements regarding recommended project activities; and</td>
</tr>
<tr>
<td></td>
<td>4. Participated in the EA study TAC as an observer during the early part of Stage 1 of this EA study.</td>
</tr>
<tr>
<td>Ministry of Natural Resources</td>
<td>1. Review the potential impacts and mitigation measures of the project on the aquatic and terrestrial environments;</td>
</tr>
<tr>
<td>Cataraqui Region Conservation Authority</td>
<td>2. Collaborate with the proponent on related Provincial approval requirements regarding recommended project activities; and</td>
</tr>
<tr>
<td></td>
<td>3. Participated in the EA study TAC.</td>
</tr>
<tr>
<td>Ministry of Culture</td>
<td>1. Review the potential impacts and mitigation measures of the project on heritage and archaeological resources.</td>
</tr>
</tbody>
</table>

.2 Federal Involvement

The respective roles and involvement of Federal authorities in this EA study (both prior and subsequent to the submission of the initial Project Description to the CEAA at the start of Stage 2 of this EA study) are highlighted in Table 1.5 below.

Table 1.5

<table>
<thead>
<tr>
<th>Agency</th>
<th>Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEAA</td>
<td>1. FEAC of Federal authorities during Stage 1 of this EA study, being responsible for reviewing the EA and coordinating the review activities of the RA’s and expert FA’s;</td>
</tr>
<tr>
<td></td>
<td>2. Contributed expert information and participated in the EA study TAC during Stage 1 of this EA study; and</td>
</tr>
</tbody>
</table>
### Table 1.5
Project Involvement: Federal Authorities

<table>
<thead>
<tr>
<th>Agency</th>
<th>Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CEAA</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Transferred its FEAC role to Parks Canada and withdrew its participation in the project during Stage 2 of this EA study, as the project site location is within the Rideau Canal.</td>
</tr>
<tr>
<td><strong>Parks Canada</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. An RA during Stage 1 of this EA study, given that:</td>
</tr>
<tr>
<td></td>
<td>a) it is responsible on behalf of i) the Federal government for managing and protecting the Rideau Canal as a National Historic Site and Canadian Heritage River; and ii) the UNESCO World Heritage Committee for ensuring that the canal’s Outstanding Universal Value is maintained; and</td>
</tr>
<tr>
<td></td>
<td>b) the project would require authorization under the ‘Historic Canals Regulations’ and could further be subject to the ‘Federal Real Property and Federal Immovable’s Act’;</td>
</tr>
<tr>
<td></td>
<td>2. As an RA:</td>
</tr>
<tr>
<td></td>
<td>a) contributes expert information;</td>
</tr>
<tr>
<td></td>
<td>b) reviews the potential impacts and mitigation measures of the project on the heritage values of the Rideau Canal and approve recommended project activities;</td>
</tr>
<tr>
<td></td>
<td>c) collaborates with the proponent to ensure Federal Duty to Consult protocol with First Nations communities is effected;</td>
</tr>
<tr>
<td></td>
<td>d) collaborates with the proponent on other related Federal approval requirements regarding recommended project activities;</td>
</tr>
<tr>
<td></td>
<td>e) participated in the EA study TAC; and</td>
</tr>
<tr>
<td></td>
<td>3. Assumed the FEAC role from the CEAA during Stage 2 of this EA study, as the project site location is within the Rideau Canal, and as such:</td>
</tr>
<tr>
<td></td>
<td>a) is responsible for reviewing the EA and coordinating the review activities of the RA’s and expert FA’s; and</td>
</tr>
<tr>
<td></td>
<td>b) continues to collaborate with the proponent on EA study activities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Agency</th>
<th>Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Department of Fisheries and Oceans</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. An RA, given that it administers the ‘Fisheries Act’ and that the project would be subject to it and require related approvals;</td>
</tr>
<tr>
<td></td>
<td>2. Contributes expert information;</td>
</tr>
<tr>
<td></td>
<td>3. Reviews the potential impacts and mitigation measures of the project on the aquatic environment and the role of the Rideau Canal as a Federally regulated waterway;</td>
</tr>
<tr>
<td></td>
<td>4. Collaborates with the proponent on related Federal approval requirements regarding recommended project activities; and</td>
</tr>
<tr>
<td></td>
<td>5. Participated in the EA study TAC.</td>
</tr>
<tr>
<td><strong>Transport Canada</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. An RA, given that it administers the ‘Department of Transport Act’ and the ‘Navigable Waters Protection Act’ and that the project would be subject to both and require related approvals;</td>
</tr>
<tr>
<td></td>
<td>2. Contributes expert information;</td>
</tr>
<tr>
<td></td>
<td>3. Reviews the potential impacts and mitigation measures of the project on the LaSalle Causeway and the Rideau Canal as a Federally regulated navigable waterway; and</td>
</tr>
<tr>
<td></td>
<td>4. Collaborates with the proponent on related Federal approval requirements on recommended project activities.</td>
</tr>
<tr>
<td><strong>Environment Canada</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. An expert FA, in that it has specialist or expert information that may assist RA’s with the Federal EA of the project; and</td>
</tr>
<tr>
<td></td>
<td>2. Participated in the EA study TAC.</td>
</tr>
<tr>
<td><strong>National Defence</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Reviews the potential impacts and mitigation measures of the project on CFB Kingston and contribute expert information; and</td>
</tr>
<tr>
<td></td>
<td>2. Participated in the EA study TAC.</td>
</tr>
</tbody>
</table>
### Table 1.5

**Project Involvement: Federal Authorities**

<table>
<thead>
<tr>
<th>Agency</th>
<th>Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Canada</td>
<td>1. Contributes expert information, if requested; and</td>
</tr>
<tr>
<td></td>
<td>2. Participated in the EA study TAC.</td>
</tr>
<tr>
<td>Natural Resources Canada</td>
<td>1. Contributes expert information, if requested.</td>
</tr>
<tr>
<td>Infrastructure Canada</td>
<td>1. The proponent will seek Federal financial assistance prior to project construction activities, for which a Federal EA would likely be required.</td>
</tr>
</tbody>
</table>

#### 1.3 First Nations Involvement

The Canadian constitutional framework takes into account that the First Nations of Canada were here first as sovereign peoples who were never conquered. Further, the ‘Crown’, which is made up of the Federal and Provincial levels of government, has an obligation, based on its own inherent honour, to consult on matters affecting Aboriginal interests raised by First Nations. In 2010, the Supreme Court of Canada in the *Rio Tinto* ruling confirmed that the purpose of consultation with First Nations was not only based on the honour of the Crown but also, because of that honour, related to the onerous demands of the trial process. Accordingly, it has been established that consultations must be undertaken with the awareness not only of the constitutional fiduciary duty of the Crown to protect Aboriginal interests but also that the process stand as a surrogate for a full court process. As such, the ‘Duty to Consult’ is a means to ensure First Nations’ interests and rights are identified and respected. It also helps the Crown to make better more durable decisions and strengthen its relationships with the First Nations of Canada.

Procedural aspects of First Nations consultation processes are often delegated to the project proponent. The project proponent is typically best-suited to speak to technical and environmental aspects of the project and where appropriate, is best-placed to address concerns raised by First Nations communities. As the project proponent for this EA study, the City has been delegated the procedural aspects of First Nations consultation from the RA’s.

First Nations history in the region of Kingston is complex, in that the establishment of a European presence occurs far earlier here as compared to most other cities in Ontario. As such, the City has sought to be recognized as a municipality which takes the Duty to Consult with First Nations communities as a serious obligation. This is due in no small part to the City’s interest in understanding the rich and complex historic and continuing experience of First Nations as part of its overall cultural awareness. Consistent with this commitment, the City, through its First Nations Consultation Sub-Committee, undertook consultations either though meetings or regular mailings with the following First Nations communities having an interest within the EA study area:

1. Ardoch Algonquin First Nation.
4. Tyendinaga Mohawk Territory.
5. Shabot Obaadjiwan First Nation.
8. Algonquins of Pikwàkanagàn.

#### 1.3.4 Time Frame and Approvals Process

As previously noted, this EA study was initiated on March 3, 2009 with the ‘Notice of Study Commencement’. This Report can be used to satisfy both the Provincial and Federal EA frameworks.

Upon City Council’s review and approval of this Report under the Class EA planning process, a formal ‘Notice of Completion’ will be issued by the City. The public and review agencies will have thirty days to request a ‘Part II Order’ from the Ontario Minister of Environment. This is an appeal provision whereby a person or party with outstanding concerns may request the Ontario Minister of Environment to make an order requiring the City to comply with Part II of the OEA Act before proceeding any further with the Schedule C Class EA phase of the project. If no request for a Part II Order is received, the Schedule C Class EA phase of the project will be complete. As shown on Table 1.1, this is anticipated to occur by June 2012. The City will then seek Federal approval of the EA pursuant to the CEA Act. Following Federal EA approval, the City will be in a position to initiate project implementation (long-term planning and budget programming, detail design, final approvals and construction) within the next ten years without having to revisit the findings and recommendations identified through the Schedule C Class EA. Should a ten year time lapse occur between completion of the Schedule C Class EA and commencement of the implementation phase, the City would be required to review the planning and design process as well as the environmental setting at that time to ensure the project and proposed mitigation measures are still appropriate. Such a review would be documented through an Addendum to this Report. Only the changes to the original project, if any, would be open for public review.
1.4 Proponent and Project Team

1.4.1 Proponent

The project proponent is the City. City contact information is as follows:

City of Kingston
216 Ontario Street
Kingston, Ontario K7L 2Z3
Mr. Mark Van Buren, P.Eng.
Director, Engineering Department
Phone: (613) 546-4291, Extension 3218
Fax: (613) 542-7880
E-mail: mvanburen@cityofkingston.ca

1.4.2 Project Team

A team led by J. L. Richards & Associates Limited was retained by the City to undertake this EA study, including the coordination and production of this Report. Project team contact information is as follows:

J.L. Richards & Associates Limited
Suite 203 – 863 Princess Street
Kingston, Ontario K7L 5N4
Mr. Dan Lalande, P.Eng.
Director, Kingston Office Manager
Phone: (613) 544-1424
Fax: (613) 544-5679
E-mail: dlande@d Richards.ca

Additional information on the main project team members and their roles in this EA study is provided in Table 1.6 below.

<table>
<thead>
<tr>
<th>Project Team Partner</th>
<th>Project Team Personnel</th>
<th>Project Team Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>J.L. Richards &amp; Associates Ltd.</td>
<td>Dale Craig, P.Eng.</td>
<td>Principal-In-Charge</td>
</tr>
<tr>
<td></td>
<td>Dan Lalande, P.Eng.</td>
<td>Project Manager and EA Lead</td>
</tr>
<tr>
<td></td>
<td>Wes Paetkau, MCIP, RPP</td>
<td>Assistant Project Manager</td>
</tr>
<tr>
<td></td>
<td>Manuel Stevens, M.A.</td>
<td>Senior Advisor</td>
</tr>
<tr>
<td>Associated Engineering</td>
<td>John Fussell, P.Eng.</td>
<td>Bridge Engineer</td>
</tr>
<tr>
<td></td>
<td>Bala Balakrishnan, P.Eng.</td>
<td>Bridge Engineer</td>
</tr>
<tr>
<td></td>
<td>Bryan Petzold, P.Eng.</td>
<td>Transportation Engineer</td>
</tr>
<tr>
<td>Bridgescapes LLC</td>
<td>Fred Gottemoeller, PE, AIA</td>
<td>Bridge Architect</td>
</tr>
<tr>
<td>Williamson Consulting Inc.</td>
<td>Howard Williamson, B.A. (Hons.)</td>
<td>Public Consultation Specialist</td>
</tr>
<tr>
<td>Scarlett Janusas Archaeological and Heritage Consulting</td>
<td>Scarlett Janusas, M.A.</td>
<td>Marine Archaeologist</td>
</tr>
<tr>
<td>Adams Heritage</td>
<td>Nick Adams, M.A.</td>
<td>Land Archaeologist</td>
</tr>
<tr>
<td>Bowfin Environmental Consulting</td>
<td>Michelle Lavoitire, B.Sc.</td>
<td>Marine Ecologist</td>
</tr>
<tr>
<td>Ecological Services</td>
<td>Mary Alice Snetsinger, M.Sc.</td>
<td>Land Ecologist</td>
</tr>
<tr>
<td>HCCL Inc.</td>
<td>Stu Seabrook, P.Eng., M.Sc.</td>
<td>Hydrotechnical Engineer</td>
</tr>
<tr>
<td>Golder Associates Ltd.</td>
<td>Gerry Webb, P.Eng.</td>
<td>Geotechnical Engineer</td>
</tr>
<tr>
<td></td>
<td>Berend Veldermain, P.Geo.</td>
<td>Geoscientist</td>
</tr>
<tr>
<td></td>
<td>Bruce Goddard, PE, P.Eng.</td>
<td>Geotechnical Engineer</td>
</tr>
<tr>
<td>Smith Heritage Consulting</td>
<td>Laurie Smith, M.A, LLB, CAHP</td>
<td>Cultural Heritage Specialist</td>
</tr>
<tr>
<td>Corush Sunderland Wright</td>
<td>John Wright, CSLA, MCIP, RPP</td>
<td>Landscape Architect</td>
</tr>
<tr>
<td>RWDI Air Inc.</td>
<td>Ben Coulson, P.Eng.</td>
<td>Noise Specialist</td>
</tr>
<tr>
<td>Leslie Higginson Surveying Ltd.</td>
<td>Leslie Higginson, O.L.S., O.L.I.P.</td>
<td>Land Surveyor</td>
</tr>
<tr>
<td>Monteith &amp; Sunderland Ltd.</td>
<td>Glenn Dawson, P.Eng.</td>
<td>Hydrographic Surveyor</td>
</tr>
</tbody>
</table>
1.5 Report Sections

This Report documents the decision making and consultation process during Stage 1 and Stage 2 of this EA study. It presents and evaluates alternative solutions to the problem statement and determines a preferred solution. It then builds on the preferred solution by assessing alternative designs, which in turn leads to the selection of a preferred design. The potential effects on (and from) the environment from (and on) activities associated with implementing the preferred design (construction, operation, decommissioning) are then discussed. Mitigation measures and monitoring, where necessary, are also identified.

This Report is organized in the following main sections:

1. Introduction and Background.
2. The EA Problem Statement.
3. The Alternative Solutions and The Preferred Solution.
5. The Project Description.
6. Project Monitoring.
8. Conclusion.

2.0 THE EA PROBLEM STATEMENT

2.1 Problem Description

Two major east-west transportation crossings of the Cataraqui River currently exist within the City’s urban limits. One crossing is the LaSalle Causeway-Highway 2 corridor, which crosses the Cataraqui River at the southerly confluence of the Cataraqui River and Lake Ontario. The LaSalle Causeway is comprised of a two-lane cross section and a series of structures (fixed truss, rigid frame structure and Bascule Lift Bridge). It is under the jurisdiction of Public Works & Government Services Canada. The LaSalle Causeway has an average estimated capacity of 900 vehicles per hour, per lane (for a total two-way capacity of 1,800 vehicles per hour given its 2-lane configuration), based on the City’s target LOS D.

The second crossing is the Highway 401 corridor, which crosses the Cataraqui River approximately 6 km north of the LaSalle Causeway. Highway 401 is owned by the Province of Ontario through the Ministry of Transportation Ontario (MTO). It is a four-lane Freeway that extends through the City and is the primary inter-city freeway, with local interchanges at Joycleville Road, Kingston Road 15, Montreal Street, Division Street, Sir John A. Macdonald Boulevard, Sydenham Road, and Highway 38. The Highway 401 crossing capacity is estimated to be approximately 1,500 to 2,000 vehicles per hour, per lane (for a total two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration).

Other key roadway network links within the EA study area include:

1. Highway 2, which is a major east-west arterial that connects the east part of the City to the downtown via the LaSalle Causeway and connects with Kingston Road 15 on the east side of the Cataraqui River by a signalized T-intersection.
2. Kingston Road 15, which is a major north-south arterial on the east side of the Cataraqui River that connects with Highway 2 in the south via a signalized T-intersection (as noted above) and Highway 401 in the north by a modified diamond grade separated interchange.
3. John Counter Boulevard, which is a major east-west arterial that serves development in west Kingston up to the east of Montreal Street where it becomes a local street.
4. Montreal Street, which is a major north-south arterial on the west side of the Cataraqui River that connects with the downtown core in the south and Highway 401 in the north via a grade separated interchange.

Both the 2004 KTMP and 2009 KTMP Update confirmed a 0.90 volume/capacity ratio as the appropriate trigger for recommending roadway solutions for the ‘Cataraqui River screenline’ (which includes the LaSalle Causeway and Highway 401 crossing), which is based on an urban arterial road classification from the Transportation Association of Canada. This means the trigger for recommending improvements for the LaSalle Causeway is 810 vehicles per hour, per lane (based on an average estimated capacity of 900 vehicles per hour, per lane) and 5,400 vehicles per hour for the Highway 401 crossing (based on its total two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration).

Drawing 2.1 shows the 2009 PM peak hour crossing demand patterns for local travel across the Cataraqui River. Drawing 2.1 also shows the 2009 PM peak hour crossing demand patterns for longer distance trips both to and from the City, excluding trips using Highway 401. Note the trip demand lines of specific traffic zones have been aggregated to broader zones in order to simplify the demand patterns. As Drawing 2.1 illustrates, there is strong demand for trips crossing the Cataraqui River via the LaSalle Causeway in both the southern and northern portions of the City’s urban limits.
Existing traffic volumes on the LaSalle Causeway during the PM peak hour from Stage 1 and Stage 2 of this EA study are shown in Table 2.1 below. Existing volumes are in the order of 1,000 vehicles per hour for eastbound travel and 1,100 vehicles per hour for westbound travel during the PM peak hour. As shown on Drawing 2.2 which is based on the 2011 ‘Traffic Operations Study For The LaSalle Causeway Corridor’ prepared by HDR/iTrans pursuant to Stage 1 of this EA study, trip destinations for eastbound and westbound travel via the LaSalle Causeway during the PM peak hour are more specifically defined as follows:

1. Eastbound trip destinations are split between Kingston Road 15 (51 percent) and Highway 2 (46 percent) and originate from the following main areas on the west side of the Cataraqui River:
   a) 38 percent originate from the downtown area and Queen’s University;
   b) 15 percent originate from north of the downtown area;
   c) 13 percent originate from Princess Street;
   d) 15 percent originate from Johnson Street; and
   e) 7 percent originate from King Street west of Queen’s University.

2. Westbound trips originating from Kingston Road 15 (35 percent) and CFB Kingston-Highway 2 (59 percent) are destined to the following main areas on the west side of the Cataraqui River:
   a) 36 percent are destined to the downtown area and Queen’s University;
   b) 10 percent are destined to north of the downtown area;
   c) 10 percent are destined to the Bath Road-Concession Street corridor;
   d) 14 percent are destined to Princess Street;
   e) 15 percent are destined to Johnson Street; and
   f) 7 percent are destined to King Street west of Queen’s University.

Based on existing traffic volumes, the LaSalle Causeway is currently operating below the City’s target LOS D. Existing conditions affecting LOS on the LaSalle Causeway-Highway 2 corridor are as follows:

1. The discharge of vehicles from the Wolfe Island Ferry at the Barrack Street-Ontario Street intersection. Each hourly arrival of the ferry can offload up to 55 vehicles and 330 passengers, which impacts the Barrack Street-Ontario Street intersection where all unloading vehicles exit through the east leg of the intersection. Travel time surveys done as part of the 2011 HDR/iTrans report indicate that this surge causes a 2-3 minute delay on the LaSalle Causeway-Highway 2 corridor during the PM peak hour. The MTO is undertaking an EA study to determine future transportation needs between Wolfe Island and the City. The current preliminary recommendation is to add a second ferry service to meet projected ferry demands over the next 20 years. If implemented, this service would not be available until 2014. But it would further affect queues on Ontario Street and increase the delay on the LaSalle Causeway to 7-8 minutes during the PM peak hour.

2. The operation of the signalized intersections at each end of the LaSalle Causeway, namely, the Highway 2-Kingston Road 15 intersection to the east and the Barrack Street-Ontario Street intersection to the west. The 2011 HDR/iTrans report indicates that signal timings and offsets on Ontario Street, Highway 2 and Kingston Road 15 are not fully optimized to serve current demand during the PM peak hour. This is particularly apparent for eastbound travel on the LaSalle Causeway exiting the downtown and for northbound travel on Kingston Road 15:
   a) For eastbound travel, there are high eastbound left turn delays at the Highway 2-Kingston Road 15 intersection. This subsequently creates long queues extending back to Ontario Street that block the eastbound through lane on Highway 2, causing an 8-12 minute delay on the LaSalle Causeway during the PM peak hour (versus 3-4 minutes during non-peak hours); and
   b) For northbound travel on Kingston Road 15, travel times during the PM peak hour were almost two times longer than during the non-peak hours and coincide with when northbound commuters from CFB Kingston exit onto Kingston Road 15 at Craftsman Boulevard.

For westbound travel into the downtown during the PM peak hour, demand is equally high, with queues extending to Niagara Park Drive east of Kingston Road 15. This is caused by a combination of delays at the Barrack Street-Ontario Street intersection, the Highway 2-Duty Drive intersection and the Highway 2-Kingston Road 15 intersection as a result of the left-turn advance phases and competing traffic from the cross streets which take away from ‘green time’ that could otherwise be allocated to the westbound through movements. The need to accommodate pedestrian crossings at the signalized intersections also limits the available green time to serve traffic.

3. The Bascule Lift Bridge portion of the LaSalle Causeway that is raised to accommodate recreational boat traffic. The Bascule Lift Bridge is raised about 15-30 times per day during the summer months, but is closed during the 8:00-8:30 AM, 12:30-1:00 PM and 4:30-5:00 PM periods. The 2011 HDR/iTrans report states that since the Bascule Lift Bridge does not operate during the
AM and PM peak hours, it is not a major contributing factor to existing traffic congestion. However, it still is noteworthy that:

a) The Bascule Lift Bridge is closed for only a portion of the PM peak hour period but can be opened at 4:13 PM, which is considered in the 2011 HDR/iTrans report as the ‘worst case travel time’ on the LaSalle Causeway;

b) The 1992 TSH report estimated that the traffic delay caused by the bridge opening could reduce the capacity of the LaSalle Causeway by an additional 100 vehicles per hour; and

c) The ‘Master Fire Plan’ concluded that traffic congestion on the LaSalle Causeway and the operation of the Bascule Lift Bridge portion of the LaSalle Causeway for boat traffic is negatively impacting existing emergency response agencies due to the limited access to resources located in the core area when career staff from the downtown core stations are required to be assigned to support the volunteer staff in the east side of the City in a timely manner.

As noted in Table 2.1 below, projected traffic volumes on the LaSalle Causeway, also undertaken during Stage 1 and Stage 2 of this EA study, are expected to increase in the future. Based on the 2011 HDR/iTrans report, the forecasted 2019 PM peak hour demand is estimated to be 1,260 vehicles per hour for both eastbound and westbound travel. This increase in travel demand is in response to urban growth projections in the City and surrounding area [or the Census Metropolitan Area (CMA)], as noted below:

1. Projected population growth could reach 9 percent from 2009 to 2019 (for a total population of 167,200 people) and 19 percent from 2009 to 2029 (for a total population of 183,200 people). 77 percent of this growth is expected to occur within the City boundaries, based on 2006 Census characteristics of the Kingston CMA.

2. Projected employment growth could reach 11 percent from 2009 to 2019 (for a total of 87,300 jobs) and 22 percent from 2009 to 2029 (for a total of 96,300 jobs). 88 percent of this growth is expected to occur within the City boundaries, based on demographic research work done in 2006 by TeraTrends. This projected employment growth includes long-term plans at CFB Kingston. Further in this regard, CFB Kingston employs a workforce of roughly 8,000 individuals (military and civilians) with residency being approximately 50 percent on each side of the Cataraqui River. CFB Kingston’s long-term strategic plan is expected to create approximately 100 employment opportunities per year during the next several years. As a result, trips to and from CFB Kingston is anticipated to increase by 10 percent to 12.5 percent in 10 years, with approximately half of those trips originating from the west side of the Cataraqui River, based on current residency.

The City’s Official Plan identifies various growth and development areas as shown on Drawing 2.3. It organizes the City into broad structural parts and highlights areas that are to accommodate the City’s future urban population and employment growth via infill, intensification and new development. As Drawing 2.3 illustrates, growth and development areas within the City are shown on both sides of the Cataraqui River. Notable areas include east of Division Street in the downtown area and Rideau Heights, Cataraqui North and Cataraqui West along Princess Street as well as Westbrook, the Novelis-Alcan area and Creekfield Road south in west Kingston as well as the St. Lawrence and Rideau communities in east Kingston. Future employment growth areas include the Highway 401 corridor and the potential surplus lands at the Collins Bay Penitentiary in west Kingston as well as the St. Lawrence Business Park and CFB Kingston (including the potential surplus lands at CFB Kingston) in east Kingston.

As shown on Drawing 2.4 and summarized below, based on the 2011 HDR/iTrans report, forecasted trip destinations for eastbound and westbound travel via the LaSalle Causeway during the PM peak hour are expected to change:

| Table 2.1 | Existing and Forecasted PM Peak Volumes on Highway 401 and the LaSalle Causeway |
|-----------|----------------------------------|-------------------|-----------------|-------------------|
|           | Existing 2019 | 5% Transit and 14% 'Active' Modes | 2029 | 5% Transit and 14% 'Active' Modes | 2029 |
|           | EB 7 WB 8    | EB 7 WB 8            | EB 7 WB 8    | EB 7 WB 8 |
| Stage 1 EA | Highway 401  | 1,260 1,252 2,392 2,479 2,513 2,756 2,466 2,744 |
|           | LaSalle Causeway | 1,017 1,187 1,319 1,192 1,353 1,346 1,331 1,351 |
| Stage 2 EA | Highway 401  | 1,260 1,252 2,392 2,479 2,513 2,756 2,466 2,744 |
|           | LaSalle Causeway | 1,017 1,100 1,260 1,260 1,353 1,346 1,331 1,351 |

1 Note ‘EB’ means ‘eastbound’ travel.
2 Note ‘WB’ means ‘westbound’ travel.
1. Eastbound trip destinations are still generally split between Kingston Road 15 (49 percent) and Highway 2 (44 percent) and originate from the following main areas on the west side of the Cataraqui River:
   a) 45 percent originate from the downtown area and Queen's University (a 7 percent increase from 2009);
   b) 2 percent originate from north of the downtown area (a 13 percent decrease from 2009);
   c) 17 percent originate from Princess Street (a 4 percent increase from 2009);
   d) 4 percent originate from Johnson Street (a 11 percent decrease from 2009); and
   e) 21 percent originate from King Street west of Queen's University (a 14 percent increase from 2009).

2. Westbound trips originating from Kingston Road 15 decrease from 35 percent to 27 percent, whereas trips from CFB Kingston-Highway 2 increase from 59 percent to 64 percent. Main destinations on the west side of the Cataraqui River are as follows:
   a) 38 percent are destined to the downtown area and Queen's University (a 2 percent increase from 2009);
   b) 6 percent are destined to north of the downtown area (a 4 percent decrease from 2009);
   c) 5 percent are destined to the Bath Road-Concession Street corridor (a 5 percent decrease from 2009);
   d) 14 percent are destined to Princess Street (unchanged from 2009);
   e) 4 percent are destined to Johnson Street (a 11 percent decrease from 2009); and
   f) 11 percent are destined to King Street west of Queen's University (a 4 percent increase from 2009).

As a result of this increased travel demand, the current problems and deficiencies on the LaSalle Causeway-Highway 2 corridor are expected to worsen in the future, if left unaddressed. By 2019, travel time delays during the PM peak hour are expected increase by an average of 79 percent for eastbound traffic and 76 percent for westbound traffic. Northbound travel time delays on Kingston Road 15 are also expected to increase by 27 percent on average.

In regards to the Highway 401 crossing, existing traffic volumes during the PM peak hour is 1,260 vehicles per hour per lane for eastbound travel and 1,252 vehicles per hour per lane for westbound travel. The forecasted 2019 PM peak hour demand for the Highway 401 crossing is estimated to be 2,392 vehicles per hour for eastbound travel and 2,479 vehicles per hour for westbound travel. Based on its current capacity of 1,500 to 2,000 vehicles per hour, per lane (for a total two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration), the Highway 401 crossing has ample capacity to accommodate additional traffic. The MTO is also currently widening Highway 401 from four to six lanes west of Sydenham Road to west of Montreal Street as part of a broader provincial strategy to ultimately twin Highway 401 from the City of Windsor to the Quebec border in response to traffic volume growth and traffic collision incidents.

Though Highway 401 has ample capacity to handle more traffic both now and in the future, two issues need to be considered. The first is that the primary function of Highway 401 is to accommodate regional (or long distance) traffic. Traffic operations related to local traffic needs are fundamentally different than regional traffic needs. These differences can result in compromised efficiency and safety for both local and regional traffic. The second issue relates to the strong demand for trips crossing the Cataraqui River via the LaSalle Causeway in both the southern and northern portions of the City's urban limits. The Highway 401 crossing is 6 km north of the LaSalle Causeway. Diverting traffic to the Highway 401 crossing would lead to further out of way travel and additional travel delays.

The current and future traffic volumes on Table 2.1 also account for modal splits for active transportation (cycling and walking) and public transit use. Both are important factors in managing growth and reducing the number of single-occupant vehicles. The 2004 KTMP included numerous recommendations in keeping with the City's objectives for increasing both active transportation and transit use. At that time, modal splits for active transportation and transit were at 12 percent and 3 percent, respectively. Despite the City's subsequent strategic efforts, today's modal shares are at 14 percent for active transportation and 5 percent for transit. This represents a 2 percent share increase for each mode since 2004. The 2009 KTMP Update concluded that significantly increasing these modal shares would be very difficult to achieve in the City within the next 15-20 years, given the size of the City and the significant investment in infrastructure and aggressive policy approach that would be required. As such, the existing modal shares for active transportation and transit have been carried forward to the 2019 horizon, which results in the projected capacity deficiencies on the LaSalle Causeway-Highway 2 corridor shown on Table 2.1.

It is recognized however, that the City's Transit Department has been reviewing the City's existing transit system. A number of transit service enhancements were recently approved by City Council including the introduction of two new express bus routes serving the east and west sides of the City. Express Route 1, covering the west side of the City, will form a loop from the downtown and connect the west end of the City along the King Street-Bayridge Drive-Princess Street corridors. Express Route 2, covering the east side of the City, will also form a loop both to and from the downtown across the LaSalle Causeway-Highway 2
corridor and extending north on Kingston Road 15. Based on preliminary assessments, these Express Routes are expected to increase transit ridership in the City and result in a 1 percent increase in the overall City-wide transit mode share, or from 5 percent today to 6 percent by 2019. This 1 percent modal share increase for transit is expected to generate 1,049 new transit trips during the PM peak hour, which represents a reduction of 384 vehicle trips City-wide. As such, this increase would have a marginal impact on the capacity deficiency on the LaSalle Causeway-Highway 2 corridor. As shown on Table 2.1 and based on the 2009 KTMP Update, even at a simulated 9 percent transit mode share by 2029, the projected decrease in traffic volume on the LaSalle Causeway would still only amount to 0.6 percent (a decrease from 2,699 vehicles per hour in 2019 to 2,682 vehicles per hour in 2029). Thus, despite the projected modal shares for transit and active transportation and despite the even higher simulated increase for the transit mode share in particular (which would be difficult to achieve in any event as noted above), the projected traffic volumes on the LaSalle Causeway would still result in the corridor operating below the City’s target LOS D over the immediate-to-long-term.

2.2 EA Problem Statement

Based on the above and in accordance with Phase 1 of the Schedule C Class EA process, the EA Problem Statement is as follows:

There are currently two crossings of the Cataraqui River within the City of Kingston urban limits, namely: the LaSalle Causeway-Highway 2 corridor located at the southerly confluence of the Cataraqui River and Lake Ontario; and the Highway 401 crossing located 6 km upstream of the LaSalle Causeway-Highway 2 corridor. There is a requirement to evaluate the need for and the feasibility of implementing additional transportation capacity across the Cataraqui River over the immediate (2009), mid-term (2029) and long-term (2050/2075) planning horizons in response to:

1. The effects of the LOS for the LaSalle Causeway-Highway 2 corridor, which is failing below the City’s accepted policy level of LOS D as a result of existing traffic congestion on the LaSalle Causeway during peak hour traffic demand (and during a Highway 401 detour event), despite focused strategies to optimize the transportation system and increase walking, cycling, and public transit use. The LOS is expected to continue to decrease in the future due to population and employment growth and increased traffic congestion.

2. The current role of the Highway 401 crossing as an inter-city roadway facility and the related safety and system efficiency issues that can result from conflicts between local and regional traffic use as well as the strong demand for trips crossing the Cataraqui River via the LaSalle Causeway in both the southern and northern portions of the City’s urban limits.

3. Projected 19 percent population growth and 22 percent employment growth in the City and surrounding area by 2029 and the need to determine whether the City’s transportation networks will be able to accommodate long-term planned growth and development programs on the east and west sides of the Cataraqui River in an efficient and effective manner.

2.3 EA Study Purpose

Based on the EA Problem Statement, this EA study is to involve an assessment of the potential positive and negative social, cultural, economic and environmental impacts of the following alternative solutions:

1. Retain the status quo or ‘do nothing’, which means that no facilities would be constructed to provide additional transportation capacity across the Cataraqui River and the problem would remain and/or an opportunity would not be addressed.

2. Increase the capacity of the LaSalle Causeway.

3. Increase the capacity of Highway 401 from Kingston Road 15 to Montreal Street.

4. Implement a new crossing between the LaSalle Causeway and Highway 401 by either a tunnel or bridge.

3.0 THE ALTERNATIVE SOLUTIONS AND THE PREFERRED SOLUTION

3.1 EA Study Area Conditions

3.1.1 Provincial and Municipal Land Use Planning Considerations

.1 2005 Provincial Policy Statement

The 2005 Provincial Policy Statement (PPS) provides general policy guidance on matters of provincial interest related to land use planning and development and is considered in conjunction with local policies. All municipal land use and development decision-making must be consistent with the policies of the 2005 PPS. The intent of this EA study is to be consistent with the 2005 PPS, in that its purpose is to enable the City to:

1. Provide infrastructure to meet current and projected needs and do so in a coordinated, efficient and cost-effective manner (Sections 1.1.1, 1.6.1, 1.6.5 and 1.6.6 of the 2005 PPS).

2. Optimize the use of existing infrastructure, wherever feasible, before consideration is given to developing new infrastructure (Section 1.6.2 of the 2005 PPS).
3. Strategically locate infrastructure to support the effective and efficient delivery of emergency management services (Section 1.6.3 of the 2005 PPS).

4. Plan for major transportation and infrastructure facilities in a manner that:
   a) Accounts for natural and cultural heritage resources having provincial significance (Section 1.6.6 of the 2005 PPS); and
   b) Mitigates their adverse effects on adjacent sites and surrounding land uses to acceptable levels (Section 1.7.1 of the 2005 PPS).

5. Satisfy both the Provincial and Federal EA frameworks, in addition to other applicable legislation and regulations (Section 4.8 of the 2005 PPS).

   .2 City of Kingston Official Plan

The City's Official Plan was adopted in 2010. Reviewed at least every 5 years, the Official Plan provides a 20-year development blueprint for the community and must be consistent with the 2005 PPS. The various growth and development areas identified in the Official Plan were already highlighted earlier in Section 2 of this Report. Other policy areas in the Official Plan that are pertinent to this EA study include:

1. The need for proposed developments to be implemented in a manner that either eliminates or minimizes to an acceptable level any adverse effects on adjacent sites and surrounding land use designations (Section 2.7.4 of the Official Plan).

2. Municipal infrastructure (which includes transportation corridors and facilities) may be permitted in all land use designations, provided they can be made compatible with surrounding land uses and that all works are carried out in accordance with the 'Ontario Environmental Protection Act' (OEPA) and other Ministry of Environment regulations (Section 3.1.1 of the Official Plan).

3. Should an application for development be located on land adjacent to or forming part of an 'Environmental Protection Area' designation, an Environmental Impact Assessment must be submitted for review to the City, the CRCA and other agencies having jurisdiction (Section 3.10.9 of the Official Plan).

4. The intent of the Official Plan is to maintain and protect the resources related to the Rideau Canal in cooperation with Parks Canada and other agencies having jurisdiction. Development is permitted only if potential adverse effects on the canal and its environs can be remedied, as demonstrated through a heritage impact statement (Sections 3.10.A.3, 3.10.A.6 and 7.3.A of the Official Plan).

5. Based on the 2004 KTMP, the recommended 2-lane bridge crossing at the John Counter Boulevard-Gore Road alignment is cited as a strategic 'future major road extension', subject to the outcome of an EA study (Sections 2.5.12 and 4.6.35 of the Official Plan).

6. Should an application for development be located on a site that may be contaminated by a prior or current use, the Environmental Site Assessment protocol shall take effect in accordance with Ministry of Environment regulations and guidelines (Sections 5.10, 5.11, 5.12 and 5.13 of the Official Plan).

7. The City may permit development on lands adjacent to a protected heritage property, provided a heritage impact statement demonstrates that the heritage attributes of the protected heritage property will be conserved (Section 7.2.5 of the Official Plan).

8. The City will permit development either on lands containing archaeological resources or in areas of archaeological potential if the archaeological resource has been conserved by removal or conserved on-site (Section 7.4.2 of the Official Plan).

9. There are a series of protected views that include views to and from protected heritage properties, or between related heritage properties (Section 8.6 of the Official Plan).

10. Proposed Official Plan amendments must show that the subject development meets the City's long-term plans for the area, is compatible with surrounding land uses and is consistent with Provincial policy and/or plans (Section 9.3 of the Official Plan).

11. The entire area within the City is designated as a Site Plan Control Area (Section 9.5.31 of the Official Plan).

   .3 Existing Zoning By-Laws

The EA study area is regulated by the following three Zoning By-Laws that are still in effect since the amalgamation in 1998 of the former City and the former Townships of Pittsburgh and Kingston:

1. City of Kingston Zoning By-Law No. 8499, as amended.

2. Downtown and Harbour Zoning By-Law No. 96-259, as amended.

3. Township of Pittsburgh Zoning By-Law No. 32-74, as amended.
Together, these Zoning By-Laws contain numerous zones as well as site-specific zones and regulations that affect the lands within the EA study area. What is critical to note as part of this EA study however, is that under the General Provisions in these Zoning By-Laws, ‘Public Uses’\(^9\) are permitted in all zones. From a high level perspective (and notwithstanding some of the site-specific zones and regulations), a pertinent exception to this provision is found in the Former Township of Pittsburgh Zoning By-Law No. 32-74, wherein ‘Public Uses’ are not permitted in the ‘Extractive Industrial Zone (MX)’. As further referenced below, this zone affects the Pittsburgh quarry site, which is located to the north of the Pittsburgh Branch of the Kingston Frontenac Public Library (Gore Road Library) on Kingston Road 15.

3.1.2 Existing Land Use Conditions

There are a wide range of environmental and land use features within the EA study area. These features, which are discussed throughout this Report, are highlighted below and are supplemented with Drawings 3.1 to 3.4, which highlight the City’s Official Plan designations and overlay policies for the EA study area:

1. The ‘Central Business District’ designation for the City’s downtown core area, which serves to support and enhance the multi-faceted centre of the City and the surrounding region. It includes and accommodates the wide range of retail services, business offices, entertainment, cultural and recreational facilities, tourism and hospitality facilities, as well as institutional, open space and residential uses in the downtown core area.

2. The Cataraqui River has a water depth averaging 1.2 m except at the buoyed channel and the southern portion of the Inner Harbour. Watercraft navigation is an important feature of the EA study area, typified most directly by the Inner Harbour and Outer Harbour, the HMCS Cataraqui Facility immediately north of the LaSalle Causeway, the Kingston Marina (located in the Inner Harbour), Rideau Marina (located south of the Point St. Mark residential neighbourhood) and Music Marina (located north of John Counter Boulevard) as well as the Rideau Canal’s navigable channel and the rowing lanes that run adjacent on either side of it. Most of these features are captured in the ‘Harbour Area’ designation, which also accommodates various water-related activities ranging from marine retail, mooring facilities, yacht clubs and rowing clubs (Kingston Rowing Club, Queen’s University Rowing Club), to dry docks, marine salvage and repair services, tourism and hospitality uses.

3. The ‘District Commercial’ designation just south of Emma Martin Park and the Kingston Rowing Club on the west side of the Cataraqui River, which recognizes the character of the Woolen Mill as a designated cultural heritage property, its waterfront site and unique mix of land uses ranging from artisan workshops to businesses, professional offices and a restaurant.

4. Areas designated ‘Residential’ that pertain, in particular to:

   a) The St. Lawrence Ward Heritage Area immediately adjacent to the downtown area to the north, which is one of the oldest areas of the City;

   b) The Barriefield Village Conservation District on the east side of the Cataraqui River, which contains historic residences, buildings, laneways and landscapes that reflect a 19th Century village setting;

   c) The Village On The River apartments and the River Park subdivision along John Counter Boulevard; and

   d) The Greenwood, Point St. Mark and Grenadier Village residential neighbourhoods, also located on the east side of the Cataraqui River, which are part of the Rideau Community Secondary Plan area.

5. The ‘Environmental Protection Area’ designation, which includes:

   a) The Greater Cataraqui Marsh in recognition of its designation as a Provincially Significant Wetland and Provincially Significant Coastal Wetland;

   b) ‘Riparian Habitat’ areas extending from the confluence of the Cataraqui River and Lake Ontario up to and including the tributaries and channels within the Greater Cataraqui Marsh;

   c) The provincially significant and contributory woodland areas along both sides of the Cataraqui River;

   d) An area extending 30 m from either shoreline of the Cataraqui River to encourage the protection of a ‘ribbon of life’ along the waterfront (note landscaping and passive trail/open space development may be permitted in affected designated areas, subject to review and approval by the City, CRCA and other agencies having jurisdiction); and

   e) Areas that either are or may be contaminated by a prior or current use, which are focused on the west side of the Cataraqui River at the former Davis Tannery site southwest of Belle Park and the federal dredged sediment disposal site along the north shore of Belle Island.

\(^9\) ‘Public Uses’ are generally defined to include lands, buildings, structures and uses by any public authority for the provision of infrastructure and utilities, including transportation services.
6. The ‘Open Space’ designation, which includes park and open space areas as well as lands adjacent to the ‘Environmental Protection Area’ designation, such as Douglas Fluhrer Park, Emma Martin Park, Belle Park and Belle Island on the west side of the Cataraqui River.

7. A ‘General Industrial’ node south of the Canadian National Railway (CNR) line, east of Division Street and west of Montreal Street that contains older, heavy industrial uses and which is part of a Community Improvement Plan intended to encourage site and area rehabilitation programs.

8. The ‘Business Park Industrial’ designation for the St. Lawrence Business Park, which is also part of the Rideau Community Secondary Plan area and is located north of the Greenwood neighbourhood on the east side of the Cataraqui River. The St. Lawrence Business Park is intended to provide prominent locations for corporate administrative, research and development and related business industrial uses in a prestige, business park setting.

9. A ‘Special Study Area’ designation in the Rideau Community Secondary Plan area, which is subject to further planning and development analyses and includes:
   a) The Gore Road Library located at the northwest corner of Gore Road and Kingston Road 15, which is a designated cultural heritage property; and
   b) The Pittsburgh quarry operation located north of the Gore Road Library.

10. The ‘Institutional’ designation, which serves to support and accommodate the City’s major institutions, some of which are further designated as cultural heritage properties. Within the EA study area, the major institutions include:
   a) The Rideaucrest Home Long-Term Care Facility located on Rideau Street on the west side of the Cataraqui River;
   b) Fort Frontenac at the eastern end of Ontario Street adjacent the LaSalle Causeway which refers to both the archaeological remains of the 17th century French fort (Fort Frontenac National Historic Site) and the present-day Department of National Defence barracks that occupy part of the same site;
   c) CFB Kingston on the east side of the Cataraqui River which includes land and buildings for military purposes, armories, training facilities, administrative offices, residential accommodation, recreation facilities such as the Garrison Golf and Curling Club and complementary commercial support services;
   d) The Royal Military College (RMC), which is also part of the CFB Kingston land base and offers a wide variety of educational programs in Arts, Science, and Engineering at both the undergraduate and graduate levels; and
   e) Fort Henry and the Kingston fortifications comprising Fort Frederick and the Murney, Shoal and Cathcart Martello Towers, which are part of the inscribed property of the UNESCO World Heritage Site for the Rideau Canal as well as National Historic Sites.

11. The navigable channel within the Cataraqui River, which starts at the LaSalle Causeway and extends northwards as part of the Rideau Canal. The Rideau Canal is a UNESCO World Heritage Site, National Historic Site, Canadian Heritage River and Federally regulated navigable waterway (and which is officially closed to watercraft from Thanksgiving to Victoria Day). Within the EA study area, the designated site of the canal (for all three designations) begins at Belle Island and follows the high-water marks on either shore, north to and beyond the limits of the EA study area. The canal is owned by the Federal government and managed and regulated by Parks Canada according to management plans and guidelines that conserve its heritage values.

12. Though not shown, there are major utility works within the Cataraqui River, including a buried sewage forcemain and watermain that extends from River Street on the west side of the Cataraqui River southward to James Street on the east side as well as three Hydro One marine electrical cables (3-phase 44 kV line) that cross the Cataraqui River in the John Counter Boulevard-Gore Road area.

3.1.3 Ecological Conditions

The EA study area is part of an important natural system passing through the City. As per the 2005 PPS and the City’s Official Plan referenced earlier, development shall not be permitted on lands adjacent to identified natural heritage features unless it can be demonstrated by an Environmental Impact Assessment that there will be no residual negative impacts. As shown in Table 3.1 below, the extent of the ‘adjacent lands’ depends on the natural heritage feature.

---

10 ‘Adjacent lands’ means those lands contiguous to a specific natural heritage feature where it is likely that development or site alteration would have a negative impact on the feature.
Table 3.1
2005 PPS: Natural Heritage Features and ‘Adjacent Lands’ Considerations

<table>
<thead>
<tr>
<th>Natural Heritage Feature</th>
<th>Existing ‘Adjacent Lands’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant habitat of endangered and threatened species</td>
<td>50 m</td>
</tr>
<tr>
<td>Provincially significant wetlands</td>
<td>120 m</td>
</tr>
<tr>
<td>Locally significant wetland</td>
<td>30 m</td>
</tr>
<tr>
<td>Significant woodlands, valleylands and significant wildlife habitat</td>
<td>50 m</td>
</tr>
<tr>
<td>Significant areas of natural and scientific interest (ANSI)</td>
<td>50 m</td>
</tr>
<tr>
<td>Fish habitat</td>
<td>30 m</td>
</tr>
</tbody>
</table>

As shown on Drawing 3.5, within the EA study area, the following natural heritage features are identified:

1. The Greater Cataraqui Marsh is a Provincially Significant Wetland that extends from the Woolen Mill / Barriefield area in the southern portion of the EA study area to just north of Highway 401. The Greater Cataraqui Marsh is the most significant ecological system on the landscape [based on the Ontario Wetland Evaluation System (OWES), its visible cattail portion north of John Counter Boulevard has higher ecological diversity (more plant and animal species) and greater potential for pollution/erosion/flood control than the southern portion]. The Rideau Canal’s navigable channel and the dredged access route for the Music Marina at the end of John Counter Boulevard are excluded from the Provincially Significant Wetland designation.

2. The Greater Cataraqui Marsh is also a Provincially Significant Coastal Wetland which means its water levels are largely controlled by a Great Lake (Lake Ontario), it is a wetland that is within the floodplain of a Great Lake (Lake Ontario) and it is on a tributary to a Great Lake (Lake Ontario) 11. Based on the 2006 ‘Central Cataraqui Region Natural Heritage Study’ from the CRCA, most of the identified provincially significant and contributory woodlands in the EA study area are in narrow, fragmented strips, except for areas on the former Davis Tannery site, Belle Park Fairways, along the visible cattail portion of the Greater Cataraqui Marsh north of John Counter Boulevard and Belle Island whereon its old oak grove is well-documented for its ecological significance.

4. ANSI’s, which are areas having identified life science or earth science values, are focused on the visible cattail portion of the Greater Cataraqui Marsh and the buffering woodlands on both sides of the Cataraqui River north of John Counter Boulevard.

5. The Cataraqui River, its seven tributaries and the channels within the Greater Cataraqui Marsh provide significant habitat to a wide range of terrestrial and aquatic wildlife species, including feeding areas for migratory waterfowl, 206 bird species (at least 21 of which are dependent on the marsh for nesting habitat), at least 26 sport and forage fish species that use the river system for spawning, nursing and rearing and 16 amphibian and reptile species. Available data on mammal populations is more limited, but 25 species have been observed or reported.

6. As shown in Table 3.2 below, there are 30 listed terrestrial and aquatic wildlife and plant ‘species at risk’ (SAR) that are potentially present in the area, but their habitats are not precisely mapped.

---

Table 3.2
Species at Risk or Species of Conservation Concern

<table>
<thead>
<tr>
<th>Category</th>
<th>Species Name</th>
<th>Common Name</th>
<th>S-rank12</th>
<th>COSEWIC</th>
<th>MNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birds</td>
<td>Rallus elegans</td>
<td>King Rail</td>
<td>S2B</td>
<td>END</td>
<td>END</td>
</tr>
<tr>
<td></td>
<td>Colinus virginianus</td>
<td>Northern Bobwhite</td>
<td>S1S2</td>
<td>END</td>
<td>END</td>
</tr>
<tr>
<td></td>
<td>Ammodramus heslowliei</td>
<td>Henslow's Sparrow</td>
<td>S1B</td>
<td>END</td>
<td>END</td>
</tr>
<tr>
<td></td>
<td>Ixobrychus exilis</td>
<td>Least Bittern</td>
<td>S3B</td>
<td>THR</td>
<td>THR</td>
</tr>
<tr>
<td></td>
<td>Chilidonas niger</td>
<td>Black Terr</td>
<td>S3B</td>
<td>NAR</td>
<td>SC</td>
</tr>
<tr>
<td></td>
<td>Hydroprogne caspia</td>
<td>Caspian Terr</td>
<td>S3B</td>
<td>NAR</td>
<td>NAR</td>
</tr>
<tr>
<td></td>
<td>Circus cyaneus</td>
<td>Northern Harrier</td>
<td>S4B</td>
<td>NAR</td>
<td>NAR</td>
</tr>
<tr>
<td></td>
<td>Juglans cinerea</td>
<td>Butternut</td>
<td>S3?</td>
<td>END</td>
<td>END</td>
</tr>
<tr>
<td></td>
<td>Eurybia divaricata</td>
<td>White Wood Aster</td>
<td>S2</td>
<td>THR</td>
<td>THR</td>
</tr>
<tr>
<td></td>
<td>Crataegus brainerdii</td>
<td>Brainerd’s Hawthorn</td>
<td>S2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gentianella quinquefolia</td>
<td>Stiff Gentian</td>
<td>S2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carex albicans var. albicans</td>
<td>White-tinged Sedge</td>
<td>S3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Juncus secundus</td>
<td>Secund Rush</td>
<td>S3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Najas guadalupensis</td>
<td>Southern Naiad</td>
<td>S3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Juncus vaseyi</td>
<td>Vasey’s Rush</td>
<td>S3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Schoenoplectus sulphureus</td>
<td>Smith’s Bulrush</td>
<td>S3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alisma gramineum</td>
<td>Grass-leaved Water-Plantain</td>
<td>S4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Najas marina</td>
<td>Prickly Naiad</td>
<td>S1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Porteranthus trifoliatus</td>
<td>Bowman’s-root</td>
<td>SX</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sparganium androcladum</td>
<td>Branching Burreed</td>
<td>SH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grimmia olneyi</td>
<td>A Moss</td>
<td>S2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plants</td>
<td>Sternotherus odoratus</td>
<td>Stinkpot Turtle</td>
<td>S3</td>
<td>THR</td>
<td>THR</td>
</tr>
<tr>
<td></td>
<td>Emydobia blandingi</td>
<td>Blanding’s Turtle</td>
<td>S3</td>
<td>THR</td>
<td>THR</td>
</tr>
<tr>
<td></td>
<td>Graeffina geographica</td>
<td>Map Turtle</td>
<td>S3</td>
<td>SC</td>
<td>SC</td>
</tr>
<tr>
<td></td>
<td>Lampropeltis triangulum</td>
<td>Milk Snake</td>
<td>S3</td>
<td>SC</td>
<td>SC</td>
</tr>
<tr>
<td></td>
<td>Cheylepis serpentina</td>
<td>Snapping Turtle</td>
<td>S3</td>
<td>SC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thamnophis sauritus</td>
<td>Eastern Ribbon Snake</td>
<td>S3</td>
<td>SC</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>Anquilla rostrata</td>
<td>American Eel</td>
<td>S1?</td>
<td>SC</td>
<td>END</td>
</tr>
<tr>
<td></td>
<td>Moxostoma valenciennesi</td>
<td>Greater Redhorse</td>
<td>S3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Notropis anogenus</td>
<td>Pugnose Shiner</td>
<td>S2</td>
<td>END</td>
<td>END</td>
</tr>
<tr>
<td></td>
<td>Calliophiphys gryneus</td>
<td>Juniper Hairstreak</td>
<td>S2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12 S-ranks range from S1 (Critically Imperiled), S2 (Imperiled), S3 (Vulnerable), S4 (Apparently Secure), to S5 (Secure); the use of the ‘?’ in the S-ranks is to suggest that its ranking needs to be confirmed; B indicates breeding status for bird species; END is an Endangered species; THR is a Threatened species; SC is a species of Special Concern; and NAR is a species that has been evaluated, but is considered Not at Risk.

7. Though not shown on Drawing 3.5, it is recognized that, as shown earlier on Drawing 3.1, there is also an ‘Environmental Protection Area’ as per the City’s Official Plan which extends 30 m from either shoreline of the Cataraqui River in order to encourage the protection of a ‘ribbon of life’ along the waterfront.

3.1.4 Cultural Heritage Conditions

As shown on Drawing 3.6, there are 72 identified cultural heritage sites within the EA study area. One of the most significant identified cultural heritage properties is the Rideau Canal. The Rideau Canal is a 202 km long waterway, built by the Royal Engineers between 1826 and 1832 to provide a secure alternate supply route in the event of a military blockade by the Americans. The canal is a UNESCO World Heritage Site (designated in 2007), National Historic Site (designated in 1925), Canadian Heritage River (designated in 2000) and Federally regulated navigable waterway (which is officially closed to watercraft from Thanksgiving to Victoria Day). Within the EA study area, the designated site of the canal (for all three designations) begins at Belle Island and follows the high-water marks on either shore, north to and beyond the limits of the EA study area. The inscribed property of the UNESCO World Heritage Site includes the Rideau Canal National Historic Site as well as the Fort Henry and Kingston fortifications (Fort Frederick and the Murney, Shoal and Cathcart Martello Towers) National Historic Sites in the southern portion of the EA study area.

It is important to note that UNESCO World Heritage Site designations are based on 10 criteria and the canal’s designation in 2007 was based on two of these criteria13, namely:

1. That it remains the best preserved example of a slackwater canal in North America demonstrating the use of European slackwater technology in North America on a large scale. It is the only canal dating from the great North American canal-building era of the early 19th century that remains operational along its original line with most of its original structures intact.

2. That it is an extensive, well preserved and significant example of a canal which was used for a military purpose linked to a significant stage in human history, that of the fight to control the north of the American continent.

13 There are eight other UNESCO World Heritage Site designation criteria that do not apply to the canal. These criteria relate to the interchange of human values within cultural areas, traditional human settlements, living traditions having outstanding universal significance, or areas representing natural, ecological, or biological phenomena.
The Statement of Outstanding Universal Value for the Rideau Canal UNESCO World Heritage Site further reflects these two criteria, wherein it states that:

‘The Rideau Canal is a large strategic canal constructed for military purposes which played a crucial contributory role in allowing British forces to defend the colony of Canada against the United States of America, leading to the development of two distinct political and cultural entities in the north of the American continent, which can be seen as a significant stage in human history.’

Parks Canada is responsible on behalf of the Federal government for managing and protecting the Rideau Canal as a National Historic Site and Canadian Heritage River. Parks Canada is also responsible on behalf of the UNESCO World Heritage Committee for ensuring that the Outstanding Universal Value is maintained, enhanced and presented and that the integrity (wholeness and intactness) and authenticity (expression of value through attributes such as use, function, location and setting) are protected and preserved. This mandate is reflected in the management plans that have been put in place to conserve the heritage values of the canal. These include:

1. The 1994 ‘Cultural Resource Management Policy’ (CRM) which effects Parks Canada’s legislated mandate as per the ‘Parks Canada Agency Act’ to manage nationally significant heritage resources. The CRM policy reinforces the importance of managing the natural and cultural values of such resources, which is germane to the Rideau Canal context, in that its historic value is derived from the interaction of nature and human activities. The CRM policy contains 18 guiding principles falling under the categories of ‘Value’, ‘Public Benefit’, ‘Understanding’, ‘Respect’ and ‘Integrity’. The guiding principles pertinent to the canal within the EA study area context deal with: i) protecting its ecological and commemorative integrity; ii) Parks Canada’s role as Canada’s State Party Representative to the World Heritage Convention; iii) enhancing public education and experience of the canal; and iv) Parks Canada’s collaborative role with other jurisdictions and stakeholders in employing a values-based approach to decision-making in the protection and presentation of the canal’s inter-related ‘physical heritage’ (such as its locks, lock stations and dams) and ‘associative heritage’ (such as its historic, natural and cultural importance). The guiding principles then form the basis of seven activity policies. Applicable policies to the canal within the EA study area context relate to:

   a) The ‘Canadian Heritage Rivers Policy’, which effects Parks Canada’s objective of designating river systems such as the canal as Canadian Heritage Rivers, which recognize their respective roles in shaping Canada’s natural and human history;

   b) The ‘National Historic Sites Policy’, which effects Parks Canada’s objective of protecting and enhancing the natural and cultural values of the canal as a National Historic Site; and

2. The 2000 ‘Commemorative Integrity Statement’ (CIS) applies the principles and activity policies of the CRM Policy. In support of the Rideau Canal’s designation as a National Historic Site, the CIS further articulates both the physical and associative heritage values of the canal. The CIS reflects the canal’s unique historic and natural environment, including its rich and varied landscapes. The lower section of the canal south of Kingston Mills is a rare example of the wateryway where the landscape was not altered during canal construction. The CIS identifies the following three strategies to ensure the protection and enhancement of the ‘Designated Place’ of this section of the canal (which consists of the designated site of the canal as noted above):

   a) Maintaining through-navigation of the canal system to help assure the preservation of the canal’s unique historic environment and cultural resources;

   b) Safeguarding the heritage character of corridor shore-lands from inappropriate development or uses; and

   c) Safeguarding the landmarks, viewscapes and natural ecosystem features of the canal’s islands, shore-lands and wetlands that are related to the construction of the canal and which are part of the canal’s unique historical environment.

3. The 2005 ‘Rideau Canal World Heritage Site Management Plan’ which prohibits activities that would alter the size, shape, depth or configuration of the slackwater sections of the canal; requires that new bridge and public utilities crossing proposals include detailed environmental assessments; and requires Parks Canada to work with municipalities to maintain a 30 m buffer zone for new shoreline construction along the canal. This 30 m buffer zone corresponds to the 30 m ‘ribbon of life’ which, as highlighted earlier regarding the City’s Official Plan, extends from either shoreline of the Cataraqui River.

4. The 2005 ‘Rideau Canal National Historic Site Management Plan’ identifies elements which must be safeguarded to ensure the commemorative integrity of the canal’s heritage values, including: i) continued through-navigation of the canal system; ii) view sheds and visual linkages in the Kingston harbour landscape that portray the relationship between the fortifications, the harbour and the canal; iii) cultural resources of the military period; iv) the heritage character of corridor shore lands and identified corridor communities; v) the landmarks, viewscapes and natural ecosystem features (such as wetlands and critical habitats) of the canal that are related to the construction of the canal and which are part of the canal’s unique historic environment; and vi) working with other
jursdictions and stakeholders in protecting and enhancing the natural and cultural values of the canal. Critical cross-jurisdictional safeguard requirements regarding the canal’s features include:

a) Protecting the status of the canal as a UNESCO World Heritage Site, National Historic Site and Canadian Heritage River;

b) Protecting species listed in the Ontario ‘Endangered Species Act’ (OESA) as well as Federal ‘Species at Risk Act’ (SARA), ‘Fisheries Act’ (FA) and ‘Migratory Birds Convention Act’ (MBCA);

c) Ensuring continued through-navigation and natural resource protection of the canal system as per the ‘Department of Transport Act’ and ‘Navigable Waters Protection Act’;

d) Ensuring there is no net loss of wetland structure or function and no net loss of fish habitat as per the ‘Federal Wetlands Policy’; and

e) Ensuring municipal land use and development decision-making is consistent with the policies of the 2005 PPS.

5. The 2007 ‘Rideau Canal and Trent-Severn Waterway National Historic Sites of Canada Policies for In-Water and Shoreline Works and Related Activities’ contains policies regarding the construction of in-water and shoreline works normally associated with the development and use of waterfront properties for residential purposes adjacent to the Rideau Canal and Trent-Severn Waterway National Historic Sites. The intent of the policies is to:

a) Contribute to ensuring the commemorative integrity of the National Historic Sites;

b) Ensure the protection of cultural resources;

c) Minimize the cumulative effects of in-water and shoreline works;

d) Contribute to the sustainability and public enjoyment of the National Historic Sites; and

e) Protect public safety by ensuring that in-water and shoreline works do not interfere with navigation or other uses of the National Historic Sites.

This document includes a policy that restricts dredging in wetlands or in areas containing rock rubble on lakes or riverbeds. Proponents for dredging are required to demonstrate through an EA study that it could be environmentally beneficial and that there will be no significant adverse environmental impacts or impacts to cultural resources.

6. The 2008 ‘Standards and Guidelines for the Conservation of Historic Places in Canada’ set out the following 8 general standards in dealing with visual relationships that have been identified as a character-defining element of an historic place, which includes the canal:

a) Understand the visual relationships and how they contribute to the heritage value of the cultural landscape;

b) Understand designed landscapes and the planning principles behind the visual relationships in the cultural landscape;

c) Understand the evolution of visual relationships in terms of how they may have changed or been lost over time;

d) Document the visual relationships in the cultural landscape, including viewscapes and their foreground, middle ground and background;

e) Assess the overall condition of the visual relationships early in the planning process;

f) Protect and maintain the features that define the visual relationships;

 g) Retain or rehabilitate features that define the visual relationships in the cultural landscape; and

h) Design a new feature when required by a new use that respects the historic visual relationships in the cultural landscape.

In addition, the EA study area east of the Cataraqui River includes the following major identified heritage sites:

1. The Barriefield Village Conservation District which encompasses the entire village, including its buildings, landscape features, topography, and archaeological sites and resources. Buildings are not individually designated, but are protected as elements of the district. Management of the district is governed by a Conservation Plan, which strives to: maintain the low density residential profile of the Village; avoid destruction of its built and landscape fabric; maintain the visibility and prominence of St. Mark’s Church; and preserve its built heritage, landscape character, natural features and viewscapes from the Village towards the Cataraqui River and St. Lawrence River, Fort Henry and downtown Kingston.

2. As noted above, the Fort Henry site and RMC site comprise many overlapping designations, including a portion of the Rideau Canal’s UNESCO World Heritage Site designation at Fort Henry, four national historic sites (Fort Henry, Point Frederick Buildings, Navy Bay and Kingston
Fortifications), 35 federal heritage buildings and numerous plaques erected by federal, provincial, municipal and private authorities. The heritage value of these sites includes important viewscape, both between the various sites and to/from other significant landmarks, such as Kingston Harbour, City Hall and the Barriefield Village Conservation District.

3. The Gore Road Library which is located at the northwest corner of Gore Road and Kingston Road 15. It was acquired by the City of Kingston in 1997 and designated as a cultural heritage property in 2007. The cultural heritage value of the property lies in its physical and design values (the exterior and interior of the stone farmhouse, the traditional dry stone wall and evidence of an historic garden and agricultural activities, its scenic pathways with views of the Rideau Canal), its historical associations with several families and individuals who were prominent in the former Pittsburgh Township, and its contextual value as a community resource and landmark on Kingston Road 15. Although the designation covers the entire property, identified heritage resources are for the most part clustered on the upper plateau area, along Gore Road and Kingston Road 15.

4. There are three federal heritage buildings at CFB Kingston on the east side of Kingston Road 15 and two other farmhouse properties that are municipally designated on both sides of Kingston Road 15, north of Gore Road.

The EA study area west of the Cataraqui River includes the following major identified heritage sites:

1. The LaSalle Causeway which is a municipally listed property and its Bridge Office and Shop portion is also a federal heritage building.

2. Fort Frontenac which refers to both the archaeological remains of the 17th century French fort (Fort Frontenac National Historic Site), and the present-day Department of National Defence barracks (formerly Tête du Pont Barracks) that occupy part of the same site, at the eastern end of Ontario Street.

3. Within the area bound by Ontario Street, Queen Street, Montreal Street, and North Street there are 45 identified cultural heritage properties, including municipal listings and designations, plaques erected by various government authorities and private organizations, and a federal heritage building. Well-known heritage properties include the Kingston Armouries, Wellington Terrace, St. Paul’s Anglican Church and burial ground, Cataraqui School, and the Wellington Street Brewery.

4. The area north of North Street has comparatively few identified heritage properties. The City has designated five properties, including the old stone Imperial Oil building, the Woolen Mill, the stone Depot School, the Grand Trunk Railway Station property and the stone Grand Trunk Railway Terrace and has listed six properties.

In addition, in certain cases, heritage protection also extends beyond the boundaries of the heritage property to include the consideration of visual impacts from proposed developments on the heritage property (both to and from the heritage property) or between related heritage properties. Within the EA study area these views are identified by Parks Canada in its World Heritage Site and/or National Historic Site management documents, the Barriefield Conservation District Plan, municipal designations and the City’s Official Plan. As noted below, there are 9 of these views within the EA study area and some of these are referenced above. They include:

1. From the LaSalle Causeway up to Belle Island:
   a) Views between the Kingston Fortifications and between each fortification and Kingston Harbour;
   b) Views from the Barriefield Village Conservation District towards the Cataraqui River, St. Lawrence River, Fort Henry and downtown Kingston;
   c) Views of St. Mark’s Church in Barriefield Village;
   d) Views from the Woolen Mill to City Hall and the Cataraqui River;
   e) Views from Barrack Street and Queen Street to the Inner Harbour;
   f) Views of the City Hall cupola from the LaSalle Causeway and RMC; and
   g) Views across the Inner Harbour.

2. From Belle Island to the Highway 401 crossing:
   a) Views of the Rideau Canal from the Gore Road Library; and
   b) All development overlooking the Rideau Canal.

To put the above discussion in further context, the southern portion of the EA study area from the LaSalle Causeway up to Belle Island contains 64 of the 72 identified heritage sites and seven of the nine protected views. Most of the southern portion of the EA study area is either part of a World Heritage Site and/or a National Historic Site, part of a Heritage Conservation District or subject to protected views to and from significant landmarks. But as also noted, the cultural heritage context in the northern portion of the EA study area from Belle Island to Highway 401 should not be overlooked, given the presence of the Rideau Canal and Gore Road Library on the cultural heritage landscape.
### 3.1.5 Archaeological Conditions

Table 3.3 highlights the cultural history of the Kingston area.

**Table 3.3 Cultural Chronology of the Kingston Area**

<table>
<thead>
<tr>
<th>Period</th>
<th>Timeframe</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paleo</td>
<td>Ca. 12000 to 10000 Before Present (B.P.)</td>
<td>The first inhabitants of Ontario lived in small family-based groups, depending on plants and large game animals (moose, deer, caribou, elk) for their food. These nomadic peoples used stone, skin, antler bone, wood, and plant fibers to produce the tools and goods necessary for their survival. A survey of Allen Point along the Rideau Canal system north of Kingston Mills resulted in the identification of a late Paleo point, the first recorded find from this period in Kingston.</td>
</tr>
<tr>
<td>Early Archaic</td>
<td>Ca. 5000 B.C.</td>
<td>Early Archaic peoples produced a greater variety of items than their predecessors. Of particular importance were the dugout canoes and stone tools made by grinding rather than by flaking. The water craft allowed the Early Archaic peoples to travel greater distances, facilitating the exchange of new ideas and goods.</td>
</tr>
<tr>
<td>Middle Archaic</td>
<td>Ca. 3000 B.C.</td>
<td>The early people who inhabited Eastern Ontario during the Middle Archaic Period participated in a trade network that spanned the Great Lakes region. For example, copper obtained from the shores of Lake Superior was traded in Eastern Ontario, where it was made into awls, needles, knives, fish hooks, spear points, and bracelets. The earliest recorded human burials in Eastern Ontario date to the Middle Archaic Period.</td>
</tr>
<tr>
<td>Late Archaic</td>
<td>Ca. 700 B.C.</td>
<td>Changes that characterized the Late Archaic Period include increased population size, distinction in social status, and new hunting techniques. Evidence of these changes is the inclusion of trade goods in the burial of selected individuals and tool kits consisting of a variety of projectile point types.</td>
</tr>
<tr>
<td>Early Woodland</td>
<td>Ca. 300 B.C.</td>
<td>Peoples living in Eastern Ontario began to use pottery during the Early Woodland Period. Early pots were crudely made, with thick walls and a distinct cord-marked exterior surface. The practice of including grave goods with burials continued, influenced by the Adena Culture, centred in the Ohio River Valley, and the Middlesex tradition, which was focused in New York State.</td>
</tr>
<tr>
<td>Proto-Historic</td>
<td>Ca. 500 to 350 B.P.</td>
<td>Domesticated plants (corn, beans, and squash) increased in significance as supplements to the more traditional foods such as deer, fish, and wild plants during the Late Woodland Period. Agriculture allowed the Late Woodland Peoples to live in permanent villages. Increasing conflict between groups resulted in the construction of palisades around some of these villages. There is only one identified permanent settlement that can be attributed to this period in the region and it is located in the Cataract Creek area. This is a proto Huron or Middleport site. The Kingston Outer Station was a fishing camp utilized throughout the Late Woodland period.</td>
</tr>
<tr>
<td>Middle Woodland</td>
<td>Ca. 900 A.D.</td>
<td>During the Middle Woodland Period regionally distinct pottery styles developed, and trade networks began to disintegrate. Ceramic vessels were of a higher quality than previously, and appeared in a greater range of shapes and with a greater variety of decorations. The disintegration of trade networks toward the end of this period coincided with the decline of major cultural influences centred in Ohio and Illinois. Agriculture was introduced to Eastern Ontario towards the end of the Middle Woodland Period. Middle Woodland sites are located throughout the region including the 1000 Islands, the Cataract River (Belle Island), the Gananoque River System and along the Napanee River system. Middle Woodland ceramics were recovered in the excavation of Fort Frontenac suggesting that this was once the location of settlement prior to the arrival of the Europeans.</td>
</tr>
<tr>
<td>Late Woodland</td>
<td>Ca. 1600 A.D.</td>
<td>Distinguished by the introduction of European influences prior to the actual settlement of the region. This was a turbulent period for Aboriginal populations in the area. The St. Lawrence Iroquois located just east of the region had been absorbed into other Iroquoian peoples, including the Mohawk, Onondaga and Wendat-Huron, by the time of Champlain's arrival in the area in 1612. The Huron, initially located along the north shore of Lake Ontario, moved to the Lake Simcoe-Georgian Bay area where they too were eventually dispersed in 1649. Fort Frontenac, established in 1673, was the first permanent European settlement in the region. Also established were a series of mission sites along the north shore of Lake Ontario including one in the Napanee area and La Presentation near the present day site of Ogdensburg New York. By the early 18th century, the Iroquois had been driven from the north shore of Lake Ontario by the Mississauga.</td>
</tr>
</tbody>
</table>
Table 3.3

Cultural Chronology of the Kingston Area

<table>
<thead>
<tr>
<th>Period</th>
<th>Timeframe</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historic</td>
<td>15th Century to Today</td>
<td>Kingston benefited considerably by the presence of the military and developed fairly quickly through the early-to-mid-19th century. The War of 1812 increased activity and development of military property in the region. The potential for shipwrecks and associated marine structures in the area is high.</td>
</tr>
</tbody>
</table>

There are 37 registered archaeological sites within and adjacent to the EA study area and an undetermined number of areas that are in process of being investigated. However, the number of registered archaeological sites is a poor indicator of pre-Contact settlement history. As reflected in Table 3.3 above, given the rich ecological resources of the Cataraqui River and the archaeological evidence found in nearby areas, the EA study area, in all likelihood, would have been used and periodically inhabited by peoples for the last 10,000 years or more. Archaeological evidence of this has yet to be verified and archaeological potential in some areas may have already been removed due to subsequent urban development. Still, since a large percentage of the EA study area remains essentially unaltered, indicators point to virtually the whole EA study area exhibiting high archaeological potential, except for:

1. The land-based features of Belle Park Fairways, the Pittsburgh quarry operation as well as the Rivers Edge and Point St. Mark residential neighbourhoods.
2. The marine-based features associated with the in-water development of the LaSalle Causeway, the HMCS Cataraqui Facility, the Rideau Marina, the federal dredged sediment disposal site along the north shore of Belle Island, the Rideau Canal's navigable channel as well as the existing marine utilities associated with the River Street Pumping Station and Hydro One marine electrical cables (3-phase 44 kV line) in the John Counter Boulevard-Gore Road area.

Areas within the EA study area containing known or potential archaeological resources include the following:

1. Significant archaeological resources are present on both sides of the LaSalle Causeway. Despite the extent of modern developments in that area, intact archaeological remains representing Pre-Contact First Nations, French and British Military Periods (especially at Frontenac, RMC and Fort Henry), and remains relating to subsequent urban development are present.
2. The area between the LaSalle Causeway and Belle Island contains fourteen registered Euro-Canadian shipwrecks in its southern portion and intact Euro-Canadian archaeological remains relating to subsequent urban development.
3. Belle Island contains an extensive Middle Woodland Period archaeological settlement site and cemetery. Only two small portions of the island have been archaeologically tested and the archaeological potential of the untested areas is very high. Despite recent developments, portions of the shoreline opposite Belle Island also have a high archaeological potential for Pre-Contact First Nations, Historic First Nations, and Historic Euro-Canadian archaeological sites. The archaeological significance of Belle Island is further reinforced by the 2001 City Council resolution acknowledging Belle Island as a site of significant Aboriginal cultural heritage. This resolution engaged a strategy that was subsequently formalized through negotiation between the City and representatives of local First Nations communities and is embodied in an agreement that was endorsed by City Council in 2006. The framework of the agreement includes a process that would set Belle Island physically apart from the mainland and place Belle Island under the joint ownership of the City of Kingston and the Mohawk Nation Council of Chiefs.
4. The Kingston Outer Station site north of Belle Island, John Counter Boulevard and the Music Marina on the west side of the Cataraqui River contains intact archaeological remains of a Pre-Contact First Nations and Historic First Nations hunting and fishing camp.
5. While other areas north of Belle Island have had minimal development disturbance to date, there is high potential for Pre-Contact and Historic First Nations archaeological remains in this portion of the EA study area.

3.1.6 Geo-Environmental Conditions

Within the EA study area, there are approximately 750 +/- sites where on-site operations have had spills reported to have either ‘high’ or confirmed environmental impacts (285 +/- sites), ‘medium’ or possible environmental impacts (270 +/- sites), or ‘low’ or no anticipated environmental impacts (200 +/- sites).

Historically, the lands on the west side of the Cataraqui River from the LaSalle Causeway to just north of John Counter Boulevard were more heavily industrialized than in other portions of the EA study area. Consequently, there are numerous sites of potential environmental concern throughout the EA study area, including:

1. The Katings Pasture waste disposal site north of Cataraqui Street to Montreal Street and west of Rideau Street.
2. The Belle Park Landfill site.
3. The federal dredged sediment disposal site along the north shore of Belle Park.
4. The Frontenac Lead Smelter and Davis Tannery operations southwest of Belle Park.
5. The McLeod’s Tannery operation at Emma Martin Park.

6. The rail yards and shipbuilding operations at Anglin Bay.

7. The Kingston Coal Gasification Plant in the downtown area.

8. The fill material along the western shoreline of the Cataraqui River between the Canadian National (CN) / Canadian Pacific (CP) railway tracks and the western shoreline of the Cataraqui River from approximately Place D’Armes in the south to Drennan Street in the north.

Drawings 3.7 and 3.8 highlight areas having the highest densities of potential environmental impact. These include:

1. The Downtown area bounded by Brock Street, Barrie Street, North Street and Ontario Street.

2. The Cataraqui Street - Orchard Street - River Street area.

3. Joseph Street between Montreal Street and Patrick Street.

4. Segments of Montreal Street in the downtown area and between Raglan Road and James Street, Stephen Street and Railway Street, John Counter Boulevard and Drennan Street as well as Weller Avenue and Sutherland Drive.

5. Belle Park and its vicinity.

6. Areas bounded by Hickson Avenue, Harvey Street, John Counter Boulevard and Montreal Street.

7. The southwestern portion of the Inner Harbour, where sediment contamination has been found to exceed Provincial and Federal guidelines.

### 3.1.7 Geotechnical Conditions

The EA study area is located in the physiographic region of Southern Ontario known as the Napanee Plain. The Napanee Plain is flat to undulating, and is characterized by relatively shallow soil deposits overlying bedrock. Geologic mapping indicates that the bedrock within the Napanee Plain consists of grey limestone/dolostone of the Gull River Formation, which contains some shale partings and seams.

The overburden soils within the Napanee Plain generally consist of glacial till, although alluvium is present in river and stream valleys. In the southern portion of the Plain, low-lying areas are typically covered with deposits of stratified clay. Water well records indicate that the average depth to bedrock within the Napanee Plain is approximately 2 m. However, in many areas, bedrock outcrops are observed at ground surface, while deeper soil deposits (in the order of 10 m) are present in the northern portion of the Plain and within and adjacent to river valleys throughout the Plain.

As shown on Drawing 3.9, the EA study area is generally characterized by shallow limestone bedrock. Where overburden is present, it consists mostly of post-glacial silts and clays. Much of the Cataraqui River bank south of Highway 401 and north of Weller Avenue as well as Belle Park (excluding the federal dredged sediment disposal site along the north shore) are lined with organic deposits. The elevation of the Cataraqui River is at roughly 74.5 m (+/-). The bedrock at either shoreline is at elevation 73 m (+/-) which dips to elevations that vary from 36 m to 55 m (+/-) within the Cataraqui River. This ‘bedrock valley’ is made up of clay soils and organic deposits.
3.1.8 Landscape and Viewscape Conditions

As shown on Drawing 3.10, there is a series of paths and trails for active transportation in various states of planned development within and adjacent to the EA study area. These include:

1. An east-west route extending from the downtown, across the LaSalle Causeway, around RMC and Fort Henry and continuing along Highway 2.

2. A north-south route extending from the downtown-LaSalle Causeway along the west shoreline of the Cataraqui River and continuing northwest through City Centre Business Park and north of John Counter Boulevard and around Belle Park Fairways, ending north of John Counter Boulevard at Weller Avenue.

3. A north-south route extending through the Point St. Mark residential neighbourhood and along the east shoreline of the Cataraqui River to and beyond Highway 401.

4. Routes internal to Barriefield Village as well as the Grenadier Village and Greenwood Park subdivisions east of Kingston Road 15.

There are also a series of commuter cycling lanes in various states of planned development within and adjacent to the EA study area. These include:

1. Routes along the main roads in the downtown area and extending north along Montreal Street up to and beyond Highway 401 with east-west routes connecting to Montreal Street at John Counter Boulevard and Benson Street-Dalton Avenue on the west side of the Cataraqui River.

2. Routes extending from the downtown, across the LaSalle Causeway and continuing along Highway 2 and Kingston Road 15 on the east side of the Cataraqui River.

The current road network within and extending from the downtown on the west side of the Cataraqui River and its connection with the LaSalle Causeway, Highway 2, and Kingston Road 15 on the east side of the Cataraqui River play a major role in terms of system continuity and flows for both active travel and commuter cycling modes. As noted earlier, the LaSalle Causeway-Highway 2 corridor is located at the south end of the EA study area, while the Highway 401 crossing is located 6 km upstream. As a result, this road network cannot provide shorter loops along and across the Cataraqui River in order to improve east-west connections for active travel and commuter cycling modes.

In addition, there are two landscape character types within the EA study area. The lower Cataraqui section of the Rideau Canal south from Highway 401 to the northern entrance of Kingston’s Inner Harbour near Belle Island is a rare example of the waterway where the natural environment was not altered during canal construction. Over the intervening 178 years, the extensive wetlands of the Great Cataraqui Marsh, as well as the river valley’s sloped physiography and forested landscapes adjacent to the navigation channel proceeding south from Highway 401 have remained largely intact. The northern entrance of the Inner Harbour near Belle Island provides a transition point between a predominantly natural environment of the Cataraqui River to the north and a more urbanized, manicured landscape of the City to the south, east and west. This is depicted on Drawings 3.11 to 3.16, which are a series of on-water photographs taken at certain buoys marking the navigable channel within the EA study area. Drawings 3.11 to 3.13 show that as boaters proceed from the Highway 401 crossing southward (roughly 4 km north of the Inner Harbour entrance), the visible cattail portion of the Greater Cataraqui Marsh dominates the landscape at first, with its shallow water and emergent aquatic plants, near continuous overhanging tree canopy and shrub understory. The City’s urban landscape then becomes increasingly more visible in the background as boaters pass through the visible cattails. At roughly 1 km north of the Inner Harbour entrance near Belle Island, boaters enter an open vista, where more of the City’s urban landscape is in full view. Views further south of Belle Island are blocked by the tree line along the northern portion of Belle Park and Belle Island as well as by the extension of the eastern shoreline whereon the Gore Road Library, Point St. Mark residential neighbourhood and Rideau Marina are located. South of Belle Island, boaters then experience the full view of the City’s Inner Harbour and downtown area.

The opposite is true as boaters proceed from the LaSalle Causeway roughly 2 km northward to the Inner Harbour exit near Belle Island. Drawings 3.14 to 3.16 highlight such features as the City’s downtown, Kingston Marina and Douglas Fluhrer Park on the west side of the Inner Harbour and the HMCS Cataraqui Facility to east. Proceeding further northward, this then leads to more of the City’s urban landscape, typified by the Woolen Mill heritage property and Emma Martin Park to the west and the Barriefield Village Conservation District to the east. As boaters near Belle Island, a sense of the urban-to-natural landscape transition begins, with Belle Island’s old oak grove to the west juxtaposed with views of CFB Kingston and the Rideau Marina to the east-northeast. At the tip of Belle Island, boaters enter the open vista referenced above, where more of the City’s urban landscape to the west (the Elliott Avenue Parkette, Village On The River apartments and the River Park subdivision, for example) and east (the Rideau Marina and Point St. Mark residential neighbourhood, for instance) is in full view. The visible cattail portion of the Greater Cataraqui Marsh begins to emerge in the background.

In addition, as noted earlier, the inscribed property of the UNESCO World Heritage Site includes the Rideau Canal National Historic Site as well as the Fort Henry and the Kingston fortifications (Fort Frederick and the Murney, Shoal and Cathcart Martello Towers) National Historic Sites in the southern portion of the EA study area. Drawing 3.17 is a photograph of the EA study area taken on the walkway leading from the public parking lot to Fort Henry. It shows that views of the Inner Harbour are obscured in the background, not only by distance but also by the CFB Kingston and RMC facilities in the foreground. The tree line along the southern portion of Belle Park and Belle Island as well as the extension of the eastern shoreline similarly blocks views of the remaining EA study area that extends further north to Highway 401.
3.2 EA Alternative Solutions

This EA study involves an assessment of the potential positive and negative social, cultural, economic and environmental impacts of the following alternative solutions:

1. Retain the status quo or ‘do nothing’, which means that no facilities would be constructed to provide additional transportation capacity across the Cataraqui River and the problem would remain and/or an opportunity would not be addressed.

2. Increase the capacity of the LaSalle Causeway.

3. Increase the capacity of Highway 401 from Kingston Road 15 to Montreal Street.

4. Implement a new crossing between the LaSalle Causeway and Highway 401 by either a tunnel or bridge.

3.2.1 Retain the Status Quo or ‘Do Nothing’

With an existing traffic volume in the order of 1,000 to 1,100 vehicles per hour in each direction during the PM peak hour, the LaSalle Causeway-Highway 2 corridor is currently operating below the City’s target LOS D, which is based on an average estimated capacity of 900 vehicles per hour, per lane. Based on population and employment forecasts, the projected traffic volumes on the LaSalle Causeway, undertaken during Stage 1 and Stage 2 of this EA study, are expected to increase. As a result of increased travel demand, the current problems and deficiencies on the LaSalle Causeway-Highway 2 corridor are expected to worsen in the future, if left unaddressed. By 2019, travel time delays during the PM peak hour are expected increase by an average of 79 percent for eastbound traffic and 76 percent for westbound traffic. Northbound travel time delays on Kingston Road 15 are expected to increase by 27 percent on average.

Delays on the LaSalle Causeway-Highway 2 corridor would also continue to increasingly impact emergency response agency resources in the core area when career staff from the downtown core stations are required to be assigned to support the volunteer staff in the east side of the City in a timely manner.

In addition, focusing solely on active transportation (cycling and walking) and public transit, though laudable, would not be able to address the entire capacity on the LaSalle Causeway over the immediate-to-long-term, based on the following current and projected conditions:

1. The projected 2019 traffic congestion on the LaSalle Causeway takes into account the existing modal shares for active transportation (14 percent) and public transit (5 percent).

2. Though Kingston Transit expects the introduction of 2 new express bus routes serving the east and west sides of the City to increase the modal share for public transit from 5 percent to 6 percent by 2019, even at a simulated 9 percent public transit modal share by 2029, the LaSalle Causeway is still projected to operate below the City’s target LOS D.

3. Significantly increasing the modal shares for active transportation and public transit over-and-above current and simulated projections would be very difficult to achieve within the next 15 to 20 years, given the size of the City in relation to the major infrastructure investment and aggressive policy approach that would be required.

Based on forecasted traffic modeling by AECOM in 2011 of the ‘Cataraqui River screenline’ to 2019, retaining the status quo would cause a portion of the local traffic wanting to cross the Cataraqui River to divert 6 km north to use the Highway 401 crossing, thereby leading to potential local-regional traffic conflicts on Highway 401 as well as further out of way travel and additional delays. Traffic infiltration through the adjacent road network could then also be expected to occur as drivers seek less congested routes to reach their destinations. An estimation of the total vehicle-kilometres of travel (veh-km)14 by 2019 during the PM peak hour is summarized by area on Drawing 3.18.

Thus, retaining the status quo would not address the EA Problem Statement for this EA study and is not considered a viable alternative solution.

3.2.2 Increase the Capacity of the LaSalle Causeway

As highlighted earlier, studies predating this EA study concluded that potential improvements along the LaSalle Causeway-Highway 2 corridor (channelization, signal timing and phasing, lane additions) and optimizing public transit use could enhance operations along the corridor but would not be able to solely address corridor deficiencies over the long-term. These studies also cautioned that expanding the capacity of the LaSalle Causeway could result in increased traffic congestion in the downtown core unless major changes to the surrounding intersections and street networks were effected.

Despite the above and as per the 2005 PPS, the need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is duly noted. The 2011 HDR/iTrans report undertaken subsequent to Stage 1 of this EA study also reaffirmed that existing conditions on the LaSalle-Causeway-Highway 2 corridor would continue to negatively affect its LOS. The report outlines a preferred strategy to address existing and future deficiencies along the corridor. It consists of the following improvements (listed in terms of greatest-to-least benefit):

14 Vehicle-kilometre of travel is used to measure the relative change in overall usage of the roads within the neighbourhoods. It is calculated based on the volume on each road multiplied by the length of the road.
1. Installing adaptive traffic controls\textsuperscript{15} on Highway 2 at Fort Henry Drive-Duty Drive and Kingston Road 15\textsuperscript{16}.

2. Installing a roundabout at the Highway 2-Kingston Road 15 intersection.

3. Transportation Demand Management (TDM) programs at the employer and City-wide level to provide vehicle trip reductions of 5 percent to 10 percent.

4. Installing a north-south road connection from Lance Street to Gore Road through CFB Kingston.

5. Optimizing traffic signal timing plans on Ontario Street and Highway 2, including the installation of Global Positioning System (GPS) synchronization of the traffic signal control clocks to maintain traffic signal coordination.

6. A 40 m eastbound left-turn lane extension on Highway 2 at Kingston Road 15\textsuperscript{17}.

7. Installing an eastbound right-turn lane at the Ontario Street-Barrack Street intersection.

8. Optimizing traffic signal timing plans and increasing the cycle length on Kingston Road 15.

9. Incorporating a transit queue jump lane on Highway 2 at Fort Henry Drive.

10. Improving transit service through the proposed two new express bus routes serving the east and west sides of the City.

These improvements were then modelled relative to current and projected eastbound travel times on the LaSalle Causeway-Highway 2 corridor during the PM peak hour. As shown in Table 3.4 below, the report concluded that the City’s target of LOS D on the corridor could be maintained until at least 2020 with the implementation of the improvements.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>EB Modelled Travel Time (Minutes)</th>
<th>Improvement From Existing (Minutes)</th>
<th>Percent Improvement From Existing</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 Existing</td>
<td>7.6</td>
<td></td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>2020 Baseline (No Changes)</td>
<td>13.0</td>
<td>-5.4</td>
<td>(72%)</td>
<td>F</td>
</tr>
<tr>
<td>2020 Preferred Strategy (Without the Roundabout)</td>
<td>6.2</td>
<td>1.4</td>
<td>19%</td>
<td>D</td>
</tr>
<tr>
<td>2020 Preferred Strategy (With the Roundabout)</td>
<td>5.5</td>
<td>2.1</td>
<td>27%</td>
<td>D</td>
</tr>
</tbody>
</table>

The estimated cost of these improvements is roughly $1.2 million which could be distributed over a ten-year period as part of a phased implementation program. As such, by maximizing the use of existing and committed infrastructure and using technology and sustainable transportation initiatives, these improvements are considered viable short-to-medium term solutions. But it is also acknowledged that the improvements may not be able to solely reduce congestion and accommodate future traffic volume demand on the LaSalle Causeway-Highway 2 corridor over the long-term.

Thus, increasing the capacity of the LaSalle Causeway may not be able to solely address the EA Problem Statement for this EA study over the long-term, but is considered a viable alternative solution in the short-to-medium term. Future monitoring of traffic conditions by the City would further confirm the viability of this scenario.

3.2.3 Increase the Capacity of Highway 401

With an existing traffic volume during the PM peak hour of 1,260 vehicles per hour per lane for eastbound travel and 1,252 vehicles per hour per lane for westbound travel, the Highway 401 crossing has ample capacity to accommodate additional traffic (based on its current two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration). Its current widening from four to six lanes west of Sydenham Road to west of Montreal Street means that the Highway 401 crossing will also be able to handle even more traffic in the future.

However, two issues need to be considered. The first is that the primary function of Highway 401 is to accommodate regional (or long distance) traffic. Traffic operations related to local traffic needs are fundamentally different than regional traffic needs. These differences can result in compromised efficiency and safety for both local and regional traffic. This is inconsistent with effective transportation engineering

\textsuperscript{15} Note an adaptive control system continually adjusts signal timings and cycle lengths by collecting traffic volume and queuing data on every leg of the intersection. This allows the traffic signals to adapt to changing demand more effectively than non-adaptive signals, thereby reducing queues and delays for all intersection users.

\textsuperscript{16} Note an adaptive control system was tested at the Ontario Street-Barrack Street intersection but did not result in any reductions in travel delay and/or vehicle queuing.

\textsuperscript{17} Note the widening of Highway 2 to accommodate an extra lane (either for a through lane or an extended eastbound left-turn lane) between Duty Drive and Kingston Road or dual eastbound left-turn lanes at Kingston Road 15 were also considered. But the capital cost of the widening, combined with the property requirements and the impact on the Barriefield Rock Cut required to accommodate it, outweighed the benefits. In addition, the dual eastbound left-turn lane option would not be able to accommodate future vehicle queues and would also create unnecessary delay for vehicles travelling outside of the peak hour periods.
practice. The second issue relates to the strong demand for trips crossing the Cataracaui River via the LaSalle Causeway in both the southern and northern portions of the City’s urban limits. The Highway 401 crossing is 6 km north of the LaSalle Causeway. Diverting traffic to the Highway 401 crossing would lead to further out of way travel and additional travel delays. As noted earlier, traffic infiltration through the adjacent road network could then also be expected to occur as drivers seek less congested routes to reach their destinations.

Thus, increasing the capacity of Highway 401 would not address the EA Problem Statement for this EA study and is not considered a viable alternative solution.

3.2.4 Implement a New Bridge Crossing

As shown on Drawing 3.19, for the purposes of evaluating the feasibility of implementing a new bridge crossing across the Cataracaui River, the EA study area was subdivided into six corridor areas and crossing alignment options were developed based on potential connections to existing infrastructure. The corridor areas and potential links are as follows:

1. Area 1 deals with the option to expand the LaSalle Causeway structure itself (as an additional means to potentially increase the capacity of the LaSalle Causeway) and also shows a crossing link via North Street on the west and James Street on the east (Option 1).
2. Area 2 covers the Inner Harbour area and shows a crossing link via Russell Street on the west and Craftsman Boulevard on the east (Option 2).
3. Area 3 deals with the Belle Island area and shows a crossing link from Belle Island on the west to Craftsman Boulevard on the east (Option 3).
4. Area 4, which focuses on the area between Belle Island and the visible cattail portion of the Greater Cataracaui Marsh, shows two crossing links. Option 4A shows a crossing from John Counter Boulevard on the west to Gore Road on the east. This is in response to the City’s Official Plan which, as based on the 2004 KTMP, cites a 2-lane bridge crossing as a ‘future major road extension’, subject to the outcome of an EA study. Option 4B also extends from John Counter Boulevard on the west but connects to Kingston Road 15 on the east further north of Gore Road. This option responds to the potential impacts a bridge crossing could have on both the Point St. Mark residential neighbourhood south of Gore Road and the Gore Road Library at the northwest corner of Gore Road and Kingston Road 15.
5. Area 5, which covers the visible cattail portion of the Greater Cataracaui Marsh, also shows 2 crossing links. Option 5A shows a crossing from Weller Avenue on the west to Kingston Road 15 on the east. Option 5B shows a crossing from Sutherland Drive on the west to Kingston Road 15 on the east.
6. Area 6 deals with the option to expand the Highway 401 crossing by a parallel, but separate, crossing for local traffic (as an additional means to potentially increase the capacity of the Highway 401 crossing area).

The six corridor areas were short-listed for further assessment, as discussed below, based on six TAC meetings as well as specific consultations with senior staff at Parks Canada and CFB Kingston during Stage 1 of this EA study. The short-listed corridors are Area 2 and Area 4, as shown on Drawing 3.20.

1. Area 1

Area 1 was not short-listed for the following main reasons:

1. Despite the proximity to Bay Street as part of the proposed Wellington Street Extension on the west side of the Cataracaui River, both the James Street-North Street alignment and the LaSalle Causeway expansion options could impact the fourteen registered shipwrecks that rest in the southern portion of the Inner Harbour and the other significant archaeological resources that are present representing Pre-Contact First Nations, French and British Military Periods (especially at Fort Frontenac, RMC and Fort Henry) and the subsequent Euro-Canadian urbanization of the City.
2. Widening the Bascule Lift Bridge portion of the LaSalle Causeway is not considered a practical option. The fill and additional loads from the expanded structure could overstress the clay and organic soils in the ‘bedrock valley’ within the Cataracaui River and cause differential settlement patterns between the existing structure and the expanded structure.
3. Though Area 1 is part of the City’s ‘urban landscape’ (south of the Inner Harbour exit near Belle Island), this portion of the EA study area contains most of the identified heritage sites and protected viewscapes. In particular, the James Street-North Street alignment option would increase traffic in the Barriefield Village Heritage Conservation District area and would require a high navigable clearance to accommodate watercraft in the Inner Harbour, resulting in significant visual impacts.
4. It should also be noted that while Area 1 is south of the Greater Cataracaui Marsh wetland, both the James Street-North Street alignment and the LaSalle Causeway expansion options could impact aquatic resources and species at risk, for which mitigation measures would be required. Additional mitigation measures would also be required for the identified provincially significant woodlands on the eastern shoreline that could be impacted by the James Street-North Street alignment.
5. Both options could further encounter contaminated sediments within the Inner Harbour and contaminated soil and groundwater conditions on the western shore as this area was more heavily industrialized than other portions of the EA study area.
.2 Area 2

Area 2 was short-listed for further assessment for the following main reasons:

1. Though it is not the most direct mid-City east-west link and there would be limited capacity at the Rideau Street-Russell Street connection on the west side of the Cataraqui River, it could be made more effective with the future Wellington Street Extension which, if implemented, could accommodate traffic flows both to/from the downtown and north to other portions of the City via John Counter Boulevard.

2. Area 2 is also part of the City’s ‘urban landscape’ and the Russell Street-Craftsman Boulevard alignment option is north of most of the identified heritage sites, protected views and the fourteen registered shipwrecks that rest in the southern portion of the Inner Harbour.

3. The Russell Street-Craftsman Boulevard alignment option, if designed to stay low to the water from west-to-east and rise above the navigable channel near the west shoreline, its silhouette, in conjunction with its proximity to Belle Island to the north and the steep and wooded west shoreline, could be below the tree line. This context could serve to mitigate potential visual impacts.

Despite the above, the Russell Street-Craftsman Boulevard alignment option in Area 2 raises the following potential issues:

1. The Russell Street-Craftsman Boulevard alignment option is not the most direct mid-City east-west link and the current limited capacity at the Rideau Street-Russell Street connection on the west side of the Cataraqui River would require the future Wellington Street Extension to make it more effective from a transportation perspective. There is also limited space at the Craftsman Boulevard connection on the east shore to accommodate future crossing infrastructure works.

2. The Russell Street-Craftsman Boulevard alignment option would only create a short loop of the Inner Harbour with the LaSalle Causeway to serve active travel and commuter cycling needs. Again, the future Wellington Street Extension would be required to improve east-west connectivity both to/from the downtown and John Counter Boulevard, but this is not the most direct mid-City east-west link.

3. Though Area 2 is not part of the visible cattail portion of the Greater Cataraqui Marsh north of John Counter Boulevard, the Russell Street-Craftsman Boulevard alignment option is still within the Provincial Significant Wetland and Provincially Significant Coastal Wetland and could further impact aquatic resources, species at risk and identified provincially significant woodlands, for which mitigation measures would be required.

.3 Area 3

The Belle Island-Craftsman Boulevard alignment option in Area 3 was not short-listed due mainly to its severe impacts on First Nations interests. Belle Island contains a historic First Nations hunting settlement and cemetery. It is also the subject of a site protection strategy that would set it physically apart from the mainland and place it under the joint ownership of the City and the Mohawk Nation Council of Chiefs. An agreement to this effect was endorsed by City Council in 2006.

Other issues impacting the Belle Island-Craftsman Boulevard alignment option in Area 3 are as follows:

1. Though Area 3 is not part of the visible cattail portion of the Greater Cataraqui Marsh north of John Counter Boulevard, the Belle Island-Craftsman Boulevard alignment option is still within the Provincially Significant Wetland and Provincially Significant Coastal Wetland and could further impact aquatic resources, species at risk and the provincially significant old oak grove on Belle Island, for which mitigation measures would be required.

2. Similar to Areas 1 and 2, the Belle Island-Craftsman Boulevard alignment option could also encounter contaminated sediments within the Inner Harbour and contaminated soil and groundwater conditions on the western shore associated in particular with the former Belle Park Landfill site.
3. Similar to Area 2, though Area 3 is north of most of the identified heritage sites and protected views, the fact that Area 3, particularly on the west side of the Cataraqui River, has yet to be systematically reviewed for cultural heritage resources, only reinforces the possible issues resulting from its mere proximity to these resources.

4. The Belle Island-Craftsman Boulevard alignment option is still not the most direct mid-City east-west link and the current limited capacity of Belle Park Drive and beyond on the west side of the Cataraqui River would require extensive improvements and the future Wellington Street Extension to make it more effective from a transportation perspective. Moreover, as the Craftsman Boulevard link on the east shore is similar to what is shown in Area 2, there is also limited space here to accommodate crossing infrastructure works.

5. Though more northerly of Areas 1 and 2, the Belle Island-Craftsman Boulevard alignment option in Area 3 would still create a loop of the Inner Harbour with the LaSalle Causeway that would primarily serve active travel and offer marginal improvements to east-west commuter cycling networks. The future Wellington Street Extension would be required to improve east-west connectivity both to/from the downtown and John Counter Boulevard but again, this is not the most direct mid-City east-west link.

Area 4 was short-listed for further assessment for the following main reasons:

1. Area 4 represents the most central crossing location within the EA study area. Based on the 2004 KTMP, the John Counter Boulevard-Gore Road alignment option (Option 4A) is cited as the location for a future 2-lane bridge in the City’s Official Plan, subject to the outcome of an EA study. As such, Option 4A could:
   a) Provide a direct mid east-west connection to existing road infrastructure on either shore and thereby provide an efficient and effective link in addressing the travel demand patterns to/from the downtown and/or to/from John Counter Boulevard and beyond to other parts of the City;
   b) Tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area;
   c) Enhance emergency response services, in that the City’s 2010 ‘Master Fire Plan’ recommends that a new fire substation be built at Elliott Avenue and Division Street in 2013-
      2014 in strategic response to the transportation network improvements that could result from installing both a bridge at this location along with the future Wellington Street Extension.
   d) As per the 2007 ‘Master Plan for Water Supply for the City of Kingston Urban Area’, facilitate the installation of an east-west watermain across the Cataraqui River that:
      i. is required to improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (located northeast of Area 4) in order to improve the redundancy in the municipal water system on the east side of the Cataraqui River; and
      ii. has been requested by Utilities Kingston as the preferred location for this infrastructure;
   e) Further enhance the City’s express bus route strategy as well as active travel and commuter cycling networks by providing a direct mid east-west urban transportation corridor; and
   f) Based on discussions with CFB Kingston personnel:
      i. tie into the CFB Kingston’s intentions to explore implementation of a new access directly from Gore Road to provide an alternative route for its workforce;
      ii. improve access from CFB Kingston to the VIA Rail Station which is used regularly by military personnel travelling to other centres;
      iii. serve as an alternate route to the Kingston Airport which could add benefits to CFB Kingston’s operations in the long term; and
      iv. not be subject to potential lockdown situations as it is not directly adjacent to CFB Kingston.

2. The John Counter Boulevard-Kingston Road 15 alignment option (Option 4B) could provide similar benefits on the west side of the Cataraqui River as Option 4A, but its more northerly connection to Kingston Road 15 on the east side of the Cataraqui River would result in staggered intersections with Kingston Road 15. This is not ideal from a transportation perspective.

Note Elliott Avenue is an east-west collector road that intersects with John Counter Boulevard (and the future Wellington Street Extension) just west of Montreal Street (outside the EA study area).
3. The John Counter Boulevard-Kingston Road 15 alignment option (Option 4B) could address potential impacts of a crossing on the Point St. Mark residential neighbourhood and the Gore Road Library located on the south and north sides of Gore Road, respectively.

4. Area 4 is part of the transition point between the ‘natural landscape’ of the Cataraqui River to the north and the City’s ‘urban landscape’ to the south, east and west. If both alignment options were designed to stay low to the water from west-to-east and rise above the navigable channel near the east shoreline, its silhouette, in conjunction with its proximity to Belle Island to the south and the steep and wooded west shoreline, could be below the tree line. Similarly, when viewed from the west, the rising silhouette of the bridge could either be at or below the tree line on the east side lands and, from the south, by the natural landscape that emerges in the background further north to Highway 401. This context could serve to mitigate potential visual impacts.

Despite the above, Option 4A and Option 4B raise the following potential issues:

1. Though Area 4 is not part of the visible cattail portion of the Greater Cataraqui Marsh north of John Counter Boulevard, both alignment options are still within the Provincially Significant Wetland and Provincially Significant Coastal Wetland and could further impact aquatic resources, species at risk and identified provincially significant woodland, for which mitigation measures would be required.

2. Both alignment options could encounter contaminated soil and groundwater conditions on the western shore as this area was subject to intensive urban industrialization.

3. Area 4, particularly on the west side of the Cataraqui River, has yet to be systematically reviewed for cultural heritage potential. This, in conjunction with the presence of the Rideau Canal, the Gore Road Library and the Point St. Mark residential neighbourhood and the Gore Road Library located on the south and north sides of Gore Road, respectively, for which mitigation measures would be required.

4. The John Counter Boulevard-Gore Road alignment (Option 4A) could impact the Point St. Mark residential neighbourhood and the Gore Road Library located on the south and north sides of Gore Road, respectively, for which mitigation measures would be required. Though the John Counter Boulevard-Kingston Road 15 alignment (Option 4B) could address these potential impacts, its more northerly connection to Kingston Road 15 on the east side of the Cataraqui River would result in staggered intersections with Kingston Road 15 which again, is not ideal from a transportation perspective.

5. The shore-to-shore crossing distance of Option 4B is 25 percent longer than Option 4A, which would result in additional capital and maintenance costs.

Area 5 was not short-listed for the following primary reasons:

1. Both the Weller Avenue-Kingston Road 15 (Option 5A) and Sutherland Drive-Kingston Road 15 (Option 5B) alignments extend through ANSI’s, which are areas having identified life science or earth science values. Both alignment options also extend through the visible cattail portion of the Greater Cataraqui Marsh which, based on the OWES, has higher ecological diversity (more plant and animal species) and greater potential for pollution/erosion/flood control than the southern portion of the wetland. The identified provincially significant woodlands on either shore would be impacted as well, for which mitigation measures would be required.

2. Area 5, particularly on the west side of the Cataraqui River, has yet to be systematically reviewed for cultural heritage potential. This, in conjunction with the presence of the Rideau Canal and the Kingston Outer Station site north of Belle Island on the west side of the Cataraqui River as well as the high archaeological potential of this area, only reinforces the possible issues resulting from its mere proximity to these resources.

3. Area 5 is further north of established urban areas. As such, there are limited roadway links on the west and east sides of the Cataraqui River in Area 5 to disperse traffic, which would provide limited opportunities to improve vehicular traffic as well as active travel and commuter cycling networks through a more mid-east-west urban transportation corridor.

4. Both Options 5A and 5B involve the longest shore-to-shore crossing distances in comparison to the other alignment options. The shore-to-shore crossing distance, in conjunction with the overhead road crossing that would be required at the CNR line on the west shore, would result in additional capital and maintenance costs.

6. Area 6

Expanding the Highway 401 crossing in Area 6 by a parallel, but separate, crossing for local traffic is not considered a practical option for the following main reasons:

1. Similar to Area 5, Area 6:
   a) Extends through ANSI’s, the visible cattail portion of the Greater Cataraqui Marsh and identified provincially significant woodlands on either shore would also be impacted, for which mitigation measures would be required; and
   b) Has yet to be systematically reviewed for cultural heritage potential.
2. Area 6 is the furthest north of established urban areas in comparison to the other corridor areas. As such, there are limited roadway links on the west and east sides of the Cataraqui River in Area 6 to disperse traffic, which would provide limited opportunities to improve vehicular traffic as well as active travel and commuter cycling networks through a more mid east-west urban transportation corridor.

3.2.5 Implement a New Tunnel Crossing

As noted earlier, the feasibility of implementing a tunnel crossing in Area 4 at the John Counter Boulevard-Gore Road alignment was considered in the 1992 TSH study and found to be non-viable. The tunnel crossing options considered as part of this EA study focused on the short-listed corridor Area 2 and Area 4. A tunnel crossing in Area 2 would also be non-viable as there is limited land available on the east shore near Craftsman Boulevard. A tunnel at this location would thus need to extend under and well east of Kingston Road 15 onto CFB Kingston property in order to maintain the acceptable geometric design criteria of a 6 percent slope or less to match the existing elevation at the intersection.

Two possible tunnel crossing options were then considered in Area 4, as shown on Drawing 3.21:

1. Tunnel Option A would require its east section to extend parallel to Kingston Road 15 between the river’s edge and the Gore Road Library in order to achieve an acceptable vertical profile and eventually connect with Kingston Road 15 at a new “T” intersection roughly 350 m north of Gore Road. This alignment would require substantial clearing of the treed area along the river’s edge and would reduce opportunities for future development north of the Gore Road Library.

2. Tunnel Option B would involve a spiral ramp around the Gore Road Library including a section through the Kingston Road 15-Gore Road intersection. Traffic along the Kingston Road 15-Gore Road intersection would need to be detoured for several months to permit construction. The posted speed along the spiral ramp section would be limited to 30 km/hr due to the relatively short radius required with this horizontal alignment.

For either option, the tunnel would be constructed using a cut and cover technique. A tunnel through rock is not feasible due to vertical profile constraints, as the rock elevation is roughly 20 m to 40 m below the riverbed surface. With the cut and cover technique, construction would be carried out in a series of roughly 100 m sections inside a 25 m wide cofferdam area that would be dredged and dewatered to a depth of approximately 12 m below the riverbed surface. This, in conjunction with the extensive excavations at the west and east shores that would also be required, would result in severe environmental impacts.

In addition, during the construction of the tunnel section at the Rideau Canal’s navigable channel, boat traffic would need to be re-routed. Furthermore, special consideration would be required to address issues including, but not limited to, fire safety, emergency response, ventilation, drainage, lighting, and crime prevention. Depending on the extent of fire protection provided, the transportation of dangerous goods such as fuel tankers through the tunnel may need to be prohibited for public safety reasons. It should also be noted that the tunnel option could only accommodate vehicular use as neither cyclists nor pedestrians would be allowed through the tunnel, also for public safety reasons.

Finally, the preliminary opinion of probable cost for Tunnel Options A and B are in the $350 million to $450 million range, respectively, based on 2 lanes in each direction. Given the above-noted design and construction challenges and impacts as well as probable cost considerations, it would not be practical or cost effective to implement a tunnel option with one lane in each direction and then later expand it to two lanes in each direction.

Thus, implementing a new tunnel crossing would not address the EA Problem Statement for this EA study and is not considered a viable alternative solution.

3.3 Detailed Evaluation of Area 2 and Area 4

The more detailed assessment of a possible bridge crossing within the shortlisted Area 2 and Area 4 corridors involved two key components, namely: i) outlining preliminary opinion of probable cost considerations; and ii) assessing the potential positive and negative social, cultural, economic and environmental impacts of the proposed bridge alignment locations.

3.3.1 Preliminary Opinion of Probable Cost Considerations

A number of different arrangements, types of structures and span lengths can be considered for a bridge crossing. The following provides a contextual discussion of the assumptions used in developing the preliminary opinion of probable cost for a bridge crossing at each of the proposed bridge alignment locations within the shortlisted Area 2 and Area 4 corridors.

Firstly, the types of bridges include:

1. Steel and concrete girder bridges which are cost effective for spans up to 100 m.

2. Pre-stressed segmental concrete box girder bridges which are cost effective for spans up to 200 m.

3. Cable stayed bridges which are cost effective for spans up to 1,000 m.

4. Suspension bridges which are cost effective for spans of over 1,000 m.

A bridge tends to be more prominent and more visible at longer spans because its elements tend to be larger, taller or higher above the water surface. Many factors require careful consideration in designing a bridge. These include the navigable clearance required and maintaining appropriate length-to-height proportions for visual and aesthetic reasons.
Capital and maintenance costs are also an important consideration. The cost per lineal metre increases as the span length increases. Bridge spans in the 200 m range are typically 50 percent more costly than spans in the 50 m range. Similarly, long span bridges, such as those involving 500 m spans or longer, are typically 100 percent more costly than spans in the 50 m range. Thus, the preliminary opinion of probable cost was developed on the basis that a shore-to-shore crossing with multiple bridge spans in the 50 m to 100 m range would be cost-effective and able to maintain appropriate span length-to-height proportions as well as a relatively low profile above the water to mitigate potential visual impacts.

Secondly, temporary access into the Cataraqui River would be required for construction equipment to install the pile foundations, construct the piers and install the superstructure. Temporary in-water construction access options include:

1. The use of construction barges, which require 2 m to 3 m of water depth for draft purposes. Given that the Cataraqui River has a water depth averaging 1.2 m except at the buoyed channel and the southern portion of the Inner Harbour, the use of construction barges would require dredging of an access channel from shore to reach each of the pier locations. Once the bridge is built, the dredged channel could either be back-filled or left in place.

2. The installation of a temporary earth berm, which would involve infilling an area with earth material and capping it with gravel to provide a temporary roadway to facilitate construction. A series of culverts would also be installed in the berm to allow for river flow continuity and species movement. The berm would be removed after the permanent bridge is built.

3. The installation of a temporary work bridge, which would be built adjacent to the permanent bridge to facilitate construction. It too would be removed once the permanent bridge is built. However, it is more costly to install compared to the use of construction barges or a temporary earth berm.

The preliminary opinion of probable cost incorporated costs for a temporary work bridge as a worst case scenario.

The final issue regards the number of lanes that should be part of the bridge in order to meet current and projected needs (2 lanes versus 4 lanes). The ‘Canadian Highway Bridge Design Code’ (CHBDC) requires a design life for new bridges of at least 75 years. New bridges having similar shore-to-shore characteristics to those within the shortlisted Area 2 and Area 4 corridors typically have a design life of at least 100 years. As such, approval authorities may permit only one intrusion into the Cataraqui River to minimize environmental disruptions and impacts. Thus, the preliminary opinion of probable cost was developed for three potential scenarios, namely, a 2-lane bridge, a four-lane bridge and a 2-lane bridge that could be expanded to 4 lanes in the future.

Based on the above, the preliminary opinion of probable cost is shown in Table 3.5 below.

### Table 3.5

<table>
<thead>
<tr>
<th>Bridge Corridor Location</th>
<th>Shore to Shore Distance (m)</th>
<th>Preliminary Opinion of Probable Cost</th>
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<tr>
<td></td>
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<tr>
<td>Area 4 – Option 4A: John Counter Boulevard to Gore Road</td>
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<td>Area 4 – Option 4B: John Counter Boulevard to Kingston Road 15</td>
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<td>Area 2 – Option 2: Russell Avenue to Craftsman Boulevard</td>
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<td>$141 million</td>
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Notes: 1. Includes $15 million and $18 million at Option 4A and Options 2 and 4B, respectively, for a temporary work bridge; 2. Based on multiple 50 m spans; 3. Includes a sidewalk and bicycle lane in both directions; 4. Includes 15 percent for Engineering and 25 percent for Contingency; 5. Expressed in 2010 dollars, with no allowance for cost escalation/inflation; and 6. Excludes property acquisition and applicable taxes.

### 3.3.2 EA Evaluation Matrix

The purpose of the EA evaluation matrix was to further assess the proposed bridge alignment locations within the shortlisted Area 2 and Area 4 corridors. It was developed in response to the Municipal Class EA framework and in direct consultations with the TAC. The matrix is summarized in Table 3.6 and shown in more detail in Table 3.7 below. It includes six main criteria groups with weighting that, combined, totals 100 points. The main criteria deal with:

1. Aquatic Natural Environment which was assigned 20 points.
2. Cultural Heritage Environment which was assigned 15 points.
3. Economic Environment which was assigned 20 points.
4. Social Environment which was assigned 10 points.
5. Terrestrial Natural Environment which was assigned 10 points.
6. Transportation Environment which was assigned 25 points.

Each of the main criteria groups has seven to nine sub-criteria, for a total of 48 sub-criteria, which have also been assigned relative weighting totaling 100 points. The scoring, which was reviewed and endorsed by the TAC, is based on a range of minus 3 to plus 3 to show potential negative and positive impacts, respectively, for pre-mitigation associated with the bridge crossing by itself and post-mitigation associated with preliminary bridge design considerations.
### Table 3.6
EA Evaluation Matrix Summary

<table>
<thead>
<tr>
<th>EA Evaluation Criteria</th>
<th>EA Criteria Weight</th>
<th>Summary Scores</th>
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### Table 3.7

#### EA Evaluation Matrix

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<th>EA Criteria Weight</th>
<th>EA Corridor Areas and Options</th>
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### EA Evaluation Matrix

#### EA Evaluation Criteria

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<th>EA Criteria Weight</th>
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<td><strong>Score</strong></td>
<td><strong>Total</strong></td>
<td><strong>Score</strong></td>
<td><strong>Total</strong></td>
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</tbody>
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#### Notes
- Option 4A as optimum mid east-west corridor for all growth areas; Options 2/4B still address growth area sectors.
- Property acquisition required in Areas 2/4 (future development impacts on east side on Option 4B landing); ROW for link on east side for Option 4A; property acquisition may be required for construction staging in Areas 2/4.
- The 'bedrock valley' and contaminated soils in Areas 2/4; Inner Harbour sediment contamination in Area 2.
- Crossing length is 25% shorter for Option 4A, therefore capital costs and maintenance costs will be 25% lower with Option 4A; crossing length for Options 2/4B are similar.
- Option 2 north of Barriefield; impacts to Point St. Mark / Gore Road Library with Option 4A but caveat on title for Point St. Mark landowners acknowledging potential crossing; rationale for Option 4B crossing north of Point St. Mark / Gore Road Library but future development impacts on east side on Option 4B landing.
- Option 4A is in the City’s adopted Official Plan, subject to an EA.
- The Inner Harbour/Belle Island as a transition between a natural environment to the north and a more urbanized landscape to the south, east and west; potential for low profile design.
- No anticipated net negative effects, subject to detailed Stage 2 assessment and mitigation.
- The Inner Harbour/Belle Island as a transition between a natural environment to the north and a more urbanized landscape to the south, east and west.
### Table 3.7: EA Evaluation Matrix

<table>
<thead>
<tr>
<th>EA Evaluation Criteria</th>
<th>EA Criteria Weight</th>
<th>EA Corridor Areas and Options</th>
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<td>-1</td>
<td>-50</td>
</tr>
<tr>
<td>.9 Effect of Stormwater Management on Environment</td>
<td>5</td>
<td>-1</td>
<td>-50</td>
</tr>
<tr>
<td><strong>SCORE SUB-TOTAL</strong></td>
<td></td>
<td>-850</td>
<td>0</td>
</tr>
<tr>
<td>Transportation</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.1 Effect on Road Network Continuity / Improvements</td>
<td>20</td>
<td>-3</td>
<td>-1500</td>
</tr>
<tr>
<td>.2 Effect on Level of Service / Congestion / Travel Times</td>
<td>25</td>
<td>2</td>
<td>1250</td>
</tr>
<tr>
<td>.3 Effect on Pedestrian / Cyclist Access and Mobility</td>
<td>10</td>
<td>2</td>
<td>500</td>
</tr>
<tr>
<td>.4 Effect on Public Transit Access and Operations</td>
<td>15</td>
<td>1</td>
<td>375</td>
</tr>
<tr>
<td>.5 Effect on Emergency Vehicle Access and Mobility</td>
<td>15</td>
<td>3</td>
<td>1125</td>
</tr>
<tr>
<td>.6 Effect on Universal Access and Mobility</td>
<td>5</td>
<td>1</td>
<td>125</td>
</tr>
<tr>
<td>.7 Effect on Public / User Safety</td>
<td>5</td>
<td>1</td>
<td>125</td>
</tr>
<tr>
<td>.8 Effect on Navigable Waterways</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>SCORE SUB-TOTAL</strong></td>
<td></td>
<td>2000</td>
<td>2000</td>
</tr>
</tbody>
</table>
3.3.3 Preferred Solution

Based on the above-noted potential benefits and impacts of the proposed bridge alignment locations within the shortlisted Area 2 and Area 4, the Russell Street-Craftsman Boulevard alignment (Option 2) in Area 2 scored lower than both the John Counter Boulevard-Gore Road (Option 4A) and John Counter Boulevard-Kingston Road 15 (Option 4B) alignments in Area 4. Primary considerations regarding the ranking of Option 2 in Area 2 included:

1. The role that mitigation measures could fulfill in addressing potential impacts of a crossing on the aquatic and terrestrial natural environments.

2. Its potential to impact viewscapes in and south of Area 2 and its proximity to Belle Island which could affect both cultural heritage considerations and First Nations interests.

3. Its more indirect mid-City east-west link and the current limited capacity at the Rideau Street-Russell Street connection on the west side of the Cataraqui River which would require the future Wellington Street Extension to make it more effective for vehicular traffic as well as active travel and commuter cycling.

4. Its shore-to-shore crossing distance which is 25 percent longer than at Option 4A and its requirement for the future Wellington Street Extension to address traffic flows which would further affect economic considerations and external road network improvement requirements.

Option 4A, as shown on Drawing 3.22, scored higher than Option 4B in Area 4. Main considerations in this regard included:

1. Similar to the scoring of Option 2 in Area 2, the role that mitigation measures could fulfill in addressing potential impacts of both alignment options in Area 4 on the aquatic and terrestrial natural environments.

2. The potential for Option 4A and Option 4B in Area 4 to:
   a) Tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area;
   b) Incorporate into the bridge design the east-west watermain that is required to service a proposed new water booster station in east Kingston (located northeast of the project site location); and
   c) Potentially incorporate into the bridge design the three Hydro One marine electrical cables (3-phase 44 kV line) that currently cross the Cataraqui River in the John Counter Boulevard-Gore Road area.

3. Option 4A offers a more direct mid east-west connection to existing road infrastructure on either shore. This is more effective in addressing travel demand patterns, accommodating CFB Kingston’s future strategic plans as well as providing opportunities to enhance emergency response services, the City’s express bus route strategy and active travel and commuter cycling networks. The more northerly connection to Kingston Road 15 on the east side of the Cataraqui River with Option 4B results in staggered intersections with Kingston Road 15, which is not ideal from a transportation perspective.

4. The potential impacts of Option 4A being proximate to the Point St. Mark residential neighbourhood and the Gore Road Library could negatively impact cultural heritage and social environment considerations, for which mitigation measures would be required. It should also be noted however, that there is a caveat on each title for Point St. Mark landowners acknowledging the potential for a bridge crossing at the Option 4A location. The location of Option 4B north of Point St. Mark and the Gore Road Library could more positively address such considerations.

5. Option 4B is 25 percent longer shore-to-shore than Option 4A, which would have a more negative impact on capital cost and other related economic considerations.
In addition, Option 4A and the Retain the Status Quo (or ‘Do Nothing’) option were compared on the basis of environmental considerations [fuel consumption and greenhouse gas (GHG) emissions] for the 2009 and 2029 planning horizons. Firstly, idling fuel consumption is based on the assumption that travel time delay is equivalent to vehicle idling time. Transport Canada estimates that the average idling fuel consumption for passenger cars and heavy vehicles is 2.5 litres/hour (L/hr) and 4 L/hr, respectively. As such, Table 3.8 below suggests that a bridge crossing at the Option 4A location could reduce idling fuel consumption in the order of 85 percent to 70 percent during the PM peak hour in 2009 and 2029 compared to the Retain the Status Quo option.

Table 3.8
Idling Fuel Consumption

<table>
<thead>
<tr>
<th>Alternative Solution</th>
<th>2009 Annual PM Peak Hour Fuel Consumption (L)</th>
<th>2029 Annual PM Peak Hour Fuel Consumption (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retain the Status Quo</td>
<td>21,000</td>
<td>68,000</td>
</tr>
<tr>
<td>Option 4A</td>
<td>3,000</td>
<td>20,000</td>
</tr>
</tbody>
</table>

Secondly, emissions statistics are defined by both Natural Resources Canada and Transport Canada in terms of kilograms of carbon monoxide (CO$_2$) produced per litre of fuel consumed, which is estimated to be 2.4 kilograms/litre (kg/L). With this in mind, CO$_2$ emissions produced during idling are the product of CO$_2$ emission statistics (2.4 kg/L) and the total fuel consumed during idling. Table 3.9 below shows that 2029 PM peak hour greenhouse emissions could be 70 percent less with Option 4A compared to the Retain the Status Quo option.

Table 3.9
Annual CO$_2$ Produced During Idling

<table>
<thead>
<tr>
<th>Alternative Solution</th>
<th>2009 Annual PM Peak Hour CO$_2$ Production (kg)</th>
<th>2009 Annual PM Peak Hour CO$_2$ Production (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retain the Status Quo</td>
<td>50,000</td>
<td>163,000</td>
</tr>
<tr>
<td>Option 4A</td>
<td>7,000</td>
<td>48,000</td>
</tr>
</tbody>
</table>

Based on this assessment, the recommended preferred solution is a bridge crossing at the John Counter Boulevard-Gore Road alignment (Option 4A), as shown on Drawing 3.22. This was outlined in the ‘City of Kingston Third Crossing of the Cataraqui River Environmental Assessment Stage 1 Summary Report’ (Stage 1 Summary Report), which was prepared to conclude Stage 1 of this EA study. The Stage 1 Summary Report was presented to City Council in April, 2010. As part of this process, it was also recommended that the City continue its ongoing assessment of ways to reduce congestion on the LaSalle Causeway-Highway 2 corridor and enhance public transit services as an interim measure.

At the May 25, 2010 City Council meeting, Council approved the Stage 1 Summary Report and authorized that this EA study proceed to completion, or Stage 2. City Council also subsequently commissioned the undertaking and completion of the 2011 HDR/iTrans report, which, as noted earlier, recommended improvements to address existing and future deficiencies along the LaSalle Causeway-Highway 2 corridor over the short-to-medium term.

The purpose of Stage 2 of this EA study is to address Phase 3 and Phase 4 of the Ontario Municipal Class EA process, namely:

1. Assessing and identifying a preferred bridge crossing design solution at the John Counter Boulevard-Gore Road alignment (the project site location, as shown on Drawing 3.22), including the identification of potential impacts, the development of mitigation measures, monitoring requirements as well as capital and maintenance costs (or ‘Phase 3’).
2. Finalizing approval of this Report that documents the decision-making process during Stage 1 and Stage 2 of this EA study (or ‘Phase 4’).

4.0 THE ALTERNATIVE DESIGNS AND THE PREFERRED DESIGN

4.1 Corridor Conditions

4.1.1 Traffic

This section of the Report discusses the capacity analysis for the bridge crossing at the project site location. This analysis is divided into the following three sub-sections:

1. The timing of the need for a four-lane bridge.
2. Intersection configuration needs at the project site location.
3. The potential for short cutting at the project site location.

.1 The Timing of the Need for a Four-Lane Bridge

A. Methodology

In 2011, AECOM reviewed the City’s Travel Demand Forecast Model specifically to test nine capital works upgrading scenarios and forecast the resulting travel demand on the bridge at the project site location. The framework for this analysis was taken from the 2000 Highway Capacity Manual (HCM).
calculates travel speed and delay [based on seconds/vehicle (s/veh)] on a facility during a defined peak hour period and uses LOS to rate operational performance. As stated earlier, the City’s minimum acceptable LOS target is LOS D. This would correspond to a travel speed ranging from 26 kilometres/hour (km/hr) to 33 km/hr during the PM peak hour on the bridge.

The bridge at the project site location is located between two signalized intersections, namely, John Counter Boulevard-Montreal Street on the west side of the Cataraqui River and Gore Road-Kingston Road 15 on the east side. There are also three non-signalized intersections: i) John Counter Boulevard-Duckett Lane on the west side of the Cataraqui River; and ii) Gore Road-Gore Road Library access and Gore Road-Point St. Mark Drive on the east side. AECOM’s analysis forecasted travel demand across the bridge during the PM peak hour at 2019 (which is the earliest possible time frame by which the bridge could conceivably be built) and 2029. Once the bridge is built, the analysis further assumed that:

1. Left-turn storage would be provided at the two signalized intersections.
2. The posted speed limit on the bridge would be 60 km/hr, which is consistent with the existing posted speed limit on John Counter Boulevard.
3. Based on the TransCAD travel demand model in the 2009 KTMP Update, PM peak hour traffic demand crossing the Cataraqui River screenline is expected to grow at an annual rate of 0.4 percent for eastbound travel and 0.9 percent for westbound travel from 2019 to 2029.

B. Observations

As shown in Table 4.1 below, the forecasted 2019 PM peak hour traffic demand and nine planned road network improvement scenarios indicate the need for a four-lane bridge would be triggered by 2029 to 2034. Table 4.1 also estimates the change in the total veh-km by area, as shown earlier on Drawing 3.14, relative to the Retain the Status Quo option. Specific highlights are as follows:

1. The total Cataraqui River screenline would operate at LOS B by 2019 for all nine scenarios if the unused capacity of Kingston Mills Road and Highway 401 is included. However, as stated earlier, relying on Highway 401 to accommodate local traffic does not recognize: i) the primary function of Highway 401 which is to serve regional (or long distance) traffic and not local traffic needs; and ii) the strong demand for trips crossing the Cataraqui River south of Highway 401.
2. Under Scenario ‘A’ (All City Development Charge Projects and a 2-Lane Bridge), a portion of trips are projected to divert from the LaSalle Causeway to the bridge at the project site location as well as Highway 401.
3. For Scenario ‘B’ (AECOM Suggested Development Charge Projects and a 2-Lane Bridge), a portion of the traffic is forecast to be routed to Highway 401 in order to take advantage of the Division Street widening. Higher eastbound traffic volumes are also projected on the LaSalle Causeway due to the widening of Kingston Road 15 from Highway 2 up to Gore Road. As a result, lower traffic demand is projected on the bridge at the project site location.
4. Under Scenario ‘C’ (2-Lane Bridge and John Counter Boulevard Widening), a projected increase in traffic on the LaSalle Causeway is noted due to the lack of additional capacity improvements in the network, which includes the bridge at the project site location. Compared to Scenario ‘B’, a higher eastbound volume on the bridge at the project site location is noted due to additional congestion projected on Division Street, resulting in fewer trips diverting further north to use Highway 401.
5. The above-noted rationale for the projected increase in traffic on the LaSalle Causeway in Scenario ‘C’ can also be applied to Scenario ‘D’ (2-Lane Bridge and the Wellington Street Extension). In addition, due to capacity limitations on John Counter Boulevard, a portion of westbound traffic from the bridge at the project site location would be diverted north to Highway 401. But compared to Scenario ‘B’, eastbound volume on the bridge at the project site location is higher due to additional congestion on Division Street, resulting in fewer eastbound trips via Highway 401.
6. For Scenario ‘E’ (2-Lane Bridge and new CFB Kingston Access to Gore Road), the traffic volumes on the LaSalle Causeway are similar to Scenarios ‘C’ and ‘D’ due to the lack of additional capacity improvements in the network. The new CFB Kingston access to Gore Road also increases westbound trips (mostly from those leaving the Base) onto the bridge at the project site location.
7. Under Scenario ‘F’ (Combination of Scenarios ‘C’ and ‘D’), additional traffic on the bridge at the project site location is noted due to the combined effect of the John Counter Boulevard widening and the Wellington Street Extension, which would attract trips into the downtown area.
8. For Scenario ‘G’ (Combination of Scenarios ‘C’ and ‘E’), the traffic volumes on the LaSalle Causeway are similar to Scenarios ‘C’, ‘D’ and ‘E’ due to the lack of additional capacity improvements in the network. The new CFB Kingston access to Gore Road also increases westbound trips (mostly from those leaving the Base) onto the bridge at the project site location.
9. The above-noted rationale for the projected increase in traffic on the LaSalle Causeway in Scenarios ‘C’, ‘D’, ‘E’ and ‘G’ can also be applied to Scenario ‘H’ (Combination of Scenarios ‘D’ and ‘E’), though a higher portion of eastbound traffic is noted being diverted from the LaSalle Causeway onto the bridge at the project site location due to effect of the Wellington Street Extension. The new CFB Kingston access to Gore Road also increases westbound trips (mostly from those leaving the Base) onto the bridge as well.
<table>
<thead>
<tr>
<th>Scenario</th>
<th>2019 Total Volume on a 2-Lane Bridge</th>
<th>2-Lane Bridge is at Capacity By:</th>
<th>2019 Total Volume on LaSalle Causeway</th>
<th>Cataraqui Screenline LOS (South of Hwy. 401)</th>
<th>Veh-Km of Travel in Neighbourhoods (Percent Change)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Westbound</td>
<td>Eastbound</td>
<td>LOS</td>
<td>Westbound</td>
<td>Eastbound</td>
</tr>
<tr>
<td>Do Nothing:</td>
<td>16,337</td>
<td>3,007</td>
<td>1,412</td>
<td>90</td>
<td>231</td>
</tr>
<tr>
<td>A: All City Development Charge Projects and a 2-Lane Bridge</td>
<td>840</td>
<td>800</td>
<td>E</td>
<td>2027</td>
<td>1,100</td>
</tr>
<tr>
<td>B: AECOM Suggested Development Charge Projects and a 2-Lane Bridge</td>
<td>820</td>
<td>500</td>
<td>E</td>
<td>2029</td>
<td>1,090</td>
</tr>
<tr>
<td>C: 2-Lane Bridge + John Counter Boulevard Widening</td>
<td>810</td>
<td>730</td>
<td>D</td>
<td>2031</td>
<td>1,150</td>
</tr>
<tr>
<td>D: 2-Lane Bridge + Wellington Street Extension</td>
<td>790</td>
<td>790</td>
<td>D</td>
<td>2034</td>
<td>1,130</td>
</tr>
<tr>
<td>E: 2-Lane Bridge + new CFB Kingston Access to Gore Road</td>
<td>900</td>
<td>730</td>
<td>E</td>
<td>2019</td>
<td>1,140</td>
</tr>
<tr>
<td>F: Combination of Scenarios C + D</td>
<td>830</td>
<td>790</td>
<td>E</td>
<td>2028</td>
<td>1,100</td>
</tr>
<tr>
<td>G: Combination of Scenarios C + E</td>
<td>890</td>
<td>670</td>
<td>E</td>
<td>2021</td>
<td>1,140</td>
</tr>
<tr>
<td>H: Combination of Scenarios D + E</td>
<td>890</td>
<td>770</td>
<td>E</td>
<td>2021</td>
<td>1,130</td>
</tr>
<tr>
<td>I: 4-Lane Bridge + John Counter Boulevard Widening + new CFB Kingston Access to Gore Road</td>
<td>1,180</td>
<td>820</td>
<td>C</td>
<td>N/A</td>
<td>1,090</td>
</tr>
</tbody>
</table>

Note suggested road improvements within the project site location area are: i) the John Counter Boulevard widening; ii) the Wellington Street Extension; iii) the Division Street widening; and iv) the Kingston Road 15 widening from Highway 2 to Gore Road.
10. Scenario ‘I’ (4-Lane Bridge, John Counter Boulevard Widening and new CFB Kingston Access to Gore Road) is the only scenario that would achieve LOS D across the network, though eastbound traffic volumes on the LaSalle Causeway would still be over capacity. Scenario ‘I’ would also be able to reduce traffic on local roads in all five neighbourhood areas by a combined total of 6 percent which is the highest reduction in comparison to the other scenarios.

11. All the scenarios forecast potential reductions in short cutting through the Barriefield residential neighbourhood and potential increases in short cutting through the Point St. Mark residential neighbourhood.

12. The forecasted increase in traffic volumes in the mid-town area (south of John Counter Boulevard) under Scenarios ‘A’, ‘B’, ‘D’, ‘F’ and ‘H’ is due to the projected use of the Wellington Street Extension. It should also be noted that the scenarios involving the Wellington Street Extension would direct more eastbound traffic away from the LaSalle Causeway and onto this facility.

13. The scenarios do not take into account the improvements to the LaSalle Causeway-Highway 2 corridor recommended in the 2011 HDR/iTrans report. As stated earlier, though the improvements may not be able to solely reduce congestion and accommodate future traffic volume demand on the LaSalle Causeway-Highway 2 corridor over the long-term, they are considered viable short-to-medium term solutions.

Based on these scenarios, the 2030 to 2034 trigger for a four-lane bridge would impact the viability of moving forward with a two-lane bridge or a two-lane bridge with a substructure to accommodate its widening to four lanes in the future. The reason for this is that there would be a diminishing return on the initial capital investment, as the need for bridge twinning (with the two-lane bridge scenario) or widening (with the two-lane bridge-four-lane-substructure scenario) could be triggered shortly after the two-lane bridge would be built. However, neither scenario should be ruled out completely at this time. The future monitoring of traffic conditions by the City, particularly if the aforementioned improvements to the LaSalle Causeway-Highway 2 corridor are implemented, could confirm the viability of either scenario or even potentially the timeline for engaging the Project Implementation Phase of the Class EA process for the bridge itself.

In addition, based on AECOM’s review of the City’s Travel Demand Forecast Model, another alternative staged approach to the development of an ultimate four-lane bridge could be viable. This option would involve constructing an initial three-lane bridge and a substructure that could accommodate widening to four lanes in the future. Under this scenario, the centre lane would operate as a reversible lane serving the peak direction of travel. Based on Scenario ‘I’ in Table 4.1, the centre lane and dedicated westbound lane would accommodate westbound travel during the PM peak hour. Assuming the peak direction would be reversed during the AM peak hour, the centre lane and dedicated eastbound lane would then accommodate eastbound travel during the AM peak hour.

Tables 4.2 and 4.3 below show the results of the capacity analysis for Scenario ‘I’ under the 2019 and 2029 horizons for the initial three-lane bridge and ultimate four-lane bridge, respectively.

### Table 4.2
PM Peak Hour LOS of a Three-Lane Bridge at the Project Site Location

<table>
<thead>
<tr>
<th>Year</th>
<th>Westbound Travel (2 Lanes)</th>
<th>Eastbound Travel (1 Lane)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Speed (km/hr)</td>
<td>Delay (s/veh)</td>
</tr>
<tr>
<td>2019</td>
<td>35.4</td>
<td>26.1</td>
</tr>
<tr>
<td>2029</td>
<td>34.5</td>
<td>27.7</td>
</tr>
</tbody>
</table>

Table 4.2 shows that the initial three-lane bridge is expected to operate at the acceptable LOS D in both directions under PM peak hour conditions at the 2019 and 2029 horizon years. However, while the two lanes available for westbound travel are projected to have reserve capacity, the one dedicated eastbound lane during the PM peak hour is expected to approach capacity in 2019 and would be at capacity by 2029.

At this point, the bridge deck would need to be widened from three lanes to four lanes. The widening would be applied in equal proportions to the north and south sides of the bridge deck and could be done directly from the bridge deck itself, as the required substructure would already be in place. This approach would also be viable for the two-lane-bridge-four-lane-substructure scenario mentioned above.

### Table 4.3
PM Peak Hour LOS of a Four-Lane Bridge at the Project Site Location

<table>
<thead>
<tr>
<th>Year</th>
<th>Westbound Travel (2 Lanes)</th>
<th>Eastbound Travel (2 Lanes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Speed (km/hr)</td>
<td>Delay (s/veh)</td>
</tr>
<tr>
<td>2019</td>
<td>35.4</td>
<td>26.1</td>
</tr>
<tr>
<td>2029</td>
<td>34.5</td>
<td>27.7</td>
</tr>
</tbody>
</table>

Table 4.3 shows that based on Scenario ‘I’, the four-lane bridge is expected to exceed the acceptable LOS D in both directions under PM peak hour conditions at the 2019 and 2029 horizon years.

It should be noted that a median barrier separating the eastbound and westbound vehicular lanes would not be needed immediately on the four-lane bridge. Traffic volumes and speed in relation to the probability and severity of potential accidents are critical factors in determining when the need for a median barrier should be considered. As the bridge would be a new facility, there is currently no accident history upon...
which to gauge this requirement. Assuming that the posted speed limit on the bridge would be 60 km/hr, the operating speed can be expected to be 70 km/hr. Based on this assumption and effective transportation engineering practice, the trigger point at which a median barrier may be needed is when the Average Annual Daily Traffic (AADT) on the bridge reaches 25,000 vehicles per day. This is anticipated to occur by 2051 if the PM peak hour traffic demand crossing the Cataraqui River screenline continues to grow at an annual rate of 0.4 percent for eastbound travel and 0.9 percent for westbound travel beyond 2029. Despite this projection, the future monitoring by the City of traffic conditions on the bridge, including the frequency and severity of accidents, would be equally critical in determining whether or not a median barrier is ultimately needed.

.2 Intersection Configuration Needs at the Project Site Location

A. Methodology

Under Scenario 'I' conditions, projected 2019 PM peak hour traffic volumes at the intersections within the project site location were established based on link volume forecasts from the TransCAD travel demand model used in the 2009 KTMP Update. The 2019 intersection volume forecasts are shown on Drawing 4.1. PM peak hour traffic volumes at these intersections were then forecasted from 2019 to 2029 using the model’s annual projected growth rates of 0.4 percent for eastbound travel and 0.9 percent for westbound travel. The projected 2029 intersection volumes are shown on Drawing 4.2. The traffic simulation program, Synchro 7, was then used to address traffic conditions at the project site location after the bridge would be built. The following assumptions were used in this analysis:

1. Due to right-of-way requirements, the Gore Road Library access is consolidated with the Gore Road-Point St. Mark Drive intersection to the west to form a four-leg intersection.

2. The 85th percentile speed on all roadways within the project site location was assumed to be equal to the speed limit.

3. Commercial truck volumes were assumed at 2 percent.

4. The ideal saturation flow was assumed at 1,800 vehicles per hour.

5. A minimum turning movement volume was assumed at five vehicles per hour.

6. Cycling movements were assumed at ten per hour per leg of intersection.

7. Pedestrian crossings were assumed at ten per hour per leg of intersection.

A. Observations

Table 4.4 shows the estimated storage lengths at each of the four intersections within the project site location that would be required to achieve the City’s minimum acceptable LOS target of LOS D under projected 2019 and 2029 traffic conditions. Similarly, lane requirements at the project site location are summarized in Table 4.5 below.
PROJECT: CATARAQUI RIVER THIRD CROSSING  
EA - STAGE 2  
ENVIRONMENTAL STUDY REPORT

DRAWING: PROJECTED 2029 PM PEAK HOUR TRAFFIC VOLUMES

J.L. Richards & Associates Limited  
230-383 Princess Street  
Kingston, ON Canada  
K7L 4N4  
Tel: 613 544 4424  
Fax: 613 544 5078

FILE LOCATION: P:\23000\23446-02 - Cataraqui River EA - Stage 2\23443-02 - Third Crossing ESR\Figures\Figure 4-1 & 4-2.dwg

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GORE ROAD - KINGSTON ROAD 15  
CORRIDOR

JOHN COUNTER BOULEVARD - MONTREAL STREET  
CORRIDOR
### Table 4.4

<table>
<thead>
<tr>
<th>Intersection</th>
<th>West Approach</th>
<th>East Approach</th>
<th>South Approach</th>
<th>North Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Counter Boulevard / Montreal Street</td>
<td>70 m shared thru-left / 30 m</td>
<td>30 m / channelized right</td>
<td>100 m / thru-right</td>
<td>35 m / thru-right</td>
</tr>
<tr>
<td>(Signal Control)</td>
<td>(105 m shared thru-left / 30 m)</td>
<td>(35 m / channelized right)</td>
<td>(120 m / thru-right)</td>
<td>(55 m / thru-right)</td>
</tr>
<tr>
<td>John Counter Boulevard / Ascot Lane</td>
<td>thru-left / N/A</td>
<td>thru-left / thru-right</td>
<td>thru-left / thru-right</td>
<td>thru-left / thru-right</td>
</tr>
<tr>
<td>(Stop Sign Control)</td>
<td>(thru-left / N/A)</td>
<td>(N/A / thru-right)</td>
<td>(N/A / thru-right)</td>
<td>shared left / thru-right</td>
</tr>
<tr>
<td>Gore Road / Point St. Mark Drive / Gore Road Library</td>
<td>thru-left / thru-right</td>
<td>thru-left / thru-right</td>
<td>shared left / thru-right</td>
<td>shared left / thru-right</td>
</tr>
<tr>
<td>(Signal Control)</td>
<td>thru-left / thru-right</td>
<td>thru-left / thru-right</td>
<td>(shared left / thru-right)</td>
<td>(shared left / thru-right)</td>
</tr>
<tr>
<td>Gore Road / Kingston Road 15</td>
<td>N/A / 30 m</td>
<td>50 m / thru-right</td>
<td>90 m dual left / thru-right</td>
<td>50 m / thru-right</td>
</tr>
<tr>
<td>(Signal Control)</td>
<td>(N/A / 30 m)</td>
<td>(50 m / thru-right)</td>
<td>(120 m dual left / thru-right)</td>
<td>(50 m / thru-right)</td>
</tr>
</tbody>
</table>

### Table 4.5

<table>
<thead>
<tr>
<th>Intersection</th>
<th>West Approach</th>
<th>East Approach</th>
<th>South Approach</th>
<th>North Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Counter Boulevard / Montreal Street</td>
<td>One left-turn</td>
<td>One left-turn</td>
<td>One left-turn</td>
<td>One left-turn</td>
</tr>
<tr>
<td>(Signal Control)</td>
<td>One shared thru-left</td>
<td>Two thru</td>
<td>Two thru</td>
<td>One right-turn</td>
</tr>
<tr>
<td></td>
<td>One thru</td>
<td>One right-turn</td>
<td>One right-turn</td>
<td>One left-turn</td>
</tr>
<tr>
<td></td>
<td>One right-turn</td>
<td></td>
<td></td>
<td>One right-turn / right-turn</td>
</tr>
<tr>
<td>John Counter Boulevard / Ascot Lane</td>
<td>One left-turn</td>
<td>One left-turn</td>
<td>Shared left / thru / right</td>
<td>Shared left / thru / right</td>
</tr>
<tr>
<td>(Stop Sign Control)</td>
<td>Two thru</td>
<td>Two thru</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>One left-turn / thru / right</td>
<td>One left-turn</td>
<td>Shared left / thru / right</td>
<td>Shared left / thru / right</td>
</tr>
<tr>
<td></td>
<td>Two thru</td>
<td>Two thru</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gore Road / Point St. Mark Drive / Gore Road Library</td>
<td>One left-turn</td>
<td>One left-turn</td>
<td>Shared left / thru / right</td>
<td>Shared left / thru / right</td>
</tr>
<tr>
<td>(Signal Control)</td>
<td>Two thru</td>
<td>Two thru</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One left-turn / thru / right</td>
<td>One left-turn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two thru</td>
<td>Two thru</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gore Road / Kingston Road 15</td>
<td>One left-turn</td>
<td>One left-turn</td>
<td>One left-turn</td>
<td>One left-turn</td>
</tr>
<tr>
<td>(Signal Control)</td>
<td>One shared thru-left</td>
<td>One shared thru-right</td>
<td>One left-turn</td>
<td>One right-turn</td>
</tr>
<tr>
<td></td>
<td>One right-turn</td>
<td>One shared thru-right</td>
<td>One shared thru-right</td>
<td>One shared thru-right</td>
</tr>
<tr>
<td></td>
<td>One shared thru-right</td>
<td>One shared thru-right</td>
<td>One shared thru-right</td>
<td>One shared thru-right</td>
</tr>
</tbody>
</table>
.3 The Potential for Short Cutting at the Project Site Location

This section considers the potential for short cutting to occur within the project site location after the bridge is built. Short cutting is defined as an unintended intrusion resulting from traffic choosing to drive on a shorter public road route (or the ‘short cut route’) rather than remain on the main public road route (or the ‘direct route’).

There are two potential opportunities for short cutting within the project site location. The first is through the Point St. Mark residential neighbourhood. Traffic taking the direct route, namely, Gore Road-to-Kingston Road 15 southbound, would encounter one signalized intersection at Gore Road and Kingston Road 15. Traffic taking the short cut route, namely, Gore Road-to-Point St. Mark Drive-to-Barker Drive-to-Point St. Mark Drive-to-Kingston Road 15 southbound, would encounter one signalized intersection at Kingston Road 15 and Point St. Mark Drive.

Under “Scenario I”, delays of 35 seconds to 55 seconds are expected in 2019 at the west approach of the Gore Road-Kingston Road 15 intersection. The eastbound left-turning traffic at this intersection would have to wait for an appropriate gap in the northbound traffic on Kingston Road 15, thereby creating queues and causing delay to eastbound right-turning and through traffic. Similarly, it is anticipated that northbound left-turning traffic could experience delays of 35 seconds to 55 seconds at this intersection. Northbound left-turning traffic would have to wait for an appropriate gap in the southbound traffic on Kingston Road 15. Drivers may have a perceived notion of gaining a time savings by using the short cut route through the Point St. Mark neighbourhood to avoid delays at the signalized intersection at Gore Road and Kingston Road 15.

Any additional traffic to the Gore Road-Point St. Mark intersection generated through short cutting is expected to result in a poor LOS at that intersection, in particular at its south leg (shared left/through/right). The short cut route through the Point St. Mark neighbourhood is also virtually equal in distance to the direct route of Gore Road-to-Kingston Road 15. It can therefore be expected that these conditions would discourage those drivers who would be inclined to use the Point St. Mark neighbourhood as a potential short cut route.

The second potential opportunity for short cutting is through the Village On The River apartment parking lot. Traffic taking the direct route, namely, John Counter Boulevard-to-Montreal Street southbound, would encounter one signalized intersection at John Counter Boulevard and Montreal Street. Traffic taking the short cut route, namely, John Counter Boulevard-to-the Village On The River apartment parking lot-to-Montreal Street southbound, would encounter one stop sign controlled intersection at Montreal Street. However, the speed of traffic traveling through the Village On The River apartment parking lot would be very slow as the route through the parking lot is circuitous and the travel lanes are narrow compared to travel on the direct route. As such, there is not expected to be a travel time savings by traveling through the Village On The River parking lot compared with traveling on the direct route.

The potential for short cutting should be monitored by the City after the bridge is built. There are a number of solutions that can be implemented to address this issue, should it arise. These include:

1. Monitoring signal timings to optimize traffic flow on the main public roads.
2. Building out curb radii to restrict vehicular turns.
3. Installing speed humps to slow down traffic.
4. Creating restrictions within the local road system such as one-way streets, restricted turns and dead end roads.
5. Installing traffic signage restricting vehicular turns either at all times or during certain times of the day.

4.1.2 Ecological Conditions – Land

This section of the Report discusses the terrestrial ecological fieldwork undertaken at the project site location and surrounding area. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following three sub-sections:

1. Ecological Land Classifications for the east and west side lands.
2. Faunal species inventory findings.
edges such as Ragweed, Burdock, Sow Thistle and Mullein. No trees that are listed in either the OESA or the Federal SARA are present.

As also highlighted on Drawing 4.3, there are four ELC community types found on the east side lands:

1. **‘Cultural Thicket’ (CUT) community type** is found within the Gore Road right-of-way. It is characterized as having a shrub cover greater than 25 percent and a tree cover of less than 25 percent.

   There are a few large diameter Sugar Maple, Red Oak, White Oak and Bur Oak trees that are likely over 100 years old, and a number of shrub-sized White Ash and Manitoba Maple, but the overall dominant species that characterizes this area is European Buckthorn. Other shrub species include Tartarian Honeysuckle, Staghorn Sumac, and Riverbank Grape. The ground cover is mostly weedy non-native species such as Knapweed, Burdock, Trefoil, Fragrant Bedstraw (native), Thistles, Dames Rocket, Crown Vetch, and Garlic Mustard. Many of the dominant plant species present are considered Category I invasive species.

Site disturbances include an underlay of large rock fill that appears to have been recently laid down, making much of the Gore Road right-of-way roughly 6 to 8 m higher in elevation than the woodlot to the north. As well, yard waste and detritus have been dumped into this area.

The shoreline component (about the first 20 m) of the Gore Road right-of-way is dominated by tree cover, but this area is too small to be considered a separate ELC community. The main tree species along the shoreline is Crack Willow, but Manitoba Maple and European Buckthorn are also noted down to the shoreline. Off-shore, there is little wetland vegetation, possibly due to the deposited rock fill and the existing limestone pavement. A fringe of Narrow-leaved Cattails extends to the north and south.

(B) A CUT patch is also located west of the Gore Road Library, and extends into the off-leash dog park. Weedy species are common. Riverbank Grape is abundant along with Buckthorn and Staghorn Sumac, though there is no clear dominant species. Manitoba Maple is the most common tree.

2. **‘Dry-Fresh Sugar Maple – White Ash Deciduous Forest’ (FODS-8)** is found north of the Gore Road right-of-way and extends northward in fragmented segments to the Pittsburgh quarry operation. This forest type is typical of lands that have a history of disturbance. The dominant canopy tree species is Sugar Maple, with lesser amounts of White Ash. Manitoba Maple, Ironwood, Black Cherry, Shagbark Hickory, Basswood, Red Oak and White Oak are also present. It appears, based on historic photographs from 1945, 1953, 1962 and 1978, that much of the FODS-8 forest area was used for agricultural purposes. This would coincide with the mostly young age of the woodlot, with many of the trees in the 30-year range. There are a few older trees in the 80-100 year range that, in the historic aerial photographs, are isolated within the agricultural areas.

This woodlot has a high degree of edge due to its uneven shape, and has high fragmentation due to the numerous trails within it. Common trees in the edge include Manitoba Maple and White Ash, but European Buckthorn dominates, with Garlic Mustard as a common understory plant. Overall, the Buckthorn-dominated edge areas are almost greater in size than the area dominated by Sugar Maple.

The woodlot also contains two drainage routes (shown as circles on Drawing 4.3) that collect groundwater from the Point St. Mark residential neighborhood and direct it to the Cataraqui River. During the numerous site visits in 2009 and 2010, the drainage routes were seen to be dry only once, but they do not provide fish habitat. The more easterly drainage route discharges at the base of the rock fill, near the current Gore Road-Point St. Mark Drive intersection. The other drainage route discharges within the FODS-8 area, roughly 50 m west and 20 m north of the first discharge point at the base of the rock fill.

The shoreline component of the FODS-8 area has an approximate 15 m wide verge of wetland vegetation that is too small to be considered a separate ELC community type.

3. **The ‘Cultural Woodland’ (CUW) area** is found in the southwest quadrant of the Gore Road-Point St. Mark Drive intersection. This area is also too small [less than 0.5 hectares (ha)] to be considered a separate ELC type, but it is noted here. Like the nearby FODS-8 woodland, Sugar Maple and White Ash are common, but numerous other tree species are also present, many of which were likely planted. The ground cover and shrub layers are mostly weedy non-native species.

4. The two ‘Cultural Meadow’ (CUM) patches, like most cultural meadows within urban settings, are dominated by weedy species and both have a history of disturbance. The more easterly CUM area adjacent to Kingston Road 15 is part of the off-leash dog park.

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20 Category I species are those species that can dominate a site to the exclusion of all other species and remain on-site indefinitely.
.2 Faunal Species Inventory Findings

The fieldwork on faunal species was conducted during 2010 concurrent with the ELC fieldwork.

A. Methodology

1. Turtle Trapping

Turtle trapping was undertaken at the project site location and surrounding areas. Hoop traps and basking traps were used. The hoop traps were baited with sardines and set such that a portion of the enclosure was above water, thereby allowing any trapped turtles to surface for air. The basking traps are more passive in that they provide a basking surface for the turtles. Turtles that slipped off this surface went into the interior of the trap, from where they were able to surface for air, but not escape.

Traps were placed in a site and their locations marked, as shown on Drawing 4.4. Site visits were then carried out from July to September, 2010 (July 7, 8, 15, 16, 26, 27; August 6, 7, 13, 14, 18, 19, 25; and September 2, 3, 19, 20). Parks Canada resource management personnel were advised of site visit dates in order to coordinate fieldwork activities. Weather forecasts were also checked to determine days that would have the highest probability for trapping the turtles. The traps were inspected late in the day, then left overnight and re-visited and removed the following day. In this way, no turtle remained in a trap for over 24 hours. Information sought on the trapped turtles included date of inspection, species, weight, sex, length, location and photographic documentation.

2. Birds

Birds were surveyed both prior to and during Stage 2 of this EA study in 2008, 2009 and 2010. Most of the identifications were made by sight and/or call, but recorded calls were also used to lure certain target species, particularly Species at Risk and/or species with historical but no recent records of sightings.

3. Other Fauna

Other animal species were not surveyed specifically, but any observations made were recorded during the site visits. Anecdotal reports from area residents were also noted.

B. Observations

1. Turtles

Very few turtles were observed or caught during the 2010 fieldwork. The fieldwork results are summarized in Table 4.6 below.

<table>
<thead>
<tr>
<th>Date</th>
<th>Trap Type</th>
<th>Species</th>
<th>Weight (g)</th>
<th>Sex</th>
<th>Length (cm)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-26-10</td>
<td>Observed</td>
<td>Snapping</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>08-13-10</td>
<td>Basking</td>
<td>Painted</td>
<td>300</td>
<td>Male</td>
<td>13</td>
<td>N44° 15.712' W076° 28.654'</td>
</tr>
<tr>
<td>08-13-10</td>
<td>Basking</td>
<td>Painted</td>
<td>200</td>
<td>Female</td>
<td>11</td>
<td>N44° 15.712' W076° 28.654'</td>
</tr>
<tr>
<td>08-25-10</td>
<td>Observed</td>
<td>Painted</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

It is recognized that other turtles are present in this area, based on previous fieldwork. For example, Parks Canada resource management personnel conducted turtle trapping in this area during 2008 and 2010. In 2008, Parks Canada reported Painted Turtles (60), Stinkpot Turtles (1), Snapping Turtles (1), Map Turtles (2), and a Red-eared Slider (1), the latter of which is a non-native species and was likely a pet release or escape. In 2010, Parks Canada reported Painted Turtles (22), Snapping Turtles (4) and Map Turtles (3), as well as basking Map Turtles observed across from the visible cattail marsh portion of the Greater Cataraqui Marsh wetland to the north of the project site location.

In general, the area of the Greater Cataraqui Marsh is known to support turtles. The most abundant turtle in the system is clearly the Painted Turtle, based on all the sampling done in 2010 and previous years. All turtle species with the exception of the Painted Turtle are at some level of risk: all are S3 or vulnerable, except for the Painted Turtle (S5) and the Red-eared Slider (SNA). Moreover, the Stinkpot Turtle and Blanding’s Turtle are considered to be Threatened, whereas the Map Turtle and Snapping Turtle are species of Special Concern.

2. Birds

Bird species observed during the 2008-2010 fieldwork are summarized in Table 4.7 below.  

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Table 4.7: Summary of 2008-2010 Fieldwork Observations: Birds

<table>
<thead>
<tr>
<th>Species</th>
<th>Date</th>
<th>Trap Type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diving Petrel</td>
<td>08-10-10</td>
<td>Basking</td>
<td>N44° 15.712' W076° 28.654'</td>
</tr>
<tr>
<td>American Golden-Plover</td>
<td>08-10-10</td>
<td>Basking</td>
<td>N44° 15.712' W076° 28.654'</td>
</tr>
</tbody>
</table>

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21 Data presentation and rarity information modified from the Natural Heritage Information Center (NHIC) website: <http://nhic.mnr.gov.on.ca/>. The S-rank designates rarity in Ontario as follows: S3 (Vulnerable – Vulnerable in the nation or state/province due to a restricted range, relatively few populations [often 80 or fewer], recent and widespread declines, or other factors making it vulnerable to extirpation); S4 (Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors); S5 (Secure – Common, widespread and abundant in the nation or state/province); and SNA (Not Applicable – A conservation status rank is not applicable because the species is not a suitable target for conservation activities). B refers to breeding status; SC is a species of Special Concern; and NAR is a species that has been evaluated, but is considered Not at Risk.
### Table 4.7
Summary of 2008-2010 Fieldwork Observations: Birds

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Common Name</th>
<th>S-Rank</th>
<th>Federal Status</th>
<th>Provincial Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agelaius phoeniceus</td>
<td>Red-winged Blackbird</td>
<td>S5B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aix sponsa</td>
<td>Wood Duck</td>
<td>S5B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anas americana</td>
<td>American Wigeon</td>
<td>S4B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anas platyrhynchos</td>
<td>Mallard</td>
<td>S5B</td>
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<td></td>
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<tr>
<td>Anas rubripes</td>
<td>American Black Duck</td>
<td>S4B</td>
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<td></td>
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<tr>
<td>Anas strepera</td>
<td>Gadwall</td>
<td>S4B</td>
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<tr>
<td>Ardea herodias</td>
<td>Great Blue Heron</td>
<td>S5B</td>
<td></td>
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<td>Aythya affinis</td>
<td>Lesser Scaup</td>
<td>S4B</td>
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<td>Aythya collaris</td>
<td>Ring-necked Duck</td>
<td>S5B</td>
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<tr>
<td>Aythya marila</td>
<td>Greater Scaup</td>
<td>S4B</td>
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<td>Bombycilla cedrorum</td>
<td>Cedar Waxwing</td>
<td>S5B</td>
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<td>Branta canadensis</td>
<td>Canada Goose</td>
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<td>Bucephala albeola</td>
<td>Bufflehead</td>
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<td>Bucephala clangula</td>
<td>Common Goldeneye</td>
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<tr>
<td>Butorides virescens</td>
<td>Green Heron</td>
<td>S4B</td>
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<td>Cardinalis cardinalis</td>
<td>Northern Cardinal</td>
<td>S5</td>
<td></td>
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<td>Carduelis tristis</td>
<td>American Goldfinch</td>
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<tr>
<td>Charadrius vociferus</td>
<td>Killdeer</td>
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<td>Chlidonias niger</td>
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<td>SC</td>
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<td>Colaptes auratus</td>
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<td>Corvus brachyrhynchos</td>
<td>American Crow</td>
<td>S5B</td>
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<tr>
<td>Cygnus columbianus</td>
<td>Tundra Swan</td>
<td>S4B</td>
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<td></td>
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<tr>
<td>Dendroica petechia</td>
<td>Yellow Warbler</td>
<td>S5B</td>
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<tr>
<td>Dryocopus pileatus</td>
<td>Pileated Woodpecker</td>
<td>S5</td>
<td></td>
<td></td>
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<tr>
<td>Dumetella carolinensis</td>
<td>Gray Catbird</td>
<td>S5B</td>
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<tr>
<td>Fulica americana</td>
<td>American Coot</td>
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<td>NAR</td>
<td>NAR</td>
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<td>Gallinula chloropus</td>
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<td>S4B</td>
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<td>Hydroprogne caspia</td>
<td>Caspian Tern</td>
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<td>NAR</td>
<td>NAR</td>
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<td>Larus argentatus</td>
<td>Herring Gull</td>
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<td>Larus delawarensis</td>
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<td>Lophodytes cucullatus</td>
<td>Hooded Merganser</td>
<td>S5B</td>
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<tr>
<td>Melospiza georgiana</td>
<td>Swamp Sparrow</td>
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<td>Melospiza melodia</td>
<td>Song Sparrow</td>
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<td>Common Merganser</td>
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<td>Molothrus ater</td>
<td>Brown-headed Cowbird</td>
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<td>Myiarchus crinitus</td>
<td>Great Crested Flycatcher</td>
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<td>Pandion haliaetus</td>
<td>Osprey</td>
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<td>Passer domesticus</td>
<td>House Sparrow</td>
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<td>Double-crested Cormorant</td>
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<td>NAR</td>
<td>NAR</td>
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<tr>
<td>Picoides pubescens</td>
<td>Downy Woodpecker</td>
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<td>Picoides villosus</td>
<td>Hairy Woodpecker</td>
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<td>Podilymbus podiceps</td>
<td>Pied-billed Grebe</td>
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<td>Poecile atricapillus</td>
<td>Black-capped Chickadee</td>
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<tr>
<td>Progne subis</td>
<td>Purple Martin</td>
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Table 4.7 Summary of 2008-2010 Fieldwork Observations: Birds

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Common Name</th>
<th>S-Rank</th>
<th>Federal Status</th>
<th>Provincial Status</th>
</tr>
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<tbody>
<tr>
<td>Quiscalus quiscula</td>
<td>Common Grackle</td>
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<tr>
<td>Spizella passerina</td>
<td>Chipping Sparrow</td>
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</tr>
<tr>
<td>Stelgidopteryx semipennis</td>
<td>Northern Rough-winged Swallow</td>
<td>S5B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sterna hirundo</td>
<td>Common Tern</td>
<td>S4B</td>
<td>NAR</td>
<td>NAR</td>
</tr>
<tr>
<td>Sturnus vulgaris</td>
<td>European Starling</td>
<td>SNA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tachycineta bicolor</td>
<td>Tree Swallow</td>
<td>S5B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thryothorus ludovicianus</td>
<td>Carolina Wren</td>
<td>S4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Troglodytes aedon</td>
<td>House Wren</td>
<td>S5B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turdus migratorius</td>
<td>American Robin</td>
<td>S5B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vireo gilvus</td>
<td>Warbling Vireo</td>
<td>S5B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zenaida macroura</td>
<td>Mourning Dove</td>
<td>S5B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There has been a considerable amount of previous work done on birds in the Greater Cataraqui Marsh, with 206 bird species having been observed to date. Its visible cattail marsh portion north of the project site location is the area of greatest value to birds, providing nesting habitat for bitterns, waterfowl, moorhens, rails and Black Terns, as well as roosting habitat for large numbers of migratory swallows. The open waters are important to migratory waterfowl in both spring and fall. The western shoreline of the Cataraqui River, particularly within 100 m of shore, is also important to both resident/breeding and migratory waterfowl. The shallow waters of the Cataraqui River provide rich feeding sections for waterfowl. Thousands of birds, representing over a dozen species, congregate in the area in both spring and fall.

Based on Natural Heritage Information Center (NHIC) records, there were only three at risk bird species listed within the project site location, namely:

1. The Northern Bobwhite, which is from an 1856 record. It should be noted that this species never established in the Kingston area and that none have been reported since 1859.
2. The King Rail, which is from a 1956 record. This species should be considered a very rare irregular spring and summer resident.

3. The Least Bittern, which though considered an uncommon regular summer resident, should be assumed to be present in the area, if only periodically. This is a species that is closely associated with emergent vegetation such as the visible cattail marsh to the north of the project site location.

3. Other Fauna

Other fauna species present are those normally found in a near urban site and are mostly considered habitat generalists. There is some species movement, including Red Fox that may hunt in the adjacent residential areas.

In addition, there are unconfirmed reports that Eastern Milk Snake also use the rock fill area at the end of Gore Road as a hibernaculum. While Eastern Milk Snakes were not observed during the fieldwork, a hibernaculum is conceivable due to the many crevices provided by the rock fill near the current Gore Road-Point St. Mark Drive intersection in the east side lands area (on a related note, Milk Snakes have been observed on nearby properties). The adjacent FOD5-8 area to the north is not ideal Milk Snake habitat, but the CUM area further north as well as the land around the Gore Road Library and the adjacent rear yard lawns in the Point St. Mark residential neighborhood could provide suitable habitat. The Eastern Milk Snake is relatively common in the Kingston area, but it is rare in Ontario (species of Special Concern) and across Canada (COSEWIC species of Special Concern). It is in Part 4 (species of Special Concern) of Schedule 1 of the Federal SARA. Species of Special Concern are wildlife species that may become a threatened or endangered species because of a combination of biological characteristics and identified threats. Though SARA prohibitions do not apply to species of Special Concern, the Milk Snake is protected under the Ontario 'Fish and Wildlife Conservation Act', where it is forbidden to hunt, trap, kill, trade, or hold in captivity these snakes without a permit.

3. Greater Cataraqui Marsh Wetland Vegetation

A. Methodology

The Greater Cataraqui Marsh is designated as both a Provincially Significant Wetland (PSW) and Provincially Significant Coastal Wetland, extending from the Woolen Mill / Barriefield area in the southern portion of the EA study area to just north of Highway 401. The Greater Cataraqui Marsh is the most significant ecological system on the landscape (based on the OWES, its visible cattail portion north of John Counter Boulevard has higher ecological diversity (more plant and animal species) and greater potential for pollution/erosion/flood control than the southern portion). The Rideau Canal’s navigable channel and the dredged access route for the Music Marina at the end of John Counter Boulevard within the project site location are excluded from the Greater Cataraqui Marsh PSW.

The ecological value of the vegetation that is part of the Greater Cataraqui Marsh at the project site location and surrounding area was assessed during Stage 2 of this EA study. The assessment was based...
on three sources, namely: i) historic mapping done for the wetland area in 1990; ii) the 2011 marine ecological fieldwork also done during Stage 2 of this EA study and discussed later in this Report; and iii) aerial imagery dating back roughly 50 years.

B. Observations

Drawing 4.5 illustrates four vegetation communities within the project site location and surrounding area. As described below, they have been documented in a manner generally consistent with both wetland evaluation protocols and the OWES:

1. ‘suW1’ and ‘OW’: The majority of the project site location passes over only one vegetation type (suW1) and the balance over open water areas (OW). The suW1 community is a vegetation community with only one vegetation form (submerged vegetation), dominated in 1990 by Milfoil. The OW areas are non-vegetated areas, which in this area is due to the maintenance of dredged channels for watercraft. As noted above, these areas are not part of the Greater Cataraqui Marsh PSW.

2. ‘suW2’: The suW2 community is found north and south of the project site location along the west shoreline. It consists of two vegetation forms (submerged vegetation and floating-leaved plants), dominated in 1990 by Milfoil and Waterlilies. This is consistent with current conditions. It is noted that the suW2 areas appear to be slightly more extensive in 2011 than in 1990, and aerial extent has increased both north and south of the project site location.

3. ‘reM3’: The reM3 community is made up of two vegetation forms (robust emergents and narrow-leaved emergents), dominated in 1990 by cattails and grasses. This is also consistent with current conditions. It is noted that the reM3 areas may be slightly more extensive in 2011 than in 1990, but the patches mapped on the east side of the Cataraqui River may not meet the minimum size criteria for mapping purposes of the OWES.

4. ‘reM6’: The reM6 community consists of two vegetation forms (robust emergents and ground cover), dominated in 1990 by cattails and Purple Loosestrife. It is south of the project site location, proximate to Belle Island.

In comparing the 1990 and 2011 wetland mapping and aerial imagery, it is evident that there has been little change to the Greater Cataraqui Marsh or its dominant vegetation in the intervening years. Despite some cattail infilling in the ponded areas within the main cattail swales, there has been no encroachment of the visible cattails into the project site location. There has also been limited Phragmites invasion in the Greater Cataraqui Marsh which, in eastern Ontario, is mainly apparent in marginal wet areas such as roadside ditches or roadside wetland areas.

4.1.3 Ecological Conditions – Marine

This section of the Report discusses the marine ecological fieldwork undertaken at the project site location and surrounding area. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following two sub-sections:

1. General setting.
2. Habitat description.

.1 General Setting

The Cataraqui River is roughly 1,150 m wide at the project site location and has water depths ranging from about 1.5 m over the majority of the section to approximately 4.5 m at the Rideau Canal’s navigable channel. Water flow speed at the project site location is estimated to be 0.4 m/s. The riverbed substrate consists of soft, unconsolidated muck. The shoreline substrate includes bedrock, boulders, cobbles, gravels and fines. Some areas are hardened with large boulders and/or rip rap. The shorelines also have a variety of riparian vegetation types such as wetland, forested areas that are limited mainly to the east shoreline, manicured parkland with scattered trees and manicured grass to the water’s edge. The shorelines are exposed to wave action from boats either passing through the canal’s navigable channel or using the dredged access route that extends from the channel to the Music Marina located north of John Counter Boulevard. The Cataraqui River, as part of the Greater Cataraqui Marsh PSW, is listed as having a regional significance in terms of fish spawning and rearing potential. Fish habitat is considered to be warm-water, though salmonids are known to migrate north through the area towards Kingston Mills.

.2 Habitat Description

A. Methodology

As shown on Drawing 4.6, in order to assess the potential impacts from a bridge crossing on aquatic habitat, the project site location and the adjacent 500 m upstream and downstream areas were divided into west side, mid channel and east side zones. Information on fish and fish habitat was collected by the following methods:

1. Five shoreline transects were created (two on the west side and three on the east side). The shoreline transects were established perpendicular to the shoreline and extended in-water up to a 1 m water depth. Information on the substrate, aquatic vegetation and available cover was recorded at every 1 m interval. This data was then used to create profiles of the shoreline habitat.
2. Twelve offshore transects were established (four transects within each of the three zones) with each transect varying from 40-60 m. Information was collected on aquatic and riparian vegetation, shore substrate, topography (onshore and offshore) as well as water depths, substrate, structure and quality (dissolved oxygen, temperature, turbidity). In addition, as requested by Parks Canada, samples of pondweed (*Potamogeton sp.*) were taken from each transect for analysis due to the potential for Ogden’s Pondweed (*Potamogeton ogdenii*) to occur in the area.

3. Fish community sampling was done using a boat electroshocker and bag seine net. The boat electrofishing was completed along the twelve offshore transects and the seine netting along three of the five shoreline transects. The boat sampling was done during the night on April 12, July 19 and October 17, 2010. The seine netting was completed during the day at four sites on July 20 and October 18, 2010. All fish were identified, measured [fork length (FL) or total length (TL) depending on the species] and released unharmed prior to continuing to the next site.

**B. Observations**

The marine ecological fieldwork results are summarized in Table 4.8 and the profiles of the shoreline habitat are shown on Drawing 4.6. The results indicate that the habitat within the project site location area was fairly homogenous consisting of a slow moving glide with fine sediments and dense submersgent vegetation. The aquatic vegetation along the shoreline within the bay created by Belle Island consisted mainly of extremely dense floating and submersgents with a thin band of emergant cattails. Offshore, but still within the bay at the mid channel sites, the vegetation was choked with dense subemergent vegetation. The Rideau Canal’s navigable channel contained the deepest habitat, but lacked aquatic vegetation. The presence and role of the canal’s channel helps to reduce the density of aquatic vegetation both within the channel itself and along the east side of the Cataraqui River. The aquatic vegetation within and proximate to the dredged access route that extends from the canal’s channel to the Music Marina located north of John Counter Boulevard was similarly less dense as well.

The only spawning activity observed during the spring, summer and fall field sampling consisted of Yellow Perch which were found spawning throughout the mid channel sites during the spring visit. However, the presence of young-of-the-year (YOY) Pumpkinseed, Bluegill, Largemouth Bass and the occasional Rock Bass and Brown Bullhead suggests that these species are also spawning within the project site location area. Overall, the fish species found during the spring, summer and fall field sampling were mainly common warm to cool water sport and forage fish that prefer slow moving water bodies and spawn within aquatic vegetation or algae. The sportfish captured were Northern Pike, White Sucker, Yellow Bullhead, Brown Bullhead, Rock Bass, Pumpkinseed, Bluegill, Largemouth Bass, Black Crappie and Yellow Perch.

In addition, there were no Species at Risk (SAR) or species of conservation value caught or observed during the fieldwork. Still, based on additional background research and discussions with officials at the Ontario Ministry of Natural Resources, Parks Canada and Fisheries and Oceans Canada, five SAR species and five species of conservation value were noted as potentially occurring in the project site location area. These species are discussed in Table 4.9 below. As indicated, based on existing conditions and records, only the American Eel and Pugnose Shiner are considered as ‘potentially occurring’ in the project site location area.

4.1.4 Cultural Heritage

This section of the Report discusses the cultural heritage resources at the project site location. It is divided into the following four sub-sections:

1. Fieldwork methodology.
2. The Rideau Canal.
3. The Gore Road Library.
4. The west side lands.
5. Viewscape Considerations.

### 1 Fieldwork Methodology

The more detailed accounting of cultural heritage resource conditions at the project site location involved the following activities:

1. The review of the cultural heritage survey work done as part of Stage 1 of this EA study.
2. Library and archival research at the Library and Archives of Canada, the National Air Photo Library, Queen’s University Archives, the Frontenac Land Registry Office, the Gore Road Library and City of Kingston municipal offices.
4. Consultations with staff at the City and Parks Canada as well as local historians and historic materials experts.

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22 Note the location and number of seine netting sites was restricted due to the dense aquatic vegetation, especially on the west bank, and the rocky shoreline on the east bank.

23 Note that: i) the presence of docks and fishing nets prevented sampling within the east side zone south of the project site location; and ii) sampling was restricted during the summer and fall due to dense aquatic vegetation.
<table>
<thead>
<tr>
<th>Shoreline Habitat Profile</th>
<th>West Side Zone</th>
<th>Mid Channel Zone</th>
<th>East Side Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shoreline Transect</td>
<td>Offshore Transect</td>
<td>Shoreline Transect</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td>White water-lily and stonewort at the shoreline.</td>
<td>Reed canary grass, cattails, flowering rush buckthorn, nannberry, staghorn sumac at the shoreline.</td>
<td>Reed canary grass, hog-peanut, black medick, common buckthorn, dogwood, red oak, crack willow and white ash at the shoreline.</td>
<td>Reed canary grass, cattails, fern, nannberry, white ash, field bindweed, meadowsweet at the shoreline.</td>
</tr>
<tr>
<td>100% in-stream cover (milfoil).</td>
<td>20% in-stream cover near-shore, increasing to 60% offshore (milfoil, Canada waterweed, tapegrass).</td>
<td>30% in-stream cover near-shore, increasing to 70% offshore (milfoil, Canada waterweed, tapegrass, flat-stem pondweed).</td>
<td>Sparse in-stream cover observed in the Fall only (Canada waterweed, tapegrass).</td>
</tr>
<tr>
<td>Substrate was soft and mucky.</td>
<td>Substrate was firm</td>
<td>Substrate was firm with a mix of boulders and fines.</td>
<td>Substrate was firm with a mix of boulders and fines.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring Fish Sampling:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Fish</td>
<td>174</td>
<td>163</td>
<td>155</td>
</tr>
<tr>
<td>Summer Fish Sampling:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Fish</td>
<td>59</td>
<td>81</td>
<td>125</td>
</tr>
<tr>
<td>Fall Fish Sampling:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Fish</td>
<td>97</td>
<td>69</td>
<td>194</td>
</tr>
</tbody>
</table>

Note:
1. The percentage of sportfish captured with the boat electrofisher and seine net were 83 percent and 86 percent, respectively.
2. The boat electrofishing catch across all the offshore transects was represented mainly by Yellow Perch (35 percent), Pumpkinseed (34 percent), Brook Silversides (10 percent) and Bluegill (8 percent).
3. The seine net catch at the shoreline transects was represented mainly by Yellow Perch (67 percent), Round Goby (9 percent), Pumpkinseed (7 percent) and Largemouth Bass (6 percent).
### Table 4.9
Summary of Potential Fish and Submergent Plant Species at Risk and Species of Conservation Value Occurring at the Project Site Location Area

<table>
<thead>
<tr>
<th>Species Type</th>
<th>Species Name</th>
<th>Common Name</th>
<th>S-Rank</th>
<th>Federal Status</th>
<th>Provincial Status</th>
<th>Preferred Habitat</th>
<th>Likelihood at Project Site Location Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Species at Risk</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>Acipenser fulvescens</td>
<td>Lake Sturgeon</td>
<td>S2</td>
<td>THR</td>
<td></td>
<td>Bottoms of lakes and large rivers; spawn in fast flowing waters.</td>
<td>Considered ‘unlikely to occur’ due to unsuitable habitat.</td>
</tr>
<tr>
<td>Fish</td>
<td>Lepisosteus oculatus</td>
<td>Spotted Gar</td>
<td>S1</td>
<td>THR</td>
<td>THR</td>
<td>Warm, shallow, slow-moving waters (streams, sloughs, lakes and swamps) with dense aquatic vegetation.</td>
<td>Suitable habitat but considered ‘unlikely to occur’ due to no records of the species in the area.</td>
</tr>
<tr>
<td>Fish</td>
<td>Notropis anogenus</td>
<td>Pugnose Shiner</td>
<td>S2</td>
<td>END</td>
<td>END</td>
<td>Quiet areas of large lakes, stagnant channels and large rivers (mainly on sand bottoms with organic detritus).</td>
<td>Considered as ‘potentially occurring’ due to suitable habitat.</td>
</tr>
<tr>
<td>Fish</td>
<td>Anguilla rostrata</td>
<td>American Eel</td>
<td>S1?</td>
<td>END</td>
<td></td>
<td>Near cover over muddy, silty bottoms of lakes, rivers and creeks.</td>
<td>Considered as ‘potentially occurring’ due to identified migrations through the area.</td>
</tr>
<tr>
<td>Aquatic Plants</td>
<td>Potamogeton ogdenii</td>
<td>Odgen’s Pondweed</td>
<td>SH</td>
<td>END</td>
<td>END</td>
<td>Shallow slow moving systems (typically highly alkaline).</td>
<td></td>
</tr>
<tr>
<td><strong>Species of Conservation Value</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>Esox americanus vermiculatus</td>
<td>Grass Pickerel</td>
<td>S3</td>
<td>SC</td>
<td>SC</td>
<td>Lakes, backwaters and sluggish pools of streams with mud bottom, aquatic vegetation and clear water.</td>
<td>Considered ‘unlikely to occur’ due to no records of the species in the area.</td>
</tr>
<tr>
<td>Fish</td>
<td>Moxostoma valenciennesi</td>
<td>Greater Redhorse</td>
<td>S3</td>
<td></td>
<td></td>
<td>Little is known; spawns in fast flowing waters; after spawn can be found in shallow slow moving areas.</td>
<td>Considered ‘unlikely to occur’ due to no records of the species in the area.</td>
</tr>
<tr>
<td>Fish</td>
<td>Macrhybopsis storeriana</td>
<td>Silver Chub</td>
<td>S2</td>
<td>SC</td>
<td>SC</td>
<td>Pools of slow moving streams having clean sand and gravel bottoms.</td>
<td>Suitable habitat but considered ‘unlikely to occur’ due to no records of the species in the area.</td>
</tr>
<tr>
<td>Fish</td>
<td>Notropis bifrenatus</td>
<td>Bridle Shiner</td>
<td>S2</td>
<td>SC</td>
<td>SC</td>
<td>Ponds, lakes and sluggish mud-bottomed pools of creeks and small-to-medium rivers with abundant submergent vegetation.</td>
<td>Suitable habitat but considered ‘unlikely to occur’ due to no records of the species in the area.</td>
</tr>
<tr>
<td>Aquatic Plants</td>
<td>Najas marina</td>
<td>Prickly Naiad</td>
<td>S1</td>
<td></td>
<td></td>
<td>Salt springs, brackish or highly alkaline waters.</td>
<td>Considered ‘unlikely to occur’ due to no records of the species in the area.</td>
</tr>
<tr>
<td>Aquatic Plants</td>
<td>Najas guadalupensis</td>
<td>Southern Naiad</td>
<td>S3</td>
<td></td>
<td></td>
<td>Alkaline, brackish and saline ponds, lakes, streams and coastal ponds.</td>
<td></td>
</tr>
</tbody>
</table>
As noted during the Stage 1 survey work, the cultural heritage context in the northern portion of the EA study area from Belle Island to Highway 401 should not be overlooked, given the presence of the Rideau Canal and Gore Road Library on the cultural heritage landscape. These two designated cultural heritage properties are situated within the project site location and are discussed further below.

.2 The Rideau Canal

As noted earlier, the Rideau Canal was built by the Royal Engineers between 1826 and 1832 to provide a secure alternate supply route in the event of a military blockade by the Americans. The canal is a UNESCO World Heritage Site (designated in 2007), National Historic Site (designated in 1925), Canadian Heritage River (designated in 2000) and Federally regulated navigable waterway. Parks Canada is responsible on behalf of the Federal government for managing and protecting the canal as a National Historic Site and Canadian Heritage River. Parks Canada is also responsible on behalf of the UNESCO World Heritage Committee for protecting the canal as a UNESCO World Heritage Site. The designations for the National Historic Site and Canadian Heritage River are restricted geographically to the territory owned by the Federal government, namely, the canal bed, the lands around the lock stations as well as Fort Henry and the Kingston fortifications (Fort Frederick and the Murney, Shoal and Cathcart Martello Towers) in the southern portion of the EA study area. Parks Canada is an approval authority for any proposed developments within these areas. The UNESCO World Heritage Site designation includes these areas, plus a 30 m buffer zone along the shoreline and an as-yet-undefined area of ‘visual impact’.

In the spirit of both guiding the EA study and design process and confirming its own role as an approval authority, Parks Canada articulated the heritage values and strategic principles of the section of the canal within the EA study area (or ‘the lower Cataraqui section’). Prepared in 2010, the ‘Heritage Values and Guiding Principles for the Cataraqui River Sector of the Rideau Canal’ cites the lower Cataraqui section as a rare example of the waterway where the landscape was not altered during canal construction. Over the intervening 178 years, the extensive wetlands of the Great Cataraqui Marsh, as well as the river valley’s sloped physiography and forested landscapes adjacent to the navigation channel proceeding south from Highway 401 have remained largely intact. As such, Parks Canada’s report focuses the key heritage values of the lower Cataraqui section of the canal on its historic, ecological and visual inter-relationships with the waterway and shorelands; the through-navigation of the canal system itself; and its extensive wetlands and other natural heritage elements. These key heritage values are then reflected in the following strategic principles that serve to guide and inform proposed ‘development projects’ in the lower Cataraqui section of the canal:

1. Recognize Parks Canada’s jurisdiction of the canal.
2. Protect and respect the heritage values of the canal as a UNESCO World Heritage Site and National Historic Site.
3. Maintain through-navigation of the canal system.
4. Increase the public’s understanding of and appreciation for the canal and provide a memorable visitor experience.

Five areas of concern specific to the intent of this EA study are also provided and focus on the need to:

1. Protect natural and cultural heritage resources.
2. Undertake First Nations consultations in accordance with the Federal Duty to Consult protocol.
3. Protect marine archaeological resources.
4. Maintain view sheds and visual linkages.
5. Enhance public understanding and visitor experience of the canal.

.3 The Gore Road Library

The Gore Road Library at 80 Gore Road is on a 17 ha parcel of land which is owned by the City. It forms a rough parallelogram bounded by the Cataraqui River to the west, Gore Road to the south, Kingston Road 15 to the east and an adjacent privately owned lot to the north. As shown on Drawing 4.7, in addition to the library building [which includes a 465 square metre (SM) addition at the rear], the property also contains a dry stone wall, off-leash dog park, fields and forested areas with walking paths and two parking areas that serve these functions. The Cataraqui River escarpment runs diagonally through the middle of the property, with the buildings, lawn, wall and the off-leash dog park located on the upper plateau, and the woodland, former fields and recreational pathways located on the escarpment and lower plateau.

The property was originally surveyed in the late 18th century. It was settled in 1839 by John Canniff Ruttan, a farmer from Adolphustown who became a prominent resident, councilor and one-time reeve of the former Pittsburg Township. The Ruttan family first settled in a log house elsewhere on the property, and later hired local stonemasons, Donald and Alexander Hay, to build the current one-and-a-half-storey stone house in 1863-6 (‘Hawthorn Cottage’). The Ordnance Survey prepared by the Royal Engineers in 1868 shows the house and a solid line curving west and south of the house in the current location of the dry stone wall, suggesting that the wall was also in place by 1868. The area in the lee of the wall is marked as
‘orchards’. This is consistent with the traditional practice of erecting a stone wall along the west sides of orchards to both protect fruit trees from prevailing winds and create a warmer microclimate.\(^{24}\)

The property stayed in the Ruttan family and continued to be farmed until the mid-20th century, whereupon it was subsequently subdivided and sold to the Bingham and MacLean families. In 1990 and 1992, the former Township of Pittsburgh purchased both properties from the MacLean family and used the property for municipal purposes. Following amalgamation in 1998, Hawthorn Cottage was renovated, with the addition of the library wing at the rear and restoration of the interior and exterior.

The Gore Road Library property was designated as a cultural heritage property by the City in 2007 under By-Law No. 2007-166 for its physical/design value, its historical/associative value and its contextual value. More specifically:

1. The physical/design value of the property resides in the 19th century stone house as a finely crafted example of the vernacular Classical Revival style; in the dry stone wall, which is one of only a few surviving examples of 19th Century dry stone walls in the area; the remains of the formal gardens around the house; and in the remnants of farming activities, including barns, barn foundations and orchards.

2. The historical/associative value of the property lies in its historic associations with the Ruttan and the Hay families.

3. The contextual value of the property pertains to its landmark status along Kingston Road 15, role as a City park and library and views of the Rideau Canal.

By-Law No. 2007-166 lists heritage attributes of the property which must be conserved in order to retain its heritage value. These include: i) the interior and exterior of the stone house; ii) the dry stone wall; iii) the evidence of historic garden and farming activities; iv) the intangible associations with the Ruttan and the Hay families; v) the pathways and views of the canal; vi) the role of the property as a library and centre for community activities; and vii) its status as a landmark along Kingston Road 15.\(^{25}\)

.4 The West Side Lands

In regards to the west side lands that extend along John Counter Boulevard up to Montreal Street, the Stage 1 cultural heritage survey work did not identify any cultural heritage properties on the City’s heritage list or any properties with potential cultural heritage value. Similarly, no further heritage properties were discovered as part of the more detailed research of this portion of the project site location.

.5 Viewscape Considerations

In addition, as noted earlier, in certain cases, heritage protection also extends beyond the boundaries of the heritage property to include the consideration of visual impacts from proposed developments on the heritage property (both to and from the heritage property) or between related heritage properties. Within the EA study area these views are identified by Parks Canada in its World Heritage Site and/or National Historic Site management documents, the Barriefield Conservation District Plan, municipal designations, and the City’s Official Plan. There are 9 of these views within the EA study area, 7 of which are in its southern portion up to Belle Island.

1. From the LaSalle Causeway up to Belle Island:
   a) Views between the Kingston Fortifications and between each fortification and Kingston Harbour;
   b) Views from the Barriefield Village Conservation District towards the Cataraqui River, St. Lawrence River, Fort Henry and downtown Kingston;
   c) Views of St. Mark’s Church in Barriefield Village;
   d) Views from the Woolen Mill to City Hall and the Cataraqui River;
   e) Views from Barrack Street and Queen Street to the Inner Harbour;
   f) Views of the City Hall cupola from the LaSalle Causeway and Royal Military College (RMC); and
   g) Views across the Inner Harbour.

2. From Belle Island to the Highway 401 crossing:
   a) Views of the Rideau Canal from the municipally designated site of the Pittsburgh Branch of the Kingston Frontenac Public Library (Gore Road Library); and
   b) All development overlooking the Rideau Canal.

As discussed earlier and shown on Drawings 3.11 to 3.16, there are two landscape character types within the EA study area. The lower Cataraqui section of the Rideau Canal south from Highway 401 to the northern entrance of Kingston’s Inner Harbour near Belle Island is a rare example of the waterway where

\(^{24}\) Although stone walls were also used to enclose gardens, this was not always the case. The wall may also have protected plants or trees from farm animals or wild animals, including deer that likely roamed the Cataraqui River escarpment.

\(^{25}\) Although not mentioned in the designation, the property also includes a stone marker with brass plaques explaining the significance of Hawthorn Cottage, John Canniff Ruttan and the former Pittsburgh Township.
the natural environment was not altered during canal construction. Over the intervening 178 years, the extensive wetlands of the Great Cataraqui Marsh, as well as the river valley’s sloped physiography and forested landscapes adjacent to the canal’s navigable channel have remained largely intact. As such, this natural setting has contributed to the unique historical, ecological and visual environment of this section of the waterway. As boaters proceed from the Highway 401 crossing southward (roughly 4 km north of the Inner Harbour entrance), the visible cattail portion of the Greater Cataraqui Marsh dominates the landscape at first, with its shallow water and emergent aquatic plants, near continuous overhanging tree canopy and shrub understory. The City’s urban landscape then becomes increasingly more visible in the background as boaters pass through the visible cattails. At roughly 1 km north of the Inner Harbour entrance near Belle Island, the natural landscape evolves into an increasingly urban, more manicured landscape. The project site location is part of this transition point. It is here that a vista opens, where the City’s urban landscape to the west (the Elliott Avenue Parkette, Village On The River apartments and the River Park subdivision, for example) and east (the Rideau Marina and Point St. Mark residential neighbourhood, for instance) becomes visible against the backdrop of Belle Island immediately to the south. Views further south of Belle Island are blocked by the tree line along the northern portion of Belle Park and Belle Island as well as by the extension of the eastern shoreline whereon the Gore Road Library, Point St. Mark residential neighbourhood and Rideau Marina are located. South of Belle Island, the full view of the City’s Inner Harbour and downtown area is experienced.

In addition, the inscribed property of the UNESCO World Heritage Site includes the Rideau Canal National Historic Site as well as the Fort Henry and the Kingston fortifications (Fort Frederick and the Murney, Shoal and Cathcart Martello Towers) National Historic Sites in the southern portion of the EA study area. As shown on Drawing 3.17, views of the Inner Harbour are obscured in the background at Fort Henry, not only by distance but also by the CFB Kingston and RMC facilities in the foreground. Furthermore, the tree line along the southern portion of Belle Park and Belle Island, in conjunction with the proximate extension of the eastern shoreline, blocks the protected views related to Fort Henry and the other six cultural heritage properties south of Belle Island to the project site location as well as the remaining EA study area that extends further north to Highway 401. This context establishes a more limited impacted viewshed as a bridge design consideration.

4.1.5 Archaeological Conditions – Land

This section of the Report discusses the terrestrial archaeological fieldwork undertaken at the project site location. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following two sub-sections:

1. The east side lands.
2. The west side lands.

A. Methodology

As a result of the terrestrial archaeological survey work done during Stage 1 of this EA study, Stage 2 archaeological testing of the east side lands was subsequently recommended. This was engaged in the Fall of 2010. As shown on Drawing 4.8, the fieldwork area was bounded by the Gore Road Library property to the north (excluding the off-leash dog park which was subject to a separate archaeological assessment in 2009 prior to its development), the Gore Road right-of-way to the south, Kingston Road 15 to the east and the Cataraqui River to the west. Since no part of the fieldwork area included cultivatable land, the fieldwork was done by ‘test pit survey’. This involved the excavation and sifting by hand of small, shovel-sized test pits on a 5 m grid pattern. If no evidence of cultural materials was noted, the hole was backfilled. In cases where cultural materials were found, the ‘positive’ test pit was expanded into a 1 SM unit and eight additional test pits were then also excavated around the positive test pit, spaced at 2.5 m from the original find. Each test pit was excavated until either sterile subsoil or bedrock was encountered. Any cultural material findings were bagged and labeled as per Ontario Ministry of Tourism and Culture (OMTC) guidelines.

B. Observations

The fieldwork area is typical of what much of the lower Cataraqui River valley must have looked like before modern development. As also shown on Drawing 4.8, from the river, the land rises in a series of steps, controlled by the horizontally bedded limestone bedrock which underlies the area. Exposed limestone bedrock is present at the shoreline. Proceeding easterly, a foreshore backs on to a steep, 2 m high forested bank. The land to the rear of the bank is generally level. The southern half is heavily forested and the northern half consists of open meadow. The eastern margin of these areas is defined by an abrupt rise in elevation, consisting of a bedrock and talus scarp face. Above the scarp, the terrain is essentially level limestone plain. The Gore Road Library lies on the level plain, between the scarp edge and Kingston Road 15.

26 As shown on Drawing 4.6, as the fieldwork proceeded, the study area was expanded to an area of high archaeological potential to the north, as this area could also be affected during the Project Implementation phase.

27 Note test pit surveying along the Cataraqui River shoreline was limited as it consists mainly of horizontal limestone bedrock with virtually no soil zones or vegetation.
The terrestrial archaeological fieldwork revealed the following two areas from which cultural materials were recovered:

1. Late 19th century artifacts were recovered along the existing Gore Road-right-of-way, within the garden area portion of the Gore Road Library property. The artifacts appear to be in contemporary association with the occupation of Hawthorn Cottage. Since 80 percent of its occupation would not have occurred prior to 1870, additional investigation was not pursued. Such spreads of cultural material surround all 19th century dwellings and are not regarded as warranting additional study.

2. As highlighted on Drawing 4.8, a single archaeological site was encountered adjacent to the northerly boundary of the Gore Road right-of-way near the Cataraqui River shoreline, which has been registered in the National Archaeological Site Database as BbGc-127. Subsequent Stage 3 investigations identified a small dwelling area or camp, dating to the last decades of the 18th century. Given the location of the site, its temporary nature and the type and age of the recovered cultural materials, it may have been a survey camp, occupied during the layout of the Lots and Concessions of Pittsburgh Township that occurred between 1786 and 1789.

.2 The West Side Lands

No terrestrial archaeological testing has been conducted to date of the west side lands extending along John Counter Boulevard up to Montreal Street. Visual examination of the area suggests that virtually all lands within the existing road rights-of-way have been disturbed to the extent that any archaeological testing in those areas is almost certain to be futile. On the other hand, the private lands on either side of John Counter Boulevard do not appear to have been extensively disturbed and may contain areas where archaeological potential still remains. This is germane, given that certain private lands may be required as part of the Project Implementation phase for reconfigured and expanded road, trail and intersection works, construction facilitation and lay-down areas as well as landscaping, grading, and stormwater management provisions. However, archaeologists have no right of access to conduct archaeological testing on private lands. As such, archaeological assessment and testing of the west side lands has been suspended until the City has confirmed property acquisition requirements associated with the Project Implementation phase, which is beyond the current scope of this EA study.

4.1.6 Archaeological Conditions – Marine

This section of the Report discusses the marine archaeological fieldwork undertaken at the project site location. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following two sub-sections:

1. The fieldwork methodology.

2. The fieldwork findings.

.1 Fieldwork Methodology

As a result of the marine archaeological survey work done during Stage 1 of this EA study, Stage 2 archaeological testing of the marine environment was subsequently recommended. This was engaged in the early Spring of 2011 in order to avoid the growth of dense aquatic vegetation that precluded the fieldwork from occurring in the late Spring-to-Fall period of 2010. As reflected on Drawing 4.9, the fieldwork study area was set at 100 m wide, extending shore-to-shore at 50 m equi-distant north and south of the centreline of the preferred s-curve bridge alignment which is discussed later in this Report.

The marine archaeological fieldwork included the following activities:

1. A survey of the riverbed, which was done on April 14 and April 15, 2011 using:
   a) Side Scan Sonar, which was used to prepare a riverbed profile;
   b) A Sub Bottom Profiler, which uses low sound frequencies to penetrate the sediment layers for locating buried objects or for determining stratigraphy;
   c) A Proton Magnetometer, which detects sub-surface ferrous objects by using the Earth’s field nuclear magnetic resonance (EFNMR) to measure variations in the Earth’s magnetic field; and
   d) A diver holding a forward-looking Sonar Navigation system, which was used to verify potential targets and surveyed areas that were inaccessible by watercraft.

2. Test pitting along both the east and west shorelines, which was done on April 15, 2011 using a shovel and a drop screen at 5 m intervals. 23 test pits (averaging a depth of 26 centimetres (cm) prior to hitting bedrock) were dug along the east shoreline and 11 test pits (averaging a depth of 39 cm) were dug along the west shoreline. Water depths at the test pit locations ranged from 0.3 m to 0.5 m. The test pit locations also varied by distance to shore due to existing geophysical conditions. The offshore distance averaged 10 m and 3 m along the east and west shorelines, respectively.

3. Vibrocoring of the riverbed, which was done on April 21 and April 22, 2011. This involved extracting riverbed sediment cores at ten locations across the fieldwork area and then assessing the cores to determine the potential for marine archaeological resources. Twenty samples from these cores were also taken for loss-on-ignition, particle size, microfossils and microdebitage analyses. The water level datum (IGLD 1985) at the time of the vibrocoreing was 74.90 m on April 21 and 74.91 m on April 22, 2011. All the cores were adjusted to the mean water level datum (IGLD 1985) of 74.2 m for Lake Ontario at Kingston.
.2 Observations

The findings from the marine archaeological fieldwork were as follows:

1. The Side Scan Sonar revealed a relatively featureless riverbed aside from the scour lines that are present near both the Music Marina on the west side of the Cataraqui River and the centre of the fieldwork area. These lines are most likely caused by boat traffic, based on: i) the absence of shadow indicating height; ii) the shallow water depths throughout the fieldwork area; and iii) their locations relative to the Music Marina. Mounds were also identified near the Rideau Canal’s navigable channel, which were verified by the Sonar Navigator to be ‘spoil’ from previous dredging activities of the channel.

2. The Sub Bottom Profiler revealed an area of the riverbed that is made of softer material, as indicated by lighter returns. This area was common across all track lines. There was no evidence of buried paleo channels in the fieldwork area.

3. The Proton Magnetometer revealed distinct peaks and valleys in the local magnetic field, including six targeted anomalies, namely: i) a ‘barge’ target relating to a barge that was dragged onto the west shoreline near John Counter Boulevard; ii) two small, localized readings proximate to the west shoreline; and iii) three readings, also proximate to the west shoreline, that are most likely associated with the Frontenac Axis which passes through the area.28

4. The Sonar Navigator surveyed portions of the Music Marina area where the Side Scan Sonar was blocked by pilings and, as noted above, the area along both sides of the Rideau Canal’s navigable channel. No targeted anomalies were located.

5. The test pits along the west shore consisted of a muddy loose sediment top layer (11 cm to 31 cm deep), followed by a dense organic layer (11 cm to 18 cm deep) and then a sand layer. Remnants of garbage were also evident in some of the west shore test pits. No other cultural materials were located. The test pits along the east shore consisted of an organic top layer followed by a heavy clay layer. No cultural materials were located in any of the east shore test pits.

6. As shown on Drawing 4.9, out of the ten vibrocores, a piece of submerged wood was present in ‘CR8’, proximate to the west shoreline, at elevation 72.92 m. As it was unknown whether the wood was an in situ stump or other piece of wood, additional assessment was undertaken. First, carbon 14 dating was conducted for the wood, which calibrated its date at 2480 to 2300 B.C. (or 4430 to 4250 B.P.). Next, as shown on Drawing 4.10, contour elevations were taken from the bathymetry of the area. The 73.4 m contours shown on Drawing 4.10 represent slightly higher elevations within the river basin. The location of ‘CR8’ is on one of these elevated areas, which are also evident in the current marsh environment to the north of the fieldwork area. The loss-on-ignition, particle size, microfossil and microdebitage analyses, combined with additional background research of the area, further confirmed that water levels in this area fluctuated throughout the Holocene and remained relatively stable as a large wetland after the Admiralty Lowstand (11.4 ka B.P.) and the establishment of the river channel in the past 4,000 years. This river channel would have alternately dried and been re-established as water levels fluctuated between 4 to 2 ka B.P. Modern river sedimentation has been reasonably steady since 2 ka B.P., with minor changes occurring due to channel migration and human activities.

Thus, rather than a discrete submerged shoreline, the paleo environment of the fieldwork area suggests a marsh environment, with small, isolated areas of raised elevation that may have once been dry enough to support the growth of small trees. But it is unlikely that these areas of raised elevation could have supported any prehistoric campsites or even prehistoric activities. Furthermore, no additional evidence of a submerged shoreline was present in any of the other cores or the geophysical data.

4.1.7 Geo-Environmental Conditions

This section of the Report discusses the geo-environmental fieldwork undertaken at the project site location. The fieldwork was done in accordance with a work plan that was approved by Parks Canada, OMOE and the City. Its findings are divided into the following two sub-sections:

1. The Phase I Environmental Site Assessment findings.

2. The riverbed sediment sampling findings.

.1 The Phase I Environmental Site Assessment Findings

A. Methodology

As noted earlier, there are numerous sites of potential environmental concern throughout the EA study area. Though historically, the lands on the west side of the Cataraqui River from the LaSalle Causeway to just north of John Counter Boulevard were more heavily industrialized than in other portions of the EA study area, the Phase 1 Environmental Site Assessment (ESA) focused on both shoreline areas of the Cataraqui River within the project site location. As shown on Drawing 4.11, the fieldwork area was a 100 m corridor extending north and south of the centerlines of both John Counter Boulevard up to Montreal Street (on the west side) and Gore Road up to Kingston Road 15 (on the east side).

28 The Frontenac Axis is an area of pre-Cambrian rock which joins the Canadian Shield with the Adirondack mountain range in New York State.
The Phase I ESA consisted of the following tasks:

1. A review of historic information, including City and Ontario Ministry of the Environment (OMOE) files, the Ecolog Eris Database, fire insurance plans and air photo records.
2. Information requests to the City, OMOE and the Technical Standards and Safety Authority.

B. Observations

Air photo records from the City and National Air Photo Library were reviewed to develop a general development history of the fieldwork area. The outcome of this review is summarized in Table 4.10 below and did not raise any issues of potential environmental concern.

<table>
<thead>
<tr>
<th>Year</th>
<th>Air Photo</th>
<th>General Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>West Side</td>
</tr>
<tr>
<td>1936</td>
<td>A5406-32 1:15000</td>
<td>• Both sides of John Counter Boulevard were occupied by farmlands.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The southwest corner of John Counter Boulevard and the Cataraqui River was occupied by a farm house.</td>
</tr>
<tr>
<td>1948</td>
<td>A11687-202 A11687-199 1:9000</td>
<td>• As per 1936.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• A railway track ran north-south and intersected John Counter Boulevard between Montreal Street and the Cataraqui River.</td>
</tr>
<tr>
<td>1955</td>
<td>A14613-26 A14613-5 1:7000</td>
<td>• More farmhouses were noted south of John Counter Boulevard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The railway track as described above appeared to be still in use.</td>
</tr>
<tr>
<td>1965</td>
<td>VRR2638-408 1:20000</td>
<td>• As per 1955.</td>
</tr>
<tr>
<td>1973</td>
<td>A23663-201 1:25000</td>
<td>• As per 1965.</td>
</tr>
<tr>
<td>1987</td>
<td>A27241-163 A28143-20 1:5000</td>
<td>• Residential and commercial buildings were noted on both sides of John Counter Boulevard.</td>
</tr>
<tr>
<td>1994</td>
<td>A28143-20 1:5000</td>
<td>• No air photo coverage.</td>
</tr>
<tr>
<td>1998</td>
<td>City 1:2216 (west side) 1:4433 (east side)</td>
<td>• Are per 1987, except that the railway track as described above was removed.</td>
</tr>
<tr>
<td>2004</td>
<td>City 1:2216</td>
<td>• As per 1998.</td>
</tr>
<tr>
<td>2008</td>
<td>City 1:5284 (west side) 1:4433 (east side)</td>
<td>• As per 2004, except that the undeveloped treed land north of John Counter Boulevard was cleared for the River Park subdivision.</td>
</tr>
</tbody>
</table>

Additional findings during the Phase I ESA were as follows:

1. Though the 1963 fire insurance plans did not cover the east side of the Cataraqui River, no underground storage tanks were found on the plans covering the west side of the river.
2. An approval under Section 9 of the OEPA was issued for 917 Montreal Street on November 15, 2002. Also, an approval under Section 53 of the 'Ontario Water Resources Act' (OWRA) was issued for 645 John Counter Boulevard on September 11, 2008.

29 Note the site visit did not include accessing the interior of buildings for the purposes of conducting a designated substances review, as defined in the ‘Ontario Occupational Health and Safety Act’ and the ‘Workplace Hazardous Material Information System’.
3. 931 Montreal Street was subject to a Phase II ESA indicating on-site petroleum and metals contamination, which has since been remediated and a Record of Site Condition (RSC) has been filed with the OMOE. An additional four RSCs have been filed for a property between 931 Montreal Street and O Elliott Avenue, indicating that metals and polycyclic aromatic hydrocarbons (PAHs) in the soil and groundwater samples as well as BTEX in the soil samples were lower than applicable standards in the OEPA.

4. Based on other OMOE databases, there are no: i) registered PCB storage sites; ii) active or closed waste disposal sites; iii) registered former coal gasification plants or industrial sites producing and/or using coal tar or related tars; and iv) registered waste generators.

5. During the site visit, one aboveground storage tank (AST) was noted at 917-919 Montreal Street. This property is currently being used as ‘Fitzgeralds Collision and Towing’ and was once used as ‘Kingston Used Cars’. The AST contained hydraulic transmission fluid and appeared to be in damaged condition. It was also not kept free of debris and appeared to be partially buried.

6. As per the geo-environmental survey work done during Stage 1 of this EA study, fill material is located along the western shoreline of the Cataraqui River between the CN and CP railway tracks (from approximately Place D’Armes in the south to Drennan Street in the north). The land at the northeast corner of John Counter Boulevard and Montreal Street is located between the former CN and CP railway tracks and as such, may still contain the fill material in the subsurface.

.2 The Riverbed Sediment Sampling Findings

A. Methodology

The riverbed sediment sampling fieldwork was done on September 1 and September 2, 2010. As shown on Drawing 4.12, there were ten sampling locations, of which five locations (locations SS1 to SS5) were sampled using ‘grab techniques’ (using a petor sampler) and five locations (locations CS6 to CS10) were sampled using ‘coring techniques’ (using a tech-ops sampler). As requested by Parks Canada, one sediment core (at location CS10) was collected within the Rideau Canal’s navigable channel. At each coring location, four or five samples were taken for analysis of metals, polychlorinated biphenyls (PCBs) and PAHs.

B. Observations

The summary provided in Table 4.11 below shows sediment exceedance levels at various sampling locations.

<table>
<thead>
<tr>
<th>Sampling Identifier</th>
<th>Canadian Soil Quality Guidelines</th>
<th>Provincial Sediment Quality Guidelines</th>
<th>O.Reg. 511/09 Sediment Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CCME</td>
<td>ISQG PEL</td>
<td>LEL SEL</td>
</tr>
<tr>
<td>SS1 SA1</td>
<td>Cd, Pb, PAHs</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SS2 SA1</td>
<td>Cd, Pb, PAHs</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SS3 SA1</td>
<td>As, Cd, Cr, Cu, Pb, Zn, PAHs</td>
<td>Pb, Zn</td>
<td>As, Cd, Cr, Cu, Pb, Zn, PAHs</td>
</tr>
<tr>
<td>SS4 SA1</td>
<td>PAHs</td>
<td>-</td>
<td>Cu</td>
</tr>
<tr>
<td>SS5 SA1</td>
<td>PAHs</td>
<td>PAHs</td>
<td>Cu, PAHs</td>
</tr>
<tr>
<td>SS6 SA1</td>
<td>Cd, Cu, Pb, Zn, PAHs</td>
<td>-</td>
<td>Cd, Pb, Ni, Zn</td>
</tr>
<tr>
<td>SS6 SA2</td>
<td>PAHs</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SS6 SA3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SS6 SA4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SS7 SA2</td>
<td>Cd, Cu, PAHs</td>
<td>PAHs</td>
<td>Cd, Cu, Pb, Ni</td>
</tr>
<tr>
<td>CS7 SA3</td>
<td>PAHs</td>
<td>PAHs</td>
<td>Cu, PAHs</td>
</tr>
<tr>
<td>CS7 SA4</td>
<td>-</td>
<td>-</td>
<td>Cu</td>
</tr>
<tr>
<td>CS8 SA1</td>
<td>Cd, Pb</td>
<td>-</td>
<td>Cd, Cr, Pb, Pb, Ni</td>
</tr>
<tr>
<td>CS8 SA2</td>
<td>Cd, Cu, PAHs</td>
<td>-</td>
<td>Cd, Cu, Pb</td>
</tr>
<tr>
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<td>-</td>
<td>-</td>
<td>Cu, Fe</td>
</tr>
<tr>
<td>CS8 SA4</td>
<td>-</td>
<td>-</td>
<td>Cu</td>
</tr>
<tr>
<td>CS9 SA1</td>
<td>PAHs</td>
<td>Cr, Cu, Pb, Ni</td>
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<td>Cd, PAHs</td>
<td>-</td>
<td>Cd, Cu, Fe, Pb, Ni</td>
</tr>
<tr>
<td>CS9 SA3</td>
<td>PAHs</td>
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<td>Cu, Fe</td>
</tr>
<tr>
<td>CS9 SA4</td>
<td>Cu, PAHs</td>
<td>-</td>
<td>Cr, Cu, Fe</td>
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<td>Cd, Cr, Pb, Ni</td>
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</tr>
<tr>
<td>CS10 SA3</td>
<td>Cd, PAHs</td>
<td>-</td>
<td>Cd, Cu, Fe</td>
</tr>
<tr>
<td>CS10 SA4</td>
<td>PAHs</td>
<td>-</td>
<td>Cr, Cu, Fe</td>
</tr>
</tbody>
</table>

The results were compared to the following guidelines and standards:

a) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (updated 2001): Canadian Interim Sediment Quality Guidelines (ISQGs) and Probable Effect Levels (PELs), Canadian Council of Ministers of the Environment (CCME)

b) Provincial Sediment Quality Guidelines, as provided in Appendix A of Evaluating Construction Activities Impacting on Water Resources, Part III A, Part III B and Part III C (February 1994): Lowest Effect Level (LEL) and Severe Effect Level (SEL); and

Generally, the ‘grab sample’ at Location SS3 (located in the middle of the Cataraqui River) had higher metals concentrations than the other sampling locations. The ‘core sample’ at Location CS7 (located in the middle-west portion of the Cataraqui River) had higher PAHs concentrations than the other sampling locations. This is an issue of potential environmental concern. A more detailed explanation of the exceedances is provided below.

1. For metals:
   a) At the ‘grab sample’ SS1 to SS3 locations:
      i. cadmium (Cd) and lead (Pb) concentrations were above CCME ISQG guidelines;
      ii. Location SS3 also contained exceedances of CCME ISQG guidelines for arsenic (As), chromium (Cr), copper (Cu) and zinc (Zn); and
      iii. parameters that exceeded LELs under the Provincial Sediment Quality Guidelines and O.Reg. 511/09 Sediment Standards were As, Cd, Cr, Cu, Pb, Zn, iron (Fe) and nickel (Ni); and
   b) At the ‘coring sample’ CS6 to CS10 locations:
      i) Cd, Cu, Pb and Zn concentrations were above CCME ISQG guidelines; and
      ii) parameters that exceeded LELs under the Provincial Sediment Quality Guidelines and O.Reg. 511/09 Sediment Standards were Cr, Fe, Ni and magnanese (Mn).

   The CCME ISQG exceedances noted above were within one order of magnitude above the guidelines with the exception of Pb and Zn at ‘grab sample’ location SS3, which also exceeded CCME PELs and SELs under the Provincial Sediment Quality Guidelines. Also note that at all the ‘coring sample’ locations, higher metals concentrations were found in the shallow samples (up to 0.2 m below the top of the sediment surface), compared to those obtained in the deeper samples (from 0.2 m to 0.4 m below the top of the sediment surface).

2. The results of the PCB analysis showed that there were no exceedances of CCME guidelines, Provincial Sediment Quality Guidelines or O.Reg. 511/09 Sediment Standards.

3. For PAHs:
   a) At the ‘grab sample’ SS1 to SS5 locations:
      i. one or more PAH parameters exceeding CCME ISQGs were found; and
   b) At the ‘coring sample’ CS6 to CS10 locations:
      i. one or more PAH parameters exceeding CCME ISQGs and LELs under the Provincial Sediment Quality Guidelines were found;
      ii. Location CS7 exceeded CCME PELs:
         (a) for cenaphthylene, anthracene, benzo(a)anthracene and benzo(a)pyrene at interval 0.1 m to 0.15 m and at interval 0.15 m to 0.2 m; and
         (b) for chrysene, dibenzo(a,h)anthracene, fluorene, phenanthrene and pyrene at interval 0.1 m to 0.15 m; and
      iii. Locations CS9 and CS10 exceeded CCME ISQGs at all depth intervals for benzo(a)pyrene and pyrene.

At all ‘coring sample’ locations, higher PAHs concentrations were found in the shallow samples (up to 0.2 m below the top of the sediment surface), compared to those obtained in the deeper samples (0.2 m to 0.4 m below the top of the sediment surface).

4.1.8 Geotechnical Conditions

This section of the Report discusses the geotechnical fieldwork undertaken at the project site location. The fieldwork was done in accordance with a work plan that was approved by both Parks Canada and the City. Its findings are divided into the following two sub-sections:

1. The fieldwork methodology.
2. The fieldwork findings.

.1 Fieldwork Methodology

The geotechnical fieldwork included a geotechnical subsurface investigation and a geophysical survey. The geotechnical subsurface investigation was done between August 5 and August 16, 2010. It supplemented existing subsurface data, particularly fieldwork that was undertaken as part of the 1992 TSH study (referenced earlier in this Report), by advancing three additional boreholes through the overburden soils and into the underlying bedrock. As shown on Drawing 4.13, Borehole 10-2 was put down in the middle of the Cataraqui River and Boreholes 10-1 and 10-3 were put down at the west and east banks, respectively.
The geophysical investigation was done between September 1 and September 3, 2010. It delineated the bedrock surface along the proposed bridge alignment using an electrical resistivity imaging (ERI) survey. The ERI survey measures the electrical resistivity (reciprocal of conductivity) of the subsurface to infer rock/soil types, stratigraphy and soil conditions. The apparent resistivity of the subsurface is calculated for increasing electrode separations by applying a current to the ground using two electrodes and measuring the potential difference (voltage) between two different electrodes.

.2 Fieldwork Findings

For context, the City is situated on the northeast edge of the Palaeozoic Plain of the Lake Ontario homocline. To the north and east of the City is the Frontenac Axis, which was introduced earlier in this Report. The Frontenac Axis is a low eastward trending ridge of Precambrian intrusive and metamorphosed sediments of the Grenville structural province of the Canadian Shield. The Frontenac Axis crosses the St. Lawrence River in the Thousand Island region and extends southeastward to the Adirondack Mountains of New York State, thereby separating the strata of the Ottawa-St. Lawrence plain from the Southern Ontario plain. Overlying the Precambrian surface are consolidated Palaeozoic sediments of the Late Cambrian to Middle Ordovician Periods. The Palaeozoic stratigraphy consists of a sedimentary sequence including basal conglomerates, sandstones, shales and carbonaceous rocks. This suggests that during Cambrian and Early Ordovician times, the Precambrian Shield was inundated by shallow, westward transgressing seas in which deposits consisted of the Potsdam and Shallow Lake Formations. These deposits were overlain by marine carbonates, indicative of increased water depths during the Middle Ordovician time. The carbonate sequence, collectively known as the Simcoe Group, is represented locally by the Gull River Formation.

The Precambrian bedrock underlying the project site location consists of Grenville Supergroup Clastic Metasediments which are intruded by younger granitic rocks and diabase/andesitic dykes. The Grenville Supergroup Clastic Metasediments include crystalline limestone interlayered quartzite and marble, quartzite, several types of gneiss, pyroxene granulite, migmatite, gabbro, pegmatite, red granite, monzonite. This is overlain by the Cambro-Ordovician Potsdam Formation which consists of sandstone and siltstone of variable thickness. Lying above the Potsdam formation is a series of shales, sandstones and arkoses of the Middle Ordovician Shadow Lake Formation. The Potsdam and Shadow Lake formations are limited in thickness and are commonly absent on and adjacent to Precambrian highs.

With this context in mind, the interpreted subsurface conditions at the project site location are shown on Drawing 4.14. The bedrock surface appears to be variable across the site. The bedrock is exposed or near surface on both sides of the Cataraqui River (at an elevation of 73 m at the east bank and 76 m at the west bank) and then dips to elevations ranging from elevation 30 m to elevation 55 m within the river. Limestone, present on the banks of the river, is overlain by a 3 m to 5 m layer of Shadow Lake shale. The ERI profile indicates that Precambrian rock is likely present beneath the shale across the whole site. There are two zones where low resistivity is observed within the bedrock beneath the river, centred at distances of 320 m and 970 m along the survey line. These areas are most likely associated with the Frontenac Axis.

As also shown on Drawing 4.14 and highlighted further below, the subsurface conditions at the project site location consist of overburden soils that vary from limited thickness (2 m to 3 m) at the river banks to about 40 m within the river. Along the banks, the overburden consists of fill over peat over silty clay or glacial till. Within the river, the overburden consists of peat over silty clay:

1. Topsoil and Fill: At Borehole 10-1 (west bank), a layer of fill consisting of silty sand to sandy silt with some gravel, trace clay, cobbles and organic matter was encountered. The thickness of the fill is about 1.5 metres. At Borehole 10-3 (east bank), a layer of topsoil was encountered at the existing ground surface and is about 0.15 metres thick.

2. Organic Soil: Beneath the fill layer at Borehole 10-1 (west bank) and at the floor of the river, a layer of organic soil was encountered. The organic soil is fibrous and includes peat and organic silt with traces-to-some sand and rootlets. The thickness of the organic soil generally varies from about 0.8 m to 2.2 m, with the exception of Borehole NB2 (near mid-river from the 1992 TSH study), where the organic soil is about 6.4 m thick. With the exception of the surface topsoil, no organic soil was encountered at Borehole 10-3 (east bank).

3. Silty Clay: The organic soils are underlain by a deposit of silty clay, which thickens away from the riverbanks toward the centre of the river. The silty clay was not encountered at Borehole 10-3 (east bank). The silty clay extends to depths ranging from about 3 m at Borehole 10-1 (west bank) to about 39 m at Borehole NB2 (near mid-river from the 1992 TSH study). The surface of the silty clay deposit within the river was generally encountered at elevations ranging from about 71.1 m to 72.6 m, with the exception of Borehole NB2, where the surface of the silty clay was encountered at elevation 66.8 m, due to the thicker organic soils present. At the west bank, the silty clay is about 0.8 m thick and its surface is at elevation 73.4 m.

The upper 4 m to 6 m of the silty clay deposit is grey-brown in colour and shows signs of weathering. The measured SPT ‘N’ values in this portion of the deposit were between 2 and 16 blows per 0.3 m of penetration and these results indicate that this upper silty clay layer has a firm to very stiff consistency. The silty clay below the depth of weathering is grey in colour. The in situ vane testing resulted in undrained shear strengths ranging from about 40 kilopascals (kPa) to 95 kPa. However, uncharacteristically low unconfined compression and undrained strength values of 20 and 25 kilopascals were reported in Boreholes NB2 and NB3 (near mid-river and the east shore from the 1992 TSH study), located at elevations between 60 m and 63 m, respectively.
4. **Glacial Till**: The topsoil at Borehole 10-3 (east bank) and the native clay deposit at Boreholes NB3 and NB4 (near the east shore from the 1992 TSH study) are underlain by glacial till. At Borehole 10-3, the glacial till layer was encountered at a shallow depth and was fully penetrated to a depth of 1.7 m. At Boreholes NB3 and NB4, the glacial till layer (about 0.6 m and 1.7 m thick, respectively) was encountered at a greater depth.  

The glacial till is considered to be a heterogeneous mixture of gravel, cobbles, and boulders in a matrix of sandy silt or silty sand. Only limited standard penetration testing was possible in the till deposit due to the presence of cobbles and boulders. The SPT ‘N’ values obtained from the limited testing possible ranged from 38 to greater than 50 blows per 0.3 m indicating a dense state of packing. The higher blow counts likely reflect the presence of the cobbles and boulders in the deposit.

5. **Refusal**: Practical refusal to augering by bedrock was encountered at all the Boreholes, the details of which are shown in Table 4.12 below.

<table>
<thead>
<tr>
<th>Borehole Number</th>
<th>Ground / Water Surface Elev. (m)</th>
<th>Depth to Auger Refusal (m)</th>
<th>Auger Refusal Surface Elev. (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-1 (West Bank)</td>
<td>75.7</td>
<td>3.1</td>
<td>72.6</td>
</tr>
<tr>
<td>NB1 (Near West Shore)</td>
<td>74.6</td>
<td>21.3</td>
<td>53.3</td>
</tr>
<tr>
<td>NB2 (Near Mid-River)</td>
<td>74.6</td>
<td>38.8</td>
<td>35.8</td>
</tr>
<tr>
<td>10-2 (Mid-River)</td>
<td>74.6</td>
<td>37.1</td>
<td>37.5</td>
</tr>
<tr>
<td>NB3 (Near East Shore)</td>
<td>74.6</td>
<td>22.1</td>
<td>52.5</td>
</tr>
<tr>
<td>NB4 (Near East Shore)</td>
<td>74.6</td>
<td>19.8</td>
<td>54.8</td>
</tr>
<tr>
<td>10-3 (East Bank)</td>
<td>78.1</td>
<td>1.7</td>
<td>76.4</td>
</tr>
</tbody>
</table>

6. **Bedrock**: As noted earlier, bedrock underlies the glacial till along the riverbanks and underlies the silty clay deposit within the river. Bedrock was proven in Boreholes 10-1 (west bank), 10-2 (mid-river) and 10-3 (east bank). The bedrock consists of limestone at both riverbanks and Gabbro bedrock of the Precambrian Formation within the river. The general weathering of the bedrock is slightly weathered to fresh at Boreholes 10-1 and 10-3 and entirely fresh at Borehole 10-2. In Borehole 10-1, the Rock Quality Designation (RQD) values range from 70 percent to 100 percent (generally increasing with depth), indicating a good to excellent quality rock. In Borehole 10-2, the RQD values range from 80 percent to 95 percent, indicating a very good to excellent quality rock. In Borehole 10-3, the upper 1 m of bedrock has a RQD value of zero percent, indicating high weathering. Below this weathered zone, the RQD values increase with depth, ranging from 80 percent to 100 percent, indicating a very good to excellent quality rock. The discontinuities observed in the rock core are typically sub-horizontal to sub-vertical.

The unconfined compressive strengths range from 39 Megapascals (MPa) to 183 MPa within the limestone bedrock cores at Boreholes 10-1 and 10-3. This indicates a medium strong to very strong rock quality. The results of the point load index testing on the limestone cores gave Is(50) values ranging from 1.7 MPa to 3.8 MPa (40 MPa to 91 MPa unconfined compression). The unconfined compressive strengths range from 65 MPa to 373 MPa within the Gabbro bedrock core at Borehole 10-2. This indicates a medium strong to extremely strong rock quality. The results of the point load index testing on the Gabbro core gave Is(50) values ranging from 11.7 MPa to 12.3 MPa (280 MPa to 295 MPa unconfined compression).

7. **Groundwater Conditions**: Standpipes were installed in Boreholes 10-1 (west bank) and 10-3 (east bank) and sealed within the bedrock. The water levels measured in the standpipes are generally near the river water level and are summarized in Table 4.13 below.

<table>
<thead>
<tr>
<th>Borehole Number</th>
<th>Date</th>
<th>Depth Below Existing Ground Surface (m)</th>
<th>Geodetic Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-1 (West Bank)</td>
<td>August 16, 2010</td>
<td>0.63</td>
<td>75.09</td>
</tr>
<tr>
<td>10-3 (East Bank)</td>
<td>August 16, 2010</td>
<td>3.08</td>
<td>75.06</td>
</tr>
</tbody>
</table>

Note the water elevation in the river was not measured at the time of the Stage 2 fieldwork drilling but it is documented at 74.6 m in the borehole logs appended to the 1992 TSH study. It should be expected that the groundwater levels will fluctuate seasonally.
4.1.9 Hydrotechnical Conditions

This section of the Report discusses the hydrotechnical fieldwork undertaken at the project site location. It is divided into the following two sub-sections:

1. The fieldwork methodology.
2. The fieldwork findings.

.1 Fieldwork Methodology

A technical review and analysis of environmental variables which are relevant to the conditions at the project site location was completed. This included considerations for hydrologic inputs (flows), water levels, winds and ice.

The project site location is not typical of a flow-governed watercourse. The cross section of the river at the project site location is shallow, wide and slow-moving. As a result, the magnitude of the flow becomes significantly less important in defining the conditions within the channel. The broad and shallow cross section is influenced significantly by local wind conditions. Water levels within the channel are primarily defined by the water levels in Lake Ontario. Given the complex relationship between the various environmental variables at the project site location, and the limited flow data available, a rigorous multivariate statistical analysis has not been possible. The heavily regulated state of the Rideau Canal for navigation purposes further complicates the hydrologic variables. Therefore, it has been assumed that extreme flows may be coincident with design wind conditions. It has also been assumed that the design wind conditions may be coincident with extreme water level fluctuations in Lake Ontario.

.2 Fieldwork Findings

The alignment of the Cataraqui River is generally along a SSW / NNE axis. The project site location is at a section of the Cataraqui River that is approximately 1 km wide. The watercourse is relatively shallow over the majority of this cross section, with the exception of the Rideau Canal’s navigation channel. Depths at normal water levels typically range from about 1.5 m over the majority of the cross section to roughly 4.5 m in the channel.

Wind stress is considered to be an important factor in generating flow velocities and potential water level setup within the watercourse. 1987 to 2007 wind data from the Kingston Airport was analyzed to assess typical wind direction, magnitude and persistence. Most of the winds are from the southwesterly quadrants. The largest contributions are from due south and due west, caused mainly by the effects of Lake Ontario. Table 4.14, which shows probable hourly wind speeds aggregated annually, suggests that high winds can be experienced from any direction, in that 100 year wind speeds are roughly 20 m/s (or 72 km/hr) from either the south or north.

<table>
<thead>
<tr>
<th>Years</th>
<th>North</th>
<th>Northeast</th>
<th>East</th>
<th>Southeast</th>
<th>South</th>
<th>Southwest</th>
<th>West</th>
<th>Northwest</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>12.6</td>
<td>(46.3)</td>
<td>11.2</td>
<td>(40.2)</td>
<td>9.8</td>
<td>(35.3)</td>
<td>11.0</td>
<td>(39.7)</td>
</tr>
<tr>
<td>5</td>
<td>14.2</td>
<td>(51.2)</td>
<td>12.1</td>
<td>(43.6)</td>
<td>10.9</td>
<td>(39.2)</td>
<td>12.6</td>
<td>(45.5)</td>
</tr>
<tr>
<td>10</td>
<td>15.5</td>
<td>(56.0)</td>
<td>12.8</td>
<td>(46.2)</td>
<td>11.7</td>
<td>(42.2)</td>
<td>13.9</td>
<td>(49.9)</td>
</tr>
<tr>
<td>25</td>
<td>17.4</td>
<td>(62.6)</td>
<td>13.8</td>
<td>(49.6)</td>
<td>12.8</td>
<td>(46.2)</td>
<td>15.4</td>
<td>(55.6)</td>
</tr>
<tr>
<td>50</td>
<td>18.8</td>
<td>(67.8)</td>
<td>14.5</td>
<td>(52.2)</td>
<td>13.7</td>
<td>(49.2)</td>
<td>16.7</td>
<td>(60.0)</td>
</tr>
<tr>
<td>100</td>
<td>20.3</td>
<td>(73.2)</td>
<td>15.2</td>
<td>(54.8)</td>
<td>14.5</td>
<td>(52.1)</td>
<td>17.9</td>
<td>(64.4)</td>
</tr>
</tbody>
</table>

Flows in the Cataraqui River are heavily regulated for navigation and power generation purposes. While no detailed flow data is available for the reach, its physical characteristics are such that it is in effect a lake-like setting. Thus, flows are not considered critical to the assessment of bridge performance. A flow of 50 m$^3$/s is reported by Parks Canada to be a significant fr eshet flow. But this would not generate significant velocities or water levels within the reach due to the cross sectional area of the watercourse at the project site location, which is estimated to be 775 SM at the low water datum of 74.2 m elevation.

Existing condition modeling suggests flow velocities at the project site location range from negligible up to approximately 0.4 m/s in either the upstream or downstream directions. The flow velocity is varied across the section, with the higher velocities focused towards the mid-channel area, just west of the Rideau Canal’s navigable channel. Lower velocities are typically found along the western side of the Cataraqui River where the channel is broad and relatively shallow. Under low flow conditions and southerly winds, the analysis shows reversed flows within portions of the channel, with circulation cells generated upstream and downstream of Belle Island.

Due to the effect of Lake Ontario water levels at the site, design high water levels are to be expected during the late spring and early summer months, and are therefore typically associated with ice-free conditions. It is noted however, that lake ice can persist in the Kingston region into April. Characteristic water level conditions relevant to the project site location are summarized below in Table 4.15. These water levels are referenced to the Geodetic Survey of Canada (GSC).
Table 4.15
Water Levels at the Project Site Location

<table>
<thead>
<tr>
<th>Condition</th>
<th>Water Surface Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Water Datum (LWD)</td>
<td>74.16 m</td>
</tr>
<tr>
<td>Average High Water (AHW)</td>
<td>75.26 m</td>
</tr>
<tr>
<td>100 Year Lake Ontario Water Level</td>
<td>75.99 m</td>
</tr>
<tr>
<td>CRCA Regulatory Water Level</td>
<td>76.30 m</td>
</tr>
</tbody>
</table>

The CRCA Regulatory Water Level of 76.3 m is the Regulatory Limit (or ‘design high water level’) for the project site location, which is based on the Lake Ontario water level and includes an allowance for wave action. The CHBDC requires the bridge deck to have a minimum 1 m vertical clearance above the design high water level.

In addition, ice cover on the river is variable from year to year, depending largely on climate conditions. A review of the historic ice cover charts from the Canadian Ice Service for the 1989-90 through to the 2010-11 seasons indicate that:

1. Ice cover is not typically established until mid to late December, with ice-free conditions possibly delayed as late as April 25. This would appear to indicate that thick lake ice is not generally established until early February, but can last until April.
2. The analysis of annual measured extremes would suggest that the ice is 0.84 m thick and has a strength of 1100 kilopascals (kPa) under dynamic ice (or 100 year) conditions.
3. The ice generally melts in place due to the limited flow-generated velocities.

Given these observations, ice cover design water levels have also been estimated for the purposes of preliminary design, as shown below in Table 4.16.

Table 4.16
Ice Cover Water Levels at the Project Site Location (December to April)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Water Surface Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Term Average (Static Ice)</td>
<td>74.49 m to 74.84 m</td>
</tr>
<tr>
<td>Historic Extremes (Static Ice)</td>
<td>73.70 m to 75.61 m</td>
</tr>
<tr>
<td>100 Year Extremes (Dynamic Ice)</td>
<td>73.65 m to 75.86 m</td>
</tr>
<tr>
<td>Winter Surge Conditions</td>
<td>-0.25 m to +0.47 m</td>
</tr>
</tbody>
</table>

4.1.10 Noise Impact Considerations

As discussed earlier, the project must satisfy both the Provincial and Federal EA frameworks. This also includes Provincial and Federal transportation noise guidelines.

The Provincial ‘Joint Protocol’ (1986) from the MTO and OMOE provides guidelines on assessing municipal road traffic noise impacts. The importance of changes from a noise impact perspective is based on the objective level and change from existing conditions. Cumulative sound levels are assessed based on a projected ten-year horizon. Noise mitigation is warranted when increases in sound level over the ‘no-build’ ambient is 5 dBA or greater at Noise Sensitive Areas (NSAs). Mitigation measures can include noise barriers, noise reducing asphalt and changes in the project’s vertical profile and/or horizontal alignment. Such measures, where applied, must be economically and technically feasible and must provide a noise reduction of at least 5 dB, averaged over the first row of noise-sensitive receivers. The measures are restricted to within the road right-of-way. Off right-of-way noise mitigation, such as window upgrades and air conditioning, is not considered. The Joint Protocol also sets an outdoor objective sound level of 55 dBA, or the existing ambient, whichever is higher. Mitigation should be applied to achieve the no-build ambient where feasible, or alternately as close to the Provincial objective of 55 dBA as possible.

31 NSAs include the following land uses, provided they have an Outdoor Living Area (OLA) associated with them: i) private homes; ii) multiple unit buildings such as apartments; iii) hospitals and nursing homes for the aged; iv) schools, educational facilities and day care centres; v) churches and places of worship; vi) campgrounds; vii) hotels and motels; and viii) vacant land that has been zoned to accommodate future development.
Health Canada’s active interest in environmental noise reflects its RA role under the Federal CEAA. Noise sensitive receptors in its ‘Fact Sheet for Noise Issues’ (2005) include residential land uses, hospitals, schools, daycares, seniors residences and sites where First Nations cultural/religious activities take place. Commercial and industrial land uses as well as churches and/or non-First Nations places of worship are not included. Health Canada’s assessment involves calculating changes in ‘percent highly annoyed’ using the ISO 1996-1:2003(E) international standard. For operational noise, Health Canada suggests that an increase in percent highly annoyed of 6.5 percent or higher, or an $L_{dn}$ value exceeding 75 dBA, may constitute a significant noise impact. Note however, that these guidelines are still in draft form. Health Canada uses Daytime $L_{eq}$ (15 h), night-time $L_{eq}$ (9 h) and $L_{dn}$ sound exposures for its own noise impact assessments.

4.2 Alternative Designs

A design work plan was prepared by the project team during Stage 2 of this EA study. It served as an iterative guide in the development of the alternative bridge designs and the ultimate selection of a preferred bridge design. The work plan was initially presented at a meeting with City and Parks Canada staff on September 16, 2010. This meeting involved a boat tour of the EA study area and discussions on various EA study topics, including preliminary bridge design and viewscape considerations. The design work plan and the tasks associated with it, were reviewed, vetted and updated accordingly during subsequent TAC and PLC meetings.

The design work plan involved the following four major steps:

1. The ‘Look and Listen’ step, which involved:
   a) Reviewing the background survey information from Stage 1 of this EA study;
   b) Undertaking and reviewing the Stage 2 fieldwork discussed above;
   c) Identifying the key views and viewsheds;
   d) Preparing bridge design objectives and guidelines; and
   e) Developing a catalogue of bridges.

2. The ‘Alternative Bridge Designs’ step, which used the information from the ‘Look and Listen’ step to:
   a) Develop three alternative bridge designs;
   b) Introduce in-water bridge construction options; and
   c) Confirm whether any utility distribution improvement works could (or should) be incorporated into the bridge designs.

3. The ‘Refinement of the Alternative Bridge Designs’ step, which assessed the three alternative bridge designs.

4. The ‘Selection of a Preferred Design’ step, which selected a preferred bridge design for a further detailed assessment.

4.2.1 Look and Listen

The ‘Look and Listen’ step was critical as it set the foundation for the subsequent preparation of the alternative bridge designs. It involved three main sub-tasks, namely: i) the establishment of key views and viewsheds; ii) the identification of bridge design objectives and guidelines; and iii) the preparation of a catalogue of bridges. These sub-tasks are discussed further below.

1. Key Views and Viewsheds

The limits of the key views and viewsheds at the project site location and surrounding area are shown on Drawing 4.15 and are defined further by:

1. Highway 401 to the north.
2. Craftsman Boulevard and the northern portion of Belle Island / Belle Park Fairways up to John Counter Place (immediately west of the John Counter Boulevard – Montreal Street intersection) to the south.
3. The tree line and first row of houses to the east.
4. The CNR line and tree line to the west.
The key views and viewsheds were established in response to two related factors. The first regards the landscape conditions at the project site location, which as stated earlier, are part of a transition point between the natural landscape of the Cataraqui River to the north up to Highway 401 and the City’s urban landscape which starts to emerge at the project site location just north of the Inner Harbour entrance near Belle Island. To reiterate, at this location, full views are evident of the Elliott Avenue Parkette, Village On The River apartments and the River Park subdivision to the west as well as the Rideau Marina and Point St. Mark residential neighbourhood to the east. With Belle Island and Belle Park in mind, the second factor relates to a design consideration that informed the evaluation and selection of a bridge at the project site location as the preferred solution during Stage 1 of this EA study. If the bridge profile was low to the water from west-to-east and then gradually rose above the Rideau Canal’s navigable channel, the silhouette of the bridge, in conjunction with the backdrop of Belle Island and Belle Park to the south, would be below the tree line when viewed from the north. Similarly, when viewed from the west, the rising silhouette of the bridge could either be at or below the tree line on the east side lands and, from the south, by the natural landscape that emerges in the background further north of the project site location to Highway 401. This could then help mitigate the visual impacts of the bridge on the surrounding landscape. As such, the key views and viewsheds were based on the bridge height above water being roughly 3 m starting at the west end and then gradually rising to 10 m over the canal’s navigable channel to tie into existing elevations and topographic features at the east end.

.2 Bridge Design Objectives and Guidelines

The bridge design objectives built on the ‘Mission Statement, Vision and Guiding Principles’ that were prepared at the outset of Stage 1 of this EA study. The objectives are outlined in Table 4.17 below.

<table>
<thead>
<tr>
<th>Table 4.17</th>
<th>Bridge Design Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Vision</td>
<td>1. Through innovative planning, design, and consultation, the bridge will display community leadership that reinforces the City’s proud historic association with the Rideau Canal and its goal of becoming Canada’s most sustainable City.</td>
</tr>
<tr>
<td>B. Guiding Design Objectives</td>
<td></td>
</tr>
<tr>
<td>B.1 Cultural and Natural Heritage Integrity</td>
<td></td>
</tr>
<tr>
<td>1. Complement the heritage values of the Rideau Canal as a UNESCO World Heritage Site, National Historic Site of Canada and Canadian Heritage River.</td>
<td></td>
</tr>
<tr>
<td>2. Respect the customs and traditions integral to the distinctive cultures of First Nations communities.</td>
<td></td>
</tr>
<tr>
<td>3. Respect the history of engineering innovation with the Rideau Canal within a 21st Century design context.</td>
<td></td>
</tr>
<tr>
<td>4. Enhance the natural landscape of the corridor shore lands.</td>
<td></td>
</tr>
<tr>
<td>5. Ensure that impacts on Species at Risk are minimized and that there is no net loss of fish habitat and no net loss of wetland structure and function.</td>
<td></td>
</tr>
<tr>
<td>B.2 Healthy Community</td>
<td></td>
</tr>
<tr>
<td>1. Provide safe, cost-effective (in terms of capital, maintenance and lifecycle costs), convenient and accessible pedestrian, cycling, public transit and automotive circulation and connections.</td>
<td></td>
</tr>
<tr>
<td>2. Ensure through-navigation as a valued means by which to promote public understanding, appreciation and enjoyment of the Rideau Canal and Kingston’s unique heritage and cultural character.</td>
<td></td>
</tr>
</tbody>
</table>
**Table 4.17**  
**Bridge Design Objectives**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B.2 Healthy Community</td>
<td>3. Achieve a design that is appropriate to and compatible with adjacent land uses, the immediate natural setting and the broader Belle Island and Rideau Canal contexts.</td>
</tr>
<tr>
<td></td>
<td>4. Provide functional and attractive lighting for motorists, public realms and bridge accentuation and which also mitigates light impacts on the immediate natural environment.</td>
</tr>
<tr>
<td></td>
<td>5. Enhance day and night views towards the bridge by river users, non-motorists and motorists and maximize day and night viewing opportunities to the setting from the bridge for non-motorists and motorists.</td>
</tr>
<tr>
<td></td>
<td>6. Maximize opportunities for bridge users to learn about the Rideau Canal, Belle Island and the Greater Cataraqui Marsh through such means as interpretive signage and public art.</td>
</tr>
</tbody>
</table>

Parks Canada also prepared bridge design guidelines. The guidelines supplemented the bridge design objectives and further articulated the aforementioned heritage values of the lower Cataraqui section of the Rideau Canal that Parks Canada prepared in 2010. The essence of the bridge design guidelines are as follows:

1. The Rideau Canal warrants a world-class bridge design that:
   a) Respects the natural and cultural heritage values of this part of the canal as well as First Nations customs and traditions;
   b) Is appropriate to and compatible with its natural setting, adjacent land uses and the Belle Island context;
   c) Responds to the canal’s history of engineering innovation and bridge design, but is an expression of its own time; and
   d) Supports a safe, enjoyable and memorable experience for bridge and canal users.

2. Aesthetically, the bridge should respond to the significance of the Rideau Canal by achieving a landmark quality that is aesthetically pleasing and not just a typical highway bridge. In more particular terms, it should:
   a) Be an honest expression of its function;
   b) Have a simple, economical form;
   c) Be in scale with and compatible with its surroundings;
   d) Minimize visual impact by maximizing transparency and lightness;
   e) Use order, symmetry and rhythm to create harmony and visual balance;
   f) Provide contrast and complexity through surface textures, colour and the play of light and shadow;
   g) Use high-quality, durable and compatible materials;
   h) Consider opportunities to introduce local stone and wood, particularly limestone; and
   i) Achieve timelessness through regular maintenance and by avoiding extremes of fashion or overt historicist references.

3. Key views should be taken into consideration, including:
   a) Views to the bridge from the Rideau Canal’s navigable channel and from north and south;
   b) Views to the Cataraqui Marsh and the slopes of the river valley from the canal’s navigable channel;
   c) Views from the bridge to the canal’s navigable channel, the Cataraqui Marsh, the slopes of the river valley, Belle Island, the northern entrance to the Inner Harbour and the Kingston skyline.

4. The bridge design should take advantage of interpretive opportunities and new views of the Cataraqui Marsh and the northerly portion of the Rideau Canal’s navigable channel using signage, public art, viewing nodes and interpretive media along the bridge to educate and enhance the visitor experience.
5. The bridge design should maximize viewing opportunities from the bridge, including:
   a) Providing lookout vantage points or nodes along the bridge deck with seating, interpretive signage and public art;
   b) Providing minimum height barriers and open railings; and
   c) Investigating the possibility of providing interpretation for boaters passing under the bridge.

6. The bridge design should enhance the pedestrian experience of the bridge by:
   a) Providing continuous open railings to optimize views;
   b) Using custom design to provide distinctive enhanced visual effects;
   c) Enhancing barrier-free design by providing lower inner barriers, custom-designed railings and innovative barrier wall terminations;
   d) Providing functional, high-quality and well-designed diffuse lighting that is simple and subtle; and
   e) Ensuring that signage is well-integrated and planned with no overhead signs, both on the bridge and its approaches.

3. Catalogue of Bridges

The catalogue of bridges is shown on Drawings 4.16 to 4.17. Its purpose was to help narrow down the list of possible bridge types and options in order to engage the alternative bridge design work. As these Drawings illustrate, the catalogue focused on optimum span alternatives and signature structures. The main bridge design elements from the catalogue include:

1. For structural reasons, the girder depth must increase as the spans increase. With this in mind, having less piers means that the girder depth would have to increase, leading to a ‘bulker’ visual bridge effect. On the other hand, having a more slender girder means that more piers are needed, which could lead to an on-water ‘wall’ visual bridge effect. Thus, a basic bridge design rule is to achieve appropriate span-length-to-girder-depth proportions.

2. The use of box girder piers provides a slender look but can have the visual effect of a ‘wall’ noted above, depending on the shore-to-shore crossing distance and the number of in-water piers.
4.2.2 Alternative Bridge Designs

.1 Bridge Concepts

The next step in the iterative design work plan was to develop three alternative bridge designs. The main components and structures common to each alternative are highlighted below:

1. The shore-to-shore crossing distance at the project site location is roughly 1,150 m.
2. As shown on Drawing 4.19, the bridge alignment is a constant gradual s-curve that lands north of the Point St. Mark residential neighbourhood.
3. As noted earlier, the CHBDC requires the bridge deck to have a minimum 1 m vertical clearance above the design high water level, which is at 76.3 m elevation at the project site location. The bridge clearance above the water is as follows:
   a) It is 3 m along most of its westerly portion (or at 78.8 m elevation) to accommodate existing topographic conditions on the west shore and then gradually rises to 14 m over the Rideau Canal’s navigable channel (or at 90 m elevation) near the east shore and adjacent rowing lanes; and
   c) It then descends to 12 m (or at 88 m elevation) at the east shore to tie into existing elevations and topographic features.
4. The first off-shore bridge pier would be located over 30 m from either shoreline.
5. As shown on Drawing 4.19, a 22.9 m wide bridge deck is ultimately proposed (for a total shore-to-shore bridge deck area of roughly 26,500 SM based on a crossing distance of 1,150 m) that is comprised of the following:
   a) A four-lane vehicular roadway (two 3.5 m wide lanes for westbound travel and two 3.5 m wide lanes for eastbound travel) with a 1.8 m wide median;
   b) A 3.6 m wide multi-use trail provided on the south side of the bridge for active transportation;
   c) A 1.5 m wide commuter cycling lane provided on both sides of the bridge; and
   d) A 0.5 m wide area for a barrier separating the multi-use trail and commuter cycling lane on the south side of the bridge.

A series of observation look-out/interpretive areas (or 'Belvederes') are also provided along the south side of the bridge.

As also shown on Drawing 4.19, it is recognized, based on the Stage 2 capacity analysis discussed earlier, that an initial bridge configuration could be a three lane, centre lane reversible, cross section with a four-lane bridge substructure. Under this scenario, one westbound lane and two eastbound lanes of vehicular traffic would operate in the AM peak hour and vice-versa in the PM peak hour. The three vehicular lanes along with the two commuter cycling lanes and multi-use trail could be accommodated on a 17.6 m wide bridge deck. It has been determined that this bridge configuration could operate from opening day up to approximately 2029, subject to interim monitoring of traffic volumes and other related conditions by the City. When or if ultimately required, the bridge deck could then be widened equally on both sides by 2.65 m, while maintaining the original foundation structure of the bridge, to ultimately achieve the required 22.9 m width to accommodate the four-lane vehicular roadway, commuter cycling lanes and multi-use trail described above.

6. Drawing 4.20 shows an example of barrier, railing and lighting details on the bridge, which serve to address public and traffic safety requirements and accentuate public realm and bridge features.
7. It is anticipated that the bridge would take up to three years to build. As noted earlier, the CHBDC requires a design life for new bridges of at least 75 years. New bridges having similar shore-to-shore characteristics to those within the project site location typically have a design life of at least 100 years.
8. In regards to the landscape improvements for the east and west side lands:
   a) The use of native plant materials reflective of the Deciduous Forest Region Species Association are envisioned to provide landscape variety and hardiness;
   b) Bridge abutments and retaining walls are conceptualized as large limestone ‘cap rock’ blocks in reference to both the Rideau Canal lock walls and the City’s heritage buildings;
   c) The intent of the observation look-out/interpretive areas is to:
      i. bring attention to the waterfront trail system at an appropriate scale with the bridge and gateway elements;

Note Drawing 4.19 does not show a two-lane bridge with a substructure to accommodate its widening to four lanes in the future, given that the 2030 to 2034 trigger for a four-lane bridge would impact its viability. The reason for this is that there would be a diminishing return on the initial capital investment, as the need for bridge twinning (with the two-lane bridge scenario) or widening (with the two-lane bridge-four-lane-substructure scenario) could be triggered shortly after the two-lane bridge would be built. However, neither scenario should be ruled out completely at this time. The future monitoring of traffic conditions by the City, particularly if the aforementioned improvements to the LaSalle Causeway-Highway 2 corridor are implemented, could confirm the viability of either scenario or even delay the timeline for engaging the Project Implementation Phase of the Class EA process for the bridge itself.
ii. provide a natural destination, resting place or rendezvous; and

iii. accentuate the public realm by accommodating:
   (a) interpretive signs or plaques about the Rideau Canal, Belle Island and the marsh as well as public art installations;
   (b) overhead pergolas and trellises that include mounted light sources and use materials that reflect the Rideau Canal lock station elements such as large timber and black coloured steel or cast iron; and
   (c) site furniture such as benches, waste receptacles and bike racks that also use materials that reflect the Rideau Canal lock station elements such as wood and black metal;

d) The gateway elements are intended to clearly demark the junction of bridge structure to land and impart an iconic character by being contemporary in form and by using materials and proportions that reference the cultural landscape without overt imitation of heritage architecture; and

e) The purpose of the active travel and commuter cycling provisions is to connect with existing non-automotive networks on both sides of the Cataraqui River.

9. In regards to stormwater management provisions:

   a) Stormwater quantity control is not required for the water falling on the bridge over the Cataraqui River, as 100 percent of that water would have reached the river under pre-development conditions;
   b) Stormwater quantity control is required for the water falling on the approaches to ensure that post-development peak flow rates are not greater than pre-development conditions;
   c) Stormwater generated by the bridge is to be released to the Cataraqui River using existing stormwater outlets;
   d) All stormwater released to the Cataraqui River is to meet the ‘enhanced’ level of treatment guideline used by OMOE and the CRCA; and
   e) Alternative eco-friendly de-icing chemicals would be required on the bridge, as road salt cannot be effectively removed from stormwater once it is in solution.

The stormwater management infrastructure for the approaches to the bridge would be identical to those for a typical road development. Catchbasins along the curb lines would collect the stormwater which would then be piped to a stormwater management facility (either above grade or underground) on-land, where the release rate of the water would be limited to pre-development conditions. Treatment of the water could be achieved using a variety of permanent infrastructure (vortex grit removal systems, extended detention stormwater pond, grassed swales, etc.), either individually or in combination. This infrastructure would be located adjacent to the approaches on each side of the river, discharging via existing overland channels or sewer outlets. Runoff from the bridge surface would be collected in similar catch basins and would be piped to the downstream approach for treatment with the water.

The three alternative bridge designs are as follows:

1. As shown on Drawing 4.21, the ‘Arch With V-Piers’ design, which:
   a) Provides two structural supports for the bridge girders but only one in-river foundation for each v-pier;
   b) Uses up to 13 v-piers at 83 m spans and incorporates a 100 m arch span over the Rideau Canal’s navigable channel and adjacent rowing lanes (for a total 131 m distance pier-to-pier);
   c) Each double v-pier above the mud-line is 51.5 SM (four legs each at 3.3 m long by 3.9 m wide), for a total in-water footprint of 669.5 SM;
   d) Provides an arch over the Rideau Canal’s navigable channel; and
   e) Does not require a girder under the arch portion as the arch-cable structure and skewed double v-pier at the arch provide the necessary structural support for the bridge deck, as shown on Drawing 4.22.

2. As shown on Drawing 4.23, the ‘Tube’ design, which:
   a) Uses rounded/smooth steel truss work that forms a tube around the bridge for additional structural support;
   b) Uses 11 piers at 100 m spans with a 120 m span over the Rideau Canal’s navigable channel and adjacent rowing lanes;
   c) Each pier above the mud-line is 17.5 SM (8.75 m long by 2 m wide), for a total in-water footprint of 192.5 SM; and
d) Would be the first bridge of its kind in the world for vehicular use and is considered avant garde due to its shape, aesthetics, robustness (there is less deflection and vibration) and lighter weight (it uses a third less structural steel and concrete compared to a conventional bridge with the same spans).

3. As shown on Drawing 4.24, the ‘Box Girder’ design, which:
   a) Requires 23 piers at 50 m spans in order to maintain appropriate span-length-to-girder-depth proportions;
   b) Each pier above the mud-line is 17.5 SM (8.75 m long by 2 m wide), for a total in-water footprint of 402.5 SM;
   c) Has a 65 m span over the Rideau Canal’s navigable channel only, thereby excluding the adjacent rowing lanes; and
   d) Is considered a more conventional bridge, particularly in comparison to the other alternative designs noted above.

As shown on Drawing 4.25, roadway and landscape improvements for the west side lands include:

1. For westbound travel:
   a) Two 3.5 m wide vehicular lanes along with a 3.25 m wide by 20 m long left-turn bay at the Village On The River apartment access on the south side of John Counter Boulevard and shared through/right-turn access into the River Park subdivision on the north side of John Counter Boulevard; and
   b) A 3.25 m wide by 60 m long left-turn bay and right-turn bay at Montreal Street.

2. For eastbound travel, two 3.5 m wide vehicular lanes along with:
   a) A 3.25 m wide by 60 m long left-turn bay, through lane/left-turn lane and right-turn lane option east of Point St. Mark Drive at Kingston Road 15;
   b) A 3.25 m wide by 20 m long left-turn bay at the Gore Road Library; and
   c) A right-turn option at Point St. Mark Drive.

3. Provisions for a median barrier separating the eastbound and westbound vehicular lanes.

4. The 3.6 m wide multi-use trail on the south side of the bridge:
   a) Continuing along the south side of Gore Road west of Point St. Mark Drive and connecting to the existing trail into the Point St. Mark residential neighbourhood; and
   b) Extending under the bridge to connect with the trail network on the Gore Road Library property.

5. A 1.5 m commuter cycling lane on both sides of Gore Road.

6. The existing 1.5 m wide sidewalk on the south side of Gore Road east of Point St. Mark Drive to Kingston Road 15.

7. A proposed on-land observation look-out/interpretive area is shown on the north side of the bridge on the Gore Road Library property.

8. The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River are incorporated into the landscape design as a ‘naturalized’ feature.

As shown on Drawing 4.26, roadway and landscape improvements for the east side lands include:

1. For westbound travel, two 3.5 m wide vehicular lanes along with a 3.25 m wide by 20 m long left-turn bay at Point St. Mark Drive and a right turn option at the Gore Road Library.

2. For eastbound travel, two 3.5 m wide vehicular lanes along with:
   a) A 3.25 m wide by 60 m long left-turn bay, through lane/left-turn lane and right-turn lane option east of Point St. Mark Drive at Kingston Road 15;
   b) A 3.25 m wide by 20 m long left-turn bay at the Gore Road Library; and
   c) A right-turn option at Point St. Mark Drive.

3. Provisions for a median barrier separating the eastbound and westbound vehicular lanes.

4. The 3.6 m wide multi-use trail on the south side of the bridge:
   a) Continuing along the south side of Gore Road west of Point St. Mark Drive and connecting to the existing trail into the Point St. Mark residential neighbourhood; and
   b) Extending under the bridge to connect with the trail network on the Gore Road Library property.

5. A 1.5 m commuter cycling lane on both sides of Gore Road.

6. The existing 1.5 m wide sidewalk on the south side of Gore Road east of Point St. Mark Drive to Kingston Road 15.

7. A proposed on-land observation look-out/interpretive area is shown on the north side of the bridge on the Gore Road Library property.

8. The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River are incorporated into the landscape design as a ‘naturalized’ feature.
9. Based on projected traffic volumes and patterns, it is proposed that:
   a) The following intersections would be signalized:
      i. John Counter Boulevard – Montreal Street;
      ii. Gore Road – Point St. Mark Drive – Gore Road Library; and
      iii. Gore Road – Kingston Road 15; and
   b) The Ascot Lane access onto John Counter Boulevard would have stop sign controls.

Table 4.18 below summarizes the preliminary opinion of probable capital cost for the alternative bridge designs and the four-lane shoreland roadway and landscape works, based on the: i) two-lane bridge configuration; ii) three-lane bridge / four-lane bridge substructure configuration; and iii) four-lane bridge configuration. As Table 4.18 indicates, capital cost estimates for the project (in 2011 dollars and excluding applicable taxes) range from:

1. $114 million to $120 million for the two-lane bridge scenario.
2. $145 million to $179 million for the three-lane bridge / four-lane bridge substructure scenario.
3. $161 million to $196 million for the four-lane bridge scenario.

In addition, the preliminary opinion of probable maintenance cost for the project (in 2011 dollars and excluding applicable taxes) is estimated to be up to $4,000 per lane km, or from $25,000 for the two-lane bridge configuration, to $30,000 for the three-lane bridge / four-lane bridge substructure configuration, to $35,000 for the four-lane bridge configuration.

.2 In-Water Bridge Construction Options

As introduced during Stage 1 of this EA study, temporary access into the Cataraqui River would be required for bridge construction equipment to install the pile foundations, construct the piers and install the superstructure. The three temporary in-water construction access options included the installation of a temporary earth berm, the use of dredging for construction barges or the installation of a temporary work bridge. These options are discussed below as they relate to the project site location.

A. Temporary Earth Berm

The temporary earth berm would involve infilling an area with earth material and capping it with gravel to provide a temporary roadway. Given that the water surface elevation is at roughly 74 m, the height of the berm would have to be at an elevation of around 76 m to ensure that the top of the berm is not impacted by water fluctuations and/or storm events. Moreover, as the elevation at the bottom of the peat layer and/or top of the clay layer within the riverbed ranges from around 66 m (near mid-river) to 71 m (typical), the depth of fill for the berm would also have to range from 5 m to 10 m. Note that the removal of the riverbed substrate would not be required for the berm.

As shown on Drawing 4.27, for bridge construction equipment access, the berm would have to be at least 10 m wide at the top, with an additional 40 m by 25 m area provided around each pier. The area covered by the berm at the toe of the fill would be approximately 6.2 hectares (ha). The berm would span from both riverbanks to the edge of the Rideau Canal's navigable channel. The canal's navigable channel would remain open and would not be affected by the berm. A series of culverts would also be installed in the berm to allow for river flow continuity and species movement. The berm would take up to two to three months to construct during the mid-summer/early fall and would be removed during this same period after the bridge is built. The impacted area would be left to re-vegetate naturally.

B. Dredging

Construction barges need about 3 m of draft for water access. Since the water depth at the project site location is typically 1.5 m (at elevation 74 m), the dredged level should be at about elevation 71 m, or 1.4 m below the mudline. This will remove most of the peat/vegetative layer. As shown on Drawing 4.28, for bridge construction, the bottom width of the dredged area would have to be 15 m, with an additional 45 m by 25 m area provided around each pier. The total dredged area would be about 4.3 ha. Dredging would occur over a two month period during the mid-summer/early fall. Upon completion of the bridge, the dredged channel could either be back-filled or left in place.

C. Temporary Work Bridge

Drawing 4.29 shows an example of a temporary work bridge which would be built adjacent to the permanent bridge. It would also be installed closer to the water than the permanent bridge deck in order to accommodate bridge construction equipment that need vertical reach, such as large crawler cranes. The work bridge at the project site location would consist of 15 m spans with 600 mm diameter pile supports for each span. Incremental span construction starting from each shore would be employed. Based on a 1.2 km shore-to-shore crossing distance, it is estimated that 200 piles would be needed for the work bridge. The area of disturbance from the temporary piles would be about 0.6 ha and while in place, the work bridge would also cause shading to an additional 1.4 ha area, for a total combined impact area of 2 ha. The incremental installation of the work bridge would occur during the mid-summer/early fall. The work bridge would then be removed during this same period after the bridge is built. The temporary piles would either be removed or cut off below the top of the riverbed and left in place. It is estimated that this option would add 8 percent to 12 percent to the preliminary opinion of probable costs shown above in Table 4.18, as compared to the temporary earth berm or dredging options.
Table 4.18
Preliminary Opinion of Probable Capital Cost for the Alternative Bridge Designs (2-Lane, 3-Lane and 4-Lane Bridge Scenarios) and Shoreland Works

<table>
<thead>
<tr>
<th>Construction Category</th>
<th>Arch With V-Piers</th>
<th>Tube</th>
<th>Box Girder</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2-Lane Bridge ($)</td>
<td>3-Lane Bridge ($)</td>
<td>4-Lane Bridge ($)</td>
</tr>
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City of Kingston
Third Crossing of the Cataraqui River Harmonized Environmental Assessment
Environmental Study Report

J. L. Richards & Associates Limited
JLR 23446-02
April 16, 2012
.3 Utility Infrastructure

During the Summer of 2010, mail and/or E-mail correspondence was sent by the project team to the following utility providers requesting feedback on whether any utility distribution improvement works could (or should) be incorporated into the bridge designs:

1. Union Gas – Kingston District.
2. Cogeco Cable Canada Ltd.
3. Bell Canada.
4. TransCanada Pipelines Ltd.
5. Trans-Northern Pipelines Inc.
6. Hydro One Networks Inc.
8. City of Kingston.

Hydro One Networks Inc. (Hydro One) and Utilities Kingston confirmed their interests in using the bridge to extend or improve their respective utility distribution systems. As stated earlier, there are three existing Hydro One marine electrical cables (3-phase 44 kV line) that cross the Cataraqui River in the project location area. Hydro One has acknowledged that it would need four 100 mm ducts concealed in the bridge girder superstructure to accommodate the future replacement of this infrastructure. Utilities Kingston, which provides asset management, billing and operational services to utilities in the water and wastewater, natural gas and electricity industries in the City, has made a similar request on behalf of Kingston Hydro.

In addition, and as per the 2007 ‘Master Plan for Water Supply for the City of Kingston Urban Area’ highlighted earlier, Utilities Kingston has also requested that the east-west watermain should be incorporated in the bridge design, as it is required to:

1. Improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (located northeast of the project site location).
2. Improve the redundancy in the municipal water system on the east side of the Cataraqui River.

It is estimated that a 525 mm watermain would be needed, subject to future detailed design and water distribution system modeling confirmation.

4.2.2 Refinement of the Alternative Bridge Designs

This Report acknowledges that there is no single arbiter of ‘good’ bridge design, especially given the prominence of the project and its location relative to existing land uses. As such, the advantages and disadvantages of the bridge concepts have relied on the fieldwork undertaken at the project site location, the intent of the design objectives and guidelines as well as the technical and public feedback provided at TAC meetings and the Public Information Centre on March 31, 2011.

The assessment of the bridge concepts is divided into the following seven sub-sections:

1. The bridge alignment.
2. The bridge profile.
3. The bridge deck configuration.
4. The alternative bridge designs.
5. The west and east side lands.
6. The in-water effects and bridge construction options.
7. Utility infrastructure considerations.

.1 The Bridge Alignment

As shown on Drawing 4.19, the bridge alignment is a constant gradual s-curve that lands north of the Point St. Mark residential neighbourhood. This alignment offers potential opportunities for:

1. Reduced potential noise and visual impacts on the Point St. Mark community.
2. ‘Softer landscaping’ along the Gore Road right-of-way on the east shore.
3. A more organic reflection of the bridge within the context of its transitional location between the natural landscape of the Cataraqui River to the north up to Highway 401 and the City’s urban landscape which starts to emerge at the project site location.
4. A more expanded viewscape experience for westbound bridge users, in that an open view would be provided of the visible cattail marsh and sloped river valley to the north, followed by the urban landscape on the west and then Belle Island and Belle Park to the south. The reverse of this viewscape experience would be evident for eastbound bridge users, though its effects would not be
as dramatic, given the gradual rise of the bridge above water and the less extensive urban landscape on the east side of the Cataraqui River.

It is equally acknowledged however, that the potential disadvantages of this alignment include:

1. A bridge at the project site location would have a noticeable presence on the landscape. As such, the opportunities afforded by the s-curve alignment would not completely eliminate the noise and visual impacts from the bridge on adjacent land uses on either side of the Cataraqui River.

2. The alignment, by landing north of the Point St. Mark community, would impact the westerly portion of the Gore Road Library, a designated cultural heritage property. As noted earlier, though the buildings, lawn, dry stone wall and off-leash dog park are located on the upper plateau to the north and east, portions of the woodland, former fields and recreational pathways are located on the lower plateau to the south and west. The s-curve alignment would affect the features on the lower plateau.

3. Finally, though the alignment would avoid the single archaeological site that was encountered adjacent to the northerly boundary of the Gore Road right-of-way near the Cataraqui River shoreline, the site would still be affected by site preparation and bridge construction activities in the immediate area.

2 The Bridge Profile

As shown on Drawings 4.21 to 4.24, the bridge clearance above the water for each of the three alternative bridge designs is 3 m along an eastwards portion (or at 78.8 m elevation) and then gradually rises to 14 m over the Rideau Canal's navigable channel (or at 90 m elevation) near the east shore and adjacent rowing lanes. It then descends to 12 m (or at 88 m elevation) at the east shore. This profile offers potential opportunities to:

1. Accommodate existing topographic conditions and features on the west and east side lands.

2. Exceed the Rideau Canal's minimum 6.7 m Federally regulated navigable requirement, thereby ensuring continued through-navigation and enjoyment of both the canal and the City's unique heritage and cultural character.

3. Exceed the CHBDC's required minimum 1 m vertical clearance above the design high water level, which is at 76.3 m elevation at the project site location.

4. Mitigate visual impact, which is discussed further below, based on the key viewshed limits at the project site location and surrounding area:

   a) As shown earlier on Drawing 3.11, the bridge would not be visible from the water at or near Highway 401 and, as such, the visible cattail marsh, near continuous overhanging tree canopy and shrub understory would still dominate the natural landscape;

   b) As shown on Drawing 4.30, as boaters proceed southward at roughly 1 km north of the Inner Harbour entrance near Belle Island and enter the open vista of the Cataraqui River, the bridge would be in full view along with the City's emerging urban landscape, but most of the rising silhouette of the bridge would be below the tree line along the north shore of Belle Island and Belle Park;

   c) As shown on Drawing 4.31, as boaters proceed northward from the LaSalle Causeway and round the tip of Belle Island at roughly 1 km south of the project site location, the sense of the urban-to-natural landscape transition begins with all but the east end of the bridge being visible (the east end is blocked from view by the Rideau Marina and shoreline) and its rising silhouette either at or below the tree line of the natural landscape that emerges in the background further north;

   d) Drawing 4.32, which provides a bridge profile view from the Elliott Avenue Parkette on the west side of the Cataraqui River, shows the gradual rise in bridge clearance over the water west-to-east that remains at or below the tree line on the east side of the river; and

   e) Drawing 4.33, which provides a bridge profile view from the Point St. Mark residential neighbourhood on the east side of the Cataraqui River, shows the gradual descent in bridge clearance over the water east-to-west and its integration into the urban landscape on the west side of the river, with the Village On The River Apartments and John Counter Place noted prominently in the background. It should also be noted that the landscape improvements on the west side lands provide an opportunity for the bridge to be below the 'future' tree line in this area when viewed from both the water and land on the east side.

At the same time however and as referenced earlier, given that the construction and operation of a bridge would introduce a major piece of infrastructure at the project site location, the potential opportunities afforded by the bridge profile would not completely eliminate the visual impacts from the bridge on both on-water views and adjacent land uses on either side of the Cataraqui River.

3 The Bridge Deck Configuration

The bridge deck components coincide with the rationale that led to the selection of a bridge at the project site location as the preferred solution during Stage 1 of this EA study, namely:

1. The opportunity for the bridge deck components to tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area.
2. The role of the bridge deck components in helping to provide a more direct mid east-west connection to existing road infrastructure on either shore. This in turn would address travel demand patterns, accommodate CFB Kingston’s future strategic plans as well as provide opportunities to enhance emergency response services, the City’s express bus route strategy and active travel and commuter cycling networks.

3. The intent of the observation look-out/interpretive areas along the south side of the bridge deck, which is to maximize opportunities for bridge users to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.

In addition, the purpose of the bridge deck design and staging approach is to reflect the following sensitivities:

4. How barriers and railings on the bridge could address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge.

5. How the use of soft, directional and intermittent lighting on the bridge could address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts from the bridge on the surrounding environment.

6. As per the 2005 PPS, the need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure. This Report recognizes the merits of facilitating an infrastructure improvement program that is both flexible and able to evolve in response to changing conditions. First, this Report has acknowledged the 2011 HDR/iTrans report and its recommended strategy to improve existing and future deficiencies along the LaSalle Causeway-Highway 2 corridor over the short-to-medium term. This Report and the 2011 HDR/iTrans report have also jointly acknowledged that this strategy may not be able to solely reduce congestion and accommodate future traffic volume demand on the LaSalle Causeway-Highway 2 corridor beyond 2019. As such, the capacity analysis done for this EA study has determined that a two-lane bridge could be needed by as early as 2019 and that a four-lane vehicular roadway, commuter cycling lanes and multi-use trail.

Furthermore and despite these projected requirements, this Report has also proposed that an initial bridge configuration could be a three lane, centre lane reversible, cross section. It has been determined that this configuration could operate from opening day up to approximately 2029. This too would be subject to interim monitoring of traffic volumes and other related conditions by the City.

At the same time however and as referenced earlier, Section 4.6.35 of the City’s Official Plan reflects the recommendation in the 2004 KTMP, wherein it cites a 2-lane bridge crossing at the project site location as a strategic ‘future major road extension’, subject to the outcome of an EA study. As noted above, based on the capacity analysis done for this EA study, the proposed interim three-lane and ultimate four-lane bridge deck configuration requirements would not conform to the Official Plan. As such, a text amendment to the Official Plan would be required. It is noted that the Official Plan is subject to review every five years. However, City Council may direct that such a review occur at any time due to exceptional circumstances or opportunities for the City.

4 The Bridge Concepts

Considerations regarding the bridge concepts are as follows:

1. It is anticipated that the bridge would have a minimum design life of at least 100 years, which exceeds the CHBDC’s minimum 75 year design life requirement.

2. The ‘Box Girder’ concept has the second lowest preliminary opinion of probable cost in comparison to the other concepts. Still, it was viewed as ‘somewhat preferred’ by a vast majority of residents who attended the Public Information Centre on March 31, 2011. This view was also reflected during the TAC meetings, which combined, expresses a sentiment that the ‘Box Girder’ concept is too conventional and plain from an aesthetic perspective, particularly given the Rideau Canal context. It is also unable to span over both the canal’s navigable channel and adjacent rowing lanes without negatively impacting span-length-to-girder-depth proportions. Even despite achieving this objective, as shown earlier, the profile views of the ‘Box Girder’ concept from the west and east sides of the Cataraqui River still convey an on-water ‘wall’ visual bridge effect resulting from the 23 piers. On the other hand, reducing the number of piers would require an increased girder depth, thereby potentially leading to a ‘bulkier’ visual bridge effect.

3. The avant garde nature of the ‘Tube’ concept exceeds in its response to the history of engineering innovation with the Rideau Canal within a 21st Century design context. By providing additional structural support, the steel truss work requires only 11 piers, which reduces associated in-water disturbances and provides a more open viewscape when viewed from the water. Moreover, the ‘Tube’ concept requires less structural steel and concrete compared to a more conventional bridge such as the ‘Box Girder’ concept, which results in it having the lowest preliminary opinion of probable cost in comparison to the other concepts. The benefit of its ability to span over the canal’s navigable channel and adjacent rowing lanes is also acknowledged. Despite these potential advantages, which were recognized during the TAC meetings and by residents who attended the Public Information Centre on March 31, 2011, it was equally acknowledged that the ‘Tube’ concept imposes an excessive, industrial aesthetic on the landscape. Views of the water and surrounding landscape from the bridge would be negatively impacted by the enclosed steel truss work.
Moreover, concerns were also expressed about the potential ‘shadow-flickering’ affect on bridge users from the truss work, the on-going maintenance of the truss work and the ability of the truss work to maintain its structural integrity if impacted by vehicular accidents. Finally, the ‘Tube’ concept could not be widened in the future and as such, would be unable to accommodate the bridge deck staging options cited earlier. As such, the ‘Tube’ concept was viewed as ‘least preferred’ by a vast majority of residents who attended the Public Information Centre on March 31, 2011.

4. The ‘Arch With V-Piers’ concept was viewed as ‘most preferred’ by a vast majority of residents who attended the Public Information Centre on March 31, 2011. This view was also generally reflected during the TAC meeting discussions. The ‘Arch With V-Piers’ concept is able to provide two structural supports for the bridge girders but only one in-river foundation for each pier. This could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore. It could also be feasible to reduce the number of piers from 13 double v-piers to 11 double v-piers, similar to the ‘Tube’ concept, and still maintain appropriate span-length-to-girder-depth proportions. This could further benefit viewscape considerations and reduce associated in-water disturbances. In addition, it is able to span over the Rideau Canal’s navigable channel and adjacent rowing lanes, while the arch over the canal’s navigable channel highlights the bridge as a 21st Century ‘gateway’ to/from the Inner Harbour and canal. Still, its preliminary opinion of probable cost is roughly 20 percent higher than the ‘Box Girder’ and ‘Tube’ concepts.

.5 The West and East Side On-Land Effects

A. General Effects

The potential advantages of the proposed roadway and landscape improvement on the west and east side lands include:

1. Based on the capacity analysis done for this EA study, the identified roadway improvement works should maintain the flow of traffic along this critical mid-east-west arterial corridor at an acceptable LOS D over the long-term. This analysis has also demonstrated that these improvements and their resulting effects on traffic flows should be such that short-cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated. Should future monitoring by the City of traffic flows demonstrate otherwise after the bridge is built, measures could then be put in place to help discourage short-cutting, such as those measures highlighted earlier.

2. The purpose of the active travel and commuter cycling provisions on the bridge is to connect with and thereby enhance existing non-automotive networks on both sides of the Cataraqui River.

3. The intent of the landscape concept is to:
   a) Ground the bridge structure dramatically and distinctively at each side of the crossing using gateway elements, materials and proportions that reference and enhance the cultural landscape without overt imitation of heritage architecture;
   b) Maximize opportunities for residents to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh;
   c) Enhance the natural landscape, particularly its edge condition where the land falls away under the bridge; and
   d) Demonstrate how context sensitive design could address public and traffic safety requirements, maximize viewing opportunities, accentuate public realms and mitigate impacts on the surrounding environment.

In terms of the crossing experience, the landscape concept utilizes the principle of spatial compression to amplify the difference between the views passing along a roadway corridor and the open vistas over the Cataraqui River.

4. The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River have been incorporated into the landscape design as a ‘naturalized’ feature to further accentuate the public realm.

Furthermore, based on the fieldwork done at the project site location:

5. The west side lands are dominated by urban land uses but no cultural heritage properties or ELC community types. As such, the landscape improvements represent an opportunity for a degree of restoration by creating a more naturalized landscape that mitigates the extensive environmental disturbance and alteration that has occurred in this area. This in turn could further serve to enhance both the ‘ribbon of life’ along the shoreline and visitor experience of the Rideau Canal.

6. The east side lands also demonstrate anthropogenic-based disturbances, including: i) historic agricultural land uses; ii) yard waste and detritus dumping; iii) the trails on the Gore Road library property, which have fragmented the forest block; iv) non-native and some invasive plant species; and v) surrounding urban land uses. Despite there being some aerial extent, the forest block is largely isolated, such that linkages to other forested lands are significantly affected. Moreover, none of the trees observed are listed in either the OESA or the Federal SARA. Though there are
some very large mature trees, the east side lands are generally lacking the key characteristics of an old-growth forest. Overall, the affected woodlands on the east side lands should not be considered provincially significant or contributory, as per the 2005 PPS and the City’s Official Plan. Ultimately, the landscape improvements represent an opportunity for ecological compensation in this area by recreating a more naturalized landscape. This in turn could also further serve to enhance both the ‘ribbon of life’ along the shoreline and visitor experience of the Rideau Canal.

It is equally acknowledged however, that such design measures will be a critical piece of the broader package of mitigation measures required during the Project Implementation phase to either reduce or eliminate potential negative project impacts on the surrounding terrestrial environment, including:

1. Exhaust emissions and airborne dust from equipment traffic during bridge construction and from the subsequent use and maintenance of the bridge could impact air quality (particulate matter).

2. Though the alignment would avoid the single archaeological site that was encountered adjacent to the northerly boundary of the Gore Road right-of-way near the Cataraqui River shoreline, the site would still be affected by bridge construction activities in the immediate area.

3. As shown earlier on Drawing 4.25, it is anticipated that, due to a lack of available vacant land near the project site location on the west side, certain privately owned properties (either in whole or in part) would be required for reconfigured and expanded road, trail and landscaping works, stormwater management provisions and as a bridge construction lay-down and staging area. Moreover, though visual examination of the west side lands suggests that virtually all lands within the existing road rights-of-way have been disturbed to the extent that any archaeological testing in those areas is almost certain to be futile, the private lands on either side of John Counter Boulevard do not appear to have been extensively disturbed and may contain areas where archaeological potential still remains.

4. As noted earlier, the bridge, by landing north of the Point St. Mark community, would impact the woodland, former fields and recreational pathways on the lower plateau portion of the Gore Road Library. Moreover, as shown earlier on Drawing 4.26, it is anticipated that, due to a lack of available vacant land near the project site location on the east side, a portion of the lower plateau would be required for stormwater management provisions and as a bridge construction lay-down and staging area. Furthermore, the widening of Gore Road would also require the removal of the formal gardens that extend along the southerly portion of the library property as well as the relocation of a 12 m portion of the dry stone wall that extends perpendicular from the library into the Gore Road right-of-way on the upper plateau. These features are significant attributes of the library property that contribute to its heritage value and landmark status along Kingston Road 15, as outlined in By-Law No. 2007-166. In addition to the proposed landscape improvements which represent an opportunity for ecological compensation in this area by recreating a naturalized landscape, it should also be noted that efforts have also been made during the design of the east approach to the bridge to minimize the impacts on the dry stone wall. The following three options were considered:

a) Moving the road alignment further to the south: this is not considered feasible as it would directly impact existing homes in Point St. Mark that back onto Gore Road;

b) Reducing the Gore Road right-of-way by eliminating the centre median and mature trees that currently exist in the south boulevard as well as moving the road further south and the sidewalk and multi-use trail up against the road: this is not considered feasible due to:

i. public and traffic safety concerns for those using the road, sidewalk and multi-use trail;

ii. the traffic noise impacts on the existing homes in Point St. Mark that back onto Gore Road; and

iii. the ecological and quality of life impacts from removing the mature trees that currently exist in the south boulevard; and

c) Elevating Gore Road by up to 4 m so it passes over the dry stone wall: this is not considered feasible as it would:

i. require the vertical and horizontal alignment of Gore Road to be modified in order to preserve vertical sight distances for traffic and maintain the intersections at Gore Road-Point St. Mark Drive and Gore Road-Kingston Road 15 at 90 degrees; and

ii. the traffic noise impacts on the existing homes in Point St. Mark that back onto Gore Road.

It was thus concluded that the dry stone wall would be impacted by the widening of Gore Road, but that mitigation measures will be needed to minimize the potential effects.

5. The bridge would impact existing faunal wildlife habitats and species on both sides of the Cataraqui River. Certain faunal species are also at some level of risk. Lands would be required to implement reconfigured and expanded road, trail and landscaping works, stormwater management provisions and to facilitate bridge construction. Such activities would involve: i) riparian vegetation removal; ii) stripping and stockpiling of topsoil; iii) shoreland excavation works; iv) heavy equipment use and maintenance; v) heavy material use and storage; vi) sanitary and construction waste management; and vii) accidents and malfunctions from equipment use. Without mitigation measures in place,
these activities would lead to a loss of habitat, species mortalities, restricted species movement, shoreline erosion and a subsequent decrease in surface water quality.

6. Both the property at 917-919 Montreal Street and the fill material along the western shoreline of the Cataraqui River between the CN and CP railway tracks are issues of potential environmental concern. Site preparation and bridge construction activities could disturb potentially contaminated soils in these areas.

7. The bedrock on-shore could potentially be frost susceptible, as it is at relatively shallow depths of about 1.7 m and 3.1 m at the east and west banks, respectively.

B. Noise Effects

The construction and operation of a bridge will generate noise impacts at the project site location. For this reason, a noise assessment was conducted of the four-lane bridge alignment at the project site location, as it is projected to be ultimately needed by the 2029 horizon year. The objectives of the noise assessment were: i) to predict future ‘build’ and future ‘no-build’ sound levels from road traffic sources; ii) to use these predictions to assess potential effects from bridge construction and bridge operations according to the applicable joint guidelines from the MTO and OMOE, as cited earlier; and iii) to specify mitigation measures at the project site location, which are discussed later in this Report.

As discussed earlier, the joint Provincial guidelines specify that an outdoor objective sound level is 55 dBA $L_{eq}$, or the existing ambient, whichever is higher. Mitigation is warranted when increases in sound levels over the future ‘no-build’ ambient sound levels are 5 dB or greater. Mitigation measures should achieve at least 5 dB of attenuation, averaged over the first row of noise-sensitive receivers, and can include barriers, sound reducing asphalts and/or changes in vertical profiles and horizontal alignments. The mitigation measures are restricted to within the road right-of-way and must be administratively, economically and technically feasible.

As shown on Drawing 4.34, 15 noise receptors represent the ‘Noise Sensitive Areas’ (NSAs) within the project site location area. There are roughly 700 NSAs in the following general areas:

1. Five existing residential areas.
2. The River Park subdivision on the north side of John Counter Boulevard that is currently under construction.
3. An existing day care centre on the south side of John Counter Boulevard just west of Montreal Street.
4. A vacant privately owned lot adjacent to the Gore Road Library property to the north that could potentially accommodate a future residential development.
5. The Gore Road Library, though it is not strictly considered a NSA by the joint Provincial guidelines.
The noise assessment then compared future ‘build’ sound levels (projected traffic volumes for the 2029 horizon year with the four-lane bridge in place) versus future ‘no-build’ sound levels (projected traffic volumes for the 2029 horizon year with no bridge in place). Tables 4.19 and 4.20 show this comparison under pre-mitigation conditions during the daytime (16-hours) and night-time (8-hours), respectively.

### Table 4.19
Projected 2029 Daytime Sound Levels (Unmitigated)

<table>
<thead>
<tr>
<th>Receptor Location</th>
<th>Number of NSAs</th>
<th>Unmitigated Future ‘No-Build’ (dBA)</th>
<th>Unmitigated Future ‘Build’ (dBA)</th>
<th>Unmitigated Change (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR1 (Briceland Street Residential)</td>
<td>90</td>
<td>47</td>
<td>55</td>
<td>8</td>
</tr>
<tr>
<td>NR2 (Day Care)</td>
<td>1</td>
<td>60</td>
<td>67</td>
<td>8</td>
</tr>
<tr>
<td>NR3 (Montreal Street Residential)</td>
<td>5</td>
<td>63</td>
<td>66</td>
<td>3</td>
</tr>
<tr>
<td>NR4 (River Park Subdivision West)</td>
<td>72</td>
<td>53</td>
<td>62</td>
<td>10</td>
</tr>
<tr>
<td>NR5 (River Park Subdivision East)</td>
<td>72</td>
<td>51</td>
<td>64</td>
<td>13</td>
</tr>
<tr>
<td>NR6 (Village On The River Apartment)</td>
<td>250</td>
<td>48</td>
<td>58</td>
<td>10</td>
</tr>
<tr>
<td>NR7 (Kenwood Crescent Residential)</td>
<td>20</td>
<td>45</td>
<td>58</td>
<td>13</td>
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<td>NR8 (Kenwood Crescent Residential)</td>
<td>15</td>
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<td>10</td>
</tr>
<tr>
<td>NR9 (Kenwood Crescent Residential)</td>
<td>20</td>
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</tr>
<tr>
<td>NR10 (Barker Drive Residential)</td>
<td>10</td>
<td>56</td>
<td>67</td>
<td>11</td>
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<td>NR11 (Gore Road Library)</td>
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<td>NR12 (Barker Drive Residential)</td>
<td>24</td>
<td>60</td>
<td>65</td>
<td>5</td>
</tr>
<tr>
<td>NR13 (McLean Court Residential)</td>
<td>35</td>
<td>59</td>
<td>61</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table 4.20
Projected 2029 Night-time Sound Levels (Unmitigated)

<table>
<thead>
<tr>
<th>Receptor Location</th>
<th>Number of NSAs</th>
<th>Unmitigated Future ‘No-Build’ (dBA)</th>
<th>Unmitigated Future ‘Build’ (dBA)</th>
<th>Unmitigated Change (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR14 (McLean Court Residential)</td>
<td>18</td>
<td>60</td>
<td>62</td>
<td>2</td>
</tr>
<tr>
<td>NR15 (Vacant Land-Potential Residential)</td>
<td>1</td>
<td>50</td>
<td>55</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: i) night-time sound levels were not predicted at places of business [NR2 (Day Care) and NR11 (Gore Road Library)] since they are assumed to operate during the daytime only; and ii) NR15 (Vacant Land-Potential Residential) was only considered a daytime receptor since development details are unknown.
The results show that changes in sound levels resulting from the four-lane bridge are projected to be:

1. 5 dB or less at NR3 (Montreal Street Residential) as well as at NR12 (Barker Drive Residential), NR13/NR14 (McLean Court Residential) and NR15 (Vacant Land-Potential Residential). Therefore, mitigation is predicted to be unnecessary at these receptors.

2. More than 5 dB at NR11 (Gore Road Library) but the library is considered noise-sensitive inside the building and not an OLA. Therefore, it is expected that the building construction should adequately attenuate ‘future build’ sound.

3. 5 dB or greater at the remaining NR locations for which mitigation will need to be investigated further.

Potential mitigation measures in this regard could include:

1. Changes to horizontal alignments: Horizontal changes in alignment can result in increases or decreases in sound levels at noise-sensitive receptors by moving the roadway closer or further away. However, the changes that result are limited since the distance to the roadway must be doubled for a 3 to 5 dB decrease in sound level. This is not feasible at the project site location as the alignment is constrained by the location and width of the existing rights-of-way, and by the proximate locations of the NSAs.

2. Changes to vertical alignments: Vertical changes in alignment can affect sound levels at NSAs by affecting the line-of-sight between the roadway sources and the receiver. Line-of-sight changes influence ground attenuation and barrier effects of the surrounding topography. For example, placing the roadway at the bottom of a shallow in-cut can create a natural barrier effect at the edge of the excavation. On the other hand, elevated roadways located on embankments or structures may also have reduced sound levels, as the structure can act as a barrier for ground level receptors, blocking the line-of-sight for roadway lanes on the ‘far side’ of the road from the receptor in question. However, these scenarios are not feasible at the project site location as the alignment is constrained by the location and width of the existing rights-of-way, and by the proximate locations of the NSAs.

3. Sound-reducing pavement: For vehicles travelling at highway speeds, the majority of the sound produced is due to interactions between the tires and pavement surface. Sound-reducing pavements such as ‘open-graded friction course’ or ‘stone mastic asphalt’ may cost twice as much as conventional mixes, and by themselves produce sound reductions of only 2.5 dB. This is only half of the 5 dB minimum needed to be considered effective under the Joint Protocol. Thus, other mitigation measures must also be employed to meet the 5 dB attenuation requirement.

4. Sound barriers: Barriers reduce sound levels at protected receptors by blocking the path of sound waves from the source towards the receiver, and by absorbing or reflecting the incident sound energy away. Therefore, a barrier must at least break the line-of-sight between the source (the roadway) and the NSA. Barriers can be formed of earthen berms, engineered walls, or some combination of the two. Where earthen berms are used, side slopes of 3:1 should be used for drainage and erosion control and right-of-way maintenance. Where walls are used, they should be free of gaps and cracks, and have a minimum surface density (mass per unit of face area) of 20 kg/m². Transparent barriers can also be used to minimize their aesthetic effect on current surroundings. Sound barriers can theoretically provide at least 5 dB of attenuation, which is needed to be considered effective under the Joint Protocol. The available sound barrier options may also be able to address the constraints created by the location and width of the existing rights-of-way and by the locations of the NSAs at the project site location. As such, sound barriers have been carried forward for further assessment as the preferred method of noise mitigation resulting from bridge use:

- a) Regarding the use of sound barriers for the identified NSAs on the west side lands:
  - i. there is an existing barrier at NR1 (Briceland Street Residential) and therefore, sound mitigation is not considered economically feasible without reconstructing the entire wall;
  - ii. it is not considered administratively feasible to build sound barriers along the south side of John Counter Boulevard to mitigate sound levels at NR2 (Daycare) and NR3 (Montreal Street Residential) due to right-of-way and access restrictions as well as commercial frontages;
iii. it is not considered technically or economically feasible to build sound barriers at NR6 (Village On The River Apartment) due to the height of the buildings and their 92 m distance from the bridge corridor, both conditions of which would require major barriers (more than 6 m in height) extending across the bridge to achieve the acceptable mitigation; and

iv. as shown on Drawing 4.35:

(a) for NR4 (River Park Subdivision West) a 3 m high by 110 m long sound barrier wall, earthen berm or a combination on the north side of John Counter Boulevard up to Ascot Lane would achieve an average of 7 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 55 dBA; and

(b) for NR5 (River Park Subdivision East) a 3 m high by 96 m long sound barrier wall, earthen berm or a combination on the north side of John Counter Boulevard up to Ascot Lane would achieve an average of 9 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 55 dBA; and

v. it is not considered technically or economically feasible to build sound barriers at NR8 (Kenwood Crescent Residential) because:

(a) a large sound barrier would be required to achieve the acceptable mitigation; and

(b) the mitigated sound level would be below the joint Provincial guideline of 55 dBA at NR8 due to the effects of the sound barriers at NR7/NR9 (Kenwood Crescent Residential) to the north.

The preliminary opinion of probable capital cost for the proposed sound barriers cited above is $1.1 million (in 2011 dollars and excluding applicable taxes). This could be included under the Contingency line item for the preliminary opinion of probable capital costs for the four-lane bridge scenario, as noted earlier in Table 4.18.

In addition, sound and vibration may also affect the behaviour of land and marine wildlife resulting from a bridge at the project site location. The literature on this issue indicates that human-made sound can alter wildlife patterns under some circumstances, such as with mating call interference and startle responses. These effects tend to happen when sound levels reach high values (typically 70 dBA or higher) or are elevated for prolonged periods of time. In most instances, wildlife adapt their behaviour to the new surroundings (e.g., alter mating calls, change nesting areas) or simply avoid the local area where effects are most notable. This latter behaviour helps to prevent unnecessary human interactions with wildlife that could endanger animals or result in fatalities. For transportation corridors, sound levels typically only reach the high levels of concern within 100 m of the corridor and hence tend to be localized. More detailed assessments of specific wildlife effects are very difficult since the body of available research is limited and does not adequately describe the dose-effect relationships for sound, principally since wildlife cannot communicate the effects of sound.

b) Regarding the use of sound barriers for the identified NSAs on the east side lands:

i. design constraints on the east shore related to geometry (terrain change and elevated bridge deck), the location and width of the existing Gore Road right-of-way and its proximate location to the NSAs preclude the use of an earthen berm as a feasible sound barrier;

ii. the existing Gore Road right-of-way and its proximate location to the NSAs also requires that a portion of the sound barrier extend onto the bridge deck, which further precludes the use of an earthen berm as a feasible sound barrier;

iii. sound barrier wall heights ranging from 0.5 m up to 3 m were assessed; and

iv. as also shown on Drawing 4.35:

(a) for NR7/NR9 (Kenwood Crescent Residential) a 3 m high by 400 m long sound barrier wall extending west from the south side of the Point St. Mark Drive-Gore Road intersection onto the bridge deck would achieve an average of 5 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level ranging from 53 dBA to 55 dBA; and

(b) for NR10 (Barker Drive Residential) a 2.4 m high by 168 m long sound barrier wall extending east from the south side of the Point St. Mark Drive-Gore Road intersection to Kingston Road 15 would achieve an average of 7 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 60 dBA; and
It is also anticipated that the proposed bridge may serve as an emergency detour route for Highway 401 should an accident or event cause it to be closed in the vicinity of Kingston. In this instance, traffic volumes on the proposed bridge can be expected to increase, likely to the point of causing congestion and reduced vehicle speed since the bridge would be exceeding its capacity. Such congestion events generally produce reduced sound levels from road traffic since wheel sound is largely limited by the reduced speed of the vehicles. Normally, wheel sound created by the interaction of tires with the road surface creates a large portion of traffic sound levels, which tends to increase with increasing speed. As a result, emergency detours over the proposed bridge are expected to produce lower sound levels than under more free-flow conditions. This could also extend to emergency situations on the bridge itself, which are expected to result in decreased sound levels due to restricted traffic movements.

Finally, sound from bridge construction activities would also be generated at the project site location, which will be temporary and vary temporally and spatially as construction progresses. Sound levels from construction at a given NSA will also vary over time as different activities take place and change location. Though construction sound would be largely unavoidable, guideline and Code of Practice requirements will be critical to minimize potential effects on NSAs. In this regard, the City of Kingston Noise By-Law (No. 2004-52), as amended, prohibits the following:

1. The operation of any item of construction equipment without an effective exhaust muffling device that is in good working order and in constant operation.
2. The operation of construction equipment or performing any action relating to construction between 1900 hours (7:00 PM) of one day to 0700 hours (7:00 AM) of the next day, all day Sundays and statutory holidays.

However, it is important to note that under Schedule ‘C’ to this By-law, the operation of municipal and utility service vehicles and related equipment is exempt, which could apply to bridge construction activities. Despite this, a protocol has been put in place for other past major municipal infrastructure projects to notify City Council in advance if the Contractor, in consultation with the City, has deemed it necessary to perform construction works outside of the allowable time periods listed above. This protocol has given City Council the opportunity to consider whether any conditions should be imposed on the proposed works.

Furthermore, as outlined in Table 4.21 below, the OMOE ‘Publication NPC-115: Construction Equipment’, stipulates the following limits on sound emissions from individual items of construction equipment:

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Maximum Sound Level (dBA)</th>
<th>Distance From NSA (m)</th>
<th>Power Rating (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation Equipment</td>
<td>83</td>
<td>15</td>
<td>Less than 75 kW</td>
</tr>
<tr>
<td></td>
<td>85</td>
<td>15</td>
<td>More Than 75 kW</td>
</tr>
<tr>
<td>Pneumatic Equipment</td>
<td>85</td>
<td>7</td>
<td>N/A</td>
</tr>
<tr>
<td>Portable Compressors</td>
<td>76</td>
<td>7</td>
<td>N/A</td>
</tr>
</tbody>
</table>

The OMOE also sets blast vibration limits in its ‘Publication NPC 119: Blasting’, as shown below in Table 4.22.

<table>
<thead>
<tr>
<th>Vibration Source</th>
<th>Cautionary (Unmonitored Blasts)</th>
<th>Peak (Monitored Blasts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concussion (air overpressure)</td>
<td>120 dB</td>
<td>128 dB</td>
</tr>
<tr>
<td>Ground-borne Vibration</td>
<td>1 cm/s</td>
<td>1.25 cm/s</td>
</tr>
</tbody>
</table>

.6 The In-Water Effects and Bridge Construction Options

The project has the potential to have a two-fold impact on the natural and cultural heritage of the marine environment. First, there would be the potential impacts associated with the three temporary in-water construction access options, namely, the temporary earth berm, the use of dredging for construction barge or the installation of a temporary work bridge. Once in-water access is provided, then the installation of the bridge piers and superstructure would create the second set of potential impacts. Prior to mitigation, the potential negative impacts from these two in-water activities as they relate to the project site location are discussed below:

1. The potential negative effects of the project on marine archaeological resources. As discussed earlier, no cultural heritage materials were located at the project site location during the
marine archaeological fieldwork. Moreover, the paleo-environment of the project site location suggests a marsh environment, similar to the existing marsh to the north, wherein small, isolated areas of raised elevation are evident as opposed to a discrete, submerged paleo-shoreline. As such, the project site location exhibits a low archaeological potential for encountering either prehistoric or historic cultural remains. This should not be interpreted to mean however, that marine archaeological resources are not present at the project site location and will not be potentially impacted by the project.

2. **The potential negative effects of the project on river hydrology.** The use of a temporary earth berm with culverts and the installation of piers associated with either the temporary work bridge or permanent bridge could change water levels and flows. This is due to the partial blockage of water flow from the in-water works which causes upstream water levels to increase to force the flow through the restricted openings and around the obstructions. Typically, hydraulic bridge design is based largely on the flow-generated conditions at the bridge location as these conditions generate the largest local velocities. Though wind speed and water flow velocities vary within the watercourse over time, as previously noted, the lower Cataraqui River reach is not a typical reach, in that it is wide and flow-generated velocities, especially at the project site location, are low, at roughly 0.4 m/s. As such, the physical characteristics of the lower Cataraqui River reach are similar to a lake-like setting.

Due to the reduced importance of the hydrologic conditions at the project site location, six environmental forcing scenarios reflecting a range of temporal changes in water flow and wind speeds were modeled to assess potential project impacts on river hydrology. The scenario conditions are summarized in Table 4.23 below.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Water Flow (m³/s)</th>
<th>Wind Speed (m/s)</th>
<th>Wind Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (100 Year) Condition</td>
<td>50</td>
<td>20</td>
<td>North</td>
</tr>
<tr>
<td>Moderate I Condition</td>
<td>50</td>
<td>4.5</td>
<td>North</td>
</tr>
<tr>
<td>Moderate II Condition</td>
<td>10</td>
<td>20</td>
<td>North</td>
</tr>
<tr>
<td>Moderate III Condition</td>
<td>10</td>
<td>4.5</td>
<td>North</td>
</tr>
</tbody>
</table>

The modeling results generally show that the worst case scenario is the ‘High (100 Year) Condition’ model. Under this scenario and as shown on Drawings 4.36 and 4.37, the double v-piers as part of the ‘Arch With V-Piers’ design would generate the most impact on water levels and flow-generated velocities. But these impacts are considered very minor and localized, in that:

a) The highest increase in water levels is modeled to be only 4 mm in the vicinity of the double v-piers themselves, which is due to the resistance to flow generated by the piers and the increase in flow-generated velocity between the piers;

b) The highest increase in flow-generated velocity is modeled to be only 0.035 m/s, which is found between the spans of each double v-pier and, as noted above, is due to the resistance to flow generated by the piers themselves;

c) The impact of the double v-piers on flow-generated velocity is most evident in the area between the two piers of any given pair, where flows would be stalled; and

d) As the above-noted impacts would be under worst case conditions, and as such, would not be expected to persist for any significant period of time, under more normal conditions of lighter winds, lower flows or reduced setdown in Lake Ontario, the flow-generated velocities within the channel and their related effects would be reduced even further.

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34 The ADCIRC model was used which solves time dependent, free surface circulation and transport problems in two dimensions (depth integrated). The program uses the finite element method in space allowing the use of highly flexible, unstructured grids.
In addition, general and local scour estimates were prepared based on the hydraulic modeling and as per the CHBDC requirements with guidance from MTO’s Drainage Management Manual. Given the width of the watercourse and limited flow-generated velocities at the project site location, the general scour estimates are in the order of 2 N/SM, which is considered negligible. In terms of local scour, preliminary estimates suggest a local scour depth allowance of 7.5 m. This potential undermining of the pier footings would be prevented if the piles were socketed directly into the bedrock.

Finally, the potential for any of the bridge concepts to influence ice jamming on the Cataraqui River is also considered to be negligible. As stated earlier, the ice generally melts in place due to the limited flow-generated velocities. This is not expected to change with a bridge at the project site location.

3. The potential negative effects of the project on watercraft navigation: As noted earlier, the proposed bridge clearance above the water is 14 m over the Rideau Canal’s navigable channel and adjacent rowing lanes. This exceeds the 6.7 m Federally regulated navigable requirement for the canal. The navigable channel is officially closed to watercraft from Thanksgiving to Victoria Day.

In addition, the proposed 100 m arch span over the canal’s navigable channel (for a total 131 m distance pier-to-pier) was originally considered to be sufficient to span the existing rowing course which runs in parallel to the channel from the Point St. Mark residential neighbourhood north for 2,000 m. However, the initial 131 m distance pier-to-pier has subsequently been increased to a proposed 150 m distance pier-to-pier, as shown on Drawing 4.38. This increase reflects recent consultations with the Kingston Rowing Club, during which the project team was advised that the rowing course is seven lanes wide. Four rowing lanes are on the west side of the channel and three lanes are on the east side. Though only the rowing lanes abutting either side of the channel are marked, club staff indicated that an 11 m wide rowing lane width is presumed for each lane across the full course, which accommodates the rowing shells, prevents collisions and complies with Olympic requirements. As such, concerns were expressed that the initial 131 m distance pier-to-pier would encumber the rowing course and not provide adequate horizontal and vertical clearance between the rowers and abutting piers, given:

a) The channel is at roughly a 30 degree angle to the bridge;

b) The minimum 6.7 m Federally regulated navigable requirement for the canal;

(c) The CRCA design ‘high’ water level requirement of 76.3 m; and

d) The 1H:1.2V rising slope of the v-piers above the water does not accommodate full vertical clearance from the waterline to the underside of the bridge deck.

Based on these recent consultations, the project team has determined that it would be feasible to increase the pier-to-pier distance to 150 m in order to provide unencumbered through-navigation for the existing rowing course. Proposed design features include:

a) A 9.4 m horizontal clearance from the abutting pier on the west side of the course;

b) An 8 m horizontal clearance from the abutting pier on the east side of the course; and

c) A 13.5 m wide rowing lane on either side of the navigable channel to provide an additional 2.5 m clearance from the channel itself.

The 150 m distance pier-to-pier would also provide flexibility to optimize the pier locations further during the project implementation phase in response to more specific rowing course and navigable channel configurations and characteristics north and south of the bridge corridor. It should also be noted that the preliminary opinion of probable cost for the four-lane bridge scenario cited earlier in Table 4.18 ($161 million to $196 million) would have to be reviewed further during the project implementation phase if the proposed 150 m distance pier-to-pier design is pursued to fully accommodate the rowing course.

4. The potential negative effects of geophysical conditions on the project. For seismic design purposes, Kingston is listed in Table A3.1.1 of the CHBDC and falls in an Acceleration-related seismic zone (Za) of 2 and a Zonal acceleration ratio of 0.10. Assuming the bridge would be classified as a ‘Lifeline’ bridge, the seismic performance zone would be 3 based on the CHBDC. The Site Coefficient (S) for the project site location, also based on the CHBDC, may be taken as 1.5, which is consistent with Soil Type III, due to the deep clay deposit within the Cataraqui River.

Under the design earthquake condition, the silty clay soil and glacial till soil at the project site location are not considered to be susceptible to liquefaction. This is because of their relatively high fines contents and plasticity. But the layer of organic soils below the river mudline is considered to be susceptible to liquefaction under the design earthquake condition. Provided the bridge structure is founded on bedrock, no adverse impact on the post-liquefaction capabilities of the bridge foundation is anticipated.
In addition, as discussed earlier, there are two zones within the project site location where low resistivity is observed within the bedrock beneath the river, centred at distances of 320 m and 970 m along the ERI survey line. These areas are most likely associated with the Frontenac Axis. If these zones are faults, they are considered inactive and do not pose any additional seismic impacts. Still, as shown earlier, the foundation elements associated with the ‘Arch With V-Piers’, ‘Tube’ and ‘Box Girder’ designs avoid these potential fault zones.

5. **The potential negative effects of the project on substrate disturbance.** As noted earlier, higher metals concentrations were found at sediment ‘grab sample’ location SS3 in the middle part of the Cataraqui River and higher PAHs concentrations were found at sediment ‘coring sample’ CS7 in the middle-west part of the Cataraqui River in comparison to the other sampling locations. Exceedances of CCME and Provincial Sediment Quality Guidelines were also found in all grab samples and at most depths in the sediment cores. In-water preparation and bridge construction activities could disturb this substrate, causing sediment suspension and a subsequent decrease in surface water quality.

6. **The potential negative effects of the project on fish and fish habitat.** In-water preparation and bridge construction activities could potentially lead to: i) restriction of fish movement; ii) species mortalities or avoidance of the area; iii) the loss of aquatic vegetation and fish habitat; iv) the spread of invasive species from vessels brought in from areas outside the Great Lakes system; and v) accidents and malfunctions from equipment use. It is the cumulative effect of all of these potential impacts which can result in a ‘Harmful Alteration Disruption or Destruction’ (HADD) to fish and fish habitat.

Based on the proposed in-water preparation options and bridge construction activities, a risk assessment for fish and fish habitat has been prepared in accordance with the ‘Practitioner’s Guide to the Risk Management Framework for DFO Habitat Management Staff’. This involves a matrix using the following two scales: i) the ‘scale of negative effect’, which uses three attributes, namely, extent, duration and intensity; and ii) the ‘scale of sensitivity of fish and fish habitat’, which uses four attributes, namely, species sensitivity, species dependence on habitat, rarity and habitat resiliency. It is important to note that this assessment has been guided by the above-noted discussion on potential negative effects of the project and the following four additional considerations, which are based on the bridge concepts as well as the terrestrial and marine ecological fieldwork:

1. **The footprint of the bridge itself.** As discussed earlier, the bridge deck would ultimately have a total shore-to-shore area of roughly 26,500 SM, based on a four-lane, 22.9 m deck width scenario and a crossing distance of 1,150 m. In addition, the total in-water footprint resulting from the piers in the ‘Arch With V-Piers’, ‘Tube’ and ‘Box Girder’ concepts would be up to 669.5 SM, 192.5 SM and 402.5 SM, respectively. With these factors in mind, the potential direct impacts associated with the bridge itself (foundations and superstructure) could include: i) restriction of fish movement; ii) avoidance of the area while the piers and superstructure are being installed; and iii) the loss of 192.5 SM to 669.5 SM of fish habitat. The potential indirect impacts could include: i) shading from the bridge deck on the marine environment; ii) loss of riparian vegetation; and iii) erosion along the shoreline. These impacts are considered minor relative to the following:

a) The larger potential impact spectrum associated with the in-water footprints of the three temporary in-water construction access options, which as cited earlier, could range from 2 ha (or 20,000 SM) for the temporary work bridge, to 4.3 ha (or 43,000 SM) for the dredging option, to 6.2 ha (or 62,000 SM) for the temporary earth berm;

b) It is anticipated that the bridge clearance above the water, which as noted earlier, is 3 m along most of its westerly portion and then gradually rises to 14 m over the Rideau Canal’s navigable channel near the east shore and then descends to 12 m at the east shore, should contribute only partial bridge deck shading on the marine environment; and

c) Though riparian vegetation provides habitat, shading and a food source for fish (insects falling into the water), its efficacy in doing so at the project site location is impacted by the wide span of the Cataraqui River and the limited extent of riparian vegetation.

2. **The characteristics of the Greater Cataraqui Marsh PSW at the project site location.** As noted earlier, the majority of the project site location consists of one vegetation type (suW1), and the balance is open water areas (OW). The suW1 community is a vegetation community with only one vegetation form (submerged vegetation), dominated in 1990 by Milfoil. The OW areas are non-vegetated areas, which in this area is due to the maintenance of dredged channels for watercraft. As noted above, these areas are not part of the Greater Cataraqui Marsh PSW.

In the OWES, vegetation communities are valued for their diversity and single form communities such as the suW1 community have a lower value because they will generally support a lower diversity of other wetland species. The project site location also avoids the more sensitive portions of the Greater Cataraqui Marsh PSW, most notably its visible cattail portion to the north.

3. **The fish sampling results at the project site location area.** As discussed earlier, yellow perch which were found spawning throughout the mid channel zone during the spring visit. The presence of YOY pumpkinseed, bluegill, largemouth bass and the occasional rock bass and brown bullhead suggests that these species are also spawning within the project site location area. Despite these observations, the fieldwork results demonstrated that the fish communities were composed primarily of common warm to cool water sport and forage fish. No species of conservation value or SAR were captured or observed.
4. **The role of mitigation measures.** The intent of the considerations noted above is to contextualize the potential direct and indirect negative impacts associated with the footprint of the bridge and the three temporary in-water construction access options discussed further below. The role of mitigation measures during the project implementation phase will be critical to either reduce or eliminate its potential negative impacts on the natural and cultural heritage of the marine environment.

With the above considerations in mind, the risk assessment results on fish and fish habitat are outlined below in Table 4.24 (‘scale of negative effect’) and Table 4.25 (‘scale of sensitivity of fish and fish habitat’) and focus on the three temporary in-water construction access options. This assessment indicates that all three temporary in-water construction access options would be categorized as acceptable low risk projects under the DFO risk management framework, provided best management practices and mitigation measures are properly implemented and maintained. By extension, the bridge would similarly be categorized as an acceptable low risk project under the DFO risk management framework, given the role of mitigation measures and its more limited footprint and impacts in comparison to the three temporary in-water construction access options.

.7 **Utility Infrastructure Considerations**

As highlighted earlier, Utilities Kingston has requested that an east-west watermain, which is required to service a proposed new water booster station in east Kingston, should be incorporated in the bridge design. It is estimated that a 525 mm watermain would be needed, subject to future detailed design and modeling confirmation. There are two options available to incorporate this infrastructure in the bridge design, namely:

1. Attach it to the bridge deck and provide for necessary: i) insulation equipment to maintain water flows during the winter months; ii) heat tracing equipment for monitoring and maintenance purposes; and iii) expansion joints on the watermain to accommodate bridge expansion and contraction. This would increase the diameter of the watermain and associated infrastructure to at least 800 mm.

2. Dredge the riverbed and install the watermain within the dredged channel. It is important to note that Utilities Kingston installed a watermain and forcemain across the Cataraqui River within a dredged channel south of Belle Island and the Rideau Canal (but within the Greater Cataraqui Marsh PSW) in 2003.

The selection of a preferred temporary in-water construction access option will have a direct bearing on how and where the watermain could be installed. If either the temporary earth berm option or temporary work bridge option is preferred, then the watermain and associated equipment would have to be incorporated into the bridge superstructure. If aesthetics were not an issue, it would typically be installed alongside the bridge deck. But this approach would be difficult to justify at the project site location, given the Rideau Canal context. Thus, the watermain would need to be installed underneath the bridge deck and either enclosed within a bridge girder or installed between bridge girders so as to block its view. In this regard, if the watermain was installed between the bridge girders, Utilities Kingston would need ‘snooper’ trucks to inspect the integrity and condition of the watermain and the functionality of the expansion joints, so as to mitigate the risk of a potential infrastructure breach. If the watermain was enclosed within a bridge girder, then inspections would have to occur within a ‘confined space entry’ protocol. Two access points to the watermain between each pier would be needed from the bridge deck level shore-to-shore. This is due to the diaphragms at each pier which would restrict full access pier-to-pier. Up to forty-six access points could be required, given that the ‘Box Girder’ concept has the most piers (23 piers) in comparison to the other concepts. In addition, it is also important to note that with the ‘Arch With V-Piers’ concept, a girder is not needed under the arch portion, as the arch structure and skewed double v-pier at each end of the arch would provide the necessary structural support for the bridge deck. As such, additional masking or screening of the watermain under the arch portion would be required, which could impact the slenderness of its design.

If the dredging option is preferred, then the watermain could be installed within the dredged channel. Snooper trucks, expansion joints, heat tracing and insulation jacket equipment would not be needed under this scenario. This would simplify maintenance and reduce associated costs and eliminate the risk of a potential infrastructure breach. Masking or screening of the watermain under this scenario would also not be required, given that it would be located within the dredged channel. Utilities Kingston has requested the dredged channel as the preferred location for the watermain, based on its advantages and their past experience with installing and monitoring infrastructure in this manner.

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Note the snooper truck has a positional platform or basket that is able to extend under the bridge deck from the bridge deck level to facilitate inspections.
### Table 4.24
Temporary In-Water Construction Access Options and the ‘Scale of Negative Effect’

<table>
<thead>
<tr>
<th>Construction Option</th>
<th>Attribute</th>
<th>Rating</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary Earth Berm</td>
<td>Extent</td>
<td>Low</td>
<td>The direct footprint will be 6.2 ha which is considered to have a localized effect within one portion of a larger marine environment. No indirect impacts are anticipated provided best management practices and mitigation measures are properly implemented and maintained.</td>
</tr>
<tr>
<td>Duration</td>
<td>High</td>
<td>The temporary earth berm would take up to two to three months to construct during the mid-summer/early fall and would be in place for two consecutive construction seasons. It would then take up to two to three months to remove, also during the mid-summer/early fall period, after the bridge is built. Fish use of the area would be prevented for up to four years.</td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td>Low</td>
<td>It is anticipated that the area would return to pre-construction conditions within one to two years after the bridge is built.</td>
<td></td>
</tr>
<tr>
<td>Dredging</td>
<td>Extent</td>
<td>Low</td>
<td>The direct footprint will be 4.3 ha which is considered to have a localized effect within one portion of a larger marine environment. As such, no indirect impacts are anticipated provided that best management practices and mitigation measures are properly implemented and maintained.</td>
</tr>
<tr>
<td>Duration</td>
<td>High</td>
<td>Dredging would occur over a two month period during the mid-summer/early fall and would create a non-vegetated area that could last for eight years or more in light of the relatively shallow waters (ranging from 1.5 m over the majority of the section to approximately 4.5 m at the Rideau Canal’s navigable channel) and low water flow velocities ranging from negligible up to 0.4 m/s). If the dredgeate is returned to the affected area after the bridge is built, then the vegetation should re-establish to pre-construction conditions within one to two years.</td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td>Low (dredgeate returned)</td>
<td>Moderate (dredgeate not returned)</td>
<td>If the dredgeate is returned to the affected area after the bridge is built, it is anticipated that the area would return to pre-construction conditions within one to two years. If the dredgeate is not returned to the affected area after the bridge is built, then the area could become less productive as it is not expected to re-vegetate. On the other hand, given that the project site location area is dominated by littoral habitat and represents only a single habitat type, dredging has the potential to create lentic habitat and thereby increase the biodiversity in the wetland.</td>
</tr>
<tr>
<td>Temporary Work Bridge</td>
<td>Extent</td>
<td>Low</td>
<td>The direct footprint will be 0.6 ha from the temporary piles. The indirect impact due to shading would result in a loss of vegetation within an additional 1.4 ha area. This is considered to have a localized effect within one portion of a larger marine environment. As such, no other indirect impacts are anticipated provided best management practices and mitigation measures are properly implemented and maintained.</td>
</tr>
<tr>
<td>Duration</td>
<td>High</td>
<td>The incremental installation of the temporary work bridge would occur during the mid-summer/early fall. The work bridge would be in place for two consecutive construction seasons. It would then take up to two to three months to remove, also during the mid-summer/early fall period, after the bridge is built.</td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td>Low</td>
<td>After the bridge is built, the temporary piles would either be removed or cut off below the top of the riverbed and left in place. It is anticipated that the area would return to pre-construction conditions within one to two years.</td>
<td></td>
</tr>
</tbody>
</table>

36 The ‘Working Around Wetlands? What You Should Know’ publication on the Environment Canada website (www.ec.gc.ca/Publications) states that though dredging is generally not favoured because it provides only a temporary solution and can cause environmental damage, it also acknowledges that carefully dredged channels sometimes can provide important deeper water habitat for freshwater and other wildlife. Also, three case studies done in areas having similar conditions to the project site location area have cited that dense aquatic macrophytes results in specific types of fish communities. The creation of low or no vegetation can create an area for larger fish species and thereby potentially increase local productivity and biomass diversity.
### Table 4.25
Temporary In-Water Construction Access Options and the ‘Scale of Sensitivity of Fish and Fish Habitat’

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Construction Option</th>
<th>Rating</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Species Sensitivity</strong></td>
<td>Dredging</td>
<td>Low</td>
<td>The fish species at the project site location area are mostly moderately sensitive to turbidity. Provided that best management practices and mitigation measures are properly implemented and maintained, the potential impacts from turbidity would be low.</td>
</tr>
<tr>
<td></td>
<td>Temporary Earth Berm</td>
<td>Low</td>
<td>The fish species at the project site location area are habituated to areas with dense vegetation, soft substrate and slow water velocities. These species are generally resilient and will avoid the impact area if active disturbances are taking place. Provided that best management practices and mitigation measures are properly implemented and maintained, the potential for species mortalities would be low.</td>
</tr>
<tr>
<td></td>
<td>Temporary Work Bridge</td>
<td>Low</td>
<td>No highly sensitive species such as salmonides are present at the project site location area.</td>
</tr>
<tr>
<td><strong>Species Dependence on Habitat</strong></td>
<td>Dredging</td>
<td>High</td>
<td>This area, especially the mid channel, is used for spawning by several species (sunfish, bass, perch). There is a potential to impact spawning habitat over the long term for the temporary earth berm and dredging options.</td>
</tr>
<tr>
<td></td>
<td>Temporary Earth Berm</td>
<td>High</td>
<td>For the temporary work bridge option, it is uncertain what portion of the area would no longer function as spawning habitat as it would depend on the amount of shading and resilience of the vegetation.</td>
</tr>
<tr>
<td></td>
<td>Temporary Work Bridge</td>
<td>Low-High</td>
<td></td>
</tr>
<tr>
<td><strong>Rarity</strong></td>
<td>Dredging</td>
<td>NIL</td>
<td>There is an abundance of one habitat type at the project site location area.</td>
</tr>
<tr>
<td></td>
<td>Temporary Earth Berm</td>
<td>NIL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temporary Work Bridge</td>
<td>NIL</td>
<td></td>
</tr>
<tr>
<td><strong>Habitat Resiliency</strong></td>
<td>Temporary Earth Berm</td>
<td>Low</td>
<td>The Cataraqui River system is classed as warm-water and there will be no thermal or flow effects associated with project implementation.</td>
</tr>
<tr>
<td></td>
<td>Temporary Work Bridge</td>
<td>Low</td>
<td>As discussed earlier, for the temporary earth berm and temporary work bridge options, it is anticipated that the area would return to pre-construction conditions within one to two years after the bridge is built.</td>
</tr>
<tr>
<td></td>
<td>Dredging</td>
<td>Low</td>
<td>As noted earlier, if the dredgeate is returned to the affected area after the bridge is built, it is anticipated that the area would return to pre-construction conditions within one to two years.</td>
</tr>
<tr>
<td></td>
<td>(dredgeate returned)</td>
<td>Moderate</td>
<td>As discussed earlier, if the dredgeate is not returned to the affected area after the bridge is built, the aquatic conditions will change from a shallow habitat choked with vegetation to a more pelagic habitat, particularly for larger species. This has the potential to increase the quantitative value of the wetland and fish habitat diversity at the project location area.</td>
</tr>
</tbody>
</table>
4.2.3 Mitigation Measures

The assessment of the bridge concepts and their potential impacts is useful in further exploring the interactions of the project during each stage of its design life (construction, operation and decommissioning) with valued ecosystem components (VECs) at the project site location area. This can assist in identifying best management practices and mitigation measures required to either reduce or eliminate the potential negative effects of specific project activities. The potential project-environmental interactions are introduced in Table 4.26 below.

<table>
<thead>
<tr>
<th>PROJECT PHASE AND ACTIVITIES</th>
<th>Air Quality (Particulate Matter)</th>
<th>Air Quality (Noise)</th>
<th>Soil and Groundwater Systems</th>
<th>Vegetation</th>
<th>Wildlife Habitat</th>
<th>Aquatic Habitat</th>
<th>Cultural Heritage Resources</th>
<th>Archaeological Resources</th>
<th>Local Community</th>
<th>Roads and Road Traffic; Boat Traffic</th>
<th>Business and Job Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSTRUCTION PHASE (UP TO 3 YEARS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Site Preparation</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>●</td>
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<tr>
<td>Temporary Facilities and Lay-Down Areas</td>
<td>●</td>
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<td>●</td>
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<tr>
<td>Superstructure Construction and Installation</td>
<td>●</td>
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<tr>
<td>Bridge Deck Construction and Installation</td>
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<tr>
<td>Utility Installations</td>
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<tr>
<td>Road and Landscape Works</td>
<td>●</td>
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<tr>
<td>Waste Management Systems</td>
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<tr>
<td>Malfunctions and Accidents</td>
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<tr>
<td>OPERATION PHASE (OVER 100 YEARS)</td>
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<tr>
<td>Bridge and Road / Water Use</td>
<td>●</td>
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<tr>
<td>Bridge and Road Maintenance</td>
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<td>●</td>
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</tr>
<tr>
<td>Utility Operations</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>0</td>
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<td>0</td>
</tr>
</tbody>
</table>

Based on these potential project-environmental interactions, the mitigation measures outlined below are introduced that could reduce or eliminate potential negative impacts from specific activities associated with the design life of the bridge. There are two important tools that will be administered by the City during future project phases to mitigate potential adverse environmental effects. The first tool deals with the preparation and implementation of a Cultural-Natural Heritage Protection Plan (C-NHPP) in advance of each phase of the project. The C-NHPP will be written in industry-accepted specification format and contain best management practices, including:

1. As part of the project construction phase:
   a) Ensuring all construction equipment:
      i. is maintained in good working condition through regular maintenance and inspections;
      ii. includes industry-standard emissions treatment and noise-suppression systems that meet applicable Provincial guidelines current at that time; and
      iii. operate and re-fuel only in designated areas;
   b) Employing dust suppression techniques such as watering on construction access roads and sweeping at construction site entrances;
c) Installing:
   i. ditches along temporary roadways to direct surface drainage to temporary treatment ponds or permanent facilities; and
   ii. permanent stormwater drainage and management facilities to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements;

d) Using local aggregates for site preparation and construction activities, subject to availability;

e) Conducting analyses of sediments in advance of and following excavation activities both on-shore and in-water in order to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage and agency notification) and excavated material disposal to an approved landfill facility are mobilized in accordance with regulatory requirements;

f) In advance of shoreland excavation works, installing sediment fencing along the riverbanks to prevent sediment movement and erosion outside of the work area;

g) Ensuring shoreland excavation works meet applicable Provincial blasting vibration guidelines current at that time;

h) Installing silt fencing for spoil stockpiling or fill materials and ensuring such areas are at least 30 m off-shore;

i) Ensuring spill kits are located on-site and storing construction materials and debris as well as fuel, lubricants and other hazardous materials in designated areas away from high-traffic areas and the Cataraqui River;

j) Purging the ballasts of all in-water vessels, should they originate from outside the Great Lakes system, in order to minimize the risk of introducing invasive species into the Cataraqui River;

k) Suspending in-water construction activities during periods of heavy rain and high wind events;

l) Minimizing the removal of shoreline and riparian vegetation as this could represent an opportunity for the continuance of existing ecosystem features and functions;

m) In advance of in-water removal of aquatic vegetation or substrate, installing silt curtains and/or turbidity barriers around in-water work areas and ensuring such measures remain in place until the sediments within the affected work areas have settled;

n) Regularly monitoring:
   i. shoreline erosion and sediment control measures and ensuring such measures are not removed until the terrestrial vegetation is re-established as part of the landscape improvement works; and
   ii. river water quality north and south of the project site location for turbidity, suspended soils, nutrients and contaminants.

o) Conducting advance inspections in areas slated for site preparation and construction activities in order to assess the presence of sensitive vegetation and tree species as well as wildlife species and the feasibility of relocating affected species to other hospitable environments and/or establishing buffers to protect affected species and to restrict access;

p) Scheduling site preparation and construction activities:
   i. to avoid sensitive areas as well as breeding/spawning seasons and over-wintering periods for wildlife (from March 15 to July 15 for fish; Spring and Fall for migratory waterfowl; from May to late September and the Fall-Winter months for the Eastern Milke Snake; between early August and late September for turtle species), unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts; and
   ii. in consultation with:
      (a) the Kingston Rowing Club and Queens Rowing Club to avoid impacts to the local rowing community as much as possible; and
      (b) Parks Canada, Department of Fisheries & Oceans and Transport Canada to ensure the Rideau Canal’s navigable channel remains open and the arch span bridge section installation in particular occurs during when the channel is officially closed to watercraft (from Thanksgiving to Victoria Day);

q) In advance of site preparation activities and in consultation with the appropriate Provincial and Federal agencies, preparing a Natural Environment Enhancement Plan that includes measures related to wetland restoration, creating aquatic habitat enhancements (such as
islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows and re-vegetating and re-foresting the east and west side lands in direct response to the detail bridge design and construction program;

r) In regards to the Gore Road Library property:

i. documenting the condition of historic structures in advance of site preparation works and during construction activities to ensure that any adverse effects are promptly addressed;

ii. ensuring that the historic structures are protected from direct impact by vehicles during site preparation and construction activities;

iii. assessing the condition of trees and plantings along the southern boundary of the property and avoiding or relocating those specimens having historical significance to other suitable locations on the property, as feasible and appropriate;

iv. despite efforts to avoid the impact on the dry stone wall:

(a) relocating as little of the wall as possible in order to facilitate the widening of Gore Road and to meet safety and traffic requirements in road construction;

(b) documenting the section of the wall to be relocated, both for historical purposes and to facilitate site reconstruction;

(c) ensuring the relocated section of the wall is reconstructed by a qualified heritage stonemason and that it is rebuilt as a continuation of the existing wall, but at right angles and heading eastward on a parallel to Gore Road (the latter as per the request of representatives of the Kingston Heritage Advisory Committee); and

(d) assessing the condition of the remaining wall by a qualified heritage stonemason; and

v. preparing and implementing an Interpretation Plan that both documents and presents the known history of the property in situ;

s) In advance of site preparation works, removing and documenting archeological site BbGc-127 through archaeological excavation in order to mitigate the risk of the site being damaged during the project construction phase;

t) Conducting periodic monitoring of excavated materials to minimize potential impacts on previously undocumented archaeological resources;

u) Ensuring proper in situ conservation or excavation and removal measures as well as notification protocols are in place regarding the discovery of previously undocumented cultural heritage and archaeological resources;

v) In the event that human remains are encountered, immediately notifying the Kingston Police, OMTC, the Cemeteries Registrar of the Ontario Ministry of Government and Consumer Services and the City’s Heritage Planner;

w) Sorting construction debris for recycle or disposal for hauling off-site by licensed operators to approved facilities;

x) Using licensed personnel to:

i. handle hazardous materials; and

ii. provide regular pump-out and haulage services of temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment;

y) Ensuring proper on-site construction signage and controls are installed for designated areas and traffic lanes to ensure safe and efficient circulation on-land and in-water;

z) Establishing a remote off-site facility for construction labour force parking complete with scheduled shuttle service to and from the project site location as well as encouraging the construction labour force to carpool to and from the project site location;

aa) Unless otherwise necessary, undertaking site preparation and construction activities during daylight hours in accordance with the City’s Noise By-Law and to avoid potential effects of noise and artificial night lighting on the natural environment;

bb) Implementing the preferred design, which as noted above, incorporates additional elements as potential mitigation measures; and

cc) Employing detailed protocols for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures.
2. As part of the project operation phase:

   a) Ensuring all maintenance equipment is in good working condition through regular maintenance and inspections;

   b) Continuing to regularly monitor:
      i. shoreline erosion and sediment control measures and ensuring such measures are not removed until the terrestrial vegetation is re-established as part of the landscape improvement works; and
      ii. Cataraqui River water quality north and south of the project site location for turbidity, suspended soils, nutrients and contaminants;

   c) Maintaining and monitoring those works that are included in the Natural Environment Enhancement Plan;

   d) Implementing dust suppression measures as part of maintenance activities;

   e) Using only non-chlorinated de-icing agents on the bridge deck;

   f) Ensuring the stormwater drainage and management facilities are in good working condition through regular maintenance and inspections;

   g) Suspending in-water maintenance activities during periods of heavy rain and high wind events;

   h) Conducting advance inspections in areas slated for maintenance activities in order to assess the presence of sensitive vegetation and tree species as well as wildlife species and the feasibility of relocating affected species to other hospitable environments and/or establishing buffers to protect affected species and to restrict access;

   i) Ensuring that the historic structures are protected from direct impact by maintenance equipment;

   j) Scheduling maintenance activities to avoid sensitive areas as well as breeding/spawning seasons and over-wintering periods for wildlife (from March 15 to July 15 for fish; Spring and Fall for migratory waterfowl; from May to late September and the Fall-Winter months for the Eastern Milke Snake; between early August and late September for turtle species), unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts;

   k) Monitoring future traffic conditions by the City in order to:
      i. confirm the future viability of the initial three-lane bridge scenario, should it be pursued;
      ii. optimize the coordination of traffic signals to maximize efficient traffic flows; and
      iii. address the potential issue of short-cutting through residential neighbourhoods on the west and east side lands through such means as:
      a) monitoring signal timings to optimize traffic flow on the main public roads;
      b) building out curb radii to restrict vehicular turns into residential areas;
      c) installing speed humps on residential roads to slow down traffic;
      d) creating restrictions within the residential road system such as one-way streets, restricted turns and dead end roads; and/or
      e) installing traffic signage restricting vehicular turns into residential areas either at all times or during certain times of the day; and
      i) Preparing and employing an Operations and Maintenance (O & M) Manual that contains detailed protocols for employees/contractors regarding stormwater management system and maintenance equipment inspections and maintenance procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures.

3. Similar mitigation measures used during the project construction phase would be employed as part of the project decommissioning phase. If and when decommissioning and rehabilitation are required at the project site location, it is anticipated that such works would take up to two years to complete. Such works would also be assessed as part of a Decommissioning Plan (DP), which would further be subject to EA regulations current at that time.

The second tool deals with the preparation and implementation of a Community Action Plan (CAP) that will be in place from the start of the construction phase and extend into the operation phase of the project. The CAP will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.
4.2.4 Selection of a Preferred Design

The components of the ‘preferred design’ consist of the bridge design, roadway and landscape design improvements on the west and east side lands as well as the temporary in-water bridge construction access option. These elements are based on the fieldwork done at the project site location and the assessment of the concepts, including their potential impacts and the role of mitigation measures to reduce or eliminate potential impacts.

Firstly, the ‘Arch With V-Piers’ concept is the preferred bridge design for the following reasons:

1. It provides two structural supports for the bridge girders but only one in-river foundation for each pier. This could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore. To further benefit viewscape considerations and reduce associated in-water disturbances, it could be feasible to reduce the number of piers from 13 double v-piers to 11 double v-piers and still maintain appropriate span-length-to-girder-depth proportions.

2. The hydraulic modeling results show that the double v-piers would generate only minor impacts on water levels and flow-generated velocities.

3. It is able to span over the Rideau Canal’s navigable channel and adjacent rowing lanes, while the arch over the canal’s navigable channel highlights the bridge as a 21st Century ‘gateway’ to/from the Inner Harbour and canal.

4. The bridge alignment, as a constant gradual s-curve that lands north of the Point St. Mark residential neighbourhood, offers opportunities for:
   a) Reduced potential noise and visual impacts on the Point St. Mark community;
   b) ‘Softer landscaping’ along the Gore Road right-of-way on the east shore;
   c) A more organic reflection of the bridge within the context of its ‘transitional’ location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west; and
   d) A more expanded viewscape experience for bridge users, in that open views would be provided of the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west.

5. The bridge clearance above the water accommodates existing topographic conditions on both shorelines and exceeds the Rideau Canal’s Federally regulated navigable requirement. It also mitigates visual impacts, in that its silhouette would be below the tree line when viewed:
   a) On the water from the north by the north shore of Belle Island and Belle Park;
   b) On the water from the south by the visible cattail portion of the Greater Cataract Marsh that begins to emerge in the background; and
   c) To the east from both water and land on the west side by the existing topography of the east side lands.

It should also be noted that the restorative landscape improvements on the west side lands provide an opportunity for the bridge to be below the ‘future’ tree line in this area when viewed from both the water and land on the east side.

6. The bridge deck components contribute to providing a more direct mid east-west connection to existing road infrastructure on either shore and would be able to tie into the northern terminus of the future Wellington Street Extension. This could further serve to direct traffic south to the downtown area.

7. The observation look-out/interpretive areas along the south side of the bridge deck maximize opportunities for bridge users to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.

8. The use of context sensitive:
   a) Barriers and railings on the bridge and their potential to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and
   b) Directional and intermittent lighting on the bridge and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts from the bridge on the surrounding environment.

9. The need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is recognized in the initial bridge configuration design which consists of a three lane, centre lane reversible, cross section that can be widened in response to future traffic conditions.

Secondly, the roadway and landscape improvements on the west and east side lands shown on Drawings 4.25 and 4.26 are preferred for the following reasons:
1. Based on the capacity analysis done for this EA study, the identified roadway improvement works should maintain the flow of traffic along this critical mid east-west arterial corridor at an acceptable LOS D over the long-term. This analysis has also demonstrated that these improvements and their resulting effects on traffic flows should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated.

2. The active travel and commuter cycling provisions on the bridge serve to connect with and thereby enhance existing non-automotive networks on both sides of the Cataraqui River.

3. The observation look-out/interpretive areas serve to maximize opportunities for residents to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.

4. The landscape improvements represent an opportunity for a degree of ecological restoration on the west side lands and ecological compensation on the east side lands by creating/re-creating naturalized landscapes.

5. In the public realm areas, the use of context sensitive:
   a) Barriers and railings serve to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and
   b) Directional and intermittent lighting serve to address public and traffic safety requirements, accentuate public realms and mitigate light impacts on the surrounding environment.

6. The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River further accentuate the public realm as a ‘naturalized’ feature.

Thirdly, though unmitigated changes in sound levels resulting from the project would exceed the applicable criteria at some representative receptors of concern, the proposed mitigation measures, in the form of earthen walls and/or sound barriers shown on Drawing 4.35, are preferred for the following reasons:

1. For NR4 (River Park Subdivision West) a 3 m high by 110 m long sound barrier wall extending west from the south side of the Point St. Mark Drive-Gore Road intersection onto the bridge deck would achieve an average of 5 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level ranging from 53 dBA to 55 dBA.

2. For NR5 (River Park Subdivision East) a 3 m high by 96 m long sound barrier wall extending east from the south side of the Point St. Mark Drive-Gore Road intersection to Kingston Road 15 would achieve an average of 7 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 54 dBA.

3. For NR7/NR9 (Kenwood Crescent Residential) a 3 m high by 400 m long sound barrier wall extending west from the south side of the Point St. Mark Drive-Gore Road intersection onto the bridge deck would achieve an average of 5 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level ranging from 53 dBA to 55 dBA.

4. For NR10 (Barker Drive Residential) a 2.4 m high by 168 m long sound barrier wall extending east from the south side of the Point St. Mark Drive-Gore Road intersection to Kingston Road 15 would achieve an average of 7 dB in mitigated noise reduction, thereby resulting in a mitigated daytime noise level of 54 dBA.

5. The sound attenuation measures noted above are considered administratively, economically and technically feasible to implement.

Fourthly, dredging, which would include not backfilling the dredged channel after the bridge is built, is the preferred temporary in-water bridge construction access option for the following reasons:

1. The excavated channel could represent a mitigation measure in response to potential project effects, in that it would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more.

2. It would reduce capital costs in the range of 8 percent to 12 percent in comparison to the temporary work bridge option.

3. It could accommodate Utilities Kingston’s east-west watermain within the dredged channel, which:
   a) Has been requested by Utilities Kingston as the preferred location for this infrastructure;
   b) Would provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain underneath the permanent bridge deck; and
   c) Offers a more sustainable design solution, in that the need for expansion joints, heat tracing and insulation jacket equipment as well as related maintenance and servicing would not be required.

4. In light of the above-noted hydraulic modeling results for the double v-piers, it is similarly expected that the dredged channel, and the associated removal of aquatic vegetation that is required to accommodate it, would not have any significant influence on water levels or flow-generated velocities.
Finally, the preparation and implementation of the Natural Environment Enhancement Plan during the project implementation phase will include detailed measures related to wetland restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows and re-vegetating/re-forested the east and west side lands in direct response to the detail bridge design and construction program.

5.0 THE PROJECT DESCRIPTION

This section of the Report discusses the potential environmental effects from the project on the VECs. Summary tables are presented indicating the valued ecosystem components (VECs), potential environmental effects, mitigation measures that would reduce or eliminate the potential effects, the significance of the residual effects and the net residual effects after mitigation measures are applied. The potential effects of the environment on the project and the potential cumulative effects of the project in conjunction with existing and future projects in the area are also outlined.

The significance of the residual effects on each VEC is evaluated using the following factors as per the CEA Act:

1. **Magnitude.** This pertains to the typical effects of the impact on each VEC, which are rated as 'low', 'medium' or 'high'.

2. **Geographic Extent.** This relates to the area where the effect occurs, which is rated as 'immediate', 'local' or 'regional'.

3. **Duration.** This regards the duration of the effect on each VEC, which is rated as 'short term' or 'long term'.

4. **Frequency of Occurrence.** This pertains to the frequency that the effect occurs, which is rated as 'intermittent' or 'continuous'.

5. **Reversibility/Irreversibility.** This regards an estimate of whether or not an effect, once it has been stopped, has the potential to be 'reversed' and return to its pre-existing situation or is 'irreversible'.

6. **Ecological Context.** This provides an estimate of the ecological value of the area in which the effect occurs, using a 'low' or 'high' rating.

The scope of the assessment covers works and activities associated with the construction, operations and decommissioning phases of the project. It should be noted that only those VECs determined to be affected by project activities during each phase are discussed. In addition, the preliminary and detailed design stage of the Project Implementation phase of the EA planning process will review and confirm specific implementation options and techniques. Additional scrutiny will also occur as part of the pre-construction approval process to further ensure that potential negative project effects can and will be mitigated in a satisfactory manner.

5.1 Project Activities

5.1.1 Construction Phase

The best management practices and mitigation measures noted earlier will be in place as part of the construction phase of the project. They are more specifically applied to the project construction activities later in this Report.

.1 Site Preparation

The main site preparation activities will include:

1. Brush and tree removal as well as site grading and excavation works, which will be completed mainly by using heavy machinery. However, along the shorelines, brush and tree removal will be completed by using small machinery.

3. Stripping of topsoil and stockpiling spoil or fill materials.

4. Construction of temporary granular roadways, roadside ditches (that would direct storm water runoff to either temporary treatment ponds or permanent facilities) and material storage/re-fueling areas.

5. Commencing dredging activities, which would involve the following detailed tasks, including further best management practices and mitigation measures in addition to those noted earlier regarding in-water works:

   a) Turbidity Barriers: The full length of the dredge corridor will be divided into segments referred to as dredge zones. A dredge zone of 150 m to 200 m in length is manageable and is a function of practical fish salvage, dredging production swaths and third party river activities. Each dredge zone will be dredged individually and in a sequential program. Double turbidity barriers would be suspended in the water column around individual dredge zones. A turbidity barrier is a geotextile fabric similar to silt fencing that is suspended from an upper sleeve float and weighed down with chain links in a bottom sleeve. As a zone is dredged, a new zone would be isolated until the full corridor is dredged. A snap shot of the zones during mid-production should result in fishing of zone 3 (lead), dredging of zone 2...
(production) and stabilization of zone 1 (removal turbidity barriers post dredge activity/turbidity settlement). This protocol would carry through subsequent zones until the turbidity barriers in the final zone have been removed after the stabilization period.

The combination of dredge zones would not block the flow of water, prevent fish migration or restrict boat traffic. The double turbidity barrier system is made up of an inner curtain and a second outer curtain. The inner curtain is the primary barrier to prevent suspended sediments from dispersing to the open water environment. The outer curtain facilitates two purposes: i) to prevent fish and other marine species from migrating into the dredge zone; and ii) to provide secondary containment in the event the inner curtain is breached. The outer curtain should be separated from the inner curtain by a minimum buffer of 4 m. This allows for the monitoring of water quality within the buffer annulus and if there is a breach of the inner curtain, then the suspended cloud plume of escaped sediment is easier to trace.

There is the possibility that the bottom sleeve of the curtain would not seal with the river bottom due to aquatic vegetation growth. If this could occur, the vegetation in the dredge zone should be mowed with a boat mounted oscillating cutter bar prior to the deployment of the barriers.

b) Wildlife Capture and Release: Best management practices would be put in place to prevent wildlife from being stranded within the lead dredge zone. The techniques vary but for shallow water containing dense aquatic vegetation, fish capture with minnow traps, electroshocking, hoop net traps and/or bag seine nets are effective. Hoop traps and basking traps are similarly effective for capturing turtles. The duration of wildlife capture and release outside of each lead dredge zone will vary, subject to the number and type of species that are caught.

c) Dredging: The river bottom is soft sediment comprised of organic matter and fine grain inert soil, such as silt. Dredging of this material can be done with a self-propelled hydraulic auger-head dredge. This is a barge like vessel complete with hopper suction inlet at the bow, discharge outlet/pipeline connection at the stern, split twin paddle wheels at the stern, diesel power plant, hydraulic drives, high solids suction pump and a control/instrumentation operator’s cab.

Vegetation in the water column and roots in the upper layers of sediment are anticipated to be encountered which will require the need for a weed cutter head attachment. The cutter head auger and suction inlet is housed within a wide mouth inlet that can dredge a 2 m to 3 m swath depending on the size of the dredge model. The depth of cut is dependent on the resistance the grade bar encounters due to roots and compact sediment. The self-propelled mechanism is a stern drive paddle wheel that thrusts against water and in some cases, such as in shallow water with a firm bottom (sand), crawls along the bottom. Thrust can be increased with dead-man weights, cables and winches for long deep cutting production passes.

The dredge will require one to two support work boats to assist in towing and repositioning for each pass. Multiple passes will be required. In addition to work boats, a refuelling barge with double wall enviro fuel tank will also be needed on a daily basis to refuel the dredge units. Spill response kits will be required on all water based work units. The hydraulic fluid for the drives on the dredge units is ecologically friendly (vegetable based oils). At this stage, water access for the dredge and associated equipment could be from existing marine facilities on either the east or west shore.

If the schedule limits the dredging window of opportunity and if there is sufficient working space, a second dredge could be deployed. With two dredges, the first unit can make passes with the weed cutter head attachment, but tends to have a low daily sediment production rate. The second unit would be a high daily sediment production unit as it will not be encumbered with cutting, augering and hydraulic suction of weeds and roots. The production unit will auger sediment, draw by hydraulic suction and pump slurry on a steady production program.

Survey control of the dredge would be done by electronic devices such as global position system (GPS), auger head dipstick depth gauge and portable laptop data collector. GPS tracking is full time in real time kinematics (RTK) and displayed live on the laptop with AutoCAD mapping in the background. The benefit of RTK data logging is the operator can maintain horizontal control of the dredge passes and adjust bearing and offset as required to maintain course. Depth measurement is by manual survey down to the cutter bar. Accurate verification of the dredge pass depths can be done by a support survey boat equipped with RTK GPS, depth sounding sonar and portable laptop. Permanent water elevation gauges would be installed at each shoreline and at intermediate points along the crossing for the purpose of recalibrating the datum elevation for the sonar transponder. Data could then be downloaded into modelling software for comparison of the RTK digital terrain model (DTM) and the design DTM. This data can also be up loaded to the dredge operator laptop for the purposes of planning the dredge depth swaths for the next shift.

d) Transport and Disposal: Prior to transporting the dredged material to an approved landfill facility off-site, the in-situ sediment will be mixed with water to form slurry that can range from 5 to 15 percent solids content. This will largely be a function of the specific gravity of the sediment, interference from vegetative stringy matter, hydraulic suction pump capacity and slurry pipeline conveyance to a land based receiving location. Dependent on the in-situ
solids content of the sediment which can vary significantly from organic sediment (low percent solids) to sand sediment (high percent solids) the volume of additional water to dilute the sediment into transportable slurry for pipeline flow will vary. The main portion of the pipeline will likely be butt fused HDPE pipe and located generally beyond the limits of an active dredge zone. It is anticipated the pipeline will be suspended in the water with floats. At the navigable channel, the pipeline will need to be weighed down near the channel bottom. The same HDPE pipe construction would carry beyond the shoreline as a ground surface laid pipeline to the land base disposal site. Within the active dredge zone the pipe will be a flexible hose, suspended from floats and connected to the discharge of the dredge unit outlet.

The width of the water crossing is approaching a limiting distance for slurry pipeline conveyance of heavy solids slurry. It is possible the furthest dredge zones will see a decrease in daily sediment production due to the need to reduce solids content in order to maintain flow velocities in the pipeline. A floating in-line booster pump is feasible; however, the preference is for a land based booster pump(s).  In the event there is a need for in-line booster pumps to augment the capacity of the dredge suction pump it is best to interlock the pump operations.  This can be done manually with full time pump operators and hand held radio control or unmanned and remotely controlled with electronic control devices from the dredge operator’s cab.

.2 Temporary Facilities and Lay-Down Areas

Temporary office and parking facilities as well as equipment and material lay-down areas will be required for the duration of the construction period. As shown earlier on Drawings 4.25 and 4.26, it is anticipated that, due to a lack of available vacant land near the project site location, certain privately owned properties (either in whole or in part) on the west side and a portion of the lower plateau of the Gore Road Library on the east side will be required. Due to limited working space at the project site location, it is anticipated that most of the on-site storage and temporary facilities would be located on the east side of the river, west of the Gore Road Library. Access to this area would be directly from Kingston Road 15, north of the library building. Moreover, parking for construction workers will most likely be limited on-site. It is thus anticipated that a remote off-site facility would be required for parking along with shuttle service provided to and from the project site location. In order to limit the disturbed area, the steel box girder and precast bridge components could be fabricated in an approved off-site facility. Following construction, the temporary facilities will be removed and the disturbed areas will then be part of the landscape improvement works shown earlier on Drawings 4.25 and 4.26.

.3 Superstructure Construction and Installation

As noted earlier, the bedrock surface appears to be variable across the project site location. It is exposed or near surface on both sides of the Cataraqui River (at an elevation of 73 m at the east bank and 76 m at the west bank) and then dips to elevations ranging from elevation 30 m to elevation 55 m within the river. As such, the bridge superstructure will require deep foundations, which will be installed by the Contractor. Potential installation options include driven piles or drilled foundations such as large diameter concrete caissons, which are highlighted below:

1. Driven steel H-piles or pipe piles are usually 18 m long and would require two or more welded splices on-site. The piles would then be installed using a barge mounted pile driving hammer. The size of the barge and hammer equipment would determine the size and number of required piles. Pile caps/footings would also be needed at or below the top of the riverbed/waterline, as the base for the double v-pier columns. Sheet pile cofferdams would be used if the footings are installed below the waterline in order to construct the footings in the dry. The sheet piles could be driven by barge mounted cranes. If the footings are installed above the waterline, the formwork footing could be mounted on the piles protruding above the waterline. Driven steel H-piles or pipe piles have the advantages of faster installation, no tailings and better adaptability to varying bedrock depths. However, the use of pile driving hammers and sheet pile cofferdams generate major noise and potentially harmful impacts on the marine environment. This latter point also applies to formwork footings that protrude above the waterline, in that they have the potential to attract debris (wind-or-water-sourced).

2. Drilled shafts for large diameter caissons will require barge mounted cranes and steel casings. Drilling slurry will likely be required and preventive measures will need to be in place to avoid spillage of the slurry into the Cataraqui River. The steel casing will remain below the top of the riverbed. The double v-pier columns would then be extended directly from the top of the large diameter caissons, without the need for footings below the waterline. The formwork for the double v-pier columns would preferably be made of steel so that it is watertight and durable for repeated use. Alternatively, they could be made of segmental precast concrete sections and post-tensioned together.

The use of rock socketed piles was selected as the basis for the conceptual design as they are the least intrusive and have the smallest environmental impact of the various types of pile foundation available. Pile casings would be located in position and driven or vibrated through the silts and overburden to contact with the underlying rock. The casings would then be driven into the rock to obtain a seal. The depth of penetration into the rock would be dependent on the hardness of the rock, but is usually in the order of 500 mm. Silt and over burden would then be removed from inside the pile and pumped to a settling pond onshore. There is some vibration and sound waves generated in this part of the operation but it is limited.
The use of air-bubble curtains could further mitigate vibration and sound effects, if needed. Once dewatered, the sediment would be tested for contaminants. Disposal would be dependent on the presence and level of contaminants. It could either be transported to an approved landfill facility off-site or, if it is clean fill, taken to another construction site. The piles would be drilled into the rock to the specified design depth. Drilling could be performed using a variety of equipment (either coring or drilling). The environmental effects of either option are similar and limited since all work would be performed inside of the casing. The drilled rock would then be removed to a spoil barge and taken to an approved landfill facility off-site.

Concrete could either be delivered by barge (with the truck on the barge) or pumped using a line pump from shore. Barge/truck delivery is considered more likely as volumes in each pile are small relative to the amount required to charge the pump and fill the line, which could be up to 500 m in length. Water access for construction barges and associated equipment would be mainly from the east shore at this stage, given the likelihood that most of the on-site storage and temporary facilities would be located on the east side of the river. Water access from the west shore would also be available, as needed and logistically practical. Since the concrete would be delivered directly to the pile location, no environmental impacts are anticipated. Once the piles are complete at each pier location, temporary supports for pier cap construction would be attached to the piles.

The v-piers may require temporary support during construction. Steel piles would be driven to achieve the required bearing capacity and completely removed after construction. If the Contractor sequenced the work from east-to-west (or longer to shorter) then the steel piles could be reused. Alternatively, there could be a series of horizontal ties to provide temporary support for the inclined legs of the piers.

In addition, shallow foundations bearing on the limestone bedrock may be used for the support of the bridge abutments. As noted earlier, the bedrock surface at the east and west banks are at relative shallow depths of about 1.7 m and 3.1 m, respectively. Due to the possible presence of frost susceptible materials in joints and seams within the bedrock, the bedrock is considered to be potentially frost susceptible. Therefore, foundations founded directly on the bedrock will require at least 1.6 m of earth cover for frost protection purposes.

.4 Bridge Deck Construction and Installation

Various options exist for the construction of the concrete deck slabs by the Contractor, including: i) cast-in-place concrete; ii) partial depth precast panels with cast-in-place topping; or iii) full depth precast concrete panels. The use of full depth precast deck panels would minimize on-site construction time. The panels are biaxially pre-stressed (both in the longitudinal and transverse directions) to minimize cracking, which increases their durability (the elliptical paraboloid shell soffit allows for the optimization of the panel weight). These panels could be fabricated in either the on-site lay-down areas or an approved off-site facility and transported by barges. Local aggregates would be used for concrete construction to the greatest extent possible, subject to availability.

The steel girders and precast components could be delivered by either barges or road. The steel girder segments would be between 20 m and 50 m in length depending on the capacity of the fabrication plant, mode of transportation and the erection method to be used. The girders could be erected by cranes mounted on barges. For each span, the pier girders would be erected first, followed by the infill segment. Other methods of girder erection, such as the use of temporary piers, span-by-span erection using traveling cranes and launching methods could also be used. However, girder erection using barges provides faster installation and minimizes risks to the marine environment.

The arch span could be fabricated in an approved off-site facility and then transported by barges and lifted into place by cable suspenders from the piers. Alternatively, the arch segments could be fabricated in smaller segments and bolted together in the on-site lay-down areas. In this latter case, the box girders and tie girders at the deck level would have to be designed to temporarily support the weight of the arch segments or shoring would have to be extended from the Cataraqui River. The precast deck panels could be erected sequentially, panel by adjacent panel, by moving the crane over the previously completed part. Fast-setting grout would be used to connect the panels to steel girders. The size of the panels would be maximized if they are cast on-site. If they are cast in an approved off-site facility and transported by barges, the panels would be approximately 3.6 m wide by 24 m long. Therefore, 330 panels would be required. If these panels were transported by truck, each panel would have to be transported separately, which would generate significantly higher truck traffic to the site and require a larger lay-down area.

.5 Utility Installations

As stated earlier, there are three existing Hydro One marine electrical cables (3-phase 44 kV line) that cross the Cataraqui River in the project location area. Hydro One has acknowledged that it would need four 100 mm ducts concealed in the bridge girder superstructure to accommodate the future replacement of this infrastructure. Utilities Kingston, which provides asset management, billing and operational services to utilities in the water and wastewater, natural gas and electricity industries in the City, has made a similar request on behalf of Kingston Hydro. In addition, and as noted earlier, Utilities Kingston has requested that an east-west watermain be installed within the dredged channel, as it is required to improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (located northeast of the project site location); and improve the redundancy in the municipal water system on the east side of the Cataraqui River.
All existing and new utility connections and relocations, including related approvals, will be coordinated with the appropriate authorities during the preliminary and detailed design phase. The actual work will be undertaken directly by the authority or by approved Contractors.

.6 Road and Sound Attenuation Works

As shown earlier on Drawing 4.25, the existing horizontal alignment of John Counter Boulevard will then be widened to municipal standards by the Contractor in order to accommodate:

1. For westbound travel:
   a) Two 3.5 m wide vehicular lanes along with a 3.25 m wide by 20 m long left-turn bay at the Village On The River apartment access on the south side of John Counter Boulevard and shared through/right-turn access into the River Park subdivision on the north side of John Counter Boulevard; and
   b) A 3.25 m wide by 60 m long left-turn bay and right-turn bay at Montreal Street.

2. For eastbound travel, two 3.5 m wide vehicular lanes along with a 3.25 m wide by 20 m long left-turn bay at the River Park subdivision access and shared through/right-turn access into the Village On The River apartments.

3. Provisions for a median barrier separating the eastbound and westbound vehicular lanes.

4. The 3.6 m wide multi-use trail on the south side of the bridge:
   a) Continuing along the south side of Gore Road west of Point St. Mark Drive and connecting to the existing trail into the Point St. Mark residential neighbourhood; and
   b) Extending under the bridge to connect with the trail network on the Gore Road Library property.

5. A 1.5 m commuter cycling lane on both sides of Gore Road.

6. The existing 1.5 m wide sidewalk on the south side of Gore Road east of Point St. Mark Drive to Kingston Road 15.

Local aggregates would be used for the roadway works to the greatest extent possible, subject to availability.

As also shown earlier on Drawing 4.35, the four sound attenuation barriers would also be installed at the following locations to reduce the predicted sound levels from the project at noise-sensitive areas:

1. Adjacent to the River Park subdivision along the north side of John Counter Boulevard:
   a) A 3 m high by 110 m long wall and/or berm extending west from the John Counter Boulevard-Ascot Lane intersection; and
   b) A 3 m high by 96 m long wall and/or berm extending east from the John Counter Boulevard-Ascot Lane intersection.

2. Adjacent to the Point St. Mark subdivision along the south side of Gore Road:
   a) A 3 m high by 410 m long wall extending west from the Gore Road-Point St. Mark intersection onto the south side of the bridge deck and ending proximate to the Rideau Canal’s navigable channel; and
b) A 2.4 m high by 96 m long wall extending east from the Gore Road-Point St. Mark intersection and ending proximate to the Gore Road-Kingston Road 15 intersection.

.7 Waste Management Systems

The following waste management systems will be required during the construction period:

1. Temporary on-site holding tanks will manage the effluent from construction washrooms and related facilities and will be located at least 30 m from the shorelines. A licensed operator will be engaged to provide regular pump-out and haulage services to an approved water pollution control plant for disposal and treatment.

2. Construction debris will be sorted for recycling. Non-recyclable waste will be stored separately for disposal within areas that are at least 30 m from the shorelines and protected by silt fencing. All construction waste will be hauled off-site by licensed operators to approved facilities.

3. Groundwater or runoff will be discharged into a stilling basin or sediment trap prior to being released into the City’s existing storm drainage works.

4. Double lined fuel storage tanks with vacuum monitors will be used for centralized vehicle fuelling purposes. Equipment refueling and maintenance will occur in designated areas equipped with appropriate spill containment measures. Emergency response procedures, equipment and materials will be in place to respond to any fuel or hydraulic leaks that may occur.

.8 Natural Environment Enhancement

Following construction, the temporary facilities will be removed. The provisions in the Natural Environment Enhancement Plan, related to wetland restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows and the landscape improvement works (as shown on Drawings 4.25 and 4.26), will then be installed.

5.1.2 Operations Phase

Maintenance is required to ensure public safety, serviceability and durability of the infrastructure. Maintenance activities will occur at programmed intervals which will be outlined in an O & M Manual, and as-required in response to the inspection process. These activities are highlighted in Table 5.1 below.

Table 5.1

<table>
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<tr>
<th>Programmed Maintenance Activities</th>
<th>Responsive Maintenance Activities</th>
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<tr>
<td>Sweeping and washing the bridge deck, multi-use trails, seats, caps and salt spray zones</td>
<td>Resealing expansion joints</td>
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<tr>
<td>Cleaning the bridge drainage systems</td>
<td>Repainting structural steel members</td>
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<tr>
<td>Cleaning and lubricating the expansion bearing assemblies</td>
<td>Replacing wearing surfaces</td>
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<tr>
<td>Sealing the exposed concrete elements</td>
<td>Extending or enlarging the bridge deck drains</td>
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<tr>
<td>Patching the bridge deck</td>
<td>Replacing damage from vehicles hitting the structure</td>
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</table>

The best management practices and mitigation measures noted earlier will be in place as part of the operations phase of the project. They are more specifically applied to the project operations activities later in this Report. In addition, it should also be noted that as needed maintenance requirements would be reduced with appropriate selection of bridge materials and details. For example, some of the materials and details that could be considered are:

1. Full depth precast pre-stressed concrete panels for the bridge deck.
2. Stainless steel or FRP reinforcement in barriers.
5. Long durability painting of the structural steel components.
6. Polymer wrap around the base of the piers in the water fluctuation/splash zone.
7. Fixed Automated Spray Technology (FAST) for the automatic de-icing system.
8. Solar panels for the bridge lighting/deck heating.
10. Vandal resistant coating.
11. LED light fixtures.

12. Minimize the number of expansion joints.

13. Minimize the number of bearings and, where required, use bearings requiring low maintenance.

14. Minimize the number of steel girder splices.

A Life Cycle Cost Analysis should be undertaken during the detailed design stage for selecting the appropriate materials and methods. This analysis should take into consideration the environmental and societal factors such as sustainability and climate change effects, user costs and serviceability.

5.1.3 Decommissioning Phase

As noted earlier, the CHBDC requires a design life for new bridges of at least 75 years. New bridges having similar shore-to-shore characteristics to those within the project site location typically have a design life of at least 100 years. It is anticipated that the materials and methods of bridge construction could extend the design life of the bridge at the project site location well in excess of 100 years.

However, this Report acknowledges that the bridge may need to be decommissioned for a number of reasons, including functional obsolescence or irreparable damage due to highly improbable human-made disasters or natural causes such as earthquakes or wind producing forces in excess of design forces. If or when the bridge becomes functionally obsolete, a change of use on the bridge may also be considered, such as commercial or residential structures that are supported by the bridge. This was done, for example, on the London Bridge in the 17th Century. But if the structure is to be removed, the basic procedure would closely follow activities associated with the construction phase. It is briefly outlined below:

1. Install temporary work platforms and dust enclosures, as necessary.

2. Remove the barriers, bridge railing and deck slab, starting from the middle and progressing towards the abutments. The use of barges will expedite the removal, transportation and disposal of the materials at approved facilities. The use of full depth precast components for the deck slab is beneficial in this regard. The deck slab segments could be salvaged. The concrete could be crushed for reuse as construction aggregate and the steel could also be recycled.

3. Remove the girder segments by disconnecting them at the splice points. The girders could either be salvaged or recycled.

4. Cut off the piers below the top of the riverbed and leave the foundation caissons in place. The use of precast pier segments would expedite removal.

5. Undertake rehabilitation works at the project site location, as necessary.

Given the projected design life of the project, more specific details regarding decommissioning and rehabilitation works are premature at this time. Still, it is anticipated that it would take up to two years to complete and that similar best management practices and mitigation measures used during the project construction phase would be part of a Decommissioning Plan (DP). A Decommissioning CAP (D-CAP), similar to the CAP that will be in place from the start of the construction phase and extend into the operation phase, would also be part of the project decommissioning phase. The D-CAP will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge decommissioning and site rehabilitation activities.

Such measures are more specifically applied to the project decommissioning activities later in this Report. It should also be noted that, if and when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.

5.2 Project Effects

There are two important tools that will be administered by the City during future project phases to mitigate potential adverse environmental effects. The first tool deals with the preparation and implementation of a Cultural-Natural Heritage Protection Plan (C-NHPP) in advance of each phase of the project. The C-NHPP will be written in industry-accepted specification format and contain best management practices, including the recommended mitigation measures contained in this Report. The second tool deals with the preparation and implementation of a Community Action Plan (CAP) that will be in place from the start of the construction phase and extend into the operation phase of the project. The CAP will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.

The evaluation of project effects on valued ecosystem components (VECs) impacted during the construction, operations and decommissioning phases of the project are shown in Tables 5.2, 5.3 and 5.4, respectively.
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<tbody>
<tr>
<td>1. Air Quality (Particulate Matter)</td>
<td>Site Preparation</td>
<td>1.1 Diesel exhaust emissions from heavy equipment.</td>
<td>1.1.1 Diesel exhaust emissions, which are largely unavoidable due to the type of equipment needed during the construction phase.</td>
<td>1.1.2 (a) In accordance with the C-NHPP, all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time. (b) Construction is temporary and expected to last 24 to 36 months. (c) The CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>Magnitude: M, Geographic Extent: I, Duration: S, Frequency of Occurrence: I, Reversibility: R, Irreversibility: L</td>
<td>The residual environmental effect will be Low to reflect existing land uses in relation to weekday construction activities, the short-term duration of construction and the proposed mitigation measures.</td>
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<td>Temporary Facilities and Lay-Down Areas</td>
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<td>Utility Installations Road and Landscape Works</td>
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<td>Malfunctions and Accidents</td>
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<td>Airborne dust from heavy equipment operations.</td>
<td>1.2.1 There is potential for airborne dust to be generated by equipment operations, construction traffic or the wind.</td>
<td>1.2.2 (a) In accordance with the C-NHPP, dust suppression techniques will be used by the Contractor such as watering on construction access roads and sweeping at construction site entrances. (b) Construction is temporary and expected to last 24 to 36 months. (c) Site re-vegetation will be undertaken as soon as is practical following the construction phase to minimize airborne dust. (d) The CAP will detail the response plan to be implemented if public complaints are received.</td>
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<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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<td>1.3 Unplanned events.</td>
<td>1.3.1 Accidental discharges of airborne matter can result in a degradation of the air quality at nearby points of reception.</td>
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<td>2. Air Quality (Noise)</td>
<td>Site Preparation</td>
<td>2.1 Noise emissions from heavy equipment.</td>
<td>2.1.1 Noise emissions, which are largely unavoidable due to the type of equipment needed during the construction phase.</td>
<td>2.1.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools will be in good working condition; ii. River water quality will be monitored north and south of the site for turbidity, suspended soils, nutrients and contaminants; iii. in-water works will be suspended during periods of heavy rain and high wind events; and iv. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions.</td>
<td>Magnitude: M, Geographic Extent: I, Duration: S, Frequency of Occurrence: I, Reversibility: R, Irreversibility: L</td>
<td>The residual environmental effect will be Low to reflect existing land uses in relation to weekday construction activities, the short-term duration of construction and the proposed mitigation measures.</td>
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<td>Noise emissions from heavy equipment.</td>
<td>2.2.1 Accidental high noise events can result in disturbance to residents and wildlife. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.</td>
<td>2.2.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools will be in good working condition, including the use of appropriate noise-suppression devices as determined by industry standards and Provincial guidelines current at that time; ii. works will be undertaken in accordance with the City’s Noise By-Law (unless otherwise necessary and subject to Council notification and conditions); iii. in-water works will be suspended during periods of heavy rain and high wind events; and iv. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions.</td>
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<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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### Table 5.2

**Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase**

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<td>Duration</td>
<td>Frequency of Occurrence</td>
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<td>3</td>
<td>Soil and Groundwater</td>
<td>Site Preparation</td>
<td>3.1 Soil erosion and sediment deposition.</td>
<td>3.1.2 (a) In accordance with the C-NHPP: i. riverbank erosion and sediment control measures will be installed along the riverbanks; ii. silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; iii. the removal of shoreline vegetation will be minimized and done using small machinery; and iv. the erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works.</td>
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<td>Temporary Facilities and Lay-Down Areas</td>
<td>3.1.1 There is potential for soil erosion and sediment deposition.</td>
<td>3.1.2 (a) In accordance with the C-NHPP: i. riverbank erosion and sediment control measures will be installed along the riverbanks; ii. silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; iii. the removal of shoreline vegetation will be minimized and done using small machinery; and iv. the erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works.</td>
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<td>Superstructure Construction and Installation</td>
<td>3.1.2 There is the potential to uncover contaminated soils. Also, accidental spills of hazardous materials can result in groundwater contamination. Note groundwater should not be encountered during the construction phase.</td>
<td>3.1.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation; activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; and viii. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
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<td>Bridge Deck Construction and Installation</td>
<td>3.1.2 Unplanned events.</td>
<td>3.1.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation; activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; and viii. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
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<td>4</td>
<td>Surface Water</td>
<td>Site Preparation</td>
<td>4.1 Soil erosion and sediment deposition.</td>
<td>4.1.2 (a) In accordance with the C-NHPP: i. riverbank erosion and sediment control measures will be installed along the riverbanks; ii. silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; iii. the removal of shoreline vegetation will be minimized and done using small machinery; and iv. the on-land erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works; and silt curtains and/or turbidity barriers will be installed in advance of in-water removal of aquatic vegetation or substrate and kept in place, monitored and maintained until the sediments within the</td>
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<td>Temporary Facilities and Lay-Down Areas</td>
<td>4.1.1 There is potential for soil erosion and sediment deposition.</td>
<td>4.1.2 (a) In accordance with the C-NHPP: i. riverbank erosion and sediment control measures will be installed along the riverbanks; ii. silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; iii. the removal of shoreline vegetation will be minimized and done using small machinery; and iv. the on-land erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works; and silt curtains and/or turbidity barriers will be installed in advance of in-water removal of aquatic vegetation or substrate and kept in place, monitored and maintained until the sediments within the</td>
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J. L. Richards & Associates Limited

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April 16, 2012
The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.

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<td>Magnitude</td>
<td>Geographic Extent</td>
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<tr>
<td>Utility Installations</td>
<td>Road and Landscape Works</td>
<td>Waste Management Systems Malfunctions and Accidents</td>
<td>4.2 Unplanned events.</td>
<td>Accidental spills of hazardous materials can result in surface water contamination.</td>
<td>4.2.2</td>
<td>(a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; and viii. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
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<tr>
<td>Site Preparation</td>
<td>Temporary Facilities and Lay-Down Areas</td>
<td>Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations</td>
<td>5.1 Change in vegetation diversity.</td>
<td>Vegetation removal will be required during the construction phase. Note: a) there are no ELC community types on the west side lands and the affected woodlands on the east side are not considered provincially significant or contributory; and b) the marine environment is currently dominated by one type of submerged vegetation (Milfoil).</td>
<td>5.1.2</td>
<td>(a) In accordance with the C-NHPP: i. surveys will be done in advance of excavation activities to assess for any sensitive vegetation and tree species, which if identified, will then be avoided or relocated to other suitable locations, as feasible and appropriate; and ii. the removal of shoreline vegetation will be minimized. (b) The landscape improvement works represent an opportunity for a degree of ecological restoration on the west side lands and ecological compensation on the east side lands. (c) The implementation of the Natural Environment Enhancement Plan will include detailed design measures related to wetland restoration, aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking) as well as stabilizing and rehabilitating the shoreline shallows.</td>
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<td>5. Vegetation</td>
<td>Road and Landscape Works Malfunctions and Accidents</td>
<td>5.2 Unplanned events.</td>
<td>Accidental spills of hazardous materials can result in degradation to vegetated areas.</td>
<td>5.2.2</td>
<td>(a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements.</td>
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Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase
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<td>6.1</td>
<td>Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Malfunctions and Accidents</td>
<td>6.1 Sensory disturbance.</td>
<td>6.1.1 There is potential for increased levels of sensory disturbance to local wildlife due to the types of activities and equipment used during the construction phase. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.</td>
<td>6.1.2 (a) In accordance with the C-NHPP:  i. advance inspections will be done in areas slated for site preparation and construction activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access;  ii. site preparation and construction activities will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place have ensured that there will be no potential species impacts;  iii. all heavy equipment will be in good working condition through surveys will be done in advance of excavation activities to assess for any sensitive vegetation and tree species, which if identified, will then be avoided or relocated to other suitable locations, as feasible and appropriate; and  iv. the removal of shoreline vegetation will be minimized and done using small machinery.  (b) The landscape improvement works represent an opportunity for a degree of ecological restoration on the west side lands and ecological compensation on the east side lands.</td>
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<td>6.3</td>
<td>Mortality risk.</td>
<td>6.3.1 There is potential for wildlife to experience an increased risk of mortality due to the types of activities and equipment used during the construction phase.</td>
<td>6.3.2 (a) In accordance with the C-NHPP: i. advance inspections will be done in areas slated for site preparation and construction activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access; and ii. site preparation and construction activities will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place have ensured that there will be no potential species impacts.</td>
<td>L/M I S I R L</td>
<td>(c) The Proposed mitigation measures. The residual environmental effect will be Low to reflect 100 percent mortality avoidance is not possible in relation to the short-term duration of construction and the proposed mitigation measures.</td>
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<td>6.4</td>
<td>Unplanned events.</td>
<td>6.4.1 Accidental spills of hazardous materials can result in degradation to wildlife habitat.</td>
<td>6.4.2 (a) In accordance with the C-NHPP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; and viii. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>H I S I R L</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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7. Aquatic Habitat
Site Preparation
Temporary Facilities and Lay-Down Areas
Superstructure Construction and Installation
Bridge Deck

7.1 Mortality risk.
7.1.1 There is potential for aquatic wildlife to experience an increased risk of mortality due to loss of wetland structure or function resulting from the types of activities and equipment used during the construction phase. | 7.1.2 (a) In accordance with the C-NHPP: i. advance inspections will be done in areas slated for site preparation and construction activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and to restrict wildlife access; ii. site preparation and construction activities will be scheduled to avoid sensitive areas as well as spawning seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place have ensured that there will be no potential species impacts. | L/M I S I R L | The short-term residual environmental effect will be Low to reflect 100 percent mortality avoidance is not possible in relation to: (a) the short-term duration of construction; (b) the characteristics of the existing aquatic vegetation; and...
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<td>Construction and Installation</td>
<td>Utility Installations</td>
<td>Road and Landscape Works</td>
<td>Malfunctions and Accidents  7.2 Unplanned events.</td>
<td>(a) In accordance with the C-NHPP:</td>
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<td>i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; vii. construction debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities; viii. river water quality will be monitored north and south of the site for turbidity, suspended solids, nutrients and contaminants; ix. in-water works will be suspended during periods of heavy rain and high wind events; and x. detailed protocols will be established for employees/contractors regarding procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response.</td>
<td>(b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
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<td>8.1</td>
<td>Loss and fragmentation.</td>
<td>The potential for the loss and fragmentation of the Rideau Canal.</td>
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<td>Site Preparation Temporary Facilities and Lay-Down Areas Road and Landscape Works</td>
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<td>Malfunctions and Accidents</td>
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<td>channel and adjacent rowing lanes, while the arch over the canal's navigable channel highlights the bridge as a 21st Century 'gateway' from the canal.</td>
<td>H L S I R L</td>
<td>residual environmental effect will be Positive given the proposed mitigation measures.</td>
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<td>8.2 Loss and fragmentation</td>
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<td>(a) The condition of historic structures will be documented in advance of site preparation works and during construction activities to ensure that any adverse effects are promptly addressed.</td>
<td>(a) The condition of historic structures will be documented in advance of site preparation works and during construction activities to ensure that any adverse effects are promptly addressed.</td>
<td>H L S I R L</td>
<td>The short-term residual environmental effect will be Low to reflect construction in relation to its short-term duration and the proposed mitigation measures. Also, the mid-to-long-term residual environmental effect will be Positive given the proposed mitigation measures.</td>
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<td>8.3 Loss and fragmentation</td>
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<td>(a) In accordance with the C-NHPP, notification and mitigation protocols will be in place regarding the discovery of previously undocumented cultural heritage resources.</td>
<td>(a) In accordance with the C-NHPP, notification and mitigation protocols will be in place regarding the discovery of previously undocumented cultural heritage resources.</td>
<td>L I S I R L</td>
<td>The residual environmental effect will be Minimal given:</td>
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| 8.2.1 The potential for the loss and fragmentation of the Gore Road Library |                                   |                                                 | (b) The bridge alignment is an organic reflection of the transitional context between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west. | (b) The bridge alignment is an organic reflection of the transitional context between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west. | H L S I R L                        | (a) the cultural heritage characteristics of the project site location; and
(b) the proposed mitigation measures.                                                                                           |
| 8.2.2.1 The potential for the loss and fragmentation of previously undocumented cultural heritage resources. Note the Stage 1 and Stage 2 cultural heritage survey work did not identify any other cultural heritage properties on the City's heritage list or any properties with potential cultural heritage value at the project site location. |                                   |                                                 |                                                                                                                   |                                                                                                                                         |                                      |                                               |
## Table 5.2
### Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

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<tr>
<th>VEC</th>
<th>Project Activity – VEC Interaction</th>
<th>Potential Environmental Effect Before Mitigation</th>
<th>Discussion of Potential Effects</th>
<th>Mitigation Measures</th>
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<tr>
<td>9. Archaeological Resources</td>
<td>Site Preparation Temporary Facilities and Lay-Down Areas</td>
<td>Loss and fragmentation.</td>
<td>9.1.1 The potential for the loss and fragmentation of archaeological site BbGc-127.</td>
<td>9.1.2 (a) In accordance with the C-NHPP, in advance of site preparation works, archaeological site BbGc-127 will be removed and documented through archaeological excavation in order to mitigate the risk of the site being damaged.</td>
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<td>Superstructure Construction and Installation</td>
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<td>Bridge Deck Construction and Installation</td>
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<td>Utility Installations</td>
<td>9.2 Loss and fragmentation.</td>
<td>9.2.1 The potential for the loss and fragmentation of previously undocumented archaeological resources. Note: (a) Apart from Archaeological Site BbGc-127, no other archaeological materials were located on the east side lands during the terrestrial archaeological fieldwork. (b) No archaeological materials were located at the project site location during the marine archaeological fieldwork. (c) Visual examination of the west side lands suggests the John Counter Boulevard right-of-way has been extensively disturbed but the private lands may contain areas where archaeological potential still remains.</td>
<td>9.2.2 (a) In accordance with the C-NHPP: i. excavated materials will be periodically monitored to minimize potential impacts to previously undocumented archaeological resources. ii. in situ preservation or excavation and removal measures as well as notification protocols will be in place regarding the discovery of previously undocumented archaeological resources; and iii. protocols will be in place in the event that human remains are encountered (work stoppage, notification and mitigation).</td>
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<td>Road and Landscape Works</td>
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<td>Malfunctions and Accidents</td>
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<th>VEC</th>
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<th>Potential Environmental Effect Before Mitigation</th>
<th>Discussion of Potential Effects</th>
<th>Mitigation Measures</th>
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<tr>
<td>10. Local Community</td>
<td>Site Preparation Temporary Facilities and Lay-Down Areas</td>
<td>10.1 Compatibility.</td>
<td>10.1.1 (a) Diesel exhaust emissions, airborne dust and noise emissions, which are largely unavoidable due to the type of equipment needed during the construction phase. (b) Vegetation removal will be required during the construction phase. (c) Access to the site will be via major roads such as Montreal Street and Kingston Road 15. Access to the main construction lay-down and staging area on the east side (west of the Gore Road Library) will be directly from Kingston Road 15, north of the library building. (d) Private property acquisition will be required on the west side lands for reconfigured and expanded road, trail and landscaping works, stormwater management and bridge construction lay-down and staging areas. (e) The proposed interim three-lane and ultimate four-lane bridge deck would not conform to the Official Plan.</td>
<td>10.1.2 (a) In accordance with the C-NHPP: i. heavy equipment and tools will be in good working condition through regular maintenance and inspections, including appropriate emissions treatment and noise-suppression systems as determined by industry standards and Provincial guidelines current at that time; ii. dust suppression techniques will be used by the Contractor such as watering on construction access roads and sweeping at construction site entrances; iii. the removal of shoreline vegetation will be minimized; iv. the landscape improvement works will be undertaken as soon as is practical following the construction phase to minimize airborne dust and create/re-create naturalized landscapes on the west and east side lands, respectively; v. works will be undertaken in accordance with the City’s Noise By-Law (unless otherwise necessary and subject to Council notification and conditions) and Provincial guidelines current at that time; vi. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response procedures; vii. all heavy equipment will be required to operate and re-fuel in designated areas; viii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; ix. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River.</td>
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<td>VEC</td>
<td>Project Activity – VEC Interaction</td>
<td>Potential Environmental Effect Before Mitigation</td>
<td>Discussion of Potential Effects</td>
<td>Mitigation Measures</td>
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<td>10.2 Unplanned events.</td>
<td>10.2.1 Traffic accidents as well as accidental spills, discharge of airborne matter or noise and contaminated soil discoveries can negatively impact the quality of life in the local community.</td>
<td>(a) In accordance with the C-NHPP: i. all heavy equipment and tools will be in good working condition, including the use of appropriate noise-suppression devices as determined by industry standards and Provincial guidelines current at that time; ii. all heavy equipment will be required to operate and refuel in designated areas; iii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response; iv. works will be undertaken in accordance with the City’s Noise By-Law (unless otherwise necessary and subject to Council notification and conditions) to avoid potential effects of noise on the natural environment; v. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; vi. spill kits will be on-site and construction materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; vii. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; viii. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; and x. river water quality will be monitored north and south of the site for</td>
<td>Residual Effects Evaluation Criteria</td>
<td>Significance of Residual Environmental Effects</td>
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<td>Geographical Extent</td>
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<td>Magnitude</td>
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The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.
### Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

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<td>11</td>
<td>Roads and Road Traffic, Boat Traffic</td>
<td>Site Preparation Temporary Facilities and Lay-Down Areas Superstructure Construction and Installation Bridge Deck Construction and Installation Utility Installations Road and Landscape Works Waste Management Systems Malfunctions and Accidents</td>
<td>11.1 Level of service. 11.1.1 (a) Road and boat traffic patterns will change as additional traffic will use the roads and water in the area due to the types of activities and equipment needed to carry out the construction phase. (b) Land access to the site will be via major roads such as Montreal Street and Kingston Road 15. Access to the main construction lay-down and staging area on the east side (west of the Gore Road Library) will be directly from Kingston Road 15, north of the library building. Parking for construction workers will most likely be limited on-site. (c) Initial water access to the site for dredging activities could be from existing marine facilities on either the east or west shore. As construction progresses, water access for construction barges and associated equipment would be mainly from the east shore, given the likelihood that the main construction lay-down and staging area would be located on the east side of the river. Water access from the west shore would also be available, as needed and logistically practical. 11.1.2 (a) In accordance with the C-NHPP: i. anticipated road and boat traffic volumes to and from the site will be documented; ii. site preparation and construction activities will be undertaken in accordance with the City’s Noise By-Law (unless otherwise necessary and subject to Council notification and conditions); iii. site preparation and construction activities will also be scheduled and coordinated in consultation with: (a) the Kingston Rowing Club and Queens Rowing Club to avoid impacts to the local rowing community as much as possible; and (b) Parks Canada, Department of Fisheries &amp; Oceans and Transport Canada to ensure the Rideau Canal’s navigable channel remains open during the construction phase and the arch span bridge section installation in particular occurs during when the channel is officially closed to watercraft; iv. the transport of oversized construction components to the site will require local, Provincial and Federal approvals and may also involve formal transport escort; v. the construction labour force will be encouraged to carpool to and from the site; vi. a remote off-site facility will also be established for construction labour force parking along with shuttle service providing scheduled transport to and from the site; and vii. proper on-site construction signage and controls will be installed for designated areas and traffic lanes to ensure safe and efficient circulation on-land and in-water. (b) Construction is temporary and expected to last 24 to 36 months.</td>
<td>turbidity, suspended solids, nutrients and contaminants; and a. in-water works will be suspended during periods of heavy rain and high wind events. (b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>Magnitude Geographic Extent Duration Frequency of Occurrence Reversibility Irreversibility Ecological Context</td>
<td>The residual environmental effect will be Low to reflect changes to existing road and boat traffic patterns due to weekday construction activities, the short-term duration of construction and the proposed mitigation measures. Also, the mid- to long-term residual environmental effect will be Positive given the proposed mitigation measures.</td>
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<td>11.2</td>
<td>Unplanned events.</td>
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### Table 5.2
Project Effects on Impacted Valued Ecosystem Components (VECs): Construction Phase

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<tr>
<td>12. Business / Job Opportunities</td>
<td>Site Preparation</td>
<td>12.1 Employment opportunities and local economic growth.</td>
<td>12.1.1 There is potential for employment and local economic growth throughout the construction phase.</td>
<td>H R S C R L</td>
<td>The residual economic effect will be Positive.</td>
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Note the significance of the residual effects on each VEC is evaluated in Table 5.2 using the following factors as per the CEA Act:

1. **Magnitude.** This pertains to the typical effects of the impact on each VEC, which are rated as ‘low’ (L), ‘medium’ (M) or ‘high’ (H).
2. **Geographic Extent.** This relates to the area where the effect occurs, which is rated as ‘immediate’ (I), ‘local’ (L) or ‘regional’ (R).
3. **Duration.** This regards the duration of the effect on each VEC, which is rated as ‘short term’ (S) or ‘long term’ (L).
4. **Frequency of Occurrence.** This pertains to the frequency that the effect occurs, which is rated as ‘intermittent’ (I) or ‘continuous’ (C).
5. **Reversibility/Irreversibility.** This regards an estimate of whether or not an effect, once it has been stopped, has the potential to be ‘reversed’ (R) and return to its pre-existing situation or is ‘irreversible’ (I).
6. **Ecological Context.** This provides an estimate of the ecological value of the area in which the effect occurs, using a ‘low’ (L) or ‘high’ (H) rating.

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12.1.1 There is potential for employment and local economic growth throughout the construction phase.

12.1.2 (a) The potential economic opportunities are as follows:

i. local aggregates will be used for construction, subject to availability;

ii. the employment opportunities during the construction phase are estimated at 300 new jobs over 24 to 36 months;

iii. local support businesses will benefit from the construction works and the presence of the construction labour force; and

iv. the project represents up to a $200 million investment, which will directly benefit the local community.
## Table 5.3

### Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

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<td>Magnitude</td>
<td>Geographic Extent</td>
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<td>1.</td>
<td>Air Quality (Particulate Matter)</td>
<td>Bridge and Road / Water Use</td>
<td>1.1.1 Exhaust emissions from vehicles.</td>
<td>1.1.2 (a) All vehicles are licensed by the MTO, which administers emissions control regulations. (b) The bridge could reduce idling fuel consumption and greenhouse emissions.</td>
<td>L/M</td>
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<td>Bridge and Road Maintenance</td>
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<td>Malfunctions and Accidents</td>
<td>1.2.1 There is potential for airborne dust to be generated by maintenance equipment operations, vehicle traffic or the wind.</td>
<td>1.2.2 (a) In accordance with the C-NHP and O &amp; M Manual: i. dust suppression techniques such as watering will be used by the City and/or contractors during programmed and responsive maintenance activities; and ii. all maintenance equipment will be in good working condition through regular maintenance and inspections, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time. (b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
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<td>1.3 Unplanned events.</td>
<td>1.3.1 Accidental discharges of airborne matter can result in a degradation of the air quality at nearby points of reception.</td>
<td>1.3.2 (a) In accordance with the C-NHP and O &amp; M Manual: i. river water quality will be monitored north and south of the bridge for turbidity, suspended solids, nutrients and contaminants; i. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; and iii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response.</td>
<td>L/M</td>
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<tr>
<td>2.</td>
<td>Air Quality (Noise)</td>
<td>Bridge and Road / Water Use</td>
<td>2.1.1 Emissions are largely unavoidable as vehicle traffic is part of intended use of the bridge and roadways.</td>
<td>2.1.2 (a) All vehicles are licensed by the MTO, which administers emissions control regulations. (b) The sound attenuation barriers will further reduce the predicted sound levels from the bridge at noise-sensitive areas. (c) The CAP will also detail the response plan to be implemented if public complaints are received.</td>
<td>L/M</td>
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<td>Bridge and Road Maintenance</td>
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<td>Malfunctions and Accidents</td>
<td>2.2.1 There is potential for noise from maintenance equipment operations.</td>
<td>2.2.2 (a) All vehicles are licensed by the MTO, which administers emissions control regulations. (b) The sound attenuation barriers will further reduce the predicted sound levels from the bridge at noise-sensitive areas. (c) In accordance with the C-NHP and O &amp; M Manual, all maintenance equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time. (d) The CAP will also detail the response plan to be implemented if public complaints are received.</td>
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<td>2.3 Unplanned events.</td>
<td>2.3.1 Accidental high noise events can result in disturbance to residents and wildlife. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.</td>
<td>2.3.2 (a) In accordance with the C-NHP and O &amp; M Manual: i. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; and ii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response.</td>
<td>L/M</td>
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### Table 5.3

**Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase**

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<td>Magnitude</td>
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<td>3</td>
<td>Soil and Groundwater</td>
<td>Bridge and Road / Water Use</td>
<td>3.1 Soil erosion and sediment deposition.</td>
<td>3.1.1 There is potential for soil erosion and sediment deposition from activities that alter or affect the stormwater management facilities.</td>
<td>3.1.2 In accordance with the C-NHPP, the erosion and sediment control measures from the construction phase will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works.</td>
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<td></td>
<td>Bridge and Road Maintenance</td>
<td>Unplanned events.</td>
<td>3.2 Unplanned events.</td>
<td>3.2.1 Accidental spills on grounds adjacent to roadway approaches may result in contaminants reaching the groundwater table.</td>
<td>3.2.2 (a) In accordance with the C-NHPP and O &amp; M Manual: i. the stormwater drainage and management facilities will be inspected and maintained; and ii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
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<tr>
<td>4</td>
<td>Surfase Water</td>
<td>Bridge and Road / Water Use</td>
<td>4.1 Soil erosion and sediment deposition.</td>
<td>4.1.1 There is potential for soil erosion and sediment deposition.</td>
<td>4.1.2 (a) In accordance with the C-NHPP: i. the stormwater management will be designed to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above ground or underground) for treatment (sediment removal) and release in accordance with regulatory requirements; and ii. the shoreline erosion and sediment control measures from the construction phase will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works.</td>
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<td>Bridge and Road Maintenance</td>
<td>Unplanned events.</td>
<td>4.2 Surface water contamination from bridge de-icing activities.</td>
<td>4.2.1 There is potential for chemical de-icing of the bridge deck to impact surface water.</td>
<td>4.2.2 (a) In accordance with the C-NHPP: i. melted snow and ice will be designed to drain from all roadway and bridge deck areas to an on-land stormwater management facility (either above ground or underground) for treatment (sediment removal) and release in accordance with regulatory requirements; and ii. the shoreline erosion and sediment control measures from the construction phase will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works. (b) In accordance with the C-NHPP and O &amp; M Manual, de-icing systems will use only non-chlorinated de-icing agent(s).</td>
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<td>Maintenance</td>
<td>Unplanned events.</td>
<td>4.3 Unplanned events.</td>
<td>4.3.1 Accidental spills of hazardous materials can result in surface water contamination.</td>
<td>4.3.2 (a) In accordance with the C-NHPP and O &amp; M Manual: i. the stormwater drainage and management facilities will be inspected and maintained; and ii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
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<td>5</td>
<td>Vegetation</td>
<td>Bridge and Road / Water Use</td>
<td>5.1 Soil erosion and sediment deposition.</td>
<td>5.1.1 There is potential for vegetation degradation from activities that alter or affect the stormwater management facilities.</td>
<td>5.1.2 In accordance with the C-NHPP and O &amp; M Manual: i. the erosion and sediment control measures from the construction phase will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the landscape improvement works; and ii. those works that are included in the Natural Environment Enhancement Plan will be inspected and maintained. (b) The maintenance of the landscape improvement works represents</td>
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J. L. Richards & Associates Limited

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JLR 23446-02

April 16, 2012
### Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

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<td>5.2</td>
<td>Unplanned events.</td>
<td>5.2.1 Accident spills of hazardous materials can result in degradation to vegetated areas.</td>
<td>5.2.2 an opportunity to further enhance the west and east side lands.</td>
<td>(a) In accordance with the C-NHPP, stormwater management will be designed to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements. (b) In accordance with the C-NHPP and O &amp; M Manual: i. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; ii. the stormwater drainage and management facilities will be inspected and maintained; and iii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (c) The CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>H I L I R H</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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<td>6.1</td>
<td>Sensory disturbance and mortality risk.</td>
<td>6.1.1 There is potential for increased levels of sensory disturbance due to the use and maintenance of the bridge and roadways as well as mortality risk due to the maintenance of the east and west side lands. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.</td>
<td>6.1.2 (a) In accordance with the C-NHPP and O &amp; M Manual: i. advance inspections will be done in areas slated for on-land maintenance in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access; ii. on-land maintenance will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts; and iii. all maintenance equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time. (b) The maintenance of the landscape improvement works represents an opportunity to further enhance the west and east side lands.</td>
<td>H I L I R H</td>
<td>The residual environmental effect will be Positive given the proposed mitigation measures.</td>
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<td>6.2</td>
<td>Unplanned events.</td>
<td>6.2.1 Accident spills of hazardous materials can result in degradation to wildlife habitat.</td>
<td>6.2.2 (a) In accordance with the C-NHPP, stormwater management will be designed to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements. (b) In accordance with the C-NHPP and O &amp; M Manual: i. the stormwater drainage and management facilities will be inspected and maintained; and ii. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (c) The CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>H I L I R H</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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<td>7.1</td>
<td>Mortality risk.</td>
<td>7.1.1 There is potential for aquatic wildlife to experience an increased risk of mortality due to the in-water maintenance of the bridge.</td>
<td>7.1.2 (a) In accordance with the C-NHPP and O &amp; M Manual: i. advance inspections will be done in areas slated for in-water bridge maintenance in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and to restrict wildlife access;</td>
<td>M I L I R H</td>
<td>The residual environmental effect will be Positive given the proposed mitigation measures.</td>
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Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

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<td>Malfunctions and Accidents</td>
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<td>ii. In-water bridge maintenance will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts; and iii. Silt curtains and/or turbidity barriers will be installed in advance of in-water bridge maintenance as required and kept in place, monitored and maintained until the sediments within the affected area have settled. (b) The maintenance of those provisions in the Natural Environment Enhancement Plan further represents opportunities related to wetland restoration, aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking) as well as stabilizing and rehabilitating the shoreline shallows.</td>
<td>H I L I R H</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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8. Cultural Heritage Resources

| Bridge and Road / Water Use | 8.1 Loss and fragmentation. | 8.1.1 The potential for the loss and fragmentation of the Rideau Canal. | (a) In accordance with the C-NHPP, the maintenance of the public realm components on the bridge deck as well as the public realm components and landscape improvement works on-land represent an opportunity to enhance the City’s Historic association with the Rideau Canal. | H I L I R H | The residual environmental effect will be Positive given the proposed mitigation measures. |
| Bridge and Road Maintenance |                                    |                                                  |                                |                     | Magnitude                           | Geographic Extent | Duration | Frequency of Occurrence | Irreversibility | Ecological Context |
| Malfunctions and Accidents | 8.2 Loss and fragmentation. | 8.2.1 The potential for the loss and fragmentation of the Gore Road Library. | (a) In accordance with the C-NHPP and O & M Manual, opportunities to enhance the City’s Historic association with the Gore Road Library through: i. the maintenance of the public realm components and landscape improvement works on the property; and ii. the preparation and implementation of the Interpretation Plan that both documents and presents the known history of the property in situ. | H I L I R H | The residual environmental effect will be Positive given the proposed mitigation measures. |
|                             | 8.3 Unplanned events. | 8.3.1 Accidents can result in degradation of cultural heritage resources. | (a) In accordance with the C-NHPP, stormwater management will be designed to drain all roadway and bridge deck areas to an on-land stormwater management facility (either above grade or underground) for treatment (sediment removal) and release in accordance with regulatory requirements. (b) The maintenance of those provisions in the Natural Environment Enhancement Plan further represents opportunities related to wetland restoration, aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking) as well as stabilizing and rehabilitating the shoreline shallows. | H I L I R H | The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents. |
### Table 5.3

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<th>VEC</th>
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<td>maintenance equipment; ii. the stormwater drainage and management facilities will be inspected and maintained; iii. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; iv. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; and v. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (c) The CAP will detail the response plan to be implemented if public complaints are received.</td>
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<td>and accidents.</td>
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9. Local Community

9.1 Exhaust, dust and noise emissions from vehicles.

9.1.1 Emissions are largely unavoidable as vehicle and equipment maintenance traffic are intended as part of bridge and roadway use.

9.1.2 (a) The bridge and associated roadways facilitate opportunities to: i. provide a critical mid east-west arterial corridor in the City, which could further reduce automotive idling fuel consumption and greenhouse emissions and enhance non-automotive networks; ii. tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area; iii. further enhance emergency services in the City and the City’s express bus transit strategy; iv. accommodate CFB Kingston’s future growth plans; v. improve water supply and service redundancies to the east side of the Cataraqui River; vi. accommodate boat traffic along the Rideau Canal’s navigable channel; and vii. accommodate the long-term rowing needs of both the Kingston Rowing Club and Queens Rowing Club. (b) All vehicles are licensed by the MTO, which administers emissions control regulations. (c) The sound attenuation barriers will further reduce the predicted sound levels from the bridge at noise-sensitive areas. (d) In accordance with the C-NHPP and O & M Manual: i. dust suppression techniques such as watering will be used by the City and/or contractors during programmed and responsive maintenance activities; ii. all maintenance equipment will be in good working condition, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time; iii. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; iv. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; and v. detailed protocols shall be established for employees/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (e) The CAP will detail the response plan to be implemented if public complaints are received.

9.2.1 Traffic patterns will change as additional traffic will use the bridge and associated roadways. The potential exists for traffic to short-cut through local areas. Note short-cutting is not anticipated.

9.2.2 The potential for short-cutting will be monitored by the City and addressed, if necessary.
### Table 5.3

**Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase**

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<td></td>
<td></td>
<td>Magnitude</td>
<td>Geographic Extent</td>
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<tr>
<td>9.3</td>
<td>Unplanned events.</td>
<td>9.3.1 Traffic accidents as well as accidental spills, discharge of airborne matter or noise can negatively impact the quality of life in the local community.</td>
<td>9.3.2 (a) All vehicles are licensed by the MTO, which administers emissions control regulations. (b) In accordance with the C-NHPP and O &amp; M Manual: i. dust suppression techniques such as watering will be used by the City and/or contractors during programmed and responsive maintenance activities; ii. all maintenance equipment will be in good working condition, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time; iii. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; iv. in-water maintenance activities will be suspended during periods of heavy rain and high wind events; and v. detailed protocols shall be established for employee/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions as well as emergency response. (b) Emergency response procedures will be outlined in the C-NHPP and O &amp; M Manual. (c) The CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>H I L I R H</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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<tr>
<td>10</td>
<td>Roads and Road Traffic, Boat Traffic</td>
<td>Bridge and Road / Water Use Bridge and Road Maintenance Malfunctions and Accidents</td>
<td>10.1.1 Traffic patterns will change as additional traffic will use the bridge and associated roadways in the area.</td>
<td>10.1.2 (a) The bridge and associated roadways facilitate opportunities to: i. provide a critical mid-east-west arterial corridor in the City, which could further enhance non-automotive networks and the City’s express bus transit strategy; ii. tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area; iii. accommodate boat traffic along the Rideau Canal’s navigable channel; and iv. accommodate the long-term rowing needs of both the Kingston Rowing Club and Queens Rowing Club. (b) Traffic signals will be monitored and coordinated to maximize efficient traffic flows.</td>
<td>H R L C R H</td>
<td>The residual environmental effect will be Positive given the proposed mitigation measures.</td>
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<td></td>
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<td>Magnitude</td>
<td>Geographic Extent</td>
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<tr>
<td>10.2</td>
<td>Traffic Short-Cutting.</td>
<td>10.2.1 Traffic patterns will change as additional traffic will use the bridge and associated roadways. The potential exists for traffic to short-cut through local areas. Note short-cutting is not anticipated.</td>
<td>10.2.2 The potential for short-cutting will be monitored by the City and addressed, if necessary.</td>
<td>H I L I R H</td>
<td>The residual environmental effect will be Low to reflect existing land uses and the proposed mitigation measures.</td>
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<tr>
<td>10.3</td>
<td>Unplanned events.</td>
<td>10.3.1 Traffic accidents could negatively impact the level of service on municipal roads.</td>
<td>10.3.2 (a) Emergency response procedures and procedures for minimizing both the duration and severity of any accidents or malfunctions will be outlined in the C-NHPP and O &amp; M Manual. (b) The CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>H I L I R H</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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J. L. Richards & Associates Limited

JLR 23446-02

April 16, 2012

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### Table 5.3
Project Effects on Impacted Valued Ecosystem Components (VECs): Operations Phase

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<tr>
<td>11. Business / Job Opportunities</td>
<td>Bridge and Road / Water Use Bridge and Road Maintenance</td>
<td>11.1 Employment opportunities and local economic growth.</td>
<td>11.1.1 There is potential for employment and local economic growth.</td>
<td>11.1.2 (a) The bridge and associated roadways provide opportunities to facilitate economic development through enhanced east-west transportation mobility across the City and north-south transportation mobility into the downtown by tying into the northern terminus of the future Wellington Street Extension. (b) Bridge and roadway maintenance activities will be ongoing and will require the expansion of the City’s public works efforts.</td>
<td>H R L C R H</td>
<td>The residual economic effect will be Positive.</td>
</tr>
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</table>

Note the significance of the residual effects on each VEC is evaluated in Table 5.3 using the following factors as per the CEA Act:

1. **Magnitude.** This pertains to the typical effects of the impact on each VEC, which are rated as ‘low’ (L), ‘medium’ (M) or ‘high’ (H).
2. **Geographic Extent.** This relates to the area where the effect occurs, which is rated as ‘immediate’ (I), ‘local’ (L) or ‘regional’ (R).
3. **Duration.** This regards the duration of the effect on each VEC, which is rated as ‘short term’ (S) or ‘long term’ (L).
4. **Frequency of Occurrence.** This pertains to the frequency that the effect occurs, which is rated as ‘intermittent’ (I) or ‘continuous’ (C).
5. **Reversibility/Irreversibility.** This regards an estimate of whether or not an effect, once it has been stopped, has the potential to be ‘reversed’ (R) and return to its pre-existing situation or is ‘irreversible’ (I).
6. **Ecological Context.** This provides an estimate of the ecological value of the area in which the effect occurs, using a ‘low’ (L) or ‘high’ (H) rating.
### Table 5.4
Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

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<tr>
<td>1. Air Quality (Particulate Matter)</td>
<td>Removals  Site Rehabilitation  Malfunctions and Accidents</td>
<td>1.1 Diesel exhaust emissions from heavy equipment.</td>
<td>1.1.1 Diesel exhaust emissions, which are largely unavoidable due to the type of equipment needed during the decommissioning phase.</td>
<td>1.1.2 (a) In accordance with the DP, all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate emissions treatment systems as determined by industry standards and Provincial guidelines current at that time. (b) Decommissioning is temporary and expected to last up to 24 months. (c) The D-CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>M I S I R L</td>
<td>The residual environmental effect will be Low presuming existing land uses remain largely unchanged and to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further subject to EA regulations current at that time.</td>
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<tr>
<td>1.2 Airborne dust from heavy equipment operations.</td>
<td>1.2.1 There is potential for airborne dust to be generated by equipment operations, traffic or the wind.</td>
<td>1.2.2 (a) In accordance with the DP, dust suppression techniques will be used by the Contractor such as watering on access roads and sweeping at site entrances. (b) Decommissioning is temporary and expected to last up to 24 months. (c) Site rehabilitation will be undertaken as soon as is practical following the decommissioning phase to minimize airborne dust. (d) The D-CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>M I S I R L</td>
<td>The residual environmental effect will be Low presuming existing land uses remain largely unchanged and to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further subject to EA regulations current at that time.</td>
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<td>1.3 Unplanned events.</td>
<td>1.3.1 Accidental discharges of airborne matter can result in a degradation of the air quality at nearby points of reception.</td>
<td>1.3.2 (a) In accordance with the DP: i. all heavy equipment and tools will be in good working condition; ii. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; iii. in-water works will be suspended during periods of heavy rain and high wind events; and iv. detailed protocols will be established for employees/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions.</td>
<td>M I S I R L</td>
<td>The residual environmental effect will be Low presuming existing land uses remain largely unchanged and to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further subject to EA regulations current at that time.</td>
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<tr>
<td>2. Air Quality (Noise)</td>
<td>Removals  Site Rehabilitation  Malfunctions and Accidents</td>
<td>2.1 Noise emissions from heavy equipment.</td>
<td>2.1.1 Noise emissions, which are largely unavoidable due to the type of equipment needed during the decommissioning phase.</td>
<td>2.1.2 (a) In accordance with the DP: i. all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time; and ii. works will be undertaken in accordance with regulations and guidelines current at that time. (b) Decommissioning is temporary and expected to last up to 24 months. (c) The D-CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>M I S I R L</td>
<td>The residual environmental effect will be Low presuming existing land uses remain largely unchanged and to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further subject to EA regulations current at that time.</td>
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### Table 5.4

#### Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

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<td>Geographical Extent</td>
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<td>2.2</td>
<td>Unplanned events.</td>
<td>2.2.1 Accidental high noise events can result in disturbance to residents and wildlife. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable.</td>
<td>2.2.2 (a) In accordance with the DP: i. all heavy equipment and tools will be in good working condition, including the use of appropriate noise-suppression devices as determined by industry standards and Provincial guidelines current at that time; ii. works will be undertaken in accordance with regulations and guidelines current at that time; iii. in-water works will be suspended during periods of heavy rain and high wind events; and iv. detailed protocols will be established for employee/contractors regarding equipment maintenance and inspections as well as procedures for minimizing both the duration and severity of any accidents or malfunctions.</td>
<td>M I S I R L</td>
<td>regulations current at that time.</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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<tr>
<td>3.1</td>
<td>Soil erosion and sediment deposition</td>
<td>3.1.1 There is potential for soil erosion and sediment deposition.</td>
<td>3.1.2 (a) In accordance with the DP: i. riverbank erosion and sediment control measures will be installed along the riverbanks; ii. silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; iii. the removal of shoreline vegetation will be minimized and done using small machinery; and iv. the erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the site rehabilitation works.</td>
<td>H I S I R L</td>
<td>The residual environmental effect will be Minimal given the proposed mitigation measures and that if decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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<td>3.2</td>
<td>Unplanned events.</td>
<td>3.2.1 There is the potential to uncover contaminated soils. Also, accidental spills of hazardous materials can result in groundwater contamination. Note groundwater should not be encountered during the decommissioning phase.</td>
<td>3.2.2 (a) In accordance with the DP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; and vii. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities. (b) The D-CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>H I S I R L</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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<tr>
<td>4.</td>
<td>Surface Water Removals</td>
<td>Soil erosion and sediment loading.</td>
<td>4.1.1 There is potential for soil erosion and sediment deposition.</td>
<td>4.1.2 (a) In accordance with the DP: &lt;br&gt; - riverbank erosion and sediment control measures will be installed along the riverbanks; &lt;br&gt; - silt fencing will be installed for spoil stockpiling or fill material areas and such areas will be at least 30 m off-shore; &lt;br&gt; - the removal of shoreline vegetation will be minimized and done using small machinery; and &lt;br&gt; - the on-land erosion and sediment control measure will be kept in place, monitored and maintained until the shorelines have become fully re-vegetated as part of the site rehabilitation works; and &lt;br&gt; - silt curtains and/or turbidity barriers will be installed in advance of in-water removals and kept in place, monitored and maintained until the sediments within the affected area have settled.</td>
<td>H I S I R L</td>
<td>The residual environmental effect will be Minimal given the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further subject to EA regulations current at that time.</td>
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<td>4.</td>
<td>Site Rehabilitation Malfunctions and Accidents</td>
<td>Unplanned events.</td>
<td>4.2.1 Accidental spills of hazardous materials can result in surface water contamination.</td>
<td>4.2.2 (a) In accordance with the DP: &lt;br&gt; - all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; &lt;br&gt; - all heavy equipment will be required to operate and re-fuel in designated areas; &lt;br&gt; - analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; &lt;br&gt; - spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; &lt;br&gt; - only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; &lt;br&gt; - ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; and &lt;br&gt; - debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities. (b) The D-CAP will detail the response plan to be implemented if public complaints are received.</td>
<td>H I S I R L</td>
<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions and accidents.</td>
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<td>5.</td>
<td>Vegetation Removals</td>
<td>Change in vegetation diversity.</td>
<td>5.1.1 Vegetation removal will be required during the decommissioning phase. Note there are no ELC community types on the west side lands and the affected woodlands on the east side are not considered provincially significant or contributory.</td>
<td>5.1.2 (a) In accordance with the DP: &lt;br&gt; - surveys will be done in advance of excavation activities to assess for any sensitive vegetation and tree species, which if identified, will then be avoided or relocated to other suitable locations, as feasible and appropriate; and &lt;br&gt; - the removal of shoreline vegetation will be minimized; &lt;br&gt; - site rehabilitation works will be undertaken as soon as is practical.</td>
<td>H L S I R L</td>
<td>The residual environmental effect will be Low to reflect the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further subject to EA regulations current at that time.</td>
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## Table 5.4

|-----|-----------------------------------|-----------------------------------------------|---------------------------------|-------------------|-------------------------------------|-----------------------------------------------|
| 6.1 | Sensory disturbance.              | There is potential for increased levels of sensory disturbance to local wildlife due to the types of activities and equipment used during the decommissioning phase. Note wildlife species typically adapt their behaviour to the new surroundings or avoid the area where most effects are most notable. | 6.1.2 (a) In accordance with the DP:  
   i. advance inspections will be done in areas slated for decommissioning activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access.
   ii. decommissioning activities will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place, have ensured that there will be no potential species impacts.
   iii. all heavy equipment will be in good working condition through regular maintenance and inspections, including appropriate noise-suppression systems as determined by industry standards and Provincial guidelines current at that time.
   iv. works will be undertaken in accordance with regulations and guidelines current at that time. | H | I | S | I | R | L | The residual environmental effect will be Minimal given:

(a) the proposed mitigation measures;

(b) the projected infrequent occurrence of malfunctions and accidents. |

| 6.2 | Loss and fragmentation.           | There is potential for habitat loss and fragmentation of habitat due to the types of activities and equipment used during the decommissioning phase. Note there are no ELC community types on the west side lands and the affected woodlands on the east side are not considered provincially significant or contributory. | 6.2.2 (a) In accordance with the DP:
   i. surveys will be done in advance of excavation activities to assess for any sensitive vegetation and tree species, which if identified, will then be avoided or relocated to other suitable locations, as feasible and appropriate; and
   ii. the removal of algaline vegetation will be minimized and done using small machinery. | L | I | S | I | R | L | The residual environmental effect will be Low to reflect the short-term duration of decommissioning, the proposed mitigation measures and that, if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time. |
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<tr>
<td>6.3</td>
<td>Mortality risk.</td>
<td>6.3.1 There is potential for wildlife to experience an increased risk of mortality due to the types of activities and equipment used during the decommissioning phase.</td>
<td>6.3.2 (a) In accordance with the DP: i. advance inspections will be done in areas slated for decommissioning activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and/or establishing buffers to protect sensitive wildlife habitat areas and to restrict wildlife access; and ii. decommissioning activities will be scheduled to avoid sensitive areas as well as breeding seasons and over-wintering periods for wildlife, unless advance inspection and exclusion provisions, in conjunction with applicable permits and approvals being in place have ensured that there will be no potential species impacts.</td>
<td>L/M I S I R L</td>
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<td>6.4</td>
<td>Unplanned events.</td>
<td>6.4.1 Accidental spills of hazardous materials can result in degradation to wildlife habitat.</td>
<td>6.4.2 (a) In accordance with the DP: i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections; ii. all heavy equipment will be required to operate and re-fuel in designated areas; iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements; iv. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River; v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site effluent holding tanks to an approved water pollution control plant for disposal and treatment; vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities; and vii. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities.</td>
<td>L I S I R L</td>
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<tr>
<td>7.1</td>
<td>Mortality risk.</td>
<td>7.1.1 There is potential for aquatic wildlife to experience an increased risk of mortality due to loss of wetland structure or function resulting from the types of activities and equipment used during the decommissioning phase.</td>
<td>7.1.2 (a) In accordance with the DP: i. advance inspections will be done in areas slated for decommissioning activities in order to assess the presence of wildlife species and the feasibility of relocating affected wildlife species to other hospitable environments and to restrict wildlife access; and ii. decommissioning activities will be scheduled to avoid sensitive areas as well as spawning seasons and over-wintering periods for aquatic wildlife.</td>
<td>L/M I S I R L</td>
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The residual environmental effect will be Low to reflect 100 percent mortality avoidance is not possible in relation to the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.

The residual environmental effect will be Minimal given:
(a) the proposed mitigation measures; and
(b) the projected infrequent occurrence of malfunctions and accidents.

The residual environmental effect will be Low to reflect 100 percent mortality avoidance is not possible in relation to the short-term duration of decommissioning, the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.

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Table 5.4

Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase

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<td>7.2 Unplanned events.</td>
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<td>7.2.1 Accidental spills of hazardous materials can result in degradation to aquatic habitat.</td>
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<td>7.2.2 (a) In accordance with the DP:</td>
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<td>i. all heavy equipment and tools used on-site will be in good working condition through regular maintenance and inspections;</td>
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<td>ii. all heavy equipment will be required to operate and re-fuel in designated areas;</td>
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<td>iii. analyses of sediments in advance of and following excavation activities will be conducted to determine sediment contamination levels and to further ensure appropriate protocols are in place for control measures (work stoppage, agency notification) and disposal to an approved landfill facility in accordance with regulatory requirements;</td>
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<td>iv. spill kits will be on-site and materials and debris as well as fuel, lubricants and other hazardous materials will be stored in designated areas away from high-traffic areas and the Cataraqui River;</td>
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<td>v. only licensed personnel will be allowed to handle hazardous materials and provide regular pump-out and haulage services of the temporary on-site efficient holding tanks to an approved water pollution control plant for disposal and treatment;</td>
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<td>vi. ditches along temporary roadways will direct surface drainage to temporary treatment ponds or permanent facilities;</td>
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<td>vii. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities;</td>
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<td>viii. river water quality will be monitored north and south of the bridge for turbidity, suspended soils, nutrients and contaminants; and</td>
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<td>ix. in-water works will be suspended during periods of heavy rain and high wind events.</td>
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<td>The residual environmental effect will be Minimal given: (a) the proposed mitigation measures and that if when decommissioning and rehabilitation are required, such works would be further be subject to EA regulations current at that time.</td>
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8. Cultural Heritage Resources

<table>
<thead>
<tr>
<th>Removals</th>
<th>Site Rehabilitation Malfunctions and Accidents</th>
<th>8.1 Loss and fragmentation.</th>
<th>8.1.1 The potential for the loss and fragmentation of cultural heritage resources.</th>
<th>8.1.2 (a) In accordance with the DP, notification and mitigation protocols will be in place regarding impacted cultural heritage resources current at that time.</th>
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9. Archaeological Resources

<table>
<thead>
<tr>
<th>Removals</th>
<th>Site Rehabilitation Malfunctions and Accidents</th>
<th>9.1 Loss and fragmentation.</th>
<th>9.1.1 The potential for the loss and fragmentation of archaeological resources.</th>
<th>9.1.2 (a) In accordance with the DP, notification and mitigation protocols will be in place regarding impacted cultural heritage resources current at that time.</th>
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<tr>
<td>10. Local Community</td>
<td>Removals Site Rehabilitation Malfunctions and Accidents</td>
<td>10.1 Compatibility</td>
<td>10.1.1 (a) Diesel exhaust emissions, airborne dust and noise emissions, which are largely unavoidable due to the type of equipment needed during the decommissioning phase. (b) Vegetation removal will be required during the decommissioning phase. (c) Access to the site will be via major road and water channel routes current at that time. (d) Private property acquisition may be required, depending on the impacts of decommissioning activities on land ownership patterns current at that time.</td>
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<td>10.1.2 (a) In accordance with the DP: i. all heavy equipment and tools will be in good working condition through regular maintenance and inspections, including the use of appropriate noise-suppression devices as determined by industry standards and Provincial guidelines current at that time; ii. debris will be sorted for recycle or disposal and hauled off-site by licensed operators to approved facilities. (b) Private property acquisition by the City would proceed as per regulations and guidelines current at that time. (c) Decommissioning is temporary and expected to last up to 24 months. (d) Site rehabilitation works will be undertaken as soon as is practical. (e) The D-CAP will detail the response plan to be implemented if public complaints are received.</td>
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<td>10.2 Unplanned events</td>
<td>10.2.1 Accidental spills, discharge of airborne matter or noise and contaminated soil discoveries can negatively impact the quality of life in the local community.</td>
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</table>
| | | | 10.2.2 (a) In accordance with the DP: i. all heavy equipment and tools will be in good working condition, including the use of appropriate noise-suppression devices as determined by industry standards and Provincial guidelines current at that time. ii. all heavy equipment will be required to operate and re-fuel in designated areas; | H I S I R L | The residual environmental effect will be Low given: (a) the proposed mitigation measures; and (b) the projected infrequent occurrence of malfunctions.
### Table 5.4

**Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase**

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<td>Magnitude</td>
<td>Geographic Extent</td>
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<tr>
<td>11</td>
<td>Roads and Road Traffic, Boat Traffic</td>
<td>Removals</td>
<td>Site Rehabilitation</td>
<td>Malfunctions and Accidents</td>
<td>11.1 Level of service.</td>
<td>11.1.1 (a) Road and boat traffic patterns will change as additional traffic will use the roads and water in the area due to the types of activities and equipment needed to carry out the decommissioning phase. (b) Access to the site will be via major road and water channel routes current at that time.</td>
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### Table 5.4  
**Project Effects on Impacted Valued Ecosystem Components (VECs): Decommissioning Phase**

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<td></td>
<td></td>
<td>Magnitude</td>
<td>Geographic Extent</td>
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</table>
| 11.2 | Unplanned events. | 11.2.1 (a) Accidents could negatively impact boat traffic and LOS on roads. | 11.2.2 (a) In accordance with the DP:  
   i. only licensed carriers and operators will be involved during the decommissioning phase; and  
   ii. in-water works will be suspended during periods of heavy rain and high wind events. |  
   L | I | S | I | R | L | The residual environmental effect will be Minimal given:  
   (a) the proposed mitigation measures; and  
   (b) the projected infrequent occurrence of malfunctions and accidents. |
| 12 | Business / Job Opportunities | Removals  
   Site Rehabilitation | 12.1 Employment opportunities and local economic growth. | 12.1.1 There is potential for employment and local economic growth throughout the Project construction phase. | 12.1.2 (a) The potential economic opportunities are as follows:  
   i. the employment opportunities during the construction phase are estimated at 100 new jobs over 24 months; and  
   ii. local support businesses will benefit from the construction works and the presence of the construction labour force. | H | R | S | C | R | L | The residual economic effect will be Positive. |

Note the significance of the residual effects on each VEC is evaluated in Table 5.4 using the following factors as per the CEA Act:

1. **Magnitude.** This pertains to the typical effects of the impact on each VEC, which are rated as ‘low’ (L), ‘medium’ (M) or ‘high’ (H).
2. **Geographic Extent.** This relates to the area where the effect occurs, which is rated as ‘immediate’ (I), ‘local’ (L) or ‘regional’ (R).
3. **Duration.** This regards the duration of the effect on each VEC, which is rated as ‘short term’ (S) or ‘long term’ (L).
4. **Frequency of Occurrence.** This pertains to the frequency that the effect occurs, which is rated as ‘intermittent’ (I) or ‘continuous’ (C).
5. **Reversibility/Irreversibility.** This regards an estimate of whether or not an effect, once it has been stopped, has the potential to be ‘reversed’ (R) and return to its pre-existing situation or is ‘irreversible’ (I).
6. **Ecological Context.** This provides an estimate of the ecological value of the area in which the effect occurs, using a ‘low’ (L) or ‘high’ (H) rating.
5.3 Effects of the Environment on the Project

This section of the Report outlines the effects of climatic fluctuations and extreme events on the project that could occur in the area.

5.3.1 Climatic Fluctuations

Climatic fluctuations cannot be accurately predicted. As such, it is considered highly unlikely that any fluctuations that affect long-term weather trends would significantly affect the project, particularly since the design features of the project will need to meet the CHBDC.

5.3.2 Extreme Events

Potential extreme weather events that could affect the project include wind, earthquake, lightning and fire. Firstly, an extreme wind event is defined as winds in the range of 100 km/hr to 140 km/hr. Extreme wind events are rare but have been known to occur in the area. As noted earlier, the 1987 to 2007 wind data from the Kingston Airport suggests that most of the winds are from the southwesterly quadrants. The largest contributions are from due south and due west, caused mainly by the effects of Lake Ontario. Probable hourly wind speeds aggregated annually suggest that high winds can be experienced from any direction. But 100 year wind speeds are roughly 20 m/s (or 72 km/hr), which falls well below the criteria for an extreme wind event.

Secondly, as also noted earlier, for seismic design purposes, Kingston is listed in Table A3.1.1 of the CHBDC and falls in an Acceleration-related seismic zone (Za) of 2 and a Zonal acceleration ratio of 0.10. Assuming the bridge would be classified as a ‘Lifeline’ bridge, the seismic performance zone would be 3 based on the CHBDC. The Site Coefficient (S) for the project site location, also based on the CHBDC, may be taken as 1.5, which is consistent with Soil Type III, due to the deep clay deposit within the Cataraqui River. Under the design earthquake condition, the silty clay soil and glacial till soil at the project site location are not considered to be susceptible to liquefaction. This is because of their relatively high fines contents and plasticity. But the layer of organic soils below the river mudline is considered to be susceptible to liquefaction under the design earthquake condition. Provided the bridge structure is founded on bedrock, no adverse impact on the post-liquefaction capabilities of the bridge foundation is anticipated. There are also two zones within the project site location where low resistivity is observed within the bedrock beneath the river, centred at distances of 320 m and 970 m along the ERI survey line. These areas are most likely associated with the Frontenac Axis. If these zones are faults, they are considered inactive and do not pose any additional seismic impacts. Still, the foundation elements associated with the project avoid these potential fault zones.

Thirdly, during the spring and summer seasons, thunderstorms and electrical storms can occur in the area. In the event of a lightning strike that hits the bridge, the built-in grounding system should prevent any severe damage and reduce the risk of fire.

5.4 Cumulative Effects

In addition to the impacts of the project on the VECs, this Report must also consider the cumulative environmental effects of the project in conjunction with existing and future activities or projects. Cumulative effects are defined as effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out. Cumulative effects are limited to those effects that are likely and for which measureable or detectable residual effects are predicted. A measureable change is defined as a change that is real, observable and detectable compared with existing (baseline) conditions. A predicted change that is negligible or indistinguishable from background conditions is not considered to be measureable.

As discussed earlier, the EA Problem Statement cited in this Report is indicative of the cumulative effects of existing and future activities or projects on local traffic and the resulting need for this project:

1. The effects of the LOS for the LaSalle Causeway-Highway 2 corridor, which is falling below the City’s accepted policy level of LOS D as a result of existing traffic congestion on the LaSalle Causeway during peak hour traffic demand (and during a Highway 401 detour event), despite focused strategies to optimize the transportation system and increase walking, cycling, and public transit use. The LOS is expected to continue to decrease in the future due to population and employment growth and increased traffic congestion.

2. The current role of the Highway 401 crossing as an inter-city roadway facility and the related safety and system efficiency issues that can result from conflicts between local and regional traffic use as well as the strong demand for trips crossing the Cataraqui River via the LaSalle Causeway in both the southern and northern portions of the City’s urban limits.

3. Projected 19 percent population growth and 22 percent employment growth in the City by 2029 and the need to determine whether the City’s transportation networks will be able to accommodate long-term planned growth and development programs on the east and west sides of the Cataraqui River in an efficient and effective manner.

Furthermore, the 2030 to 2034 trigger for a four-lane bridge cited in this Report would impact the viability of moving forward with a two-lane bridge or a two-lane bridge with a substructure to accommodate its widening to four lanes in the future. But the cumulative effects of future monitoring of traffic conditions by
the City, particularly if the aforementioned improvements to the LaSalle Causeway-Highway 2 corridor are implemented, could confirm the viability of either scenario or even delay the timeline for engaging the Project Implementation Phase of the Class EA process for the bridge itself. Moreover, the cumulative effect of future travel demand patterns could also confirm the viability of the initial three-lane bridge scenario (with the centre lane operating as a reversible lane and a substructure that could accommodate widening to four lanes) in the future. This design approach reflects the need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure. As such, this Report recognizes the merits of facilitating an infrastructure improvement program that is both flexible and able to evolve in response to changing conditions.

In addition, the bridge deck components coincide with the rationale that led to the selection of a bridge at the project site location as the preferred solution during Stage 1 of this EA study, namely:

1. The opportunity for the bridge deck components to tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area.
2. The role of the bridge deck components in helping to provide a more direct mid east-west connection to existing road infrastructure on either shore. This in turn would address travel demand patterns, accommodate CFB Kingston’s future strategic plans as well as provide opportunities to enhance emergency response services, the City’s express bus route strategy and active travel and commuter cycling networks.

Overall, the cumulative environmental effects of the project need and design approach in conjunction with existing and future activities are Positive to the local community.

5.5 Project Delivery Models

This section of the Report discusses three potential project delivery models, namely, Design-Bid-Build, Design-Build, Public-Private-Partnership and Alliance. Highlights of their advantages, disadvantages and risk sharing arrangements are also outlined.

5.5.1 The Project Delivery Models

.1 Design-Bid-Build Model

The Design-Bid-Build model is the most common and well understood project delivery model by public sector owners (Owner). It involves the Owner directing the engineering design of a project through to completion. Once the tender package is ready, the Owner can tender the project out in an open public forum. The contractor bids on the project and the award is typically made to the contractor who submits the lowest price. The Owner has separate contracts with the designer and the contractor. There are no direct contractual links between the designer and contractor. The contractor is responsible to build the project to the construction specifications that have been provided in the construction contract.

.2 Design-Build Model

The Design-Build model has also been widely used throughout the world on a variety of infrastructure projects, including major road and bridge projects. It usually involves a team comprised of one or more engineering companies and a lead contractor that is capable of designing and building the infrastructure for a guaranteed price. This approach creates a single point of responsibility for project delivery. The financing of a Design-Build project is normally provided by the Owner, which could involve a payment schedule that is tied to specific project deliverables.

The basic Design-Build process involves two main steps. The first step is pre-qualification, which is typically an open public forum wherein submissions are made by the lead contractor teams in response to project-related criteria from the Owner. The top three to four submissions are usually selected and those teams are invited to participate in the second step. This step involves the development of an early bid. The early bid is based on a preliminary design produced by the engineer in each lead contractor team to meet the project criteria specified by the Owner. The preferred team is then selected by the Owner, normally on the basis of price. More subjective evaluation criteria can also be used, provided their context and roles in the selection process are clearly defined beforehand by the Owner.

.3 Public-Private-Partnership Model

The Public-Private-Partnership (P3) model is a cooperative venture between the public and private sectors. It is built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards. This essentially involves an analysis of what it would cost the public sector to design, build, finance and maintain the infrastructure for the life of the Concession, compared to engaging the P3 model, which is a form of procurement for providing capital assets and associated long term operations that includes a component of private finance.

The P3 model can be appropriate for major and complex capital projects that are usually in excess of $100 million and have significant ongoing maintenance requirements. A P3 can ensure that the contractor is bound to provide project management, design and risk management expertise to the Owner and to enter into long term operational contracts for the project after it is built. As such, a P3 carries the responsibility for the quality of the contractor’s work over the implementation and operation phases of the project. Typically, at the end of the P3 contract, the infrastructure is turned over to the Owner under clearly defined conditions.

The initial P3 selection process is similar to the Design-Build process. The first step involves submissions by the lead contractor teams to the Owner during the pre-qualification stage. The top three to four
submissions are normally selected by the Owner and those teams are invited to develop designs of suitable detail that can be assessed by the Owner as well as used by the teams to establish their bids. Once the preferred team is selected, the Owner executes the contract agreements for the design, build, finance, operation, maintenance and transfer of the infrastructure at the end of the contract term. This is the main difference between the Design-Build and P3 models, in that the P3 model includes a process for financing and payment over a long period (usually 25 years or more).

### 4 Alliance Model

The Alliance model is fundamentally different from the three others described above in that it is based on a collaborative approach between the Owner, Designer and Contractor to design and build the project for an amount equal to, or less than the project budget. Risks and opportunities are managed jointly by all three parties to outcomes that give the best overall result for the project, rather than to one of the parties at the expense of the others. The Alliance model captures many elements of the guaranteed maximum price and construction management contractual arrangements.

There are variations on the project framework. These can range from the Owner hiring the designer and then tendering the project at a stage where the major cost elements can be identified. The three parties then work collaboratively to complete the design and construction. At the other end of the spectrum, there is a modified design-build approach where designers and contractors come together to prepare and price conceptual designs which are evaluated under previously identified criteria. Again, the parties work to complete the design and construction in a collaborative manner.

The key element is that there is no recourse to any Court by any of the three parties to settle disputes. Any dispute is settled internally by the parties, or at worst with the assistance of a facilitator. Under this process, there are no construction claims as any issues which arise are settled using a collaborative process.

The Alliance model is used extensively in New Zealand and Australia. It has also been used on transportation projects in British Columbia, including an early contract on the Sea-to-Sky project.

#### 5.5.2 Advantages, Disadvantages and Risk Sharing Arrangements

Table 5.5 highlights the advantages, disadvantages and risk sharing arrangements with the Design-Bid-Build, Design-Build, Public-Private-Partnership and Alliance models. Though these highlights treat each model in isolation, it is recognized that variations and combinations of the models have been successfully implemented. For example, the Owner can have the design completed to a stage where variations in quantities are small and then use the P3 model for subsequent completion of the design, construction, financing and maintenance components. The success and effectiveness of the models depend on a number of factors such as the specific nature of the project, the experience of the parties involved, financial market conditions, budget constraints, schedule, risk tolerance and public acceptance.

Confirming the preferred project delivery model is outside this EA framework and is best addressed during the early stages of the Project Implementation phase to reflect the City’s cost recovery model and business strategy to secure funding and manage control of the project design, construction and risk. It should be noted that a significant portion of the City’s direct costs (the net cost after funding) would be recovered through Development Charges collected from new developments. It is therefore recommended that the City develop a Business Plan in order to fund and finance the project during the early stages of the Project Implementation phase and to identify the preferred project delivery model.

### 6.0 PROJECT MONITORING

This section of the Report discusses the monitoring tools that will be applied by the City or its agent in relation to the project both leading up and subsequent to the initiation of the Project Implementation Phase of the Class EA process.

#### 6.1 Traffic Monitoring

Upon completion of this EA study, the City will monitor future traffic conditions, at a minimum, as part of the subsequent five-year review protocol for the KTMP Update. Regarding this project, the monitoring will focus on traffic conditions within the Cataraqui River screenline and the effectiveness of the aforementioned improvements to the LaSalle Causeway-Highway 2 corridor, should they be implemented. The purpose of this review would be to confirm the timeline for engaging the Project Implementation Phase of the Class EA process for the bridge itself as well as the preferred bridge configuration scenario: i) a two-lane bridge; ii) a two-lane bridge with a substructure to accommodate its widening to four lanes; or iii) a three-lane bridge with the centre lane operating as a reversible lane and a substructure that could accommodate widening to four lanes. If the preferred bridge scenario would require widening to four lanes in the future, this too, would prompt subsequent traffic monitoring by the City to confirm the timeline for this expansion.

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38 Honorariums are sometimes paid to the unsuccessful teams to partially cover the usually high cost of developing P3 proposals.
### Table 5.5  
**Project Delivery Models: Advantages, Disadvantages and Risk Sharing Arrangements**

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<thead>
<tr>
<th>Project Delivery Model</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Risk Sharing</th>
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| **Design-Bid-Build**   | 1. The Owner retains all of the control over the project.  
2. It is the most inclusive project delivery model as several Contractors can line up to bid the project.  
3. Changes can be easily implemented (although at cost) during the construction process.  
4. It is the most common and well understood model.  
5. For a nominal fraction (approximately 5 percent) of the total project cost, the design phase of the project could be undertaken early and prior to securing or committing the necessary funds for construction. This would allow the Owner to be better positioned to secure financial assistance from the upper levels of government, as the project would be ‘shovel-ready’. | 1. The Owner retains all of the risk over variances that can occur due to unknown circumstances.  
2. The project completion schedule is the longest of all the project delivery models.  
3. The Owner faces some uncertainties over final project costs, which are usually not known until project completion. | 1. The majority of the risks are carried by the Owner. |
| **Design-Build**       | 1. The Owner has early knowledge of a guaranteed cost for a defined scope of work.  
2. Some of the risks are transferred from the Owner to the Design-Builder. The general principle is that all risks are transferred unless they are specifically retained.  
3. It encourages innovation and cost savings provided that the design and performance criteria are well established, the design information is adequate and a cost-sharing mechanism for latent defects is clearly specified. But the more these elements are specified, the less opportunity there is for innovation.  
4. It saves time by compressing the overlap of design and construction at the early stages of the project. | 1. It reduces the Owner’s level of control. Because of the fast track nature of the process, changes usually become much more expensive as more rework is involved. The Owner needs to have a clear understanding of the final product and minimum standards.  
2. It is more difficult to incorporate stakeholder input.  
3. The process is more complex (requires a rigorous set of design and performance specifications) and less understood.  
4. It reduces the number of contractors who are qualified to bid on the project. | 1. Substantial risk is transferred from the Owner to the Design-Builder, but can be apportioned to where it is most appropriate and can be shared. The general principle is that all risks are transferred unless they are specifically retained. |
| **Public-Private-Partnership** | 1. The Owner has early knowledge of all costs for a defined scope of work for the term of the Concession.  
2. Most of the risks are transferred from the Owner to the Concessionaire. Some care needs to be taken in assigning risk, as there is a tendency to transfer essentially all risk to the Concessionaire but this can result in much higher costs to the Owner.  
3. It encourages innovation and subsequent cost savings.  
4. It saves time by compressing the overlap of design and construction at the early stages of the project.  
5. Substantial project financing is provided by the Concessionaire. But this is a debt, which is no different than other kinds of debt financing by the Owner.  
6. A perceived advantage is the holistic life cycle cost of the structure is minimized as all parties involved have an economic interest to keep costs as low as possible. This is not necessarily so in practice, as most Concessions in Canada have been sold early in the life of the infrastructure. | 1. It reduces the Owner’s level of control. Because of the fast track nature of the process, changes usually become much more expensive as more rework is involved. Difficult discussions between the Owner and Concessionaire will also ensue to arrive at equitable changes to the Concession Agreement. The Owner needs to have a clear understanding of the final product and minimum standards.  
2. The process is more complex (requires a rigorous set of design and performance specifications), less understood and requires rigorous accountability.  
3. It reduces the number of contractors who are qualified to bid on the project.  
4. In practice, the Concessionaire is not a single corporation, but a team constituted for a specific project and comprised of a financier, one or more construction contractors, one or more engineering firms and another contractor for operations and maintenance. As such, the expected advantages of synergies may not be realized. | 1. Substantial risk is transferred from the Owner to the Concessionaire, but can be apportioned to where it is most appropriate and can be shared.  
2. It requires an internal Owner champion to be successful.  
3. The specific form of capital asset is ultimately chosen through a design competition. |
| **Alliance**           | 1. The Owner retains all of the control over the project.  
2. Changes can be implemented if necessary through an agreed cost recovery formula. If these increase the project cost, the team works together to identify off-setting savings.  
3. There are no construction claims as any issues which arise are settled using a collaborative process. | 1. The process is less understood by the design and construction industries. | 1. Risks are minimized and shared according to the alliance agreement. |

J. L. Richards & Associates Limited  
204 April 16, 2012
After the bridge is built, the identified roadway improvement works and their resulting effects on traffic flows should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated. Still, the potential for short cutting will be monitored by the City. There are a number of solutions that can be implemented to address this issue, should it arise. These include:

1. Monitoring signal timings to optimize traffic flow on the main public roads.
2. Building out curb radii to restrict vehicular turns.
3. Installing speed humps to slow down traffic.
4. Creating restrictions within the local road system such as one-way streets, restricted turns and dead end roads.
5. Installing traffic signage restricting vehicular turns either at all times or during certain times of the day.

6.2 The Cultural-Natural Heritage Protection Plan

As part of the Project Implementation Phase of the Class EA process for the bridge, the City will prepare and implement the Cultural-Natural Heritage Protection Plan (C-NHPP) in advance of each phase of the project. The C-NHPP will be written in industry-accepted specification format and contain best management practices, including the recommended monitoring measures contained in this Report.

6.3 The Community Action Plan

As part of the Project Implementation Phase of the Class EA process for the bridge, the City will prepare and implement the Community Action Plan (CAP). The CAP will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.

7.0 PUBLIC AND FIRST NATIONS CONSULTATION

The project team has been committed to employing a partnership model to facilitate effective, open, and meaningful consultation activities for this EA study, both internally and with international, national, provincial, and local stakeholders, including First Nations communities. Critical components of this model are outlined below.

7.1 Mission Statement, Vision, and Guiding Principles

The project team prepared a ‘Mission Statement, Vision and Guiding Principles’ for use and reference throughout this EA study. It is summarized below in Table 7.1.
### C. Guiding Principles

#### C1. Scenic, Cultural and Natural Heritage Integrity

1. We respect the role of the Rideau Canal and Cataraqui River as:
   a) a cultural heritage and natural symbol of Canada's identity;
   b) a valuable tourism and recreational resource; and
   c) a valuable testimony of First Nations and early European settlements and cultures.

2. We recognize the traditional role of the Rideau Canal and Cataraqui River as a fully functional navigable historic waterway in both promoting public education and nurturing the appreciation of its scenic, cultural heritage, and natural heritage value.

3. We value the ongoing efforts of private landowners, stakeholder groups, government agencies, and public and private sector partnerships in protecting and enhancing the scenic, cultural heritage, and natural heritage character of the Rideau Canal and Cataraqui River.

4. We recognize that the sustainable design and development of the shoreline and lands adjoining the Rideau Canal and the Cataraqui River is achieved through respect of its scenic, cultural heritage, and natural heritage landscape.

#### C2. Healthy Community

1. We recognize that efficient transportation linkages guide the future development of the City of Kingston and contribute to the quality of community life.

2. We appreciate that the development of effective alternative solutions needs to incorporate, promote and respect:
   a) private and public transportation use;
   b) sustainable transportation options such as cycling and walking;
   c) the principles of universal accessibility; and
   d) remaining cultural heritage artifacts from First Nations and early European settlements.

3. We recognize that the evaluation of effective alternative solutions needs to be based on:
   a) a full set of social, cultural, economic, and environmental factors;
   b) mitigation measures that are state-of-the-art and sustainable; and
   c) the preservation of cultural and heritage resources.

#### C3. Public and Agency Engagement

1. We acknowledge that international, national, provincial, and local interests and concerns shall be considered and addressed in an equitable manner.

2. We recognize that goals are realized when local knowledge and experience promotes understanding of project issues and solutions in an atmosphere of mutual respect and trust.

3. We are committed to a process in which support and consensus is established and nurtured through open and innovative public and agency consultation activities.

4. We welcome differences of opinion and competing interests as opportunities to ensure all project issues will be considered and addressed.

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### Table 7.1 Mission Statement, Vision and Guiding Principles

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Table 7.1  
**Mission Statement, Vision and Guiding Principles**

<table>
<thead>
<tr>
<th>C4. Effective Implementation</th>
<th>1. We recognize that evaluating and developing alternatives at the same time will allow stakeholder and project team partners to better understand the issues from the outset and develop proactive solutions.</th>
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<tr>
<td></td>
<td>2. We appreciate that through effective graphic design of alternatives, the concepts will be better understood by stakeholders and help to generate feedback.</td>
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<td>3. We recognize that our sense of accomplishment is achieved by providing clear and comprehensive documents that show how project decisions have been made.</td>
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<tr>
<th>C5. Project Teamwork</th>
<th>1. We are committed to providing professional services with a strong community-based presence that reflects professional pride, personal commitment, and mutual respect.</th>
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<tbody>
<tr>
<td></td>
<td>2. We acknowledge that project milestones are met by establishing realistic task objectives, strategic personnel assignments, proactive risk management, and effective schedule control.</td>
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</table>

**7.2 Environmental Scan**

Since consultation is a key element of the EA process, a comprehensive Consultation Plan was developed to facilitate agency, public stakeholder, and First Nations input throughout the project. As a precursor to the development of the Consultation Plan, approximately 25 interviews were undertaken with key stakeholders including, but not limited to: local residents; businesses; community groups; City staff and elected officials; and environmental groups and agencies. Commonly referred to as an ‘Environmental Scan’, this process identified potential community concerns and expectations about the project in general and the planned consultation activities in particular. In addition to identifying concerns, the environmental scan provided an opportunity to identify appropriate community representatives for the Public Liaison Committee, an important component of the Consultation Plan.

**7.3 Consultation Plan**

Based on the Environmental Scan, the Consultation Plan was finalized. It reflects the extensive interest and scrutiny to which this project will be subjected. Consultation to date has been facilitated through:

2. Maintaining a comprehensive agency, stakeholder group, and contact list.
3. Preparing regular project status updates such as newsletters and information handouts distributed by mail and/or E-mail.
4. Maintaining an up-to-date project website at www.cityofkingston.ca/thirdcrossing.
5. Vetting decision-making and project activities through a Technical Advisory Committee.
6. Engaging the community and facilitating consultation activities through a Public Liaison Committee.
8. Specific consultations:
   a) During Stage 1 of this EA study with:
      i. Parks Canada on November 23, 2009 and February 8, 2010 to discuss the potential impacts of an additional crossing of the Cataraqui River on the Rideau Canal south of the Kingston Mills Lock Station; and
      ii. CFB Kingston on November 23, 2009 to provide an overview of the project and discuss CFB Kingston’s long-term strategic plans; and
   b) During Stage 2 of this EA study with:
      i. Parks Canada on September 16, 2010 which involved a boat tour of the EA study area and discussions on First Nations history in the area as well as preliminary bridge design and viewscape considerations; and
      ii. the Kingston Rowing Club on August 16, 2010 as well as March 28, April 5 and April 9, 2012 to discuss rowing needs in the Cataraqui River.
9. Facilitating five Public Information Centres to date at the following key project milestones:
   a) During Stage 1 of this EA study:
      i. on April 23, 2009 to introduce the project;
      ii. on November 28, 2009 to discuss project issues in small working groups; and
      iii. on March 3, 2010 to present the preferred solution; and
   b) During Stage 2 of this EA study:
      i. on March 31, 2011 to present and receive feedback on the three preliminary bridge concepts; and
      ii. on March 1, 2012 to provide details on the projected traffic volumes, flows and origin-destination patterns on the recommended bridge design solution and how these traffic patterns will affect the downtown and adjacent neighbourhoods as well as an EA process recap to provide a basis for the Stage 2 analyses and recommendations.

7.4 Project Committees
As shown in Table 7.2, project tasks, including decision making and consultation activities, were facilitated through four committees:

1. A Senior Management Committee to oversee the overall project direction.
2. A TAC to provide technical guidance and act as a sounding board for technical decision making on EA study alternatives, including the Stage 1 corridor area evaluation matrix and the Stage 2 preliminary bridge concepts.
3. A First Nations Consultations Sub-Committee to facilitate consultation with the following First Nations communities having an interest within the EA study area:
   a) Ardoch Algonquin First Nation;
   b) Mississaugas of Alderville First Nation;
   c) Mohawk Nation Council of Chiefs;
   d) Tyendinaga Mohawk Territory;
   e) Shabot Obaadjwan First Nation;
   f) Huron-Wendat Nation;
   g) Algonquins of Ontario;
   h) Algonquins of Pikwåkanagàn; and
   i) Mohawk Council of Akwesasne.

4. A Public Liaison Committee to provide guidance and input for public consultation activities.

7.5 Public Consultation Sessions
As previously noted, the official Notice of Commencement to initiate the EA study was issued on March 3, 2009. There have since been five public consultation sessions. Three sessions were held during Stage 1 of this EA study and two sessions were held during Stage 2.

7.5.1 Stage 1 – Public Information Centre No. 1 (April 23, 2009)
The first Public Information Centre was held at the LaSalle Secondary School on April 23, 2009 to introduce the EA study. The Public Information Centre was organized to allow attendees to review display panels and an information handout and discuss project issues with City staff and project team members. EA study topics on the display panels included:

1. Welcome and Introduction.
2. Study Area.
3. Background Information.
4. Importance of the Rideau Canal.
6. Alternatives and Outline of Preliminary Assessment Criteria.
7. Project Team Members.
10. Where Do We Go From Here?

74 people attended this session and a total of 33 comment sheets were received. In addition, there were 152 responses to an on-line survey.
<table>
<thead>
<tr>
<th>Committee</th>
<th>Committee Structure</th>
<th>Committee Roles and Responsibilities</th>
<th>Meetings to Date</th>
</tr>
</thead>
</table>
| Senior Management Committee | • Senior City Staff  
• Senior Project Team Members | • Project Oversight and Administration  
• Manage Project Budget and Schedule  
• Issue/Risk Management and Mitigation | • Various  
• Various |
| Technical Advisory Committee | • Various City Departments  
• Senior Project Team Members  
• Canadian Environmental Assessment Agency  
• CFB Kingston  
• CRCA  
• Department of Fisheries and Oceans  
• Parks Canada  
• Ministry of Transportation Ontario | • Technical Guidance on EA Study Alternatives  
• Vetting Technical Decision-Making  
• Assistance in Identifying Approval Requirements | • March 9, 2009  
• September 16, 2009  
• November 4, 2009  
• January 27, 2010  
• February 10, 2010  
• February 23, 2010 | • October 18, 2010  
• January 20, 2011  
• May 26, 2011  
• July 28, 2011 |
| First Nations Consultations Sub-Committee | • Senior City Staff  
• Senior Project Team Members  
• Special Advisors | • Led by the City  
• Represents City and Project Team  
• Maintain a Link With First Nations | • Various  
• Various |
| Public Liaison Committee | • Senior City Staff  
• Senior Project Team Members  
• Community representatives from both sides of the Cataraqui River | • Provide Input on Public Consultation Activities  
• Review Consultation Reports  
• Attend Public Information Centres | • June 4, 2009  
• August 24, 2009  
• October 14, 2009  
• January 27, 2010  
• February 25, 2010 | • October 18, 2010  
• January 19, 2011  
• March 2, 2011  
• May 25, 2011  
• February 16, 2012 |
7.5.2 Stage 1 – Cataraqui Crossing Café (November 28, 2009)

The Cataraqui Crossing Café took place at LaSalle Secondary School on November 28, 2009. This half-day event was organized to reach out to the community using an innovative, yet simple methodology for hosting conversations about EA study issues. Using the World Café methodology, the Cataraqui Crossing Café encouraged small group discussions on EA study issues in an informal setting. Each group had a trained facilitator who used issue-specific questions to engage group dialogue on the following EA study topics:

1. Existing and Future Transportation Needs.
2. Cultural Heritage Issues.
5. Terrestrial and Marine Archaeological Issues.
6. An Open Forum for Other EA Study Issues.

Discussions lasted 20 minutes per topic. Participants were then asked to move to another table to discuss one of the other topic areas. The facilitators took notes and briefed each new group about the previous discussions. In so doing, these conversations linked and built on each other as people moved between groups, generating new ideas and insights about EA study issues.

Of the 102 pre-registered participants, 51 attended the Cataraqui Crossing Café. However, 22 non-registered participants arrived at the event and participated in the session, for a total of 73 participants.

7.5.3 Stage 1 – Public Information Centre No. 2 (March 3, 2010)

A second Public Information Centre was held on March 3, 2010 to present an overview of EA study activities and findings to date, a summary of the evaluation process for the consideration of the EA alternative solutions and the preferred EA solution, including the preliminary opinion of probable cost. The format consisted of a formal presentation followed by a Question and Answer period. A copy of the presentation material was available to all attendees as an Information Handout. Signed attendance at this event was 73.

7.5.4 Stage 2 – Public Information Centre No. 3 (March 31, 2011)

A third Public Information Centre was held on March 31, 2011, to review the three alternative bridge concepts and information about the EA study as well as learn more about the EA process. The format consisted of both an information session and formal presentation format. Display panels were located around the hall in two stations. The display panels provided information on the following topics:

1. The EA Study Purpose and Process.
3. The Preliminary Bridge Alignment and Configuration.
5. The In-Water Bridge Construction Options.
6. The Preliminary Road and Landscape Concepts.

As residents arrived, they were asked to sign in and were then given a comment sheet and information package that contained the display panels. Signed attendance at this event was 178.

7.5.5 Stage 2 – Public Information Centre No. 4 (March 1, 2012)

A fourth Public Information Centre was held on March 1, 2012, to review information on the projected traffic volumes, flows and origin-destination patterns on the recommended bridge design solution and how these traffic patterns will affect the downtown and adjacent neighbourhoods as well as an EA process recap to provide a basis for the Stage 2 analyses and recommendations. The format consisted of both an information session and formal presentation and question-and-answer format. Display panels were located around the hall. The display panels provided information on the following topics:

1. The EA Study Area, Purpose and Process.
2. The EA Problem Focusing on Existing and Projected Traffic Conditions.
3. The EA Study Area Conditions.
4. The EA Alternative Solutions and the Preferred Solution.
5. The Bridge Concepts from Various Vantage Points.
6. The In-Water Bridge Construction Options.
7. The Preferred Road and Landscape Concept.
8. The Preferred Bridge Concept and In-Water Bridge Construction Option.

As residents arrived, they were asked to sign in and were then given a comment sheet and information package that contained the display panels. Signed attendance at this event was 89.

7.6 First Nations Consultations

The Canadian constitutional framework takes into account that the First Nations of Canada were here first as sovereign peoples who were never conquered. Further, the 'Crown', which is made up of the Federal and Provincial levels of government, has an obligation, based on its own inherent honour, to consult on matters affecting Aboriginal interests raised by First Nations. In 2010, the Supreme Court of Canada in the Rio Tinto ruling confirmed that the purpose of consultation with First Nations was not only based on the honour of the Crown but also, because of that honour, related to the onerous demands of the trial process. Accordingly, it has been established that consultations must be undertaken with the awareness not only of the constitutional fiduciary duty of the Crown to protect Aboriginal interests but also that the process stand as a surrogate for a full court process. As such, the 'Duty to Consult' is a means to ensure First Nations' interests and rights are identified and respected. It also helps the Crown to make better more durable decisions and strengthen its relationships with the First Nations of Canada.

Procedural aspects of First Nations consultation processes are often delegated to the project proponent. The project proponent is typically best-suited to speak to technical and environmental aspects of the project and where appropriate, is best-placed to address concerns raised by First Nations communities. As the project proponent for this EA study, the City has been delegated the procedural aspects of First Nations consultation from the RA's.

First Nations history in the region of Kingston is complex, in that the establishment of a European presence occurs far earlier here as compared to most other cities in Ontario. As such, the City has sought to be recognized as a municipality which takes the Duty to Consult with First Nations communities as a serious obligation. This is due in no small part to the City’s interest in understanding the rich and complex historic and continuing experience of First Nations as part of its overall cultural awareness. Consistent with this commitment, the City undertook consultations with the following First Nations communities as part of this EA study:

1. Ardoch Algonquin First Nation.
4. Tyendinaga Mohawk Territory.
5. Shabot Obaadjiwan First Nation.
8. Algonquins of Pikwakanagan.

The following key meetings and communications have been held to date:

During Stage 1 of this EA study:

a) a meeting with Chief James Marsden, Mississaugas of Alderville First Nation, on September 10, 2009;
b) a general mailing sent on February 1, 2010 to the First Nations noted above providing an EA study update;
c) a meeting with Chief James Marsden and Councillor David Mowat, Mississaugas of Alderville First Nation, on February 10, 2010; and
d) a meeting with Co-Chief Mareille Lapointe, Ardoch Algonquin First Nation, on March 16, 2010.

During Stage 2 of this EA study:

a) a meeting with Chief James Marsden, Mississaugas of Alderville First Nation, on June 15, 2010;
b) a meeting with Mr. Paul Williams, Mohawk Nation Council of Chiefs, on September 9, 2010;
c) a general mailing sent on November 5, 2010 to the First Nations noted above providing a copy of the Stage 1 Summary Report to City Council and an EA study update;
d) a letter, dated December 2, 2010 from Ms. Elizabeth F. Nanticoke (Acting Director, Department of Environment, Mohawk Council of Akwesasne) to Mr. Alan McLeod (Senior Legal Counsel, City), requesting that the Mohawks of Bay of Quinte – Tyendinaga be considered the point of contact for the EA study (as part of co-ordinated approach to consultations);

e) a meeting with Co-Chief Mareille Lapointe, Ardoch Algonquin First Nation, on December 9, 2010;

f) a meeting with Chief James Marsden, Mississaugas of Alderville First Nation, on January 31, 2011 during which a number of opportunities for extending consultations were identified regarding:

i. archeological monitoring;

ii. the review of archeological studies; and

iii. the review and comments on design, native plantings and the ecological effects of the project;

g) a meeting with Mr. Paul Williams, Mohawk Nation Council of Chiefs, on February 23, 2011;

h) a general mailing sent on March 21, 2011 to the First Nations noted above providing a copy of the January 20, 2011 TAC meeting agenda, Public Information Centre No. 3 public notice, archaeological assessment report on the east side lands and an EA study update;

i) a mailing sent on April 15, 2011 to the Office of the Algonquins of Ontario providing a copy of the Stage 1 Summary Report to City Council, January 20, 2011 TAC meeting agenda, Public Information Centre No. 3 public notice, archaeological assessment report on the east side lands and an EA study update;

j) a general mailing sent on August 17, 2011 to the First Nations noted above providing information on the July 28, 2011 TAC meeting and the First Nations consultation process to date as well as an EA study update;

k) a meeting with Mr. Paul Williams, Mohawk Nation Council of Chiefs, on September 6, 2011 to discuss a preliminary report on the EA study submitted on behalf of the Mohawk Nation Council of Chiefs to the City (the project team prepared responses to the recommendations in the preliminary report and submitted them to the Mohawk Nation Council of Chiefs on September 29, 2011);

l) a general mailing sent on December 15, 2011 and February 16, 2012 to the First Nations noted above providing a copy of the preliminary report on the EA study submitted on behalf of the Mohawk Nation Council of Chiefs to the City, information on the First Nations consultation process to date as well as an EA study update;

m) a letter, dated February 23, 2012 from Mr. Alan McLeod (Senior Legal Counsel, City) to Ms. Melanie Paradis (Director of Lands, Resources and Consultation, Métis Nation of Ontario) confirming the verbal notification from the Métis Nation of Ontario to the City that the EA study area is not within its consultation area; and

n) a meeting with Chief James Marsden and Councilor David Mowat, Mississaugas of Alderville First Nation, and Parks Canada on March 22, 2012.

7.7 Main Concerns

As outlined above in the EA study’s ‘Mission Statement, Vision and Guiding Principles’, the project team welcomed differences of opinion and competing interests as opportunities to ensure all project issues were considered and addressed. This acknowledgement was in recognition of the rich history, complexity and magnitude of this project, including its associated potential positive and negative social, cultural, economic and environmental impacts. The main concerns that were raised during this EA study can be summarized into the following main themes:

1. **Is a new bridge needed if Highway 401 is expanded?** With an existing traffic volume during the PM peak hour of 1,260 vehicles per hour per lane for eastbound travel and 1,252 vehicles per hour per lane for westbound travel, the Highway 401 crossing has ample capacity to accommodate additional traffic (based on its current two-way capacity of about 6,000 vehicles per hour given its current four-lane configuration). Its current widening from four to six lanes west of Sydenham Road to west of Montreal Street means that the Highway 401 crossing will also be able to handle even more traffic in the future.

However, two issues need to be considered. The first is that the primary function of Highway 401 is to accommodate regional (or long distance) traffic. Traffic operations related to local traffic needs are fundamentally different than regional traffic needs. These differences can result in compromised efficiency and safety for both local and regional traffic. This is inconsistent with effective transportation engineering practice. The second issue relates to the strong demand for trips crossing the Cataraqui River via the LaSalle Causeway in both the southern and northern portions of the City’s urban limits. The Highway 401 crossing is 6 km north of the LaSalle Causeway. Diverting traffic to the Highway 401 crossing would lead to further out of way travel and additional travel delays. As noted earlier, traffic infiltration through the adjacent road network could then also be expected to occur as drivers seek less congested routes to reach their destinations.
However, the need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is duly noted. The 2011 HDR/iTrans report undertaken subsequent to Stage 1 of this EA study also reaffirmed that existing conditions on the LaSalle-Causeway-Highway 2 corridor would continue to negatively affect its LOS. The report outlines a preferred strategy to address existing and future deficiencies along the corridor. These improvements were then modelled relative to current and projected eastbound travel times on the LaSalle Causeway-Highway 2 corridor during the PM peak hour. The modelling concluded that the City’s target of LOS D on the corridor could be maintained until at least 2020 with the implementation of the improvements. But it is also acknowledged that the improvements may not be able to solely reduce congestion and accommodate future traffic volume demand on the LaSalle Causeway-Highway 2 corridor over the long-term.

Thus, making improvements to the LaSalle Causeway-Highway 2 corridor may address the EA Problem Statement for this EA study over the short-to-medium-term but may not be able to do so over the long-term. The future monitoring of traffic conditions by the City would confirm the viability of this scenario.

4. **If a new bridge is needed, where should it be located?** The EA study area was subdivided into six corridor areas and crossing options were developed based on potential connections to existing infrastructure. The six corridor areas were then short-listed for further assessment. A bridge at the John Counter Boulevard-Canoe Road alignment option is the recommended preferred solution as it represents an opportunity, subject to best management practices and mitigation measures, to:

   a) Serve as a 21st Century ‘gateway’ to/from the Inner Harbour and canal;
   
   b) Provide a direct mid east-west connection to existing road infrastructure on either shore and thereby provide an effective and efficient link in addressing the travel demand patterns to/from the downtown and/or to/from John Counter Boulevard and beyond to other parts of the City;
   
   c) Tie into the northern terminus of the future Wellington Street Extension, which could further serve to direct traffic south to the downtown area;
   
   d) Enhance emergency response services, in that the City’s 2010 ‘Master Fire Plan’ recommends that a new fire substation be built at Elliott Avenue and Division Street in 2013-2014 in strategic response to the transportation network improvements that could result from installing both a bridge at this location along with the future Wellington Street Extension;
   
   e) As per the 2007 ‘Master Plan for Water Supply for the City of Kingston Urban Area’, facilitate the installation of an east-west watermain across the Cataraqui River that:
i. is required to improve water supply to a proposed new water storage tower in the St. Lawrence Business Park (located northeast of Area 4) in order to improve the redundancy in the municipal water system on the east side of the Cataraqui River; and

ii. has been requested by Utilities Kingston as the preferred location for this infrastructure;

f) Further enhance the City’s express bus route strategy as well as active travel and commuter cycling networks by providing a direct mid east-west urban transportation corridor; and

g) Based on discussions with CFB Kingston personnel:

i. tie into the CFB Kingston’s intentions to explore implementation of a new access directly from Gore Road to provide an alternative route for its workforce;

ii. improve access from CFB Kingston to the VIA Rail Station which is used regularly by military personnel travelling to other centres;

iii. serve as an alternate route to the Kingston Airport which could add benefits to CFB Kingston’s operations in the long term; and

iv. not be subject to potential lockdown situations as it is not directly adjacent to CFB Kingston.

5. **If a new bridge is needed, how many vehicular lanes are required to accommodate future traffic conditions?** In 2011, AECOM reviewed the KTMP Travel Demand Forecast Model specifically to test nine capital works upgrading scenarios and forecast the resulting travel demand on the bridge at the project site location. The forecasted 2031 PM peak hour traffic demand applied to the nine scenarios indicate the need for a four-lane bridge would be triggered by 2029 to 2034. Scenario ‘I’ (4-Lane Bridge, John Counter Boulevard Widening and new CFB Kingston Access to Gore Road) is the only scenario that would achieve LOS D across the network. Scenario ‘I’ would also be able to reduce traffic infiltration through the adjacent road network by a combined total of 6 percent which is the highest reduction in comparison to the other scenarios.

6. **If a new bridge is needed, can it be designed, built and/or used so that it is appropriate to and compatible with adjacent land uses?** A bridge at the project site location would have a noticeable presence on the landscape. As such, design measures will be a critical piece of the broader package of mitigation measures required during the project implementation phase to either reduce or eliminate potential negative project impacts. These include:

a) The preferred ‘Arch With V-Piers’ bridge design which, by providing two structural supports for the bridge girders but only one in-river foundation for each pier, could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore;

b) The constant gradual s-curve of the bridge alignment that lands north of the Point St. Mark residential neighbourhood, which offers opportunities for:

i. reduced potential noise and visual impacts on the Point St. Mark community; and

ii. ‘softer landscaping’ along the Gore Road right-of-way on the east shore;

c) The implementation of sound attenuation barriers to reduce the predicted sound levels from the project at noise-sensitive areas;

d) The bridge deck components, which contribute to providing a more direct mid east-west connection to existing infrastructure on either shore and would be able to tie into the northern terminus of the future Wellington Street Extension;

e) The observation look-out/interpretive nodes and public realm areas, which serve to maximize opportunities to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh;

f) The use of context sensitive directional and intermittent lighting and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts on the surrounding environment;

g) The identified roadway improvement works and their resulting effects on traffic flows, which should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated; and

h) The preparation and implementation of the Community Action Plan which will establish protocols for use by the City for notifying the general public of any service interruptions and addressing public issues and concerns arising from bridge construction activities and the subsequent use and maintenance of the bridge.

7. **If a new bridge is needed, can it be designed, built and/or used so that it can be expanded to accommodate future traffic conditions?** The 2030 to 2034 trigger for a four-lane bridge would impact the viability of moving forward with a two-lane bridge with a substructure to accommodate its
widening to four lanes in the future. The reason for this is that there would be a diminishing return on the initial capital investment, as the need for bridge twinning (with the two-lane bridge scenario) or widening (with the two-lane bridge-four-lane-substructure scenario) could be triggered shortly after the two-lane bridge would be built. However, neither scenario should be ruled out completely at this time. The future monitoring of traffic conditions by the City, particularly if the aforementioned improvements to the LaSalle Causeway-Highway 2 corridor are implemented, could confirm the viability of either scenario or even delay the timeline for engaging the Project Implementation Phase of the Class EA process for the bridge itself.

In addition, based on AECOM’s review of the City’s Travel Demand Forecast Model, another alternative staged approach to the development of an ultimate four-lane bridge could be viable. This option would involve constructing an initial three-lane bridge and a substructure that could accommodate widening to four lanes in the future. Under this scenario, the centre lane would operate as a reversible lane serving the peak direction of travel. The centre lane and dedicated westbound lane would accommodate westbound travel during the PM peak hour. Assuming the peak direction would be reversed during the AM peak hour, the centre lane and dedicated eastbound lane would then accommodate eastbound travel during the AM peak hour. The initial three-lane bridge is expected to operate at the acceptable LOS D in both directions under PM peak hour conditions at the 2019 and 2029 horizon years. However, while the two lanes available for westbound travel are projected to have reserve capacity, the one dedicated eastbound lane during the PM peak hour is expected to approach capacity in 2019 and would be at capacity by 2029. At this point, the bridge deck would need to be widened from three lanes to four lanes. The widening would be applied in equal proportions to the north and south sides of the bridge deck and could be done directly from the bridge deck itself, as the required substructure would already be in place. This approach would also be viable for the two-lane-bridge-four-lane-substructure scenario mentioned above.

8. **If a new bridge is needed, can it be designed, built and/or used so that it can, at a minimum, conserve the heritage values of the Rideau Canal?** A part of the ‘Vision’ outlined in the Bridge Design Objectives focuses on the use of innovative bridge planning and design to reinforce the City’s proud historic association with the Rideau Canal. As noted above, a bridge at the project site location would have a noticeable presence on the landscape. The lower Cataraqui section of the Rideau Canal south from Highway 401 to the northern entrance of Kingston’s Inner Harbour near Belle Island is a rare example of the waterway where the natural environment was not altered during canal construction. Over the intervening 178 years, the extensive wetlands of the Great Cataraqui Marsh, as well as the river valley’s sloped physiography and forested landscapes adjacent to the navigation channel proceeding south from Highway 401 have remained largely intact. As such, design and mitigation measures will be critical during the project implementation phase to either reduce or eliminate potential negative project impacts on the natural and cultural heritage elements of the terrestrial and marine environments. These include:

   a) The preferred ‘Arch With V-Piers’ bridge design which:
   
   i. by providing two structural supports for the bridge girders but only one in-river foundation for each pier, could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore; and
   
   ii. is able to span over the Rideau Canal’s navigable channel and adjacent rowing lanes, while the arch over the canal’s navigable channel highlights the bridge as a 21st Century ‘gateway’ to/from the Inner Harbour and canal;

   b) The constant gradual s-curve of the bridge alignment that lands north of the Point St. Mark residential neighbourhood, which offers opportunities for:
   
   i. a more organic reflection of the bridge within the context of its ‘transitional’ location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west; and
   
   ii. a more expanded viewscape experience for bridge users, in that open views would be provided of the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west;

   c) The bridge clearance above the water, which exceeds the Rideau Canal’s Federally regulated navigable requirement and could also mitigate visual impacts, in that its silhouette would be below the tree line along the north shore of Belle Island and Belle Park when viewed from the water;

   d) The observation look-out/interpretive nodes and public realm areas, which serve to maximize opportunities to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh;

   e) The use of context sensitive:
   
   i. barriers and railings on the bridge and public realm areas and their potential to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities of the Rideau Canal, Belle Island, Belle Park and the marsh; and
ii. directional and intermittent lighting and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts on the surrounding environment;

f) The use of dredging (and not backfilling the excavated channel after the bridge is built), which could:

i. represent a mitigation measure in response to potential project effects, in that the excavated channel would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more; and

ii. provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain if it was installed underneath the permanent bridge deck;

g) The preparation and implementation of a Natural Environment Enhancement Plan that includes detailed design measures related to wetland or aquatic restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows and re-vegetating and re-forested the east and west side lands; and

h) The use of best management practices and mitigation measures during the project implementation phase, as cited earlier.

9. If a new bridge is needed, can it be designed, built and/or used so that it is appropriate to and compatible with watercraft navigation? The proposed bridge clearance above the water is 14 m over the Rideau Canal’s navigable channel and adjacent rowing lanes. This exceeds the 6.7 m Federally regulated navigable requirement for the canal. In addition, the proposed 100 m arch span over the canal’s navigable channel (for a total 131 m distance pier-to-pier) was originally considered to be sufficient to span the existing rowing course which runs in parallel to the channel from the Point St. Mark residential neighbourhood north for 2,000 m. However, the initial 131 m distance pier-to-pier has subsequently been increased to a proposed 150 m distance pier-to-pier. This increase reflects recent consultations with the Kingston Rowing Club, during which the project team was advised that the rowing course is seven lanes wide. Four rowing lanes are on the west side of the channel and three lanes are on the east side, though only the rowing lanes abutting either side of the channel are marked. Club staff indicated that an 11 m wide rowing lane width is presumed for each lane across the full course, which accommodates the rowing shells, prevents collisions and complies with Olympic requirements. As such, concerns were expressed that the initial 131 m distance pier-to-pier would encumber the rowing course and not provide adequate horizontal and vertical clearance between the rowers and abutting piers, given:

a) The channel is at roughly a 30 degree angle to the bridge;

b) The minimum 6.7 m Federally regulated navigable requirement for the canal;

c) The CRCA design ‘high’ water level requirement of 76.3 m; and

d) The 1H:1.2V rising slope of the v-piers above the water does not accommodate full vertical clearance from the waterline to the underside of the bridge deck.

Based on these recent consultations, the project team has determined that it would be feasible to increase the pier-to-pier distance to 150 m in order to provide unencumbered through-navigation for the existing rowing course. Proposed design features include:

a) A 9.4 m horizontal clearance from the abutting pier on the west side of the course;

b) An 8 m horizontal clearance from the abutting pier on the east side of the course; and

c) A 13.5 m wide rowing lane on either side of the navigable channel to provide an additional 2.5 m clearance from the channel itself.

The 150 m distance pier-to-pier would also provide flexibility to optimize the pier locations further during the project implementation phase in response to more specific rowing course and navigable channel configurations and characteristics north and south of the bridge corridor. It should be noted that the preliminary opinion of probable cost for the four-lane bridge scenario cited in this Report would have to be reviewed further during the project implementation phase if the proposed 150 m distance pier-to-pier design is pursued to fully accommodate the rowing course.

10. If a new bridge is needed, can it be designed, built and/or used so that it demonstrates respect for the customs and traditions integral to the distinctive cultures of First Nations communities? As noted above, the City has sought to be recognized as a municipality which takes the Duty to Consult with First Nations communities as a serious obligation. This is due in no small part to the City’s interest in understanding the rich and complex historic and continuing experience of First Nations as part of its overall cultural awareness. Consistent with this commitment, the City endeavoured to undertake consultations either through meetings or regular mailings with local First Nations communities as part of this EA study. Feedback from local First Nations communities has been limited due to the following:
a) First Nations and Aboriginal community leadership have stated that they lack resources to respond to all requests for consultation made of them, especially in light of their own resource demands for the administration of their own communities; and

b) Each First Nation has its own history and traditions which are understood and practiced to different degrees. This difference is related to the size and resources available to each community, their distance in time and geography from their connection to the Lower Cataraqui River Valley, as well as their own understanding of their heritage in the region, which has been dislocated because of the intervention of Canadian settlement and governance.

However, a preliminary report was submitted on behalf of the Mohawk Nation Council of Chiefs to the City that outlined recommendations on the project. Subsequent direct consultations with a representative of the Mohawk Nation Council of Chiefs occurred on September 6, 2011. The project team then prepared responses to the recommendations in the preliminary report and submitted them to the Mohawk Nation Council of Chiefs on September 29, 2011. The recommendations and project team responses are summarized below:

a) The bridge should be designed to have a life cycle of at least 120 years. The CHBDC requires a design life for new bridges of at least 75 years. New bridges having similar shore-to-shore characteristics of the Third Crossing typically have a design life of at least 100 years, which exceeds the minimum CHBDC requirement. It is also anticipated that the design of the Third Crossing (in terms of its structural elements and materials, intended function and maintenance requirements in relation to the geographical setting) will yield a design life exceeding 100 or even 120 years.

b) Bridge design should be guided by principles of context sensitive design: the bridge should be considered a guest, a visitor to the river and the land, and not an owner or overlord. The guiding bridge design objectives, which speak to ‘cultural and natural heritage integrity’ and ‘healthy community’, reflect the principles of context sensitive design.

c) Natural materials should be used as much as possible in bridge and supporting areas design and construction. The use of natural materials will confirmed during the future detailed design stage prior to the construction phase of the project. In terms of durability, economy and strength, current materials such as concrete and steel are the most suitable for this bridge. However, alternative new materials as they are developed in the future as well as natural materials such as stone will be incorporated as much as possible.

d) Local materials should be used as much as possible. One useful criterion is to avoid any materials from more than 800 km away. The use of local materials will be confirmed during the future detailed design stage prior to the construction phase of the project. Note local aggregates will be used for concrete and road construction, subject to availability.

e) The bridge should be designed to have an eventual capacity of four lanes of traffic, but it should initially consist of two traffic lanes and the other lanes, on a separate track, would be used by cyclists and pedestrians. 2019 is the earliest possible time frame by which the bridge could conceivably be built. As discussed earlier, forecasted 2019 PM peak hour traffic demand and various planned road network improvement scenarios indicate the need for a four-lane bridge would be triggered by 2030-2034.

The 2030-2034 trigger for a four-lane bridge impacts the viability of moving forward with a 2-lane bridge and a substructure that could accommodate widening to 4 lanes in the future. The reason for this is that there would be a diminishing return on the initial capital investment, as the need for bridge widening could be triggered shortly after the 2-lane bridge would be built. Despite this, the EA Report recommends a re-assessment of conditions impacting the need for the four-lane bridge during the detailed design stage prior to the construction phase of the project.

f) The bridge should respond to actual and planned needs, and not to pressure from those who would develop the lands east of the river, in ways inconsistent with Kingston’s urban planning. The City’s Official Plan provides for planned current and future growth and development areas on the east side of the Cataraqui River, where adequate urban services exist or can be more efficiently extended in an orderly and phased manner. This is recognized in the Official Plan as being equally integral to, and consistent with, the City’s vision for sustainability as downtown revitalization, intensification and maintaining a sense of human scale. The need for the Third Crossing is similarly recognized in both the Official Plan (subject to this EA) and the 2004 KTMP (including its update in 2009) as a means to accommodate planned current and future growth on both the east and west sides of the Cataraqui River through improved road network connectivity. The design of the bridge is consistent with these Plans.

As noted above, this need is also reinforced through AECOM’s recent traffic demand forecasting work. With an existing traffic volume in the order of 1,000 to 1,100 vehicles per hour in each direction during the PM peak hour, the LaSalle Causeway is currently operating below the City’s LOS D policy. Without the Third Crossing in place, traffic volumes across the LaSalle Causeway are expected to increase further by 2019.

In addition, the City is currently considering a series of improvements to the LaSalle Causeway-Highway 2 corridor to help mitigate existing and expected traffic delays along this corridor. These improvements generally involve transportation demand management...
measures; traffic signal optimizations; adaptive traffic controls; storage lane extensions; constructing the new CFB Kingston access road connection to Gore Road; public transit service enhancements; and replacing the traffic signal at the Highway 2-Kingston Road 15 intersection with a roundabout.

g) **While the bridge should be designed to carry four lanes of traffic, conversion from two to four lanes, when proposed by the City, must be fully justified, and not only in terms of pressure for eastward development.** Note the project team responses above.

h) **We suggest supplementing our knowledge about the impact of a permanent trench and water main on the river environment.** As noted, dredging offers opportunities to:

i. enhance aquatic biodiversity, in that the dredged channel would introduce a new component to a marine environment that is currently dominated by submerged vegetation;

ii. reduce capital costs in the range of 8-12 percent in comparison to other potential in-water bridge construction options; and

iii. accommodate the east-west watermain within the dredged channel, which:

   (a) has been requested by Utilities Kingston as the preferred location for this infrastructure;

   (b) would provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain; and

   (c) offers a more sustainable design solution, in that the need for expansion joints, heat tracing (which requires on-going energy use) and insulation jacket equipment as well as related maintenance and servicing (if the watermain was to be attached underneath the bridge deck) would not be required.

i) **Accelerated bridge construction techniques will reduce environmental impact, cost and waste, and speed up construction.** Note that: (a) repetitive geometric design provides similar opportunities through the benefit of structural pre-fabrication; and (b) off-site bridge structural assembly will be dictated by limited land availability proximate to the bridge corridor, thus facilitating accelerated bridge construction.

j) **Bridge deconstruction must be planned and confirmed at the same time as construction is approved.** This includes plans to dismantle and recycle the bridge and its materials, and to restore the land and the river afterwards. The cost of deconstruction must be included in the life cycle assessment of the bridge. As the bridge will have a design life of at least 100 years, if and when decommissioning and rehabilitation are required, such works will be subject to an EA as per regulations current at that time. [The EA Report acknowledges that the bridge may need to be decommissioned for a number of reasons, including functional obsolescence or irreparable damage due to highly improbable human-made disasters or natural causes such as earthquakes or wind producing forces in excess of design forces. If or when the bridge becomes functionally obsolete, a change of use on the bridge may also be considered, such as commercial or residential structures that are supported by the bridge. This was done, for example, on the London Bridge in the 17th Century. If the structure is to be removed, the basic procedure would closely follow activities associated with the construction phase.]

k) **Bridge design should include monitoring systems for the state of health of the bridge, to supplement visual monitoring.** The use of such evolving design technologies and the methods, extent and implementation staging of the monitoring system will be determined during the future detailed design stage prior to the construction phase of the project.

l) **Consideration should be given to the bridge incorporating its own renewable energy sources.** The use of such evolving design technologies and the type and extent of use of these sources will be determined during the future detailed design stage prior to the construction phase of the project, based on the bridge geometry, materials, environmental effects and cost effectiveness.

m) **A Life Cycle Assessment must be part of the analysis of each alternative bridge design.** The EA framework used to both evaluate the alternative bridge designs and select a preferred design will speak to the Life Cycle Assessment criteria, namely: (a) the extent to which the alternative designs address the solution to the problem; (b) the advantages and disadvantage of the alternative designs; (c) the effects of the alternative designs on the physical, natural, social, cultural, economic and technical environments; (d) recommended mitigation measures; and (e) decommissioning and rehabilitation measures, should such works be required in the future.

n) **Bridge design and construction should take waste management into account.** Winter waste from the bridge should not be allowed to run into the river. Rapid response from dedicated crews will reduce this waste: the rest should be gathered and recycled. Rainwater, as well, must be collected and recycled, and runoff into the river must be prevented. Stormwater and snow collection and management measures will be brought forward into the future detailed design stage prior to the construction phase of the
project. Such measures will focus on on-shore treatment (for sediment removal) and release in accordance with regulatory requirements.

o) **Ultra High Performance Pavement would result in lighter, more durable road beds, and would permit more flexibility in design.** It could incorporate solar heating elements within the pavement to melt winter ice. The use of such evolving design technologies will be part of the material selection and pavement design process to be determined during the future detailed design stage prior to the construction phase of the project.

p) **High performance materials in all aspects of the bridge’s design and construction would lead to cost savings, environmental benefits and would allow more attractive bridge designs.** The use of such materials will be part of the material selection process to be determined during the future detailed design stage prior to the construction phase of the project.

q) **The bridge, as well as the traffic on it, will reverberate along the river and its valley, including in the riverbed. Sound control and damping will reduce noise and vibration.** Attenuation measures to help mitigate the effects of noise from the bridge on adjacent land uses are a critical component of the package of mitigation measures, which will be confirmed during the future detailed design stage prior to the construction phase of the project.

r) **To enable the bridge to be built with lightweight construction materials, heavy commercial vehicles should be routed into Kingston over the Highway 401 crossing, and not over the bridge.** The bridge is recognized as an essential piece of a mid-central arterial road corridor through the City that is needed to accommodate planned current and future employment and residential growth on both the east and west sides of the Cataraqui River. Restricting heavy commercial vehicles and, by extension, other 'heavy' vehicles (such as emergency vehicles and works vehicles) from using the bridge and instead routing them into the City over the Highway 401 crossing would: (a) compromise the intended function of the bridge within this broader strategic urban context; and (b) lead to further out of way travel, resulting in additional travel delays, fuel consumption and greenhouse gas emissions.

s) **To extend the bridge’s life, as well as for environmental benefits, any public transportation route using the bridge should employ lightweight vehicles.** Given that the design life of the bridge is required to be at least 75 years, any future infrastructure investments that the City makes to enhance the sustainability of public transit service will have the added benefit of extending the life cycle of the bridge even further.

t) **To reduce the bridge’s electrical consumption, the bridge should incorporate LED and other low-burden lighting.** The bridge lighting should have as little impact on the night sky and possible. The use of such evolving design technologies will be considered during the future detailed design stage prior to the construction phase of the project, based on safety, environmental effects and life cycle costs.

u) **Pedestrian and cycling lanes, especially in their approaches to the bridge, should be designed to provide variety and be as natural as possible – avoiding the rigidity of straightness and flatness.** The landscape concepts speak to the principles of organic flow and natural design. Also, the constant gradual s-curve of the bridge alignment along with the bridge clearance over the water (3 m along most of its westerly portion, then gradually rising to 14 m over the Rideau Canal and then descending to 12 m at the east shore) further avoids rigid, straight and flat design.

v) **A cable stay design with a single pylon would be economical, would reduce the bridge's footprint in the river, and would respect the values of the Haudenosaunee by incorporating the symbols of the turtle and the Tree of Peace.** The arch is the best option as it keeps the bridge profile low and allows for the spanning of both the Rideau Canal’s navigable channel and rowing lanes with no piers separating these two important elements. However, a cable-stay and tower section close to the east shore will look disproportionately skewed to the east end of the river, and that its presence could negatively impact the flight patterns of birds and waterfowl both to and from the emergent cattail marsh north of the bridge corridor. The tower section could also create negative wind load effects on the bridge, for which the extent of related structural mitigation measures would need to be assessed.

The values of the Haudenosaunee, particularly the symbols of the turtle and the Tree of Peace, are acknowledged. The symbolism of the tree emerging from the turtle’s back sends a message about creation, the natural world and peace. The City and project team are also sensitive about not wanting to either be ‘too literal’ in this regard or suggest that this Report represents the arbiter of ‘context sensitive design’. The need for this EA study to strive to achieve a balance between competing stakeholder interests is also paramount. But in the spirit of wishing to convey respect for Haudenosaunee values, this Report notes the following:

i. the arch, combined with its supporting v-piers that rise out of the water, could be viewed as the turtle’s back that 'rose to the water’s surface so Sky Woman could sit and rest before she created the soil of this continent';

ii. the v-piers, by rising out of the water, could be viewed as:
(a) ‘the mud that Sky Woman persuaded the animals to bring up from the bottom for her to spread around and create the soil of this continent’; and
(b) the branches of a tree; and
(c) turtle basking area(s) could also be designed at the base of select v-piers to look like a turtle’s back rising out of the water.

It is recognized by the City that its own commitment to consult with local First Nations communities, as demonstrated in the trust that has grown out of previous consultations on other initiatives, will continue as part of the implementation phase for this project.

11. How can the capital costs from a new bridge be recovered by the City of Kingston? There are four project delivery models, namely Design-Bid-Build, Design-Build, Public-Private Partnership and Alliance. Confirming the preferred delivery model is outside this EA framework and is best addressed during the early stages of the Project Implementation phase to reflect the City’s cost recovery model and business strategy to secure funding and manage control of the project design, construction and risk. It should be noted that a significant portion of the City’s direct costs (the net cost after funding) would be recovered through Development Charges collected from new developments. It is recommended that the City develop a Business Plan in order to fund and finance the project during the early stages of the Project Implementation phase and to identify the preferred project delivery model.

8.0 CONCLUSION

This Report has assessed alternative solutions to determine the need for and the feasibility of implementing additional transportation capacity across the Cataraqui River. Based on this assessment, the recommended preferred solution is the ‘Arch With V-Piers’ bridge crossing at the John Counter Boulevard-Gore Road alignment. This Report has also assessed the impact of this project and has concluded that it will be Low to Minimal for the following reasons:

1. The ‘Arch With V-Piers’ concept provides two structural supports for the bridge girders but only one in-river foundation for each pier. This could potentially reduce associated in-water disturbances and, combined with their transparent look, bridge profile and the slender look of the girder, minimize visual impacts by providing a more open viewscape from the water and on-shore. To further benefit viewscape considerations and reduce associated in-water disturbances, it could be feasible to reduce the number of piers from 13 double v-piers to 11 double v-piers and still maintain appropriate span-length-to-girder-depth proportions.

2. It is able to span over the Rideau Canal’s navigable channel and adjacent rowing lanes, while the arch over the canal’s navigable channel highlights the bridge as a 21st Century ‘gateway’ to/from the Inner Harbour and canal.

3. The bridge alignment, as a constant gradual s-curve that lands north of the Point St. Mark residential neighbourhood, offers opportunities for:
   a) Reduced potential noise and visual impacts on the Point St. Mark community;
   b) ‘Softer landscaping’ along the Gore Road right-of-way on the east shore;
   c) A more organic reflection of the bridge within the context of its ‘transitional’ location between the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west; and
   d) A more expanded viewscape experience for bridge users, in that open views would be provided of the natural character of the waterway to the north and the more urbanized environment of the City to the south, east and west.

4. The bridge clearance above the water accommodates existing topographic conditions on both shorelines and exceeds the Rideau Canal’s Federally regulated navigable requirement. It also mitigates visual impacts, in that its silhouette would be below the tree line when viewed:
   a) On the water from the north by the north shore of Belle Island and Belle Park;
   b) On the water from the south by the visible cattail portion of the Greater Cataraqui Marsh that begins to emerge in the background; and
   c) To the east from both water and land on the west side by the existing topography of the east side lands.

   It should also be noted that the restorative landscape improvements on the west side lands provide an opportunity for the bridge to be below the ‘future’ tree line in this area when viewed from both the water and land on the east side.

5. The bridge deck components contribute to providing a more direct mid east-west connection to existing road infrastructure on either shore and would be able to tie into the northern terminus of the future Wellington Street Extension. This could further serve to direct traffic south to the downtown area and accommodate CFB Kingston’s future growth plans.
6. The observation look-out/interpretive areas along the south side of the bridge deck maximize opportunities for bridge users to enjoy views of and/or learn about the Rideau Canal, Belle Island, Belle Park and the marsh.

7. The use of context sensitive:
   a) Barriers and railings on the bridge and their potential to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and
   b) Directional and intermittent lighting on the bridge and its potential to address public and traffic safety requirements, accentuate public realm and bridge features and mitigate light impacts from the bridge on the surrounding environment.

8. The need to maximize the use of existing infrastructure, technology and sustainable transportation initiatives before consideration is given to developing new infrastructure is recognized in an initial bridge configuration design could consist of a three lane, centre lane reversible, cross section that can be widened in response to future traffic monitoring and related conditions.

9. Based on the capacity analysis done for this EA study, the identified roadway improvement works should maintain the flow of traffic along this critical mid-east-west arterial corridor at an acceptable LOS D over the long-term. In addition, it offers opportunities to further enhance emergency services in the City and the City's express bus transit strategy. This analysis has also demonstrated that these improvements and their resulting effects on traffic flows should be such that short cutting through the Village On The River Apartments on the west side and the Point St. Mark residential neighbourhood on the east side is not anticipated.

10. The active travel and commuter cycling provisions on the bridge serve to connect with and thereby enhance existing non-automotive networks on both sides of the Cataraqui River.

11. The landscape improvements represent an opportunity for a degree of ecological restoration on the west side lands and ecological compensation on the east side lands by creating/re-creating naturalized landscapes.

12. In the public realm areas, the use of context sensitive:
   a) Barriers and railings serve to address public and traffic safety requirements and incorporate height and spacing provisions that maximize viewing opportunities from the bridge; and
   b) Directional and intermittent lighting serve to address public and traffic safety requirements, accentuate public realms and mitigate light impacts on the surrounding environment.

13. The two drainage routes that collect groundwater from the Point St. Mark residential neighbourhood and direct it to the Cataraqui River further accentuate the public realm as a 'naturalized' feature.

14. The use of dredging (and not backfilling the excavated channel after the bridge is built) as the preferred temporary in-water bridge construction access option provides the opportunity to:
   a) Introduce a mitigation measure in response to potential project effects, in that the excavated channel would introduce a more pelagic habitat (particularly for larger species) to a marine environment that is currently dominated by one type of submerged vegetation (Milfoil), and which could last for eight years or more;
   b) Reduce capital costs in the range of 8 percent to 12 percent in comparison to the temporary work bridge option; and
   c) Accommodate Utilities Kingston’s east-west watermain within the dredged channel, which:
      i. has been requested by Utilities Kingston as the preferred location for this infrastructure;
      ii. would provide more flexibility in achieving a context sensitive design by eliminating the need for masking or screening the watermain underneath the permanent bridge deck; and
      iii. offers a more sustainable design solution, in that the need for expansion joints, heat tracing and insulation jacket equipment as well as related maintenance and servicing would not be required.

15. The implementation of sound attenuation barriers further reduces the predicted sound levels from the project at noise-sensitive areas.

16. In light of the relatively shallow waters (ranging from 1.5 m over the majority of the section to approximately 4.5 m at the Rideau Canal’s navigable channel) and low water flow velocities (ranging from negligible up to 0.4 m/s), the hydraulic modeling results show that the double v-piers would generate only minor impacts on water levels [the most significant increase is up to 4 millimetres (mm) in the vicinity of the piers] and flow-generated velocities [less than 3 centimetres/second (cm/s), also in the vicinity of the piers]. As such, it is similarly expected that the dredged channel, and the associated removal of aquatic vegetation that is required to accommodate it, would not have any significant influence on water levels or flow-generated velocities.
17. The best management practices and mitigation measures are means to reduce or eliminate potential adverse environmental effects from the project. In particular, the preparation and implementation of the Natural Environment Enhancement Plan during the project implementation phase will include further detailed measures related to wetland restoration, creating aquatic habitat enhancements (such as islands or platforms for fish spawning, nesting and/or basking), stabilizing and rehabilitating the shoreline shallows as well as re-vegetating/re-foresting the east and west side lands.

This Report can be used to satisfy both the Provincial and Federal EA frameworks. Upon City Council’s review and approval of this Report under the Class EA planning process, a formal ‘Notice of Completion’ will be issued by the City. The public and review agencies will have thirty days to request a ‘Part II Order’ from the Ontario Minister of Environment. This is an appeal provision whereby a person or party with outstanding concerns may request the Ontario Minister of Environment to make an order requiring the City to comply with Part II of the OEA Act before proceeding any further with the Schedule C Class EA phase of the project. If no request for a Part II Order is received, the Schedule C Class EA phase of the project will be complete. The City will then seek Federal approval of the EA pursuant to the CEA Act. Following Federal EA approval, the City will be in a position to then initiate project implementation (detail design, final approvals and construction) within the next ten years without having to revisit the findings and recommendations identified through the Schedule C Class EA. This will enable the City to facilitate long-term planning and budget programming including the on-going collection of Development Charges and the pursuit of financial assistance from upper levels of government.

9.0 LIST OF REFERENCE AND SUPPORTING DOCUMENTS


