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4 IMPACT ASSESSMENT, MITIGATION AND MONITORING

Creating a BRT network of dedicated lanes for transit will change the existing corridors and has the potential to have impacts beyond the municipal road allowance where widening to accommodate transit facilities is required. These changes were considered during the review of alternative design options in pre-planning for TPAP and during TPAP to develop the preliminary engineering design. The following sections provide:

- An assessment and evaluation for potential impacts of the preferred design in Section 3.1. This does not include details on the alternative design options considered during pre-planning;
- A description of proposed measures for mitigating potential negative impacts the transit project might have on the environment; and,
- A description of the proposal for monitoring or verifying the effectiveness of the mitigation measures.

The potential impacts assessed include shorter-term due to construction activities and longer-term due to on-going operation and maintenance of the facilities. The evaluation factors are categorized into four themes, building on the objectives of the RTMP: transportation and utilities, cultural environment, natural environment, and socio-economic factors (Exhibit 4-1). The criteria considered reflect local conditions, best practices, and matters of provincial importance.

This section is structured to parallel Section 3, discussing the impacts of the project in the same contexts: the built, natural, socio-economic, and cultural environments. The supporting technical studies are provided in Appendices E to L.

Exhibit 4-1: Evaluation Factors and Assessment Criteria

<table>
<thead>
<tr>
<th>Evaluation Factor</th>
<th>Assessment Criteria</th>
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<tbody>
<tr>
<td><strong>Transportation And Utilities</strong></td>
<td></td>
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</tbody>
</table>
| Transit Network | - Changes to existing LTC local bus service along the Rapid Transit corridors  
- Integrating local service with the Rapid Transit service |
| Traffic Operations | - Changes in traffic circulation  
- Changes in permitted and prohibited turning movements  
- Changes to on-street parking  
- Changes to loading areas |
| Cycling and Pedestrian Network | - Changes to existing and planned cycling and pedestrian networks  
- Disruption to existing facilities during construction |
| **Surface and Subsurface Utilities** | - Relocation of existing utilities  
- Potential for service disruptions during construction |
| **Stormwater Management** | - Changes to hard surface areas along the corridors  
- Changes to stormwater runoff quantity and quality |
| **Maintenance and Emergency Services** | - Changes to existing winter maintenance operations / priorities  
- Changes to existing waste management operations  
- Changes to emergency services travel patterns |
| **Natural Environment** | |
| Groundwater and Contaminated Sites | - Potential for contaminated soils or groundwater during construction  
- Potential need for dewatering and related impacts to the groundwater regime |
| Surface Water, Fish and Fish Habitat | - Changes to existing watercourse crossings with fish habitat, riparian habitat, and aquatic ecosystems  
- Potential impacts to designated aquatic species at risk  
- Potential impacts to the water quality, thermal regime and flow of watercourse crossings |
| Vegetation and Vegetation Communities | - Potential impacts to existing vegetation communities  
- Potential impacts to designated vegetation species at risk  
- Changes to existing tree canopy and street trees |
| Wildlife and Wildlife Habitat | - Potential impacts to existing wildlife and wildlife habitat  
- Potential impacts to designated wildlife species at risk |
| Significant Natural Features and Sensitive Areas | - Potential impacts to designated Environmentally Sensitive Areas, Areas of Natural and Scientific Interest, Provincially Significant Wetlands, Significant Woodlands and Significant Valleylands |
| **Air Quality** | - Potential impacts to nearby sensitive land uses during construction, and as a result of changing traffic patterns during operation  
- Potential impacts related to net reductions in regional emission of critical contaminants including greenhouse gases |
| **Noise and Vibration** | - Potential for increase in sensitive receptors such as backyards, nursing homes, and other institutions  
- Potential noise and vibration impacts to sensitive receptors during construction  
- Potential noise and vibration impacts during operations |
| **Socio-Economic Environment** | |
| Land-use and Demographics | - Changes in demographics and population age structure  
- Ability to achieve The London Plan objectives for land use including increasing walkable, transit-oriented development |
| Local Economy | - Impacts related to construction and operation of the project  
- Potential changes in land value |
The Rapid Transit Master Plan includes a phased implementation strategy to refine and construct timing plans are confirmed.

The passenger boardings and alightings at each stop were developed through the travel demand model and adjusted since the Rapid Transit Master Plan to reflect the 38 total BRT stops, as summarized in Exhibit 4-2 and Exhibit 4-3.

4.1 Transportation and Utilities

4.1.1 Transit Network

4.1.1.1 Potential Impacts

The BRT Network has two routes: North-and-East, and South-and-West, with a total of 38 stops. The BRT network is proposed to operate seven days a week from 6 a.m. to 12 a.m. (midnight). The North-and-East route is planned to have five-minute bus frequency to serve forecasted transit ridership demand. The West-to-South route is planned to have 10-minute bus frequency during morning and afternoon weekday peak periods. Riders will be able to transfer between the two routes at the Central Transit Hub, located at the corner of Wellington Street and King Street in downtown London, as well as at the intersection of Queens Avenue and Clarence Street.

For most of the 24 km BRT network, dedicated centre-running transit lanes will be implemented with platforms at signalized intersections, and four general traffic lanes (two per direction). However, in less than 5 km of the system where the right-of-way is constrained and widening is not feasible, such as downtown, one existing traffic or parking lane, per direction, will be converted to a dedicated transit lane. This approach generally maintains existing vehicle capacity of the road network, while increasing the people-carrying capacity of the corridor on higher-occupancy transit vehicles.

With lanes dedicated for transit and reliable, the BRT network will offer improved travel times across the majority of the network. The BRT platforms will be designed to meet AODA standards to increase mobility for people of all ages and abilities.

BRT stop spacing is generally greater than local transit, which improves travel times once on the Rapid Transit vehicle. However, increased stop spacing can increase walking distances for passengers to access the BRT network. To mitigate this issue, local bus services are planned to operate along sections of the BRT corridors. For most of the network, local service will operate in the curbside general traffic lane in mixed traffic. These local bus routes will maintain more frequent stop spacing. Local routes which meet or cross the BRT corridors will also be realigned as needed to ensure that they connect directly to BRT stops where feasible.

Fares to use the BRT network are planned to match the LTC fare structure, providing an integrated easy-to-use rider experience.

During construction, local routes may be temporarily diverted as needed to avoid delayed or disconnected routes. These plans will be developed in the next design phase, as the implementation strategy is refined and construction timing plans are confirmed.

The passenger boardings and alightings at each stop were developed through the travel demand model and adjusted since the Rapid Transit Master Plan to reflect the 38 total BRT stops, as summarized in Exhibit 4-2 and Exhibit 4-3.

Exhibit 4-2: North-and-East: Projected 2034 P.M. Peak Hour Passenger Boardings and Alightings by Stop: from North to Downtown to East

<table>
<thead>
<tr>
<th>BRT Stop</th>
<th>Boarding (On)</th>
<th>Alighting (Off)</th>
<th>Passenger Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masonville Place (Terminus)</td>
<td>200</td>
<td>Not applicable</td>
<td>200</td>
</tr>
<tr>
<td>Western Rd at Richmond St</td>
<td>50</td>
<td>10</td>
<td>240</td>
</tr>
<tr>
<td>Western Rd at Hospital Driveway</td>
<td>80</td>
<td>10</td>
<td>310</td>
</tr>
<tr>
<td>Western Rd at Elgin Rd</td>
<td>570</td>
<td>10</td>
<td>870</td>
</tr>
<tr>
<td>Western Rd at Lambton Dr</td>
<td>350</td>
<td>20</td>
<td>1200</td>
</tr>
<tr>
<td>Lambton Dr / Perth St at University Dr</td>
<td>220</td>
<td>10</td>
<td>1410</td>
</tr>
<tr>
<td>Richmond St at University Dr</td>
<td>70</td>
<td>30</td>
<td>1450</td>
</tr>
<tr>
<td>Richmond St at Victoria St</td>
<td>30</td>
<td>60</td>
<td>1420</td>
</tr>
<tr>
<td>Richmond St at Grosvenor St</td>
<td>60</td>
<td>50</td>
<td>1430</td>
</tr>
<tr>
<td>Richmond St at Oxford St</td>
<td>60</td>
<td>150</td>
<td>1340</td>
</tr>
<tr>
<td>Clarence St at Central Ave</td>
<td>50</td>
<td>110</td>
<td>1280</td>
</tr>
<tr>
<td>Clarence St at Queens Ave</td>
<td>60</td>
<td>320</td>
<td>1020</td>
</tr>
<tr>
<td>King St at Wellington St</td>
<td>150</td>
<td>530</td>
<td>640</td>
</tr>
<tr>
<td>King St at Colborne St</td>
<td>30</td>
<td>120</td>
<td>550</td>
</tr>
<tr>
<td>King St at Adelaide St</td>
<td>40</td>
<td>170</td>
<td>420</td>
</tr>
<tr>
<td>Ontario St at King St</td>
<td>10</td>
<td>20</td>
<td>410</td>
</tr>
<tr>
<td>Dundas St at McCormick Blvd</td>
<td>30</td>
<td>40</td>
<td>400</td>
</tr>
<tr>
<td>Dundas St at Highbury Ave</td>
<td>30</td>
<td>220</td>
<td>210</td>
</tr>
<tr>
<td>Highbury Ave at LPH access</td>
<td>10</td>
<td>60</td>
<td>160</td>
</tr>
<tr>
<td>Highbury Ave at Oxford St</td>
<td>30</td>
<td>80</td>
<td>110</td>
</tr>
<tr>
<td>Fanshawe College (Terminus)</td>
<td>Not applicable</td>
<td></td>
<td>110</td>
</tr>
</tbody>
</table>

4-2
Bus Rapid Transit will be integrated with existing regional transit connections. Inter-regional transit services in London are offered by VIA Rail and Greyhound Canada. VIA Rail offers passenger rail service from the London Station on York Street at Clarence Street. Greyhound Canada offers bus service from the London Bus Depot on York Street at Talbot Street and from the Western University Campus. High-speed passenger rail service between Toronto and London is currently planned to be in operation as early as 2025.

Transit connections to the airport will be maintained through the existing transit route from Oxford Street West near Second Street (Fanshawe College). With future study, dedicated transit lanes could be extended to the east from the East Turnaround to accommodate future BRT service, as it was identified as a corridor for future expansion in the RTMP.

### 4.1.1.3 Net Effects

Together, BRT and LTC local buses will provide a 35% increase in transit service hours between 2015 and 2035.

The London Transit Commission (LTC) served 22.6 million revenue passengers in 2016, with a total of 24.1 million boardings which includes transfers. As documented in the Rapid Transit Master Plan, with the implementation of this BRT project, overall system ridership is projected to reach about 31 million in 2034. The split between Rapid Transit and other transit will depend on the timing of implementation and the local route plan.

#### 4.1.1.4 Monitoring

The express and local routes will be reviewed and adjusted leading up to the start of implementation. As the BRT network is constructed in phases, express and local routes will be adjusted accordingly. The BRT service and integration with express and local routes will be monitored as part of the LTC annual service review process.

### 4.1.2 Traffic Operations

Along the BRT corridors, priority is given to reliable transit service, safe and convenient pedestrian access, and access to trip generators and adjacent neighbourhoods. The balance between providing attractive BRT travel times and providing good access to adjacent land use is a key consideration to support growth along the BRT corridors.

A detailed traffic analysis of all signalized intersections in the BRT network is provided in Appendix E, focused on defining; changes to transportation infrastructure, such as new traffic signals; changes to traffic operations including U-turn operations, special signals and traffic impacts; and a queue analysis to inform lane configurations and turn lane lengths in the preliminary engineering design of the project. These elements are reflected in the design provided in Appendix A.
4.1.2.1 Potential Impacts

Short-Term Impacts

Short-term impacts to traffic operations on and across the BRT corridors may be caused during construction activities along BRT corridors, due to lane closures/reductions and work adjacent to traffic. Mitigation strategies are provided in the next section.

Long-Term Impacts

Intersections which are experiencing congestion today are likely to continue to experience congestion with BRT. This is primarily due to background traffic growth, the conversion of main street left-turn movements to fully-protected operations and increases in U-turn demand.

Following the implementation of Rapid Transit, turning movement restrictions will be required at some intersections for general traffic:

- Where dedicated centre-running transit lanes are provided, a centre island will generally be constructed between the BRT lanes. This will restrict left-turns to and from the BRT corridor at unsignalized intersections and driveways. These left-turn movements will occur at the next available signalized intersection, where U-turn movements from the dedicated left-turn / U-turn lane during a fully-protected signal phase will allow drivers to turn around the median and travel in their intended direction. Examples of resulting traffic circulation on centre-running BRT corridors are illustrated in Exhibit 4-4. During the next design phase, the interaction of right-turning vehicles with U-turning vehicles should be examined to confirm intersections where right-turn-on-red should be prohibited due to physical conflict points. Alternatives to inform drivers of right-turn-on-red restrictions can be implemented through static or blank-out signs, illustrated in Exhibit 4-5.

Exhibit 4-4: Changes to Unsignalized Intersections and Driveways

Exhibit 4-5: Signage options for right-turn-on-red restrictions
Where the dedicated transit lanes are curbside, there are options for right-turn movements by general traffic, as indicated on the design plates in Appendix A:

- At some intersections, general traffic will be permitted to use the dedicated transit lane to make right turns. To provide clarity to drivers, the transit lane will transition to “right-turn-lane, buses-excepted”, conveyed through the pavement surface, markings and signage.

- At other intersections, in the Downtown and along King Street east of Wellington Street, general traffic will be prohibited from making right-turns from either the general traffic lane or the dedicated transit lane. This is particularly important at BRT platform locations, where the interaction of buses, pedestrians, and right-turning traffic presents a complex series of conflict points. The future traffic analysis accounted for these restrictions by re-routing traffic to the next available intersection where auxiliary right-turn lanes are provided.

- In locations where an auxiliary right-turn lane can be provided behind the dedicated curbside transit lane, general traffic will be permitted to cross the dedicated transit lane, indicated by pavement markings and/or signage, to access the right-turn lane.

To minimize delays to through-traffic, left-turn restrictions are proposed during peak periods, or potentially all-day, at select signalized intersections where auxiliary left-turn/U-turn lanes cannot be accommodated – either due major constraints, or where deemed to provide little operational benefit relative to their associated costs.

Downtown London and Richmond Row currently have a number of prohibited movements, many of which apply only during a.m. and/or p.m. rush hours. Additional turn restrictions will be introduced at some signalized intersections to accommodate Rapid Transit. Exhibit 4-6 provides a comparison of existing and planned turning movement restrictions that are required with the implementation of the BRT project.

A number of new signalized intersections will be introduced following BRT implementation, particularly along corridors where centre-running transit will be provided:

- All median BRT stops will be located adjacent to a signalized intersection to facilitate safe (protected) pedestrian crossing access to/from the stop. Where a median stop is proposed at an intersection that is currently unsignalized, that intersection will be signalized as part of implementing the BRT system.

- Where routing to/from unsignalized intersections or major driveway access is impeded, and alternative routing options are limited or non-existent, signalized intersections may be introduced to provide U-turn opportunities for inbound/outbound traffic.

Exhibit 4-6: Downtown Turning Movement Restrictions (During Peak Periods)

**4.1.2.2 Mitigation**

**Short-term Mitigation**

To minimize the potential for traffic delays during construction, the City will coordinate BRT construction with other capital projects. Construction will also be carried out in phases to better manage the temporary impacts to traffic.

Construction impacts can be mitigated with the development of City-wide Travel Demand Management (TDM) plans. TDM strategies can reduce delays, identify alternative travel options, and help build support for and interest in the new travel choices that will be available after construction. Network Construction Mitigation Plans are common in the US. Recent examples in Ontario include the Confederation Line LRT (Ottawa), Eglinton...
Crosstown LRT Project (Toronto), Waterloo ION LRT (Waterloo Region), and the Queen Street Hill closure (Hamilton).

Developing localized TDM plans will be an important component in addressing the changing demands placed on RT routes and intersecting roads during construction, in particular at major intersections and RT stops. TDM plans should address the needs of all modes (pedestrian, cycle, transit and vehicular) as well as managing access to side streets and adjacent properties.

TDM plans identify the impacts at various stages of construction and define the duration of changes to lane configurations, turn restrictions, transit route changes, sidewalk impacts, or other temporary measures. Strategies can be developed that help manage these changes and capacity restrictions and keep traffic moving, and accesses open, and road users informed. Communication is the most important tool, before, during and after construction, to manage travel demand and help them understand how to carry out their travel effectively.

As the City’s ITS program is implemented on other corridors, this will also assist in the management of traffic diversions during construction of the BRT project.

Long-term Mitigation

The preferred design includes mitigation measures such as maintaining the same number of through lanes at intersections, auxiliary turn lanes at key intersections, and the provision of sufficient storage length for dedicated turn lanes to minimize the spill back of congestion to through lanes.

Traffic signal timing plans along the BRT corridor will be developed prior to construction to provide appropriate pedestrian crossing times. Signal heads for transit, pedestrians, and cyclists will be identified where appropriate during detail design.

Traffic signal phasing changes will be introduced at signalized intersections along the BRT corridors to improve efficiency and reliability of transit service, or to accommodate newly permitted traffic movements, including:

- Transit-only signal phases will be introduced at many signalized intersections to facilitate movement of BRT through the intersection. This type of phasing is used to eliminate potential conflicts between general traffic and BRT vehicles given crossing intersection movements (e.g. between centre-running transit and left-turning traffic), and thus enhance safety and reliability of operation. Transit-only signal phases are also implemented in mixed use corridors where queue jump lanes are provided, to allow BRT vehicles to move into the receiving lanes ahead of general traffic.

- Transit signal priority (TSP) will be used throughout the BRT network to maintain transit travel times and reliability of service frequency. This can be achieved through either
  - Passive TSP – where signal timing offsets between adjacent signalized intersections are determined based on anticipated BRT operating speeds (with consideration of stops and passenger loading/unloading at stops) rather than to traffic operating speeds, in order to provide a “green wave” for BRT; or,
  - Active TSP – where signals are adjusted in real-time, either through early truncation of a red-light phase or early activation of a green-light phase, to ensure green phases are provided to approaching BRT vehicles more quickly.

- U-turn movements will be permitted at many signalized intersections where centre-running transit is present. U-turns will be made from shared auxiliary left-turn/U-turn lanes. Where U-turns are permitted, the traffic signal phasing will be altered so that the shared left-turn/U-turn movement operates under fully-protected phasing in order to eliminate conflicts otherwise present with through-travelling BRT and opposing traffic. Existing left turn lanes at signalized intersections are generally maintained and lengthened to accommodate changes in traffic flow, including the additional U-turn movements due to access restrictions resulting from the introduction of the BRT.

In addition, several intersections will be signalized either to provide pedestrian access to centre platforms, or to mitigate the left-turn restrictions by providing a protected location for U-turns. The list of signalized intersections to be introduced to support the BRT system is provided in Exhibit 4-7.

Exhibit 4-7: Intersections to be Signalized to support the BRT System

<table>
<thead>
<tr>
<th>Intersections to be Signalized</th>
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<tbody>
<tr>
<td><strong>North Corridor</strong></td>
</tr>
<tr>
<td>Western Road &amp; Ambleside Drive</td>
</tr>
<tr>
<td>Richmond Street &amp; St James Street</td>
</tr>
<tr>
<td>Clarence Street &amp; Angel Street (pedestrian signal)</td>
</tr>
<tr>
<td><strong>East Corridor</strong></td>
</tr>
<tr>
<td>King Street &amp; Burwell Street (pedestrian signal)</td>
</tr>
<tr>
<td>King Street &amp; Ontario Street</td>
</tr>
<tr>
<td>Dundas Street &amp; Dorinda Street</td>
</tr>
<tr>
<td>Dundas Street &amp; McCormick Boulevard</td>
</tr>
<tr>
<td>Dundas Street &amp; Ashland Street</td>
</tr>
<tr>
<td>Highbury Avenue &amp; Canada Post / LPH Secondary Plan</td>
</tr>
<tr>
<td>Oxford Street &amp; Secondary School / LPH Secondary Plan</td>
</tr>
<tr>
<td>Oxford Street &amp; London Lane (east-most access)</td>
</tr>
<tr>
<td><strong>West Corridor</strong></td>
</tr>
<tr>
<td>Oxford Street &amp; 530 Oxford Street West (commercial access)</td>
</tr>
<tr>
<td>Oxford Street &amp; Beaverbrook Avenue</td>
</tr>
<tr>
<td>Riverside Drive &amp; Wilson Avenue</td>
</tr>
<tr>
<td><strong>South Corridor</strong></td>
</tr>
<tr>
<td>Wellington Street &amp; South Street</td>
</tr>
<tr>
<td>Wellington Street &amp; Bond Street</td>
</tr>
<tr>
<td><strong>Wellington Street &amp; Whetter Avenue (replaces existing pedestrian signal at Emery Street)</strong></td>
</tr>
</tbody>
</table>
4.1.2.3 Net Effects
Under a future “business-as-usual” scenario (i.e. without BRT), the volume of auto trips in 2035 will grow by more than 20% compared to 2009 volumes. Road improvements required in this scenario are more expensive over their lifecycle as compared to the proposed BRT system, some are infeasible once the roadway is expanded to its limits, and most are inconsistent with the goals of developing a multimodal transportation network.

Recognizing this, the overarching goal of the BRT project to provide more attractive travel choices for Londoners, thus reducing their collective dependency on the automobile. Rapid Transit is efficient at carrying large volumes of passengers compared to private vehicles, reducing the need for future roadway construction. Over the long term, this shift in behaviour can reduce the need for costly and disruptive road improvement projects, maintain good roadway level of service, and provide overall environmental benefits.

Intersections currently experiencing congestion are likely to continue to experience congestion into the future. This is primarily due to background traffic growth, as well as the conversion of main street left-turn movements to fully-protected operations; lane reductions and reallocations; and anticipated increases in U-turn demand. However, the future BRT condition includes changes to intersections to mitigate these issues while providing transit service that is fast and reliable, pedestrian access that is safe and convenient, and maintaining mobility and access to trip generators and neighbourhoods.

4.1.2.4 Monitoring
Traffic operations are monitored by the City, and this will continue in advance of, during, and after implementation of BRT. ITS solutions can be applied to manage traffic congestion during and after implementation, through the City’s planned traffic control centre.

4.1.3 Cycling and Pedestrian Network

4.1.3.1 Potential Impacts
The BRT system is designed with key consideration given to bicycle and pedestrian modes, in accordance with “complete streets” principles.

Sidewalks will be continuous on both sides of the streets along BRT corridors. To be compliant with the Accessibility for Ontarians with Disabilities Act (2005), a clear path, called a clearway, which is at least 1.5 m wide will be provided in constrained areas. In most areas, a clearway of at least 2.0 m will be provided. Other accessible sidewalk design elements include slopes less than 1:20, a slip-resistant surface, and curb ramps at intersections with tactile warning strips and high tonal colour contrast.

For cycling facilities, there are generally five possible outcomes along the BRT corridors:

- A cycling facility is not proposed in the cycling master plan but has been added to the network as part of the design of the BRT. In these instances, a cycling facility will be added to the overall network that was not previously planned, but provides continuity to a major destination or to ties into a connecting facility, or delineates a space for cyclists that otherwise would not be provided.
- A cycling facility is existing and can be accommodated through the design of the BRT. In some instances, the existing cycling facility will be upgraded along the BRT corridor, for example by bringing on-road bike lanes into the boulevard to provide separated cycling facilities.
- A cycling facility is existing and must be removed in order to accommodate the BRT. Just as there is a loss of vehicular lanes in some locations to accommodate the BRT, there are locations where the cycling facility has been eliminated through the proposed BRT design. In these cases, mitigation of the impacts of the network removal are needed through the development of network alternatives.
- A cycling facility is proposed in the cycling master plan but cannot be accommodated through the BRT corridors. In these cases, mitigation of the impacts of the removal are needed through the development of network alternatives.

Exhibit 4-8 summarizes the cycling facilities that are proposed along BRT corridors and identifies their relationship with the cycling master plan and current network.

The design also protects for future cycling connections on the majority of intersecting signalized streets. Further consideration is needed to evaluate the appropriateness of these connections in terms of the corresponding intersection upgrades required to provide access to/from the intersecting cycling facility as well as the proposed facility type relative to roadway motor vehicle volumes and speeds. Exhibit 4-9 details the cycling facilities and connections that are protected for in the design.

In addition to the dedicated and separated cycling facilities, some cyclists may find it convenient and comfortable to use curbside BRT lanes where no alternate cycling facilities are provided. Although not necessarily encouraged through signage or pavement markings, such behavior should not be discouraged or penalized. Although the level of comfort along these corridors may vary depending on the transit frequency and stop configuration, the shared operation of these curb lanes will, at a minimum, provide some network continuity, particularly through the downtown where some cycling facilities were removed to accommodate the BRT.

Exhibit 4-8: Cycling Facilities Proposed along BRT Corridors

<table>
<thead>
<tr>
<th>BRT Corridor</th>
<th>Road</th>
<th>Limits</th>
<th>Proposed Facility Type</th>
<th>Network Status / Type of Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>University Drive</td>
<td>Lambton Drive to Richmond Street</td>
<td>Bike lanes</td>
<td>Maintain existing facilities and connection to Thames Valley Parkway</td>
</tr>
</tbody>
</table>
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### Network Status / Type of Improvement

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Road</th>
<th>Limits</th>
<th>Proposed Facility Type</th>
<th>Facility Type</th>
</tr>
</thead>
</table>

**North**
- **Western Road**: Lambton Drive to Richmond Street
  - Proposed: Raised bike lanes
  - Network Status: Upgrade of existing facility (on-road bike lane to raised bike lane)

**South**
- **South**
  - **Richmond Street**: Richmond Street to Fanshawe Park Road
    - Proposed: Raised bike lanes
    - Network Status: Upgrade of existing facility (signed bike route with sharrow to raised bike lane)
  - **Dufferin Street**: Dufferin Street to Central Avenue
    - Proposed: MUP (east side)
    - Network Status: New cycling network link (not previously proposed in Cycling Master Plan). The design includes a new MUP along Victoria Park.

**East**
- **North**
  - **King Street**: Wellington Street to Rectory Street
    - Proposed: Raised bike lane (eastbound)
    - Network Status: Upgrade of existing facility (on-road bike lane to raised bike lane)
  - **Ontario Street**: King Street to Dundas Street
    - Proposed: Raised bike lane (northbound)
    - Network Status: New cycling network link (not previously proposed in Cycling Master Plan to improve network connectivity)
  - **Dundas Street**: Ontario Street to Egerton Street
    - Proposed: Raised bike lane (eastbound)
    - Network Status: Upgrade of existing facility (signed bike route to raised bike lane)
  - **Dundas Street**: Oxford Street to Front Street/Second Street
    - Proposed: MUP (south side)
    - Network Status: Upgrade of existing facility (in-boulevard facility/bike lanes to MUP)
- **South**
  - **Wellington Road**: Front Street to South Street
    - Proposed: MUP (east side)
    - Network Status: New barrier crossing over the Thames River and connections to Thames Valley Parkway
  - **Wellington Road**: Commissioners Road to Base Line Road
    - Proposed: MUP (east side)
    - Network Status: New cycling network link (not previously proposed in Cycling Master Plan to improve access to Victoria Hospital & commercial developments in the area)

### 4.1.3.2 Mitigation

**As described in Section 4.1.2.2,** to minimize the potential for breaks in the cycling network during construction, the City will coordinate BRT construction with other capital projects. Construction will also be carried out in phases to better manage the temporary impacts to the cycling network.

**During construction,** maintaining pedestrian access will be very important. Pedestrian connections will be maintained and protective fencing will be installed where needed to provide a barrier to traffic and/or road construction. Maintaining pedestrian access to destinations, especially those with a high rate of pedestrian access, such as commercial properties Downtown, will be an important part of the business impact mitigation strategies.

Post implementation, the BRT corridors will provide a pedestrian-friendly environment with improved sidewalks and intersection crosswalks to enable safe connections to and along the BRT corridors and to BRT stops.

Construction impacts can be mitigated with the development of City-wide Travel Demand Management (TDM) plans. TDM strategies can reduce delays, identify alternative travel options, and help build support for and interest in the new travel choices that will be available after construction. Cycling can be a significant part of these plans.

### 4.1.3.3 Net Effects

The City plans to update the cycling master plan to reflect the cycling infrastructure along the BRT corridors, including the new connections at signalized intersections. As part of this process, additional links in the cycling network are likely to be identified. It is recommended that connections to the Thames Valley Parkway be reviewed in more detail, for example at Wellington Street, Wharncliffe Road, Riverside Drive, and University Drive.

### 4.1.3.4 Monitoring

Walking and cycling provides an important first mile / last mile connection to transit. The City will continue to consult with cycling advocacy groups to monitor the success of the cycling connections to the BRT network once implemented. The City may consider further enhancing first mile / last mile connections with active transportation in support of the BRT.
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...project as development occurs. A monitoring program that is based on a combination of the users’ stated experiences (stated preference surveys) and visual monitoring (desire line analysis) will enable an iterative approach to improving design that is reflective of both user perception and behavioral realities.

Exhibit 4-9: Cycling Route Connections Protected for with BRT Design

<table>
<thead>
<tr>
<th>Location Of Facility</th>
<th>Facility Type</th>
<th>Cycling Master Plan Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Corridor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fanshawe Park Road (at Richmond Street)</td>
<td>Bike lanes (south side)</td>
<td>Existing bike lanes</td>
</tr>
<tr>
<td>Hillview Boulevard (at Richmond Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Sunnyside Drive (at Richmond Street)</td>
<td>Bike lanes</td>
<td>Existing signed route</td>
</tr>
<tr>
<td>Cambria Drive (at Richmond Street)</td>
<td>Bike lanes (east bound)</td>
<td>Existing bike lanes (5-15 years)</td>
</tr>
<tr>
<td>Huron Street (at Richmond Street)</td>
<td>Bike lanes</td>
<td>Existing signed route</td>
</tr>
<tr>
<td>Victoria Street (at Richmond Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Cheapside Street (at Richmond Street)</td>
<td>Bike lanes</td>
<td>Existing/future bike lanes (0-5 years)</td>
</tr>
<tr>
<td>Grosvenor Street (at Richmond Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>St James Street (at Richmond Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Pall Mall Street (at Richmond Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Central Avenue (crossing Richmond Street)</td>
<td>Signed route</td>
<td>Existing signed route</td>
</tr>
<tr>
<td>Dufferin Avenue (at Clarence Street)</td>
<td>Bike lanes</td>
<td>Existing signed route w/ sharrows</td>
</tr>
<tr>
<td>West Corridor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waterloo Street (at King Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Colborne Street (at King Street)</td>
<td>Bike lanes</td>
<td>Existing bike lanes</td>
</tr>
<tr>
<td>Maitland Street (at King Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>William Street (at King Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Adelaide Street (at King Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Lyle Street (at King Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Rectory Street (at King Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Ontario Street (at Dundas Street)</td>
<td>Bike lanes (north leg)</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Quebec Street (at Dundas Street)</td>
<td>Bike lanes</td>
<td>Existing bike lanes</td>
</tr>
<tr>
<td>Egerton Street (at Dundas Street)</td>
<td>Bike lanes</td>
<td>Existing bike lanes</td>
</tr>
<tr>
<td>Dorinda Street (at Dundas Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>McCormick Boulevard (at Dundas Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
<tr>
<td>Ashland Avenue (at Dundas Street)</td>
<td>Bike lanes</td>
<td>Future connection to BRT (TBD)</td>
</tr>
</tbody>
</table>

4.1.4 Surface and Subsurface Utilities

There are existing utilities within and across the BRT corridors that will require relocation. The utilities are classified as municipal services (such as water mains, storm sewers, and sanitary sewers) and private utilities (telecommunications, gas services, hydro, etc.).

All municipal and private utility owners have been consulted regarding the locations of their existing infrastructure. Where potential relocations were identified, relocation strategies and requirements were further discussed with the owners.

4.1.4.1 Potential Impacts

Through coordination with all of the potentially impacted utility providers, utilities found within the proposed platforms will be relocated as needed with the goal to minimize potential disruption to transit during maintenance and repair activities. Underground municipal utilities running through the platform area can remain but at grade features such as valve chambers or maintenance holes will be relocated outside the platform area. In general, all private utilities running along the roadway will be required to be relocated outside the proposed BRT dedicated lanes and platform areas, except in areas that are constrained such as the downtown. Private utilities that run perpendicular to the roadway...
for servicing can be accommodated. Potential impacts to utilities are summarized in Exhibit 4-10.

### Exhibit 4-10: Potential Impact to Utilities within the Study Area

<table>
<thead>
<tr>
<th>Service</th>
<th>Owner/Operator</th>
<th>Potential Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watermains</td>
<td>City of London - Water Division</td>
<td>Minor relocations throughout</td>
</tr>
<tr>
<td>Sanitary and Combined Sewers</td>
<td>City of London - Waste Water &amp; Drainage Engineering</td>
<td>Maintenance hole relocations outside of BRT stop area</td>
</tr>
<tr>
<td>Traffic and Street Lighting</td>
<td>City of London - Parking &amp; Traffic Signals</td>
<td>Relocations due to road widening</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>Union Gas</td>
<td>Relocation outside of BRT lanes</td>
</tr>
<tr>
<td>Electricity</td>
<td>London Hydro</td>
<td>Relocations due to road widening</td>
</tr>
<tr>
<td></td>
<td>Hydro One</td>
<td>Design developed to avoid impacts</td>
</tr>
<tr>
<td>District Energy</td>
<td>London District Energy</td>
<td>Relocations outside of platform area</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>Bell Canada</td>
<td>Maintenance hole relocations outside of BRT stop area</td>
</tr>
<tr>
<td></td>
<td>Rogers Communications</td>
<td>Potential minor relocations throughout</td>
</tr>
<tr>
<td></td>
<td>Telus Communications</td>
<td>Potential minor relocations throughout</td>
</tr>
<tr>
<td></td>
<td>Execulink Telecom</td>
<td>Shared infrastructure with others</td>
</tr>
<tr>
<td></td>
<td>Start Communications</td>
<td>Potential minor relocations throughout</td>
</tr>
<tr>
<td></td>
<td>Zayo</td>
<td>Shared infrastructure with others</td>
</tr>
<tr>
<td></td>
<td>Allstream</td>
<td>Potential minor relocations throughout</td>
</tr>
<tr>
<td>Rail Signals</td>
<td>Canadian National Railway</td>
<td>No impact to railway corridor</td>
</tr>
<tr>
<td></td>
<td>Canadian Pacific Railway</td>
<td>No impact to railway corridor</td>
</tr>
<tr>
<td>Petroleum</td>
<td>Enbridge</td>
<td>Not within study area</td>
</tr>
<tr>
<td></td>
<td>Imperial Oil - Sarnia Products Pipeline</td>
<td>Not within study area</td>
</tr>
<tr>
<td></td>
<td>Sun Canadian Pipeline</td>
<td>Not within study area</td>
</tr>
<tr>
<td>Natural Resources Gas Limited (NRG)</td>
<td>Not within study area</td>
<td></td>
</tr>
<tr>
<td>Western University</td>
<td>No impacts anticipated</td>
<td></td>
</tr>
</tbody>
</table>

Due to these relocations, services will be impacted during construction. To install some of the deeper sub-surface infrastructure, trenches will be required with proper shoring.

With the road widening to introduce the dedicated BRT lanes, hydro poles owned by London Hydro are the most widely impacted throughout the entire network. London Hydro has been consulted throughout the project and have identified strategies for the large number of pole relocations.

There may be situations where the cost of the utility relocation needs to be weighed against the disruption to the operations to determine the feasibility of the relocation. To coordinate the works effectively, utilities have been reviewed from an asset management perspective which accounts for upgrades due to growth of the service as well as non-growth upgrades such infrastructure renewal/replacement.

Potential impacts from surface and sub-surface utilities include service disruptions to both residents and businesses due to construction. Impacts due to the utility relocations can potentially include access restrictions, road closures, sidewalk closures, traffic detours and delays. Depending on the proposed location of the relocated plants, impacts to the public can be limited and minimized dependent upon available space within the Right of Way (ROW).

### 4.1.4.2 Mitigation

To mitigate the impact of the utility relocations, construction staging must be considered during detail design to minimize potential disruption. The first phase of construction for the BRT network will take place in the downtown couplet. This is being timed to align with other infrastructure and signature projects happening in the core during this time.

The highest level of communication will be required during construction to mitigate the potential impacts of a project of this scale. Robust communications protocols will be established to ensure proactive, accurate information flow to stakeholders, and real-time resources – both online and on-site – will alert stakeholders to project updates as they happen.

A BRT-specific Communications Plan, already underway, will establish communications strategies to support implementation of the project and guide transparent, inclusive, and proactive communications and consultation with affected residents, business owners and the travelling public.

In situations where the roadway will be impacted due to relocation works, traffic management plans will be created to alleviate and minimize disruption as much as possible. In addition to standard mitigation practices for potential construction impacts.
4.1.6 Stormwater Management

4.1.6.1 Potential Impacts

Within the majority of the proposed Rapid Transit corridors, there will be only a nominal increase in imperviousness which will in-turn result in a nominal increase in peak storm flows, as the majority of the corridors can already be characterized as having a high level of development. In some locations, such as the fully developed downtown or Old East Village areas, there will be no net increase in impervious areas. In other areas, such as Wharncliffe Road between Oxford Street and Riverside Drive, no improvements are planned and there will be no increase in imperviousness.

In accordance with City of London standards, areas of re-development or intensification along the corridors will be required to implement Stormwater Management (SWM) quantity and quality controls.

4.1.6.2 Mitigation

Although storm sewer replacements are not necessary for increased capacity, there will be some areas where storm sewer work will be required as a result of BRT construction:

- Storm sewers will require relocation if currently located beneath proposed BRT platforms.

4.1.5 Maintenance and Emergency Services

4.1.5.1 Winter Maintenance

During the project development, Roadside Operations staff identified a preference for centre-running transit lanes when considering the most efficient design from a winter maintenance perspective. As snowfall begins, salt trucks with ploughs are first sent out to deal with events accumulating less than 5 cm. Typical ploughing operations work from the centre lane out, and the natural runoff of salt and brine towards the curb will assist in clearing the general traffic lanes as well. Similarly during greater snowfall events, larger ploughs also start with the centre lane, progressively pushing snow to the outside, which is much less conducive to curbside BRT.

The BRT corridors will be designated a “priority” in the City’s Winter Maintenance Program. Winter Maintenance for BRT platforms is expected to require hand work to maintain. Also, consideration for snow storage will be necessary during detail design to avoid triggering the need for removal operations, especially for stop design and areas were the corridors are constrained.

The Rapid Transit Project Team will work with Roadside Operations to establish service standards for RT corridors, with those details to be determined through the next phase of the study.
New storm sewers will be required in areas that currently do not have any storm sewers and are required in the future due to the new BRT corridor cross-section. For example, on Wellington Road north of Southdale Road, storm flows currently enter a ditch on the east side of the roadway and flow into the Westminster Ponds. The proposed BRT cross-section will require curb and gutter and a new storm sewer.

In some areas, replacement of storm sewers is required due to age and capacity reasons as opposed to BRT construction. It is noted that this is the case along Richmond Street from Oxford Street to the Thames River and within the older central parts of the BRT corridor downtown.

The application of low impact development (LID) strategies within the corridors will help to provide some level of both quantity and quality control and provide for water balance conditions and it is expected that going forward, future Ministry guidelines will require the application of these strategies where practical.

Some examples of LID strategies within road rights-of-way include:

- Bio-retention (within planters, curb extensions, bio-retention units);
- Swales (enhanced grass swales, bio-swales);
- Prefabricated Modules (precast tree planters, soil support systems, phosphorus removal, proprietary stormwater treatment devices); and,
- Permeable pavement (pervious concrete, porous asphalt, permeable pavers).

It is recommended that the consideration of retention (if feasible) and LID measures be carried forward for consideration as part of detail design.

Examples of stormwater treatment methods include technologies which utilize filtration, hydrodynamic separation and/or sedimentation, such as oil/grit separators and end-of-pipe facilities (detention ponds, etc.).

4.1.6.3 Net Effects

Given the nominal increase in imperviousness, and the proposed mitigation strategies to be implemented, the anticipated net effects are expected to be positive, since some areas that currently do not receive treatment will be addressed through BRT implementation.

4.1.6.4 Monitoring

A monitoring strategy will be developed as part of detail design to ensure implemented stormwater management infrastructure meet design requirements. This may also be a requirement of the ECAs.

4.2 Natural Environment

There are seven locations along the BRT network corridor where the preferred route intersects or abuts a Natural Heritage Feature or Area. The EIS (Appendix G) assesses the preliminary engineering design for the seven locations in detail and includes recognition of the potential impacts related to the natural features, mitigation measures designed to minimize/eliminate these impacts, net residual effects of the anticipated works on the natural heritage features, and next steps to be considered during the detail design phase of the project.

The potential impacts to air quality and noise and vibration levels in proximity to the BRT network corridors are also assessed in this section, along with the identification of mitigation measures, net effects and monitoring requirements. The Air Quality Impact Assessment is provided in Appendix H, and the Noise and Vibration Assessment is provided in Appendix I.

4.2.1 Groundwater and Contaminated Sites

Further details on groundwater are provided in Appendix F.

4.2.1.1 Potential Impacts

There are no areas of significant potential for contamination at BRT stop locations. In general, low to moderate risks related to subsurface conditions are expected at a limited number of sites. The majority of potential contaminants of concern are petroleum hydrocarbon and chlorinated solvents associated with existing and former gas stations and service centres.

4.2.1.2 Mitigation

Construction at or near the groundwater level may require treatment of discharge from dewatering activities. It is anticipated that for the majority of BRT stop sites, active remediation is probably not warranted given the relatively nominal depth of excavation at these locations.

4.2.1.3 Net Effects

Should contaminated areas be encountered, the potential for net effects are limited, given that localized treatment would be used for discharge from dewatering activities in such cases.

4.2.1.4 Monitoring

During construction, a regular program of geotechnical inspections, monitoring and materials testing should be carried out to confirm that the subsurface conditions encountered are consistent with those encountered during design and that contract compliance is achieved.
4.2.2 Surface Water, Fish and Fish Habitat

4.2.2.1 Potential Impacts

Site 1: Oxford Street West at Mud Creek

This site falls within the area that will be modified and enhanced by the City as part of the Mud Creek Subwatershed EA on lands south of Oxford Street West, and by private land development to the north. It is anticipated that the works related to the Subwatershed EA and land development, including realignment of the creek, installation of a new culvert, and enhancement of the valley corridor, are to occur in advance of the Rapid Transit works for the west corridor and protect for the design requirements. As the natural heritage system associated with Mud Creek will largely be altered and restored beyond the anticipated road corridor as part of the Subwatershed EA, direct impacts to the identified natural heritage features are not anticipated as a result of the RT works.

Site 2: North Thames Crossing on Queens Avenue and Riverside Drive

There are no works proposed below the high water mark at the Queens Avenue and Riverside Drive bridges. As such, the potential impacts on fish and fish habitat below the high water mark are limited to indirect or secondary impacts associated with construction.

Site 3: Medway Creek Crossing on Western Road

Additional shading of the Medway Creek will occur as a result of the bridge deck being widened. To support the widening, the new pier will be constructed within the permanently wet portion of the channel to the east of the existing footprint to avoid the sensitive environmental features to the west, resulting in potential impacts to fish and mussels, and their habitat.

Site 4: North Thames Crossing on University Drive

A wider deck for the University Drive Bridge will result in an incremental increase in shading of the river; however, the bridge is located at such a height that the shading has nominal effects on fish and fish habitat within the channel. The potential removal of the east pier from the middle of the channel and relocating it to the river’s east bank will open up a portion of the channel bed previously covered by the pier, and allow for enhancement of the bed habitat for aquatic species (including SAR) using the habitat immediately adjacent. However, relocation of the pier to the river bank will result in the alteration of bank habitat below the high water mark that is potentially used by SAR turtles (Spiny Softshell) and snakes (Queensnake).

Site 5: Thames Crossing on Wellington Road

An increase to the in-water footprint associated with the potential extension to the pier, and the increase in the permanent footprint below the high water mark, associated with changes to the banks and the recreational trail system, has the potential to impact aquatic SAR that use habitat within and in close proximity to the watercourse. Associated impacts include the loss of habitat within the channel bed for the wider pier, loss of bank habitat for the abutments, and alteration of the bank habitat for the changes to the recreational trail.

Site 6: Westminster Ponds east of Wellington Road

There are no impacts to fish or fish habitat anticipated at this site.

Site 7: Exeter Road Park-and-Ride

There is currently no crossing of Murray Drain, nor is one required to support the proposed construction. As such, it is anticipated that potential impacts to fish and fish habitat within the drain would be limited to indirect, construction-related activities associated with works within the floodplain.

4.2.2.2 Mitigation

4.2.2.2.1 Site Specific Mitigation

A two part Environmental Management and Monitoring Plan (EMMP) is recommended to document the implementation of the mitigation and compensation measures during and after construction.

Part 1 of the EMMP will consist of a Construction Monitoring Plan to monitor construction-related impacts, document success or deficiency of the implemented mitigation measures (e.g., Erosion and Sedimentation Control Plan, Spill Control / Response Plan, etc.), and provide guidance on remedial actions/provisions for when mitigation is not successful. This plan will be developed during the detail design phase.

Part 2 of the EMMP is to consist of a long-term Post-construction Monitoring Plan to evaluate the success of the restoration / compensation efforts and to assess cumulative impacts on the Natural Heritage System. This plan should include contingency/remedial provisions that will be triggered if effects exceed a pre-determined threshold.

Site 1: Oxford Street West at Mud Creek

Re-assessment of habitat conditions should be carried out following the shifting of flows and realignment of the watercourse to the new culvert further east to determine what habitat remains for fish within the existing culvert crossing location. If fish are still using the habitat, then the following mitigation measures should be implemented to protect that habitat:

- Complete in-water works during permissible in-water window for Mud Creek to minimize impacts to the sensitive life cycle functions of the resident species.
- Isolate the construction area from main flow path behind containment measures (i.e., coffer dams or other suitable measures), and carry out fish rescue/relocations in the area supporting water at the time of construction to relocate all aquatic species within construction footprint.
Sediment and erosion control measures will need to be designed to minimize indirect impacts of sediment release to the receiving watercourse downstream during and following construction measures until the construction area has been re-stabilized.

**Sites 2, 4 and 5:**
Mitigation measures include:
- Overall increases in in-water footprints should be minimized as much as possible.
- In-water works occurring during the permissible seasonal window for the Thames River, to minimize impacts to the sensitive life cycle functions of the resident species.
- Construction areas being isolated from main flow path behind containment measures (i.e., coffer dams or other suitable measures), and fish and mussel rescue/relocations carried out to relocate all aquatic species within construction footprint.
- Additional Schedule B permitting as required for relocation of these species.
- Sediment and erosion control measures designed to minimize indirect impacts of sediment release to the watercourse during and following construction measures until the construction area has been re-stabilized.

**Site 3: Medway Creek Crossing on Western Road**
The increase of the in-water footprint will be minimized as much as feasible. In-water works will be limited to the permissible seasonal window for Medway Creek to minimize impacts to the sensitive life cycle functions of the resident species. Construction areas should be isolated from main flow path behind containment measures (i.e., coffer dams or other suitable measures) and fish and mussel rescue/relocations should be carried out to relocate all aquatic species within the construction footprint. Sediment and erosion control measures will need to be designed to minimize indirect impacts of sediment release to the watercourse during and following construction measures until the construction area has been re-stabilized.

**Site 7: Exeter Road Park-and-Ride**
Sediment and erosion control measures will need to be designed to minimize indirect impacts of sediment release to the watercourse during and following construction activities, until the construction area has been re-stabilized. Additional hydraulic modelling will be required to identify actions that can reduce the floodplain area at this location in order to address flooding concerns that may result from additional development. In addition, management of surface water flows related to the increase in impervious surfaces and redirection of flows into existing municipal storm sewers or use of LID features should be considered, as discussed in Section 4.1.6.

**4.2.2.2 General Mitigation**
In addition to the above-noted mitigation measures for the specific sites, the following mitigation measures should be considered as appropriate for each of the sites:

**Timing**
- To avoid disruption to sensitive fish life stages for all the watercourses, all in- or near-water works will be conducted within the permissible construction period of June 16th to March 14th of any given year, as identified by MNRF through the consultation process. However, it should be noted that a tighter window may be required on those watercourses where Silver Shiner have been confirmed to ensure that bank rehabilitation works have time to take hold and re-vegetate before the spring or fall rainy season, where sedimentation may become a concern for this species and its habitat.
- No equipment should be allowed to ford or otherwise enter the watercourse except as specified in the contract or unless authorized by the appropriate environmental agencies/permits.

**Debris Removal**
- The removal of material shall be limited to what is necessary for the works and shall be removed by hand or with machinery operating from the banks or a floating barge.
- During structure removal works, suitable mitigation measures will be in place to trap and avoid materials from entering the watercourses (e.g. netting, floating debris barges, etc.).

**Land-Based Impacts Through use of Industrial Equipment**
- Machinery will be operated on land in a manner that minimizes disturbance to the banks of the watercourses.
- A spill control/response plan (kept on site), will need to be developed and implemented by the contractor to prevent deleterious substances from entering the watercourses. The plan should require that well-maintained machinery, free of fluid leaks, is used for all construction activities. It should also require that washing, refueling and servicing of machinery, along with the storage of fuel, is limited to the construction staging area, which should be a minimum of 30 m away from all watercourses.

**Deposition of Deleterious Substances**
- Storage and stockpiling of soil and other fill material should be located a minimum of 30 m away from any watercourse(s), drainage features or the tops of steep slopes.
- Appropriate ‘temporary flow passage’ measures should be developed and implemented, and supported by all appropriate erosion and sediment control measures, to isolate the temporary in-stream construction zones required for the in-water works for the pier extensions/replacements.
- Only clean materials free of fine particulate matter should be placed in the water for temporary construction measures (e.g. coffer dams should be constructed of ‘pea gravel’ bags, geotextile fabric, sheet pile or other clean material).

**Erosion and Sediment Control**
- The installation of Erosion and Sediment Control (ESC) measures around the watercourses and drainage features outletting to watercourses need to be installed prior
to the initiation of construction works, to prevent encroachment and the transfer of deleterious substances into the aquatic habitat.

- All ESC measures should be inspected regularly, and maintained by the contractor to ensure they are functioning as intended throughout the construction period, and until such time as the bank areas have been re-stabilized or re-vegetated.
- Sediment-laden water from dewatering activities is to be treated using appropriate settlement (e.g. temporary pond) and/or filtration (e.g. sediment filtration device, filter bags and/or vegetated strips) before being allowed to enter into a watercourse, to ensure that no entrained sediment is released to the watercourses supporting fish habitat.

**Restoration of Disturbed Areas**

- Minimize removal of vegetation, retain existing vegetation and stabilize exposed soils with vegetation where possible, and as soon as feasible following construction, to minimize changes to the banks of the watercourses, and shade provided to the local fish community.
- Limit the duration of soil exposure and stage construction on paved surfaces where possible.
- Limit the size of disturbed areas by minimizing non-essential clearing and grading.

### 4.2.2.3 Net Effects

Net effects, categorized by site, may include:

**Site 1: Oxford Street West at Mud Creek**

Net effects of BRT are assumed to be nominal once all the channel realignment and habitat enhancement elements associated with the Mud Creek Subwatershed Class EA works are completed. If fish and fish habitat exist within the culvert following realignment works, net residual effects may include nominal shading of the habitat as well as an increase in the in-water footprint for the longer culvert length. This extension will occur prior to BRT project implementation.

**Site 2: North Thames Crossing on Queens Avenue and Riverside Drive**

No net effects are anticipated, as no in-water works are required and appropriate sediment and erosion controls will limit the potential for runoff from construction entering the waterway.

**Site 3: Medway Creek Crossing on Western Road**

Increase in permanent in-water footprint associated with longer pier. Works resulting in increases to the permanent in-water footprint may require permitting under the ESA associated with the various aquatic SAR, as well as potential FAA permitting to address impacts to fish and fish habitat generally.

**Site 4: North Thames Crossing on University Drive**

A decrease in the permanent in-water footprint may be possible if the bridge is modified to include wider spans and piers on the shores.

**Site 5: Thames Crossing on Wellington Road**

An increase in the permanent in-water footprint would be associated with a longer pier.

**Site 6: Westminster Ponds east of Wellington Road**

No net effects are anticipated to fish and fish habitat.

**Site 7: Exeter Road Park-and-Ride**

There are no net residual effects anticipated for fish and fish habitat within Murray Drain, as there are no direct impacts on the watercourse itself. UTRCA will need to ensure no net residual effects resulting from the changes in the floodplain and flooding conditions within the Drain prior to approving the development parcel.

Works resulting in permanent in water footprint increases may require permitting under the ESA associated with the various aquatic SAR, as well as potential FAA permitting to address impacts to fish and fish habitat generally.

### 4.2.2.4 Monitoring

A two part Environmental Management and Monitoring Plan (EMMP) is recommended to document the implementation of the mitigation and compensation measures during and after construction.

Part 1 of the EMMP will consist of a Construction Monitoring Plan to monitor construction-related impacts, document the successes and/or deficiencies of the implemented mitigation measures (e.g., Erosion and Sedimentation Control Plan, Spill Control / Response Plan, etc.), and provide guidance on remedial actions/provisions for when mitigation is not successful. This plan will be developed during the detail design phase.

Part 2 of the EMMP is to consist of a long-term Post-construction Monitoring Plan to evaluate the success of the restoration / compensation efforts and to assess cumulative impacts on the Natural Heritage System. This plan should include contingency/remedial provisions that will be triggered if effects exceed a pre-determined threshold. For example, the need for supplementary plantings would be triggered if survival rates reach a specified percentage (e.g., 50%), or wildlife fencing would be erected to encourage movement through the valley if there is evidence of increased road mortality at a particular site.

Compensation and monitoring requirements for SAR, are to be determined during the detail design phase in consultation with agency staff, and should also be integrated into this plan.

Recommendations for monitoring include, but are not limited to:

- Success of woodland and wetland restoration plantings;
- Transplantation success for plants and trees;
- Evidence of bank erosion or scouring at or downstream of sites with in-water works;
- Success / wildlife use of newly created habitat;
- Wildlife monitoring to confirm continued use of known habitat features post-construction (e.g., basking and nesting sites by turtles);
- Evidence of increased road mortality by wildlife at Sites 3, 4, and 5, or effectiveness of existing or enhanced movement corridors;
- Stability of bank restoration areas and success of vegetative growth on banks; and,
- Identification of drainage issues associated with increased impermeable surface at Site 7 related to the functioning of Murray Drain.

Removal of invasive species as part of the Invasive Species Management Strategy and Ecological Restoration Plans should continue during Part 2 of the EMMP.

4.2.3 Vegetation and Vegetation Communities

4.2.3.1 Potential Impacts

Site 1: Oxford Street West at Mud Creek

As the natural heritage system associated with Mud Creek will largely be altered and restored beyond the anticipated BRT road corridor as part of the Subwatershed EA, direct impacts to the identified natural heritage features are not anticipated as a result of the works. Based on the current design concept, vegetation removal along Oxford Street West is expected to be minor and restricted primarily to previously disturbed areas within the eastern portion of the site where the infrastructure extends beyond the ROW.

Site 2: North Thames Crossing on Queens Avenue and Riverside Drive

The current design concept is expected to result in minor impacts to vegetation adjacent to the Queens Avenue Bridge within a significant valleyland.

Site 3: Medway Creek Crossing on Western Road

Since the Medway Creek crossing is to be widened to the east, the works are expected to result in the limited loss of vegetation within the footprint of the proposed road and bridge abutments, as the area immediately east of the bridge consists primarily of constructed parkland (CGL_2), low density residential (CVR_1) and parking areas associated with the University Hospital (CVS_2). The bank of Medway Creek on the east of the southern abutment had some limited herbaceous vegetation amongst riprap associated with a stormwater outfall from the nearby hospital parking area, with more natural riparian vegetation further east along the bank. To the north, trees adjacent to the constructed valley wall were largely non-native species (Black Locust, Siberian Elm and European Buckthorn). By widening to the east, wooded areas within and adjacent to the Medway Valley Heritage Forest ESA and significant woodlands (unevaluated vegetation patch #3003) on the west side of the bridge beyond the right of way will be maintained.

Site 4: North Thames Crossing on University Drive

To accommodate the wider bridge and new abutment locations, grading will be required to contour and shape the banks of the valleyland, resulting in removal of vegetation within the new footprint. This would likely result in permanent habitat loss associated with the new infrastructure footprint, as well as temporary losses within the construction area. The young Kentucky Coffeetree, located north of the eastern bridge abutment, could be impacted by grading associated with construction of a new bridge abutment.

Site 5: Thames Crossing on Wellington Road

To accommodate the wider bridge concept, grading will be required to contour and shape the banks, resulting in removal of vegetation within the new footprint. This could result in permanent habitat loss associated with the new infrastructure footprint, as well as temporary losses within the construction area.

Site 6: Westminster Ponds east of Wellington Road

The existing four-lane road cross-section is to be expanded to accommodate two dedicated Rapid Transit lanes, four general use lanes, a sidewalk on the west, and a multi-use trail on the east. Within the southern portion of the site, adjacent to the Dry-Fresh Deciduous Woodland (WODM4) and Cattail Mineral Shallow Marsh (MASM1) which is part of the PSW, the proposed infrastructure is located within the right of way; but to the north, adjacent to the Buckthorn Deciduous Shrub Thicket (THDM2) portions of the multi-use trail will encroach beyond the right of way. Grading is required to achieve a suitable cross-section, and encroachment would be most significant within the southern portion of the site. The 233.1 m² of habitat within the PSW that is to be impacted by grading represents approximately 7.9% of the area to be disturbed beyond the right of way. Temporary disturbance associated with construction may also occur.

Site 7: Exeter Road Park-and-Ride

No impacts are anticipated.

4.2.3.2 Mitigation

Proposed mitigation measures include:

- Minimize vegetation clearing where possible, and when clearing, delineate vegetation clearing zones and vegetation retention zones (i.e., using silt fencing or tree protection fencing) on both the construction drawings and in the field with the Contractor prior to clearing and grading.
- Stabilize and re-vegetate exposed surfaces as soon as possible upon completion of works.
- Tree and vegetation protection is recommended for trees and vegetation to be retained.
- Tree protection should be outlined in a Tree Protection Plan (TPP) to be developed during detail design. Vegetation protection measures should be detail on contract.
drawings and implemented to ensure encroachment is limited to the construction footprint.

- Development of an invasive species management strategy, which will include a clean equipment protocol, removal of invasive species using best management practices established by the Ontario Invasive Plant Council, and the development of an ecological restoration plan using appropriate native species.

- A mitigation / compensation strategy to address removal of street trees will be developed through consultation with the City during the detail design phase. There is to be no net loss in tree canopy cover as a result of the project.

For Site 6, efforts were made to reduce encroachment into the natural area; however, in order to accommodate utility poles and street-lighting, the landscape strip between the back of curb and the edge of the multi-use pathway could not be reduced to less than 1.5 m. Side slopes associated with the road cross-section were increased from a 3:1 slope to a 2:1 slope to reduce the area of impact. These measures have decreased the overall impacts outside the right of way by 11.5% (from 3,305 m² to 2,924 m²).

4.2.3.3 Net Effects

Net effects will include:

- A minor loss of disturbed vegetation within the right-of-way
- A reduction in tree cover along BRT corridors in areas where road widening is required for 20 to 40 years until replacement trees mature

There is an opportunity for positive net effect where removal of non-native or invasive species is proposed followed by ecological restoration plan incorporating appropriate native species.

4.2.3.4 Monitoring

A two part EMMP is recommended to document the implementation of the mitigation and compensation measures during and after construction, as discussed in Section 4.2.2.2.

4.2.4 Wildlife and Wildlife Habitat

4.2.4.1 Potential Impacts

Impacts to wildlife are directly associated with impacts to vegetation, which comprises their habitat. Permanent encroachment of infrastructure into woodlands, wetlands and ESAs will result in habitat loss. Noise, dust and vibrations associated with construction activities have the potential to cause short-term disturbance to wildlife and may cause certain wildlife to abandon or avoid the area. Long-term impacts are not expected as the infrastructure is proposed in areas that are already developed and the proposed works do not involve a change in land use.

Site 1: Oxford Street West at Mud Creek

Oxford Street West will be widened through this area by up to 6 m as part of the Rapid Transit works, creating a slightly greater barrier to wildlife movement across the roadway, and increased potential for road mortality. Should mature trees exist within the proposed vegetation removal areas, there could potentially be impacts to bat maternity roost sites (cavity trees) and roosting bats.

Site 2: North Thames Crossing on Queens Avenue and Riverside Drive

No impacts are anticipated.

Site 3: Medway Creek Crossing on Western Road

No impacts are anticipated.

Site 4: North Thames Crossing on University Drive

The University Drive Bridge will be fully replaced by a wider bridge with new abutment locations, and grading required to contour and shape the banks of the valleyland. This will require the removal of vegetation within the new footprint, likely resulting in permanent habitat loss associated with the new infrastructure footprint, as well as temporary losses within the construction area.

There are potential impacts to wildlife that primarily utilize habitats below the high water mark (i.e. turtles), as well potential short-term impacts to resident birds, mammals and amphibians, due to construction activities. Birds are particularly vulnerable to impacts associated with disturbance or destruction of nests during the nesting period.

Site 5: Thames Crossing on Wellington Road

To accommodate the wider bridge proposed, grading will be required to contour and shape the banks, resulting in removal of vegetation within the new footprint. This could result in permanent habitat loss associated with the new infrastructure footprint, as well as temporary losses within the construction area. An increase to the in-water footprint associated with the proposed extension to the pier, and the increase in the permanent footprint below the high water mark, associated with changes to the banks and the recreational trail system, has the potential to impact terrestrial SAR that use habitat within and in close proximity to the watercourse. Associated impacts include the loss of habitat within the channel bed for the wider pier, loss of bank habitat for the abutments, and alteration of the bank habitat for the changes to the recreational trail.

There are potential impacts to wildlife that primarily utilize habitats below the high water mark, as well as potential short-term impacts to resident birds, mammals and amphibians, due to construction activities. Birds are particularly vulnerable to impacts associated with disturbance or destruction of nests during the nesting period.
Site 6: Westminster Ponds east of Wellington Road

There are potential impacts to wildlife and wildlife habitat, as vegetation will be removed due to grading.

Site 7: Exeter Road Park-and-Ride

No impacts are anticipated, as the proposed level of encroachment (9 m) is unlikely to impact the movement of wildlife through the valleyland.

4.2.4.2 Mitigation

Mitigation and compensatory areas for removal of natural heritage features will serve to minimize and replace habitat loss, respectively. To avoid disturbance to local wildlife and comply with the MBCA, clearing (including grubbing) of trees and vegetation should be completed outside of the bird nesting season (approximately April 1 to August 31).

Exclusion fencing is recommended to prevent species from entering the construction area. Once work is completed, fencing should be removed to facilitate passage by wildlife.

In the event an animal is found within the construction area, it should remain undisturbed and be allowed to leave on its own. Photos for identification should be taken of animals observed onsite, if possible. If Threatened or Endangered species are discovered during site preparation or construction, activities will stop, or be modified to avoid negative impacts to Species at Risk until further direction is provided by the MNRF. In the event of such a discovery, MNRF Aylmer District office should be contacted promptly.

4.2.4.3 Net Effects

Net effects may include:

- Nominal long-term negative impacts associated with a potential increase in wildlife road mortality due to the wider road cross-section required for the RT infrastructure along Oxford Street West. These impacts are expected to be nominal given the existing fragmentation of the valleyland and the nature of the resident wildlife. The new culvert may also serve to improve habitat connectivity and wildlife passage between portions of the valleyland north and south of Oxford Street West.
- Habitat associated with woodland replacement will be reduced for 20 to 40 years, while newly planted trees grow.
- Replacement of wetland area is expected to result in short-term (1 to 3 years) reduction of habitat.
- Compensatory mitigation for removal of natural features may provide additional benefit through habitat enhancements for wildlife.

4.2.4.4 Monitoring

A two part EMMP is recommended to document the implementation of the mitigation and compensation measures during and after construction, as discussed in Section 4.2.2.2.

4.2.5 Significant Natural Features and Sensitive Areas

4.2.5.1 Potential Impacts

Potential impacts are categorized by site for each significant and/or sensitive natural feature identified within the Study Area:

4.2.5.1.1 Sites 1, 3, 4 and 5: Significant Woodlands

Potential indirect impacts to woodlands include damage to vegetation outside the work zone, sedimentation, spills of contaminants / fuel, root pruning, and soil compaction.

Site 1: Oxford Street West at Mud Creek

There are woodlands north (unnumbered Patch: FODM4-11) and south (Patch 6007: FODM1-4) of Oxford Street West adjacent to the proposed works. However, the woodlands to the north have been removed by a private developer and realignment/enhancement of the Mud Creek corridor is expected to occur in advance of the RT works. As such, direct impacts from the edge encroachment beyond the ROW to the north are not anticipated. There is no encroachment into the woodland to the south anticipated.

Common Evening Primrose, a regionally rare plant species (UTRCA, 2003), was noted at this Site. There is potential for impacts to this species if it occurs within the area to be disturbed.

Site 3: Medway Creek Crossing on Western Road

Direct impacts to woodlands (FODM3-1 and WODM4-4) on the west side of Western Road are not anticipated as a result of the proposed road alignment and widening. Minor impacts to wooded areas east of the existing bridge may occur to accommodate the widened bridge abutments.

Site 4: North Thames Crossing on University Drive

Woodlands (FODM7) on both sides of the North Thames, including patch #3001 to the northwest, which was assumed to be significant as part of this study, may be impacted by the replacement of the University Drive Bridge. A Kentucky Coffeetree within the wooded area adjacent to the northeast abutment may need to be transplanted to avoid impacts.

Site 5: Thames Crossing on Wellington Road

Woodlands (FODM4-5) on the east side of the Wellington Road crossing may experience minor impacts as a result of the proposed bridge widening and alterations to the grade of the northeast Thames Valley trail access to meet accessibility standards. Work in this area also has the potential to impact adjacent turtle nesting areas. The extent to which these vegetation communities will be impacted will need to be assessed once the grading limits and extent of disturbance is confirmed during detail design.
4.2.5.1.4 Site 6: Significant Wetlands

Under the current design concept, an encroachment into the edge of the Cattail Mineral Shallow Marsh (MASM1-1) is expected. Impacts were reduced to the extent possible, by decreasing the width of the landscape strip between the multi-use trail and the east curb to 1.5 m within the vicinity of the PSW. Underground utilities and light standards occur within this strip, preventing further reduction, or elimination of the landscape strip in this area. By increasing side slopes from 3:1 slope to a 2:1 slope, the area of impact to the PSW can be reduced by 185 m², from 418 m² to 233 m².

Temporary disturbance associated with construction (grading, movement of heavy machinery, etc.) may occur.

Direct impacts may include loss of habitat, removal of wetland vegetation, and temporary construction related effects (erosion and sedimentation, noise, dust, etc.)

Regionally rare plant species including Sweetflag, Watershield, and Buffalo Berry have been observed within the vicinity. Although vegetation removal is expected to be largely restricted to the more disturbed area adjacent to the road, there is potential for impacts to these regionally rare species if they occur within the area to be disturbed.

Hybrid or Blue Cattail (Typha x glauca) was observed within the MASM1-1 vegetation community, along with the parent species, Narrow leaved Cattail and Broad-leaved Cattail. Blue Cattail is listed as rare within Middlesex County (UTRCA, 2003). Given its hybrid status, and the co-occurrence of the parent species, transplantation may not be warranted. Discussion with UTRCA during detail design will be completed to verify relocation needs, if any.

Indirect or long-term effects include potential impacts associated with increased input of road salts into the PSW and potential alteration to drainage patterns (groundwater and/or surface water flows).

4.2.5.2 Mitigation

Potential mitigation measures are categorized by site for each significant and sensitive natural feature identified within the Study Area:

Sites 1, 3, 4 and 5: Significant Woodlands

- Clearing should be minimized where possible. Vegetation clearing zones and vegetation retention zones should be clearly delineated (i.e., using silt fencing or tree protection fencing) on both the construction drawings and in the field with the Contractor prior to clearing and grading.
- Survey vegetation within the clearing zone prior to the commencement of works to identify regionally rare plant species. Surveys should be completed during appropriate timing windows when the plant species is readily identified (e.g., flowering stage, leaf on). A 'best effort' approach should be taken to relocate affected individuals to suitable habitat beyond the area of disturbance.
- Tree and vegetation protection is recommended for trees and vegetation to be retained. Tree protection should be outlined in a Tree Protection Plan (TPP) to be developed at detail design. Vegetation protection measures should be detail on contract drawings and implemented to ensure encroachment is limited to the construction footprint.
- Equipment, materials and other construction activities should not be permitted in vegetation retention zones.
- Unnecessary traffic, dumping and storage of materials over tree root zones adjacent to the proposed works should be avoided.
Exposed surfaces should be stabilized and re-vegetated as soon as possible, upon completion of works.

To offset for the removal of vegetation communities / habitat associated with significant natural features within the Natural Heritage System, mitigation in the form of habitat replacement at a ratio greater than 1:1 land area is required through plantings of appropriate native species.

Where feasible, creation of replacement habitat should occur adjacent to the impacted feature. If not possible, replacement habitat should be created as close to the site of impact as possible, and preferably within the same subwatershed. Plantings should strive to meet woodland densities for trees and shrubs, and should include establishment of a healthy understory.

At all sites there is an opportunity to provide additional compensatory mitigation through the implementation of an invasive species removal and management plan, and/or feature enhancement through plantings of appropriate native species. Due to the sensitive nature of the Natural Heritage System at Sites 3, 4, and 5, compensatory mitigation is recommended to offset impacts to the natural features and functions.

Comprehensive compensation plans are to be developed during detail design through consultation with the City and relevant agencies.

**Sites, 1, 2, 3, 4, 5, and 7: Significant Valleylands**

Changes to drainage patterns should be minimized to reduce/eliminate potential for changes to the existing wetland moisture regime and site hydrology.

Stormwater Management Plans should include strategies to balance surface water and/or ground water inputs to the PSW between pre- and post-construction. Preliminary analysis indicates that water balance at this site can be achieved; thereby maintaining the existing moisture regime within the PSW.

A Spills Management Plan should be developed and used for the construction area.

A Spills Management Plan should be developed and used for the construction area.

To offset for the removal of vegetation / habitat, mitigation in the form of habitat replacement at a ratio greater than 1:1 land area is required through plantings of appropriate native species. Where feasible, creation of replacement habitat should occur adjacent to the impacted feature. If not possible, replacement habitat should be created as close to the site of impact as possible.

Due to the significant and sensitive nature of these features, compensatory mitigation is required to offset impacts to the features and their functions. Opportunities include, replacement of habitat at a ratio greater than 1:1 land area, implementation of an invasive species removal and management plan, and enhancement of other areas within the ESAs.

**Site 6: Provincially Significant Wetlands**

Opportunities to further reduce the area of impact should be investigated during detail design.

Vegetation clearing should be minimized as much as possible.

Use of heavy machinery within the PSW should be avoided. If unavoidable, swamp mats or similar materials should be used to avoid soil compaction.

Vegetation clearing zones and vegetation retention zones should be clearly delineated (i.e. using silt fencing or tree protection fencing) on both the construction drawings and in the field with the Contractor prior to clearing and grading.

Vegetation within the clearing zone prior to the commencement of works should be surveyed to identify regionally rare plant species. Surveys should be completed during appropriate timing windows when the plant species are readily identified (e.g., flowering stage, leaf on). A best effort approach should be taken to relocate affected plants to suitable habitat beyond the area of disturbance.

Changes to drainage patterns should be minimized to reduce/eliminate potential for changes to the existing wetland moisture regime and site hydrology.

Stormwater Management Plans should include strategies to balance surface water and/or ground water inputs to the PSW between pre- and post-construction. Preliminary analysis indicates that water balance at this site can be achieved; thereby maintaining the existing moisture regime within the PSW.

A Spills Management Plan should be developed and used for the construction area.

An Erosion and Sedimentation Control Plan should be developed and used to minimize the risk of potential impacts from sedimentation on the water quality and quantity within wetlands and surface water features.

The use of alternative de-icing products / application methods should be considered to reduce the input of road salts into the wetlands and ponds. There are no stormwater management techniques that capture road salts or reduce road salt water pollution.

To offset for the removal of wetland communities / habitat, mitigation in the form of habitat replacement at a ratio greater than 1:1 land area is required through plantings of appropriate native species. Where feasible, creation of replacement habitat should...
occur adjacent to the impacted feature. If not possible, replacement habitat should be created as close to the site of impact as possible (i.e., elsewhere within the Westminster Ponds / Ponds Mills ESA).

- Due to the significant and sensitive nature of this feature, additional compensatory mitigation is recommended to offset impacts to the feature and its functions. An Invasive Species Removal and Management Plan should be developed and used, in conjunction with Enhancement Planting Plans for other areas within the ESA to provide a net environmental benefit to the area. Vegetation communities in proximity to Wellington Road contain a high proportion of undesirable invasive species (fifteen species including European Buckthorn and Glossy Buckthorn) which are outcompeting native species; thereby decreasing native diversity and degrading associated habitat. Comprehensive compensation plans are to be developed through consultation with the City and relevant agencies.

4.2.5.3 Net Effects

Potential net effects are grouped by the significant and sensitive natural feature identified within the Study Area:

Sites 1, 3, 4 and 5: Significant Woodlands

- Minor vegetation removal in woodland communities outside of the ROW may occur at Sites 1, 3, 4, and 5.
- The degree of encroachment is not anticipated to alter the designation of these woodlands as significant.
- Minor vegetation removals are not anticipated to affect resident significant flora or fauna species (following transplantation, if necessary, of Kentucky Coffeetree and Common Evening Primrose individuals, at Sites 4 and 1, respectively).
- Resident wildlife will be displaced to adjacent natural areas.
- A reduction in tree cover along BRT corridors in areas where road widening is required for 20 to 40 years until replacement trees reach maturity.

Sites, 1, 2, 3, 4, 5, and 7: Significant Valleylands

- Potential gains may be achieved at Sites 3 and 4 by increasing hydraulic capacity, and improving protection from flooding and other hazard processes.
- Minor encroachment into other natural heritage features and habitat within the valleylands at Sites 3, 4 and 5 will be offset through mitigation and compensatory mitigation measures for woodlands, and/or overall benefit permits for species at risk, if required at those sites.
- Net effects are not anticipated at Sites 1, 2, or 7

Sites 3 and 6: Environmentally Significant Areas

There are no net effects anticipated at Site 3.

Net environmental gains can be achieved at Site 6 through the implementation of an invasive species management plan focusing on removal of invasive species and replacement and enhancement with appropriate native species. Encroachment into the edge of the ESA can be offset through mitigation and compensatory mitigation measures. Impacts will not affect the designation of this area as an ESA. While limited, where mature trees are to be removed, reduction in tree cover for 20 to 40 years may occur while newly planted woodland replacement areas grow.

Site 6: Provincially Significant Wetlands

- Vegetation removal within the PSW adjacent to the ROW is to be mitigated at a replacement ratio greater than 1:1 land area.
- Encroachment is not anticipated to affect the designation of this wetland as significant.
- Proposed removals are not anticipated to affect significant flora or fauna species.
- Resident wildlife will be displaced to adjacent natural areas.
- Wetland area will temporarily be reduced for 1 to 3 years while wetland replacement area(s) grow.
- Gains in botanical diversity and quality can be obtained by enhancing adjacent terrestrial portions of the Westminster Ponds / Pond Mills ESA through removal and management of invasive species (European and Glossy Buckthorn) and planting of native species.

4.2.5.4 Monitoring

A two part EMMP is recommended to document the implementation of the mitigation and compensation measures during and after construction, as discussed in Section 4.2.2.2.

4.2.6 Air Quality

4.2.6.1 Potential Impacts

To identify the potential impact of the project on air quality, future Full Build and No-Build scenarios were compared for the horizon year of 2034 using the methodology described in Appendix H.

The cumulative impacts were calculated by aggregating the Project specific modelling results with the 90th percentile background ambient concentrations. The cumulative air quality impacts of the Project are predicted to be below the air quality thresholds, with the exception of annual NO\textsubscript{2}, PM\textsubscript{2.5}, benzene, and annual and 24 h benzo(a)pyrene, which already exceed the air quality thresholds from 90th percentile background ambient concentrations.

The air dispersion modelling results for the selected Contaminants of Concern (COCs) for the most impacted sensitive receptor for each scenario are provided in Appendix H.
4.2.6.2 Net Effects

The cumulative impacts are compared with air quality thresholds and no additional exceedances of the thresholds were identified, other than 1 h NO\textsubscript{2}, for the No-Build Scenario within the Oxford study area. The focus of this analysis was on impacts to air quality in two specific study areas where the risk to local air quality as a result of this project was highest. Given that the impacts to these high risk areas were negligible, and in some cases positive, it is a good indication that in the less risk-prone areas of the city, including areas where traffic is forecasted to decrease as a result of modal shifts, that air quality will improve.

4.2.6.3 Mitigation

To mitigate construction activities an Air Quality Management Plan will be developed to address construction equipment and vehicle exhaust, potential traffic disruption and congestion, fugitive dust and odour. Potential mitigation measures that may be included in the Air Quality Management Plan include:

- Dust suppression measures (e.g., application of water wherever appropriate, or the use of approved non-chloride chemical dust suppressants, where the application of water is not suitable) will conform to recognized standard specifications such as the Cheminfo Services Inc. March 2005 publication “Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities” prepared for Environment Canada;
- Use of dump trucks with retractable covers for the transport of soils and other friable materials;
- Minimize the number of loadings and unloading of soils and other friable materials;
- Minimize drop heights, use enclosed chutes, and cover bins for debris associated with deconstruction of affected structures;
- Washing of equipment and/ use of mud mats where practical at construction site exits to limit the migration of soil and dust off-site;
- Dust monitoring in locations where it has been determined that a particulate bound contaminant of concern exists in native soil;
- Stockpiling of soil and other friable materials in locations that are less exposed to wind (e.g., protected from the wind by suitable barriers or wind fences/screens, or covered when long-term storage is required) and away from sensitive receptors to the extent possible;
- Reduction of unnecessary traffic and implementation of speed limits;
- Permanent stabilization of exposed soil areas with non-erodible material (e.g., stone or vegetation) as soon as practically possible after construction in the affected area is completed;
- Ensuring that all construction vehicles, machinery, and equipment are equipped with current emission controls, which are in a state of good repair; and,
- Dust-generating activities should be minimized during conditions of high wind.

4.2.6.4 Monitoring

In addition to the Air Quality Management Plan, construction activities will be monitored by a qualified Environmental Inspector who will frequently review the efficacy of the mitigation measures and construction best management practices to confirm they are functioning as intended. In the event that mitigation is found to not be effective, revised mitigation measures designed to improve effectiveness will be implemented. Noise and Vibration

4.2.6.5 Fuel Source for Buses

The potential fuel sources BRT buses, considered in terms of relative change to air quality, are diesel, CNG, or electric. This AQIA was conducted for the worst-case fuel source which is diesel. Electric buses would not emit any COCs within the study areas, with the exception of particulate matter from brakewear, tirewear, and re-suspension. The remainder of the COCs generated by electric buses do not occur locally, but rather nationally/regionally depending on the source of power to generate the required electricity. Impacts associated with electric buses would need further information to assess, such as the type of electric bus, energy demand, and source of electricity generation. Regardless of vehicle type, this project is projected to have a positive impact on air quality and lead to a reduction in Greenhouse Gas Emissions. However, the use of Electric vehicles would result in the greatest net benefit to air quality.

4.2.6.6 Greenhouse Gases and Climate Change

Greenhouse gases (GHGs) are contributors to the radiative warming effect of the environment that results in global climate change. The major GHGs include carbon dioxide (CO\textsubscript{2}), methane (CH\textsubscript{4}), and nitrous oxide (N\textsubscript{2}O) which are emitted from fuel combustion as well as other anthropogenic and natural sources. Carbon dioxide is the main product of combustion while the other two gases are by-products of incomplete combustion. Methane and nitrous oxide have lower concentrations in the atmosphere than carbon dioxide, but their potential impact on global warming per molecule is larger than for carbon dioxide.

Start-up emissions have little impact to greenhouse gas emissions as the buses will be running continuously for long periods, without stopping or starting their engines within the study areas.

Idling emissions are important to the study area as buses will idle at stop lights and at bus stops. The purpose of the BRT system is to minimize idling at stop lights by timing the signals to maintain BRT traffic movement whenever possible. When idling, CNG buses have the greatest reduction to GHG emissions compared to current fleet vehicles.

For electric buses, there is no local impact within the study areas from greenhouse gases as the creation of power (i.e., electrical generation plants) is located outside of the study area; however, there will be an impact nationally/regionally from these plants which is not assessed due to a lack of knowledge of the total power demand requirement of the BRT fleet should it be all electric.
For travelling emissions, both future diesel engines and CNG engines yield a reduction of GHG generation. Future diesel buses offer the greatest decrease, but both options produce a net decrease that would assist in meeting Ontario’s 2007 Action Plan on Climate Change.

4.2.7 Noise and Vibration

4.2.7.1 Potential Impacts
To assess how future roadway noise levels will be impacted by BRT implementation, future sound levels following full build-out of the BRT were estimated and compared to existing conditions, using the methodology described in Appendix I. The sound levels for Outdoor Living Areas given road conditions and traffic volumes identified for these two scenarios are summarized in Exhibit 4-11. A copy of the Noise and Vibration Assessment is provided in Appendix I. The conservative scenarios of a full diesel BRT fleet was assumed.

<table>
<thead>
<tr>
<th>Receptor ID</th>
<th>Existing Noise Levels (dBA)</th>
<th>Future Noise Levels with BRT (dBA)</th>
<th>Change in Noise Levels (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N1</td>
<td>67</td>
<td>69</td>
<td>2</td>
</tr>
<tr>
<td>N2</td>
<td>63</td>
<td>64</td>
<td>1</td>
</tr>
<tr>
<td>N3</td>
<td>61</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>N4</td>
<td>61</td>
<td>63</td>
<td>2</td>
</tr>
<tr>
<td>N5</td>
<td>54</td>
<td>54</td>
<td>0</td>
</tr>
<tr>
<td>N6</td>
<td>54</td>
<td>54</td>
<td>0</td>
</tr>
<tr>
<td>N7</td>
<td>55</td>
<td>55</td>
<td>0</td>
</tr>
<tr>
<td>N8</td>
<td>52</td>
<td>53</td>
<td>-1</td>
</tr>
<tr>
<td>N9</td>
<td>63</td>
<td>62</td>
<td>-1</td>
</tr>
<tr>
<td>N10</td>
<td>58</td>
<td>58</td>
<td>0</td>
</tr>
<tr>
<td>N11</td>
<td>63</td>
<td>63</td>
<td>0</td>
</tr>
<tr>
<td>East Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E1</td>
<td>58</td>
<td>58</td>
<td>0</td>
</tr>
<tr>
<td>E2</td>
<td>69</td>
<td>70</td>
<td>1</td>
</tr>
<tr>
<td>E3</td>
<td>69</td>
<td>70</td>
<td>1</td>
</tr>
<tr>
<td>E4</td>
<td>65</td>
<td>66</td>
<td>1</td>
</tr>
<tr>
<td>West Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>53</td>
<td>56</td>
<td>3</td>
</tr>
<tr>
<td>W2</td>
<td>65</td>
<td>66</td>
<td>1</td>
</tr>
<tr>
<td>W3</td>
<td>50</td>
<td>57</td>
<td>7</td>
</tr>
<tr>
<td>W4</td>
<td>62</td>
<td>62</td>
<td>0</td>
</tr>
<tr>
<td>W5</td>
<td>57</td>
<td>57</td>
<td>0</td>
</tr>
<tr>
<td>W6</td>
<td>56</td>
<td>56</td>
<td>0</td>
</tr>
<tr>
<td>W7</td>
<td>62</td>
<td>62</td>
<td>0</td>
</tr>
<tr>
<td>South Corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>58</td>
<td>67</td>
<td>9</td>
</tr>
<tr>
<td>S2</td>
<td>55</td>
<td>59</td>
<td>4</td>
</tr>
<tr>
<td>S3</td>
<td>54</td>
<td>58</td>
<td>4</td>
</tr>
</tbody>
</table>

4.2.7.2 Mitigation
Regarding noise mitigation for ultimate conditions, it is noted that most receptors experience a small increase in sound levels, however noise impacts are limited and mitigation is not required along the majority of the 24 km BRT corridor. Noise increases greater than 5 decibels are predicted only to occur at select locations due to the removal of existing buildings to accommodate the design. In total, four locations were identified as having potential noise increases in excess of 5 decibels. Recommended barrier heights are summarized in Exhibit 4-12.

<table>
<thead>
<tr>
<th>Receptor ID</th>
<th>Approximate Location</th>
<th>Recommended Noise Barrier Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Corridor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W3</td>
<td>226 Cooper Street</td>
<td>1.8 metres</td>
</tr>
<tr>
<td>South Corridor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>2 Kennon Place</td>
<td>2.4 metres</td>
</tr>
<tr>
<td>S2</td>
<td>13 Bond Street</td>
<td>2.3 metres</td>
</tr>
<tr>
<td>S3</td>
<td>484 Moore Street</td>
<td>1.8 metres</td>
</tr>
</tbody>
</table>

Schematic locations of the sound barriers are provided in Appendix I, and are also indicated on the design plates in Appendix A.
4.2.7.4 Construction Considerations

The following should be specified during the preparation of detail design drawings and adhered to during construction:

- The Contractor will be required to comply with the City of London’s noise by-law (Noise By-Law, PW-12) regarding noise emission standards for construction equipment that may be in place at the time of construction.

- General noise control measures (not sound level criteria) will be referred to, or placed into the City of London contract documents.

- Any initial complaint from the public will require verification by the City of London to determine if the general noise control measures agreed to, are in effect. The City of London will investigate any noise concerns, warn the Contractor of any problems and enforce its contract.

- Nighttime construction activities should be avoided to reduce the potential impact of construction noise. Certain types of construction work can only be completed when trains are not in service (i.e., outside of business hours). Construction should be planned to minimize the number of nights where noisy nighttime construction activities may be required.

- All construction equipment used should be in good repair and properly maintained to limit noise emissions. All construction equipment should be operated with effective muffling devices that are in good working order and idling of construction equipment kept to a minimum to reduce noise from construction activities. Unnecessary noise caused by faulty or non-operating components shall be addressed by regularly maintaining all equipment.

- Noise emissions from construction equipment are to be in compliance with the limits set out in NPC-115 and NPC-118.

- The concurrent use of high impact construction equipment such as pile driving should be avoided. The feasibility of auger pile driving should be investigated if pile driving is required.

- Construction noise mitigation options should be considered based on administrative, operational, economic, and technical feasibility.

4.3 Socio-Economic Environment

4.3.1 Land Use and Demographics

Once the Bus Rapid Transit system is implemented, the Rapid Transit Corridors are envisioned to become vibrant, mixed-use, mid-rise communities that border the length of Rapid Transit route. The land uses along the corridors will vary depending on the character, uses and intensity of the surrounding areas. Some will be primarily residential with small-scale, street-facing commercial uses while others may feature stand-alone commercial uses or mixed-use development. The corridors will have easy access to Downtown and Transit Villages via Rapid Transit, and will be fundamentally walkable and transit-oriented. Areas closer to Rapid Transit stops may be more appropriate for greater density and height to support transit usage for a larger number of residents and workers.

Looking at projected demographic changes over the next 20 years, a major shift in age group structure is expected. Exhibit 4-14 shows the current and projected population age structure for Middlesex County. Some key observations include:

- The proportion of seniors (65 years and older) changes from 15% of total population in 2011 to 23% in 2030. This represents an additional 43,100 potential transit users in London.

- The 14-29 young adult age group makes up 22% of the current population. This group will age into the 35 to 49 cohort over the next 20 years and make up a large part of the commuting population.

- The current 14-29 age cohort has well-documented lower auto ownership rates across North America and higher public transit use than previous generations. If these generational lifestyle preferences are continued in the future, this has the possibility to increase demand for future Rapid Transit services.

The young adult age group is the largest, and typically more flexible with respect to transportation mode choice. Providing Rapid Transit service to this group soon could make them into choice riders, with this behaviour continuing throughout their lives. The shift towards an older population will also have major implications regarding the need to provide high quality multi-modal mobility options to many parts of the city. As people age, they begin to choose to stop driving, or may lose their ability, and convenient transit must be made available to maintain a high quality of life. Having higher quality transit will allow...
London to continue to attract many types of residents including students, young professionals, and seniors.

The impact on London’s rental housing units will be among the issues considered during the next phase of the project. Consultation with stakeholders interested in maintaining affordable housing stock will assist in identifying impacts and appropriate mitigation measures, such as opportunities to integrate affordable housing with future transit oriented development.

Exhibit 4-14 Middlesex County Population Age Structure, 2011 and 2030

4.3.2 Local Economy

4.3.2.1 Potential Impacts

Short Term Economic Benefits

The economic benefits associated with the construction of BRT network can be quantified in terms of the estimated number of direct and indirect person-years of employment, wages and additional GDP. It should be noted that GDP, by definition, includes wages and salaries as a sub-component and therefore the estimates of GDP and income cannot be added together. During construction, the project is expected to generate 4,389 employment years and increase GDP by $262 million.

The magnitude of short-term impacts is directly based on the capital cost of the project. Larger construction costs means greater person-years of employment, wages and increase in GDP.

Long Term Economic Benefits

The economic benefits associated with the ongoing operations of Rapid Transit can also be quantified in terms of the estimated number of direct and indirect person-years of employment, income (i.e. wages/salaries) and additional GDP. These long-term economic benefits are directly tied to the annual operating costs and can be impacted by changes in ridership, operational subsidy, and service standards. The operating costs estimated, and consequently the long-term economic impacts, reflect a minimum level of service to accommodate projected ridership demand.

Salary information from the London Transit Commission and Statistics Canada was used to generate estimates of direct person-years of employment and wages over the operating period of 2025 to 2050. The Rapid Transit service could generate 148 direct person-years of employment annually and $8.1 million in direct wage income annually.

During the life cycle of the project (up until 2050), the project is expected to generate 225 employment years and contribute an additional $9 million in GDP per year.

Land Value

Investment in transit often results in changes in land value. Case study research has shown for the most part these changes are positive (i.e. increased property values) as lands become more desirable in their existing form and/or redevelop into higher density, higher order uses. Over the past few decades, construction of transit systems in Canada, the United States and Australia has been seen to result in property value increases ranging from 2% to over 60%. The larger increases in property values are generally tied to heavy rail and subway systems, but the introduction of high quality BRT can also result in increased interest and demand for land and uplift in land value.

A number of other factors play an important role in the impact transit investment can have on property values, intensification and economic development. For example:

- Uplift in land value is closely tied with the levels of population and employment growth and market demand for various types of housing (e.g. lower density suburban vs higher density urban).
- Higher levels of ridership and passenger usage of stops result in greater impact on the value of retail, commercial and institutional lands and lease rates.

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1 Ontario Population Projections Update, 2012-2036, Ontario Ministry of Finance
2 London Rapid Transit Business Case, 2017
Studies have found that transit investment tends to have a larger impact on land values in lower and middle-income areas, or neighbourhoods with high proportions of students, seniors and young adults.

Research suggests that the greatest uplift in land value has been realized in areas where transit service is being introduced (opposed to an upgrade to existing service) or in situations where a Rapid Transit line is serving either a very dense urban area or a large geographic area and has particularly high daily ridership levels.

Based on The London Plan, London is projected to reach a population of 458,000 by 2035. The ReThink London Land Needs Background Study forecasts that 42,375 new residential units will be required to accommodate this population growth, with 39% (16,738) of the new units to be constructed within the ‘Built Area’ of municipality:

- 88% high-density (11,581 units);
- 21% medium-density (3,596 units); and,
- 9% low-density (1,561 units).

Based on population forecasts prepared by the City of London, it is estimated that over the period of 2011 to 2034 (horizon for which detailed forecasts by traffic zone are available), of the growth that will be constructed in the existing “Built Area”, between 60% and 70% of this growth could occur within 800 m of the proposed Rapid Transit corridors. This would translate into the need for thousands of new residential units. The City of London has a large supply of vacant or underutilized lands within 500 m of the proposed Rapid Transit corridors which could accommodate transit-oriented development.

Following a review of The London Plan and the land designations (Place Types) and density permissions along the proposed Rapid Transit corridors, estimates of the amount of land which will be required to accommodate the anticipated population growth (i.e. new buildings and units) were prepared. Residential developments which have been recently built or are planned and underway were taken into consideration.

The City of London’s economy is currently heavily dominated by information technology, medical research, manufacturing and insurance. Higher education facilities such as Western University and Fanshawe College play a major role in London’s economy, adding close to 1.5 billion dollars annually.

In past years the city has struggled with high vacancy rates specifically in the downtown core area. The Canadian Market Outlook (2015) conducted by CBRE suggests that the vacancy rates seen in recent years in London will continue, with marginal gains, but acknowledged that the City’s attempt to revitalize the downtown core by waiving development charges for certain types of developments is a positive way to stimulate growth.

The introduction of Rapid Transit should also help stimulate economic development and growth, as it will help connect people to jobs and establish clusters of industry in proximity to Rapid Transit stops. Businesses and major institutions within close proximity to the Rapid Transit corridors can be expected to benefit from improved access to skilled workers and customers, and increased productivity and competitiveness resulting from a reduction in travel times and transportation costs. The City anticipates its employment base will grow by 43,000 jobs between 2015 and 2035 and that millions of square feet of new commercial, institutional and industrial space will be required. It is estimated that when complete, a majority of London’s jobs will be within walking distance of Rapid Transit.

Overall, it is estimated that an uplift in land value of $90 million could be realized along the proposed BRT corridors if the London grows as anticipated or achieves even greater levels of population and employment growth. Some vacant or largely underutilized properties will see a major uplift in value and others will see little to none. The average uplift in land value along the corridors is anticipated to range from 2% to 10%.

4.3.3 Businesses

4.3.3.1 Potential Impacts

Businesses during Construction

Businesses typically experience impacts with urban road construction in the form of the removal/lack of street parking, road closures, signage and visibility issues, noise and vibration, and/or sidewalk closures.

The level of impact will depend on the level of disruption as well as the nature of businesses that are affected by construction. The level of disruption would depend on factors such as duration of construction, the extent/level of road closure, etc.

Certain types of businesses in certain areas of the City will be more affected by construction than others. For example, the impact of construction on office uses along Oxford Street West is likely less severe than that on retail uses downtown, since office uses are generally less dependent on customer visits. Similarly, retail/service uses that cater to specific purposes, e.g., a special item of clothing, are likely less affected by construction than retail/service uses that meet daily local needs.

The businesses in London have been categorized using the NAICS industry classification system. These categories were then assessed according to their tolerance toward business interruptions, typical of urban transportation projects. A “low tolerance” level indicates that a businesses in this category are generally more sensitive to the impacts of construction compared to those of “high tolerance”. The tolerance level for each business category is identified below.

<table>
<thead>
<tr>
<th>Low Tolerance</th>
<th>Medium-Low Tolerance</th>
<th>Medium Tolerance</th>
<th>Medium High Tolerance</th>
<th>High Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERV (Entertainment/Food/Drink)</td>
<td>FOOD STORE RETAIL</td>
<td>NON-FOOD STORE RETAIL</td>
<td>SERVICES (Other)</td>
<td>OFFICE (Private Sector)</td>
</tr>
</tbody>
</table>

London Rapid Transit Business Case, 2017

London Rapid Transit Business Case, 2017
While most areas along the BRT corridors will have very few impacts due to having large setbacks from the roadway and off-street parking, there are some areas along the BRT corridor that have a high concentration of businesses that have lower tolerance levels, have street front facades, and rely on street parking for loading and customer parking. These areas are Downtown, including Richmond Row and Wellington Street between South Street and Horton Street. A more detailed analysis of these areas is provided below.

**Downtown and Richmond Row**

Based on an inventory conducted in 2017, there were 239 downtown businesses that fronted onto the BRT corridors in Downtown London. This included sections of the RT bound by Ridout Street to the west, Oxford Street to the North, Wellington Street to the East and King Street to the South. Retail stores and restaurant establishments make up the majority with 130 businesses. The proportional distribution of businesses based on construction tolerance level is summarized in Exhibit 4-15, with businesses of a "medium" tolerance level making up the largest share at 35%.

Exhibit 4-15: Proportional Distribution of Businesses Based on Construction Tolerance Level – Downtown and Richmond Row

These businesses will be impacted during construction due to limitations on access from the temporary removal of on-street parking and temporary road closures as well as disruption from construction activity such as dust, noise and vibrations.

**Wellington Street between South Street and Horton Street**

Based on the business inventory conducted on Wellington Street between South Street and Horton Street, there are approximately 53 businesses fronting the BRT corridor. A majority (34) of these businesses are offices and are considered to have a high tolerance for construction disruption, with another two considered to have moderate tolerance for construction disruption. 17 of the businesses are either retail food stores or services (entertainment/food/drink) establishments and considered to have low or medium-low tolerance for construction disruption. The proportional distribution of businesses based on construction tolerance level is summarized in Exhibit 4-16.

Exhibit 4-16: Proportional Distribution of Businesses Based on Construction Tolerance Level - Wellington Street (Between South and Horton)

**On-Street Parking, Loading and Access**

The implementation of Rapid Transit will have both positive and negative impacts on businesses in the longer term, once this system is in place and operational. Rapid Transit will improve access to businesses for existing and new transit users and it will facilitate residential intensification in the corridors, which could increase the local customer base, encourage walkability, and incentivize localized shopping patterns. However, changes to the road corridors will reduce the amount of on-street parking and on-street loading in some areas along the corridor where it currently exists and will impact off-street parking in some locations as well.
On-Street Parking

Along the 4 BRT Corridors (North, East, South, West) and Downtown there are currently a total of 295 on-street parking spaces. The majority of these spaces are located Downtown, where there are 204 parking spaces along the BRT corridors.

As it is a goal to implement the BRT system with few impacts, on-street parking spaces in several locations was compromised in order to limit the widening of the existing road right of way to preserve adjacent property and maintain the existing building fabric. This is especially the case Downtown, where road rights of way are tight to the building faces and it is a priority to maintain the existing built form.

The removal of all bus service from Dundas Street between Wellington Street and Ridout Street involves the realignment of 10 routes (2, 5, 7, 9, 11, 12, 19, 20, 23, &102), which currently use Dundas Street in the downtown area.

The net parking loss in downtown as a result of the rerouting of buses off Dundas Street is 29 parking spaces. Business owners fronting the specific areas will be notified of the changes. A total of eight additional on-street parking spaces will be added along Clarence Street and Talbot Street due to the removal of transit from those streets. Some of these spaces may transitionally serve as business loading zones to be coordinated with the closure of Dundas Street during construction of the Dundas Place project.

Less than half of the on-street parking spaces have been removed as part of the design of the BRT network. Along the BRT corridors Downtown, a total of 82 parking spaces will be removed, bringing the total from 204 to 122.

The total number of on-street parking spaces that exist today and that will existing after the BRT system is implemented are summarized by city block in Exhibit 4-17.

Loading

Downtown has specified on-street loading zones for businesses that don’t have off-street loading facilities. On-street parking is also often used for loading and parcel delivery of adjacent businesses. The removal of on-street parking and some loading areas will therefore have an impact on loading in areas where on-street parking is compromised.

4.3.3.2 Mitigation

Businesses During Construction

The highest level of communication will be required prior to, and during, BRT construction to mitigate the potential impacts of a project of this scale. Encouraging people to continue coming to these areas during construction will be a crucial component of limiting the impacts that construction will have. It will also be important to provide timely, accurate and proactive information to stakeholders, as well as real-time, on-site resources and robust communications protocols.

The first stage of construction for the BRT network will take place in the downtown couplet. This is being timed to align with other infrastructure and signature projects happening in the core during this time.

With multiple projects being timed for completion either in close sequence or simultaneously across the BRT network, it is necessary for the Rapid Transit Office to work closely with other project teams to coordinate on communications across projects, share best practices, and ensure a consistent and holistic approach to activities and messages, building upon proven strategies and tools used for other signature projects.
### Exhibit 4-17: Changes to On-Street Parking

<table>
<thead>
<tr>
<th>Block</th>
<th>Existing On-Street Parking (2018)</th>
<th>On-Street Parking with BRT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>South Corridor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wellington Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horton to Simcoe</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Simcoe to Grey</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Grey to Hill</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Hill to South</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td><strong>South Corridor Total</strong></td>
<td>28</td>
<td>19</td>
</tr>
<tr>
<td><strong>North Corridor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richmond Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central to Hyman</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Hyman to Piccadilly</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td><strong>North Corridor Total</strong></td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td><strong>East Corridor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>King Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waterloo to Colborne</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>Colborne to Burwell</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td><strong>Dundas Street</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario to Quebec</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td><strong>East Corridor Total</strong></td>
<td>38</td>
<td>0</td>
</tr>
<tr>
<td><strong>Downtown</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarence Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>King to Dundas</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Dundas to Queens</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>Queens to Dufferin</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td><strong>King Street</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ridout to Talbot</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Talbot to Richmond</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Richmond to Clarence</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Clarence to Wellington</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Wellington to Waterloo</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td><strong>Wellington Street</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>King to Dundas</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Dundas to Queens</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td><strong>Queens Ave.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wellington to Clarence</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Clarence to Richmond</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Richmond to Talbot</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Talbot to Ridout</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td><strong>Ridout Street</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Queens to Dundas</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Dundas to King</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td><strong>Downtown Total</strong></td>
<td>204</td>
<td>122</td>
</tr>
</tbody>
</table>
A successful mitigation strategy should include the following elements:

1. Signage for local businesses during construction
2. Communication strategy to routinely update shoppers, employees and visitors/clients, with real-time information, for example, through website updates, area signage and social media.
3. Parking strategies (e.g., increase availability of on-street parking proximate to study area, reduced rates for downtown parking; wayfinding signage identifying alternative parking options)
4. Promotion of Study area businesses in collaboration with BIAs
5. Pedestrian safety and wayfinding measures (e.g., clear paths to businesses)
6. Promoting active transportation options (e.g., bike share program)

**On-Street Parking, Loading and Access**

**On-Street Parking**

As of 2015, there were 13,000 parking spaces available in downtown. The removal of 82 on-street spaces will not have a significant impact on the total available parking stock. With a high occupancy (to verified by the 2018 Downtown Parking Study) in municipal parking garages, these garages will be able to take on the burden of the removed on-street supply.

In order to promote the use of the off-street parking supply, the City can implement pricing programs and provide adequate signage to increase awareness of the availability of parking at off-street locations. Using technology to monitor parking supply and demand that is relayed to people looking for parking can also help distribute demand to off-street parking garages with adequate supply.

The demand for on-street parking downtown will also be mitigated with the promotion of active transportation and transit for getting downtown.

Outside of Downtown, the on-street parking supply is not relied on as heavily as there are more free off-street parking opportunities.

A more detailed strategy and analysis of downtown parking supply and demand will be provided in the 2018 Downtown Parking Plan.

**Loading**

The loss of on-street loading space for businesses Downtown and on Wellington Street between Horton and South can be mitigated by designating new on-street loading space on near-by side-streets or other nearby loading areas. This can also be complimented by improving maintenance on public alleyways and having access to abutting commercial parcels.

A mitigation strategy for relocating loading activity along each block that is effected is provided in the Exhibit 4-18 below.

**Exhibit 4-18 Downtown Parking and Loading Strategy**
4.3.3.3 Net Effects
In total, 106 parking spots will be removed due to the implementation of the BRT system. Parking spots on side streets adjacent to the BRT corridors will not be impacted.

4.3.3.4 Monitoring
The City will continue to work with impacted property owners, residents and businesses to mitigate the effects associated with the removal of parking, loading and access.

4.3.4 Recreation, Entertainment and Tourism

Recreation and Entertainment
In 2009, the City published a Parks and Recreation Master Plan, guiding the sustainable growth of city’s recreation facilities. The first of the guiding principles that are identified is Accessibility and Affordability, indicating that the City should “seek to provide fair, accessible and affordable recreation and leisure opportunities that encourage participation by a diverse community.” The recommendations for achieving this include locating recreation facilities so that the largest number of persons can reach the facility of foot, by bicycle, and by public transit.

The development of the Bus Rapid Transit system will also help improve upon the existing network of sidewalks, trails, and off-street bike paths. As part of the project, multi-use paths will be constructed along Wellington Road from Bradley Avenue to Base Line Road East, Western Road from Lambton Drive to Fanshawe Park Road, King Street from Waterloo to Ontario Street, Dundas Street from Ontario Street to Egerton, and on Oxford Street East from Highbury Avenue to First Street. In addition to multi-use paths, bike lanes will be added along the Rapid Transit where space allows, and facilities will be developed along parallel streets in constrained areas.

As indicated in Exhibit 3-23, several of the city’s significant recreation and entertainment attractions are located along the BRT corridors. Londoners will have improved access to these facilities with the implementation of BRT which will help achieve the guiding principles set out in the Parks and Recreation Master Plan and provide Londoners with improved access to leisure opportunities, helping to solidify London as an attractive place to live, work and play.

Tourism
When visiting a city, the ability to navigate and get to your desired destination conveniently can be a defining element of the visitor experience. Rapid Transit serves as a definitive spine in the public transit network with routes that provide fast and reliable service to major destinations and that are intuitive and easy to navigate. Rapid Transit stops can also provide information on places of interest around the local area that they serve, and they can serve as points of reference for navigating.

The BRT corridor will also provide connections to inter-city bus and rail connections as well as the proposed future high-speed rail station, as well as the potential for service connections to the airport, providing high quality transit connections from these points of entry to the rest of the city.

As indicated in Exhibit 3-24 there are several tourist destinations along the BRT corridors as well as many of the city’s hotels. These destinations and the visitors that are trying to get to and from them will be better served by the BRT system.

4.4 Cultural Environment

Further details on cultural heritage and archaeological findings, impacts and mitigations can be found in the Cultural Heritage Screening Report (Appendix K) and the Stage 1-2 Archaeological Assessment Report (Appendix J), respectively.

4.4.1 Archaeology

4.4.1.1 Potential Impacts
The BRT network was designed to stay within the existing road allowance wherever possible to minimize or avoid impacts to potential archaeological resources.

Within the Study Area, there is the potential for impacts to three registered archaeological sites (Exhibit 4-19), eight historic cemeteries (Exhibit 4-20), and 17 additional areas that have the potential for deeply buried resources that could be impacted by the construction of the BRT network.

Exhibit 4-19: Potentially Impacted Registered Archaeological Sites

<table>
<thead>
<tr>
<th>Borden Number</th>
<th>Name</th>
<th>Cultural Affiliation</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFHH-244</td>
<td>Victoria Park</td>
<td>Pre-contact; Post-contact</td>
<td>Clarence Street</td>
<td>1864 barracks structure with resources; pre-contact resources within the park away from the project</td>
</tr>
<tr>
<td>AFHH-182</td>
<td>O’Brien Block</td>
<td>Post-contact</td>
<td>West of Ridout Street</td>
<td>Line of structures; human remains also found in the area.</td>
</tr>
<tr>
<td>AGHH-72</td>
<td>Unnamed</td>
<td>Post-contact</td>
<td>Western University campus</td>
<td>Site identified during construction, potentially former tavern or hotel.</td>
</tr>
</tbody>
</table>
4.4.1.2 Mitigation

A Stage 3 Test Excavation and Deeply Buried Resource survey is to be completed within the boundaries of AfHh-244, Victoria Park. The test excavation is to entail the excavation of test units within the areas of impact, within the lawn areas of the site, at 5 m intervals to provide a sample of the site area. Addition infill units amounting to 20% of the total grid are to be completed within the site area, targeting notable areas as identified by a Licensed Archaeologist. Where the project is located within the site area, but the area is presently covered by asphalt or other modern structures, the investigation is to proceed directly to deeply buried investigations. Deeply buried investigations are to entail the excavation of the upper layers of fill down to the level of undisturbed soil horizons at 5 to 10m intervals. Should intact archaeological deposits be found, hand excavation may be employed at the discretion of the site archaeologist. All trenched areas within the Stage 3 investigation with intact archaeological deposits should be fully excavated to Stage 4 standards prior to backfilling the trenches. Stage 4 mitigations through avoidance or excavation are to follow the results of the Stage 3 investigations.

Stage 2 Test pit survey is recommended in association with AGHh-72 and AgHh-78 to entail the completion of three 1 m by 1 m test units at 5 m intervals along the edge of the parking lot or roadway in close association to the site coordinates, to determine whether further remains associated with the archaeological site are present within the project footprint at this location. This strategy is employed because of the limited information available for these sites.

Consultation with the Ministry of Tourism, Culture and Sport, and Museum of Ontario Archaeology will be undertaken to determine the extent of the original investigations into AfHh-182. Subsequent to the consultation, Stage 2 and/or 3 investigations will be completed for the project footprint within the registered site area.

Discovery of Human Remains

In the event that human remains are encountered at any point, the following response protocol will be implemented:

- All site alteration activities must cease immediately and the Quality Assurance / Environmental Administrator and Construction Manager will be contacted;
- The Construction Manager will contact the Owner and the Environmental Manager;
- Notification of the remains will be undertaken in accordance with the Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, C.33 which requires that any person who discovers human remains notify the police or coroner, and the Registrar of Cemeteries at the Ministry of Government and Consumer Services;
- The site will be secured until such time that the Police or Coroner’s Office assume control of the site;
- Should it be determined that the remains are Indigenous, the Indigenous community with cultural affiliation to the remains will be notified; and,
- Site alteration activities will not be reinstated at the site until clearance from the above noted authorities has been provided.

4.4.1.3 Net Effects

The Stage 1 Archaeological Assessment identified a number of historic and active cemeteries in close association with the project works. These cemeteries will be addressed within the archaeological assessments for the project. Each active cemetery will have consultation with the current owner/operator to garner further information on the potential for burials within the project area. All areas of impact from the project within 10m of the identified cemeteries will have a Stage 3 Cemetery Investigation completed to determine the presence of grave shafts. Should grave shafts be identified, Stage 4 Mitigation options will be discussed with the affected parties including the City of London, the Registrar of Cemeteries, the Ministry of Tourism, Culture and Sport, and the cemetery owners.

Areas with potential for the discovery of deeply buried resources are to undergo Stage 2 Deeply Buried investigations, with mechanical excavation of test trenches at intervals no greater than 10 m, targeting potential features visible on the historic mapping of the area. If the area of potential identified is located within lawn or other undeveloped areas, a test pit survey is to be completed prior to the test trenching to confirm the depth of fill and disturbance over the area.

### Exhibit 4-20: Potentially Impacted Historical Cemeteries

<table>
<thead>
<tr>
<th>Cemetery</th>
<th>Location</th>
<th>Year Established</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restmount</td>
<td>Oxford Street West and Proudfoot Lane</td>
<td>1933</td>
</tr>
<tr>
<td>Or Shalom</td>
<td>Oxford Street West and Proudfoot Lane</td>
<td>1888</td>
</tr>
<tr>
<td>Oakland</td>
<td>Oxford Street West</td>
<td>1882</td>
</tr>
<tr>
<td>Mount Pleasant Cemetery</td>
<td>Oxford Street West</td>
<td>1874</td>
</tr>
<tr>
<td>Catholic Cemetery</td>
<td>Dundas Street and Ridout Street</td>
<td>19th Century</td>
</tr>
<tr>
<td>Catholic Cemetery</td>
<td>Richmond Street and Dufferin Street</td>
<td>19th Century (around early 1930s)</td>
</tr>
<tr>
<td>St. Paul’s Anglican Cemetery</td>
<td>Prior to 1874</td>
<td></td>
</tr>
<tr>
<td>Potter’s Field</td>
<td>Victoria Park vicinity, precise location unknown</td>
<td>Prior to 1889</td>
</tr>
</tbody>
</table>

Prior to 1882

Prior to 1874

(around early 1930s)
4.4.1.4 Monitoring

Chance Discovery of Undocumented Archaeological Resources

Should previously undocumented archaeological resources be discovered during the course of site investigations or construction, they may be deemed to be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The following protocol will be implemented:

- All site alteration activities will cease immediately and the Quality Assurance / Environmental Administrator and Construction Manager will be contacted;
- The Construction Manager will contact the Owner and the Environmental Manager;
- Instruction will be provided not to move or collect the uncovered archaeological or historical materials;
- The locations of actual or suspected archaeological finds will be secured against theft or trespass by unauthorized individuals;
- A Licensed Archaeologist will be engaged to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act;
- A Licensed Archaeologist will be contacted/brought on site immediately upon discovery of a new archaeological resource, to provide recommendations for impact avoidance or further investigation;
- Results of any Archaeological Assessments will be submitted/reviewed by the Ministry of Tourism, Culture and Sport to confirm recommendations; and
- Additional Archaeological assessments (Stage 2, 3 and/or Stage 4), will be undertaken as required.

4.4.2 Built and Cultural Heritage

4.4.2.1 Potential Impacts

Within the study area, there is the potential for impacts to three Heritage Conservation Districts (Exhibit 4-21), 16 designated heritage properties (Exhibit 4-22), and 469 properties that have potential cultural heritage value or interest.

Exhibit 4-21: Potentially Impacted Heritage Conservation Districts

<table>
<thead>
<tr>
<th>Heritage Conservation District</th>
<th>Location</th>
<th>By-Law Number</th>
<th>Number of Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Woodfield Heritage District</td>
<td>Bounded by Richmond Street to the west, Dufferin Avenue and Queens Avenue to the south, Maitland Street and Peter Street to the east and Central Avenue and Pall Mall Street to the north.</td>
<td>L.S.P. 3400-254</td>
<td>500</td>
</tr>
<tr>
<td>Downtown Heritage Conservation District</td>
<td>The westerly boundary of the Downtown Heritage Conservation District is the centreline of the Thames River, the south limits of Blackfriars Bridge to the north, Fullarton Street between Ridout Street North and Richmond Street, Dufferin Avenue and mid-block between Wellington Street and Waterloo Street, north of Dundas Street. The south boundary is the Canadian National Railway tracks. The east boundary stays west and north of the Citi Plaza and extends east to Waterloo Street north of King Street.</td>
<td>L.S.P. 3419-124</td>
<td>339</td>
</tr>
<tr>
<td>Blackfriars-Petersville Heritage Conservation District</td>
<td>Blackfriars/Petersville Heritage District is bound by the Thames River on the east and the south and by Oxford Street West to the north. Wharncliffe Road North acts as the western boundary of Blackfriars/Petersville Heritage Conservation Districts, and includes properties on both sides of the road between Rogers Avenue and St. Patrick Street.</td>
<td>L.S.P. 3437-179</td>
<td>588</td>
</tr>
</tbody>
</table>
Exhibit 4.22: Potentially Impacted Designated Heritage Properties

<table>
<thead>
<tr>
<th>Municipal Address</th>
<th>By-Law Number</th>
<th>Commonly Used Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1603 Richmond Street</td>
<td>L.S.P. 2789-353</td>
<td>The Lake Property</td>
</tr>
<tr>
<td>1132 Richmond Street</td>
<td>L.S.P. 2983-98</td>
<td>The Brough House</td>
</tr>
<tr>
<td>1061 Richmond Street</td>
<td>L.S.P. 3433-46</td>
<td>Robinson Memorial United Church</td>
</tr>
<tr>
<td>1058 Richmond Street</td>
<td>L.S.P. 3155-243</td>
<td>The Funston Property</td>
</tr>
<tr>
<td>986 Richmond Street</td>
<td>L.S.P. 3224-414</td>
<td>The Mayville Property</td>
</tr>
<tr>
<td>835 Richmond Street</td>
<td>L.S.P. 3295-51</td>
<td>The Guenther Property</td>
</tr>
<tr>
<td>623 Richmond Street</td>
<td>L.S.P. 3074-186</td>
<td>The Lindsay Property</td>
</tr>
<tr>
<td>850 Highbury Avenue</td>
<td>L.S.P. 3321-208</td>
<td>London Psychiatric Hospital</td>
</tr>
<tr>
<td>1156 Dundas Street</td>
<td>L.S.P. 3441-366</td>
<td>McCormick’s Factory</td>
</tr>
<tr>
<td>871 Dundas Street</td>
<td>L.S.P. 2704-469</td>
<td>The Hayman House</td>
</tr>
<tr>
<td>866 Dundas Street</td>
<td>L.S.P. 3453-187</td>
<td>Hayman Commercial Block</td>
</tr>
<tr>
<td>389 Dundas Street</td>
<td>L.S.P. 3387-667</td>
<td>London Tower, remains of First</td>
</tr>
<tr>
<td>163 Oxford Street West</td>
<td>L.S.P. 3273-382</td>
<td>Congregational Church</td>
</tr>
<tr>
<td>138 Wellington Street</td>
<td>L.S.P. 3392-164</td>
<td>-</td>
</tr>
<tr>
<td>129-131 Wellington Street</td>
<td>L.S.P. 3409-332</td>
<td>Red Antiquities Building</td>
</tr>
</tbody>
</table>

4.4.2.2 Mitigation

For the properties located within or directly adjacent to the study area that have the potential cultural heritage value or interest (CHVI), it is recommended that Cultural Heritage Evaluation Report (CHER) be completed to determine the extent of the CHVI. All completed CHERs will be reviewed by the City of London Heritage Planning staff and the London Advisory Committee on Heritage (LACH). The LACH and the City of London Heritage Planners will then provide a determination regarding the CHVI of the property and recommend to City Council whether to designate the property under the Ontario Heritage Act.

Further, it is recommended that a Heritage Impact Assessment (HIA) be completed for the designated properties and for the Heritage Conservation Districts. The HIA will determine whether the project will impact the heritage attributes of the property and recommend mitigation and conservation strategies.

Where indirect or direct impacts are anticipated and avoidance is not possible, mitigation measures to be considered in detail design include: context sensitive design (sidewalk placement, street trees, decorative walls and fences, front yards), stop and shelter design to reflect cultural heritage resources, and documentation of resources in advance of alteration. Best practice approaches to such impacts could include a tree reinstatement plan to redevelop the mature tree canopy along the streetscape and altering design elements to reduce or remove impacts to areas where heritage attributes are identified near the roadway. Built heritage resources in close proximity to the project should undergo a pre-construction building condition survey and be monitored during heavy construction activity.

4.5 Matters of Provincial Importance

Under the TPAP, the Minister of the Environment considers whether a transit project may have negative impacts on matters of provincial importance and constitutionally protected Indigenous or Treaty Rights. The following table summarizes the findings of the analysis of potential impacts, net effects, and mitigation measures for relevant matters of provincial importance, which will be updated during TPAP.

A series of comprehensive plans for mitigation and monitoring will be developed during detail design and prior to project implementation. These plans will be based on the recommendations provided in the technical reports to produce net positive effects on matters of provincial importance. Plans will be developed specifically related to the natural environment, cultural heritage resources, hydrology, or constitutionally protected Indigenous or Treaty Rights. The plan will identify and address potential environmental impacts, approval and permit requirements, and monitoring processes to be completed during construction.
### Exhibit 4-23: Matters of Provincial Importance

<table>
<thead>
<tr>
<th>Matters of Provincial Importance</th>
<th>Definition</th>
<th>Applicability to the Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>A park, conservation reserve or protected area</td>
<td>A provincial park, conservation reserve or provincially protected area designated by the province.</td>
<td>There are no provincial parks or conservation reserves within the Study Area.</td>
</tr>
<tr>
<td>Extirpated, Endangered, Threatened, or species of special concern and their habitat</td>
<td>A species at risk (SAR): Extirpated, Endangered, or Threatened species and their habitat. A Species of Conservation Concern (SCC): Rare or substantially declining species that have a high percentage of their global population in Ontario. Special concern species identified on the Species at Risk in Ontario (SARO) List that were formally referred to as “vulnerable” in the Significant Wildlife Habitat Technical Guide (SWHTG) (MNRF, 2000). Species identified as nationally endangered or Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which are not protected in regulation under Ontario’s Endangered Species Act, 2007.</td>
<td>There are a number of species protected under the Endangered Species Act that have the potential to be impacted by the project. The net effects, mitigation and monitoring measures are identified and will be updated during TPAP as required.</td>
</tr>
<tr>
<td>A wetland, woodland, habitat of wildlife or other natural heritage feature</td>
<td>A significant Wetland, Significant Woodland, Significant Valleyland or Significant Wildlife Habitat as defined in Section 2.1.5 of the Provincial Policy Statement (2014).</td>
<td>There are portions of a Significant Wetland, Significant Woodlands, Significant Valleylands and Significant Wildlife Habitat within the Study Area.</td>
</tr>
<tr>
<td>An area of natural or scientific interest (ANSI)</td>
<td>A Significant ANSI as defined in Section 2.1.5 of the PPS (2014)</td>
<td>The Westminster Ponds/Pond Mills Area of Natural or Scientific Interest is located within the Study Area and has the potential to be impacted by the project.</td>
</tr>
<tr>
<td>A stream, creek, river, or lake containing fish and their habitats</td>
<td>A stream, creek, river or lake containing fish and their habitats.</td>
<td>The Rapid Transit route crosses the Thames River, the North Thames River, Medway Creek and Mud Creek.</td>
</tr>
<tr>
<td>An area or region of surface water or groundwater or other important hydrological feature</td>
<td>An area or region of surface water or groundwater or other important hydrological feature.</td>
<td>There are no areas or regions of surface water or groundwater or other important hydrological features within the Study Area.</td>
</tr>
<tr>
<td>Areas that may be impacted by a known or suspected on-site or off-site source of contamination such as a spill, a gasoline outlet, an open or closed landfill site, etc.</td>
<td>Areas that may be impacted by a known or suspected on-site or off-site source of contamination such as a spill, a gasoline outlet, an open or closed landfill site, etc.</td>
<td>29 areas with low or low-to-moderate risk ratings were identified within the Study Area. No areas with significant potential for contamination were identified within the Study Area.</td>
</tr>
<tr>
<td>Protected heritage property</td>
<td>Property designated under Parts IV, V or VI, of the Ontario Heritage Act; property subject to a heritage conservation easement under Parts II or IV of the Ontario Heritage Act; property identified by the Province and prescribed public bodies as provincial heritage property under the Standards and Guidelines for Conservation of Provincial Heritage Properties; property protected under federal legislation, and United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites.</td>
<td>There are 16 properties designated under part IV of the Ontario Heritage Act and three Heritage Conservation Districts (HCDs) designated under Part V of the Ontario Heritage Act located within the Study Area. These properties and HCDs will be subject to Heritage Impact Assessments.</td>
</tr>
<tr>
<td>Built heritage resources</td>
<td>A building, structure, monument, installation or any manufactured remnant that contributes to a property’s cultural heritage value or interest as identified by a</td>
<td>There are 110 properties that are listed on the City of London’s Inventory of Heritage Resources that have the potential to be impacted by the project.</td>
</tr>
<tr>
<td>Matters of Provincial Importance</td>
<td>Definition</td>
<td>Applicability to the Project</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Cultural heritage landscapes</td>
<td>A defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Indigenous community. The area may involve features such as structures, spaces, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association.</td>
<td>There are two cultural heritage landscapes within one kilometre of the project footprint. No impacts are anticipated.</td>
</tr>
<tr>
<td>Archaeological resources and areas of potential archaeological interest</td>
<td>Includes artifacts, archaeological sites, and marine archaeological sites, as defined under the <em>Ontario Heritage Act</em>. The identification and evaluation of such resources are based upon archaeological fieldwork undertaken in accordance with the <em>Ontario Heritage Act</em>.</td>
<td>There are four registered archaeological sites, eight historic cemeteries and 17 areas with the potential for deeply buried deposits within the Study Area. All areas will be subject to further archaeological assessments.</td>
</tr>
<tr>
<td>An area designated as an escarpment natural area or an escarpment protection area by the Niagara Escarpment Plan under the <em>Niagara Escarpment Planning and Development Act</em></td>
<td>An area designated as an escarpment natural area or an escarpment protection area by the <em>Niagara Escarpment Planning and Development Act</em>.</td>
<td>The study area is located outside of the Niagara Escarpment Plan area.</td>
</tr>
<tr>
<td>Property within an area designated as a natural core area or natural linkage area within the area to which the Oak Ridges Moraine Conservation Plan (ORMCP) under the <em>Oak Ridges Moraine Conservation Act, 2001</em> applies</td>
<td>Property within an area designated as a natural core area or natural linkage area within the area to which the ORMCP under the <em>Oak Ridges Moraine Conservation Act, 2001</em> applies.</td>
<td>The study area is located outside of the Oak Ridges Moraine Conservation Plan area.</td>
</tr>
<tr>
<td>Property within an area described as a key natural heritage feature or a key hydrologic feature in the Protected Countryside by the Greenbelt Plan under the <em>Greenbelt Act, 2005</em></td>
<td>Property within an area described as a key natural features or a key hydrological features in the Protected Countryside by the Greenbelt Plan under the <em>Greenbelt Act, 2005</em>.</td>
<td>The study area is located outside of the Greenbelt Plan's area.</td>
</tr>
<tr>
<td>Constitutionally protected Aboriginal or treaty rights and areas of concern</td>
<td>Specific protected rights as recognized by Section 35 of the <em>Constitution Act (1982)</em>, including treaty rights for present and future modern land claims agreements.</td>
<td>The Ministry of the Environment and Climate Change provided a comprehensive list of Indigenous Communities to consult through the study process.</td>
</tr>
</tbody>
</table>

Notes:
2. Definition based on Guide to Ontario’s Transit Project Assessment Process (MOECC, January 2014) and other applicable Acts or Guides as noted.