# Table of Contents

1 London BRT Transit Project Assessment Process – Draft Environmental Project Report

2 Project Description

2.1 Design Criteria

2.1.1 Rapid Transit Corridors

2.1.2 Rapid Transit Vehicles

2.1.3 Streetscape Elements

2.1.4 Rapid Transit Stops

2.1.5 Intelligent Transportation Systems (ITS)

2.2 Preferred Design

2.2.1 BRT Routes and Stop Locations

2.2.2 Site Specific Design Considerations

2.2.3 BRT Stop Design

2.2.4 Road Network and Traffic Management

2.2.5 Structures

2.2.6 Bicycle and Pedestrian Facilities

2.2.7 Streetscape

2.2.8 Illumination

2.2.9 Intelligent Transportation System

2.2.10 Considerations for Electric Buses

2.2.11 Operations, Maintenance and Storage Facilities

2.3 Local Transit Integration

2.3.1 Downtown

2.3.2 North Corridor

2.3.3 East Corridor

2.3.4 South Corridor

2.3.5 West Corridor

2.3.6 Summary

2.4 Land and Property Requirements

2.5 Project Implementation

2.5.1 Planning Issues

2.5.2 Project Funding

2.5.3 Construction Issues

2.5.4 Construction Phasing

2.5.5 Commitments and Future Work

2-1

2-1

2-1

2-2

2-2

2-3

2-4

2-5

2-5

2-7

2-11

2-17

2-19

2-19

2-21

2-26

2-27

2-30

2-30

2-31

2-31

2-32

2-32

2-32

2-33

2-33

2-36

2-36

2-36

2-36

2-36

2-37
2 PROJECT DESCRIPTION

2.1 Design Criteria

2.1.1 Rapid Transit Corridors

The BRT network is made up of two routes, 24 km in length combined, of which 19.5 km will have dedicated centre-running transit lanes, 3 km will have dedicated curbside transit lanes, and 1.5 km will operate in mixed traffic lanes. On-street bus turnaround routes include an additional 2 km of mixed traffic operations. The BRT corridors will be along existing streets, which will require modifications to accommodate the dedicated transit lanes.

The BRT system will operate in three primary design configurations, described below and illustrated in the following typical sections:

- **Centre-running transit** consists of dedicated BRT lanes located in the middle two lanes of the roadway (Exhibit 2-1). The BRT lanes will be identified by red-coloured pavement and pavement markings, with pavement markings separating BRT lanes from general traffic lanes. Opposing BRT lanes will be separated by a raised centre island, which also prohibits left-turn access to and from un-signalized intersections and driveway entrances. These measures reduce conflict points between traffic and BRT to improve safety and reliability;

- **Curbside transit** consists of one or two dedicated BRT lanes located on the outside of the roadway, adjacent to the curb (Exhibit 2-2). The BRT lanes will be identified by red-coloured pavement and pavement markings, with pavement markings separating them from general traffic lanes. There is no physical barrier between the BRT lane and general traffic lanes. This maintains left-turn access to and from un-signalized intersections and driveway entrances. This configuration results in potential conflict points between traffic and BRT, which can reduce reliability; and,

- **Mixed traffic** refers to BRT vehicles operating in the general traffic lanes, similar to how local transit operates. These localized sections have existing constraints and accommodating dedicated BRT lanes was deemed unfeasible (Exhibit 2-3). In these sections, the BRT service is more susceptible to delays caused by traffic congestion, particularly during peak periods. Transit queue jump lanes have been implemented where feasible at signalized intersections, to mitigate delays caused by traffic queuing on the intersection approach. Two of the four bus turnaround will occur in mixed traffic on existing streets.
2.1.2 Rapid Transit Vehicles

The BRT fleet is expected to be 28 new articulated buses, in addition to LTC’s current bus fleet. The vehicle supplier has not been selected at this time. The following elements are expected to be included in the selected vehicles.

2.1.2.1 Higher Passenger Capacity

The BRT vehicles will be articulated 18 m (60 ft) buses. With seating for approximately 60 people, plus standing passengers, each bus is planned to have a carrying capacity of 70 to 110 people.

2.1.2.2 Faster Boarding and Alighting

The number of doors available to passengers impacts boarding and alighting time and ultimately the operating speeds of the system.

BRT vehicles will have three doors on the right side. Wide aisles and limited seating around doorways should also be considered in the vehicle design to improve on-board circulation and reduce boarding delays.

The BRT network will use either off-board fare collection or all-door fare collection, further reducing the time to complete boarding and alighting, as discussed in Section 2.2.9.3.

2.1.2.3 An Improved Rider Experience

The rider experience will be improved with the addition of on-board passenger amenities, such as Wi-Fi access and real-time passenger information announcements.

Guidance systems, both mechanical and electronic, can help maintain lane keeping and level acceleration for improved ride quality. Guidance systems can also improve the accuracy of aligning the bus with platforms to enable no-step boarding and alighting.

2.1.2.4 Accessibility

Since BRT vehicles will be designed to improve boarding and alighting speeds and improve on-board passenger circulation, they will inherently improve accessibility for all passengers. Multiple boarding/alighting points, wide aisles, and more space to maneuver around the doorways all contribute to this improved condition.

Consistent with the current amenities included on the LTC fleet, BRT vehicles will include automatic signage and audible stop announcements, which is further detailed in Section 2.2.9.6. BRT vehicles are planned to stop at all stops along the BRT route, rather than operating on a stop request basis like local buses. This will contribute to improved accessibility for alighting passengers, as they will not be required to request a stop.

BRT vehicles will have low floors that will be level with the stop platforms. As mentioned in Section 2.1.2.3, guidance systems will improve the accuracy of vehicle alignment with stop platforms for boarding and alighting.

2.1.2.5 Transit Signal Priority

BRT vehicles will have transit signal priority (TSP) at a number of signalized intersections along the BRT corridors as part of the City-wide implementation of smart traffic signals. Details on the Intelligent Transportation Systems (ITS) and TSP are provided in Section 2.2.9.5.

2.1.3 Streetscape Elements

The Rapid Transit Corridor, Downtown and Transit Village streetscape design is informed by existing policy documents, as discussed in Section 1, as well as best practices, guidelines, and standards, including AODA and street trees planting requirements.

According to The London Plan, Rapid Transit Boulevards have a planned right-of-way of 50 m and are eligible to incorporate streetscape design elements such as cycling facilities, sidewalks, street trees, street furniture, pedestrian scale lighting, landscape planters, grass boulevards, enhanced cross-walk treatments and low impact development to treat storm runoff. The London Plan also defines the street classification Rapid Transit Boulevard to include a very high-quality pedestrian realm, and a very high standard of urban design.

As defined in the RTMP, the streetscape layout should uphold Complete Streets principles and best practices, as well as The London Plan’s vision for a Rapid Transit Boulevard. The streetscape also needs to respond to the present and future surrounding land uses, and available right of way. Through responding to the surrounding land use context, the streetscape can cater to the specific needs of the community.

The BRT corridors should respond to the corresponding Place Types outlined in The London Plan, as shown in Exhibit 2-4. As The London Plan describes, each Place Type provides a framework for “the range of permitted uses allowed, the expected intensity of development, and the envisioned built form that is intended within that given place type.” Through the following Place Type designations, the BRT corridors will aid in achieving the vision for the future of the City and ensure harmony with future uses.

---

1 Rapid Transit Corridors are the connectors between the Downtown and Transit Village Place Types that offer opportunities for people to live and work close to high-order transit.

2 The Downtown Place Type is the highest-order centre in the City allowing for the greatest height, and acting as a centre of commerce, culture and entertainment in London.

3 Transit Villages are to become highly-urban, transit-oriented environments that permit a broad range of uses and high-density developments.
Exhibit 2-5: Streetscape Characteristics by Place Type

<table>
<thead>
<tr>
<th>Place Type</th>
<th>Land Use Context</th>
<th>Right of Way</th>
<th>User Priority</th>
<th>Place-Making Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downtown</td>
<td>Downtown Mixed-use/ Commercial</td>
<td>Minimal and Non-Flexible</td>
<td>Transit and Pedestrian</td>
<td>Lively Public Realm and Destination</td>
</tr>
<tr>
<td>Transit Village</td>
<td>Future Development</td>
<td>Flexible</td>
<td>Multi-Modal Transportation</td>
<td>Vibrant Community Hub</td>
</tr>
<tr>
<td>Rapid Transit Corridor</td>
<td>Intensification</td>
<td>Varies</td>
<td>Multi-Modal Transportation</td>
<td>Vibrant Corridor</td>
</tr>
<tr>
<td>Institutional</td>
<td>Geometry of this cross section is to be developed in consultation with Western University</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An overview of the streetscape elements to be incorporated along the BRT corridors is provided in Section 2.2.7, with further details provided in the Streetscape Elements Report included as Appendix C, including general guidelines for their proposed geometry at stop areas/intersections. Specific contextual conditions and relevant plans and policies will also be taken into account while employing these guidelines. Where a Place Type outside of the four listed is located directly adjacent to the BRT corridor, the guidelines and policies set out in the London Plan, Urban Design Guidelines, and Secondary Plans will be used to inform the streetscape design and all future development.

### 2.1.4 Rapid Transit Stops

Rapid Transit stops are an important place where passengers transition to and from Rapid Transit to other transit routes, or to other modes of transportation. A conceptual stop design was developed with input from City staff, stakeholders and the public, as included in this report. The following sections describe the design criteria. Further details regarding the stop design are provided in Section 2.2.3, and the Stop Architecture report in Appendix D.

Building on the design principles established in The London Plan and the RTMP, and with input from the Stops and Streetscapes Workshop, held November 15, 2017, and stakeholder and public meetings (discussed in Section 5), the following design principles for the stops were established:

- **Design Excellence:** all elements to deliver a consistent elevated level of design and function appropriate for high-order transportation;
- **Sustainable:** resilient, easy to maintain with high quality materials;
- **Safe:** uncluttered, clear sightlines and intuitive to use with emergency call button;
- **Accessible:** supportive of all types of active mobility and universal accessibility; and,
- **Placemaking:** an uplifting passenger experience that establishes a positive connection to the surrounding urban context.
Two typical Rapid Transit stop layouts have been developed: typical centre platform and typical curbside platform. Each layout integrates the five design principles, and has the flexibility to accommodate a different number of passengers. For the curbside layout, multiple access points are provided, while defining the stop area from the sidewalk area.

Stop design elements include:

- **Platforms** are generally 150 mm high, 40 m long and 3.5 m wide. Curbside platforms will be integrated with the sidewalk. Centre platforms include an accessible ramp (1:20 slope) to the signalized intersection crosswalk;
- **Platfoms in the Downtown and other platforms shared with higher frequency local service** will be 80 m long to accommodate up to three buses at one time, which may include articulated and standard buses for both Rapid Transit and local transit routes;
- Centre platforms have splash protection at the rear of the platform facing general traffic, hand railings, and a concrete wall to protect people using the platform, which doubles as a space to run cables and wiring;
- The canopy and platform elements do not need to extend the entire length of the platform in all cases. Ridership numbers will help determine the extent; and,
- A standard design featuring consistent components is important for a more cost-effective manufacture, easier installation and maintenance.

The development of the conceptual BRT stop design, detailed in Section 2.2.3, can be summarized as:

- **Legible design approach**: The hierarchy of the elements, as well as the clear organization of the elements in a logical sequence, is key for the passenger to be able to navigate their transition from the platform to another mode of transportation. Refer to stop layout for how these elements have been organized in plan;
- **Welcoming design**: wide access and waiting areas with a clear connection to the street and surrounding areas;
- **Sense of ownership**: Shelter design for the BRT network is to be unique so it provides a sense of identity and pride to Londoners. Stops will incorporate heritage material so the history of London is reflected in the shelters and it becomes part of their current history. Similarly, the inclusion of public art is a great way to enhance the waiting experience and get the community involved; and,
- **Maintenance**: Consistent with the vision of sustainability, materials should be robust and easy to maintain and wash. This includes concealed fasteners and conduits to discourage vandalism. The platform will be free of obstacles with a curb so it is easy to sweep and remove snow. A maintenance program should be implemented during detail design.

### 2.1.5 Intelligent Transportation Systems (ITS)

The use of ITS technologies will support the BRT network in achieving the goals of providing safe, reliable, efficient, environmentally friendly, and attractive transit service.

User needs were identified based on a review of the RTMP, the 2015 LTC Route Structure and Service Guideline, public consultation and the LTC Technology Plan. The user needs identified are listed below, and the resulting ITS strategy is provided in Section 2.2.9.

Further details are provided in the ITS Strategy Report, included as Appendix E3.

1. A safe and secure environment for RT operators and passengers across the RT system;
2. Safe and sufficient last mile access to and from the RT stops for all passengers;
3. A fast, frequent, and reliable RT system to make RT a competitive mode of transportation against the auto mode of travel;
4. Strategic road corridor optimization and enhancements in order to support the RT system;
5. Provide a high quality transit ride;
6. Increase the carrying capacity of the City’s roadways;
7. Reduce greenhouse gas emissions across the City;
8. Encourage active transportation modes in the City to promote public health and reduce the environmental impact of transportation; and,
9. Improve the safety of the roadways in the City for all users (including pedestrians, cyclists, motorists, and transit users).

In order to address changing traffic patterns, to support rapid and local transit, to manage congestion and to move traffic more efficiently, the City has identified a need for new traffic signal system technology. In addition to supporting BRT, new traffic signal system technology can help to alleviate existing traffic problems by continuously adjusting to changing traffic volumes, improving travel time reliability, and reducing congestion along major arterials. In October 2017, the City initiated a study to define needs for a City-wide Intelligent Transportation System, and prepare for the procurement and implementation of the system. This procurement is expected to be completed prior to implementation of BRT.
2.2 Preferred Design

2.2.1 BRT Routes and Stop Locations

Two operational routes make up the BRT Network: North-and-East and South-and-West. These two routes will have 38 stops in total, spaced between 400 m and 1100 m apart, with an average spacing on all corridors of 705 m. The Business Case accounted for both routes operating from 6 a.m. to 12 a.m. (midnight), seven days a week. Operations will be reviewed annually as part of the LTC service review.

The North-and-East Route, as shown in Exhibit 2-6 will have:
- 21 stops including the Central Transit Hub;
- Average stop spacing of 655 m, with a minimum of 400 m and maximum of 1000 m;
- Buses every 5 minutes in both directions during a.m. and p.m. weekday peak periods, and every 10 minutes during off-peak periods; and,
- Turnarounds off-street at Masonville Place in the north, and off-street at Fanshawe College in the east.

The South-and-West Route, as shown in Exhibit 2-7, will have:
- 18 stops including the Central Transit Hub;
- Average stop spacing of 750 m, with a minimum of 400 m and maximum of 1100 m;
- Four stop locations in the Downtown Couplet;
- Buses every 10 minutes in both directions during peak and off-peak periods;
- A turnaround using Capulet Lane at Oxford Street West in the west with a BRT stop, and a turnaround using Holiday Avenue at Wellington Road without a BRT stop in the south; and,
- A planned park-and-ride lot, south of Exeter Road near Bessemer Road, will provide an additional way to access the network from local transit service and for drivers to park their cars near Highway 401.

The Central Transit Hub refers to the curbside platforms located at the intersection of Wellington Street and King Street in downtown London. This is the only location where all four directions of travel on the Rapid Transit network are possible. The platform on the northeast corner will serve northbound and westbound Rapid Transit buses. The platform on the southwest corner will serve eastbound and southbound Rapid Transit buses. Both platforms will also serve a number of local transit routes with standard or articulated buses.
An additional Rapid Transit interchange stop is provided at Queens Avenue and Clarence Street, where the curbside platform, located on the north side of the intersection, will serve both westbound and northbound buses. The centre platform will serve southbound buses.

The configuration of both routes are summarized in Exhibit 2-8.

### Exhibit 2-8: Rapid Transit Stops and Spacing

<table>
<thead>
<tr>
<th>North-and-East Corridor (North to Downtown to East)</th>
<th>Distance from previous stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masonville Place (Terminus)</td>
<td></td>
</tr>
<tr>
<td>Western Rd at Richmond St</td>
<td>650 m</td>
</tr>
<tr>
<td>Western Rd at Hospital Driveway</td>
<td>715 m</td>
</tr>
<tr>
<td>Western Rd at Elgin Rd</td>
<td>400 m</td>
</tr>
<tr>
<td>Western Rd at Lambton Dr</td>
<td>480 m</td>
</tr>
<tr>
<td>Lambton Dr / Perth St at University Dr</td>
<td>750 m</td>
</tr>
<tr>
<td>Richmond St at University Dr</td>
<td>750 m</td>
</tr>
<tr>
<td>Richmond St at Victoria St</td>
<td>680 m</td>
</tr>
<tr>
<td>Richmond St at Grosvenor St</td>
<td>480 m</td>
</tr>
<tr>
<td>Richmond St at Oxford St</td>
<td>500 m</td>
</tr>
<tr>
<td>Clarence St at Central Ave</td>
<td>700 m</td>
</tr>
<tr>
<td>Clarence St at Queens Ave</td>
<td>500 m</td>
</tr>
<tr>
<td><strong>Central Transit Hub (King St at Wellington St)</strong></td>
<td>450 m</td>
</tr>
<tr>
<td>King St at Colborne St</td>
<td>500 m</td>
</tr>
<tr>
<td>King St at Adelaide St</td>
<td>700 m</td>
</tr>
<tr>
<td>Ontario St at King St</td>
<td>900 m</td>
</tr>
<tr>
<td>Dundas St at McCormick Blvd</td>
<td>1100 m</td>
</tr>
<tr>
<td>Dundas St at Highbury Ave</td>
<td>650 m</td>
</tr>
<tr>
<td>Highbury Ave at LPH access</td>
<td>950 m</td>
</tr>
<tr>
<td>Highbury Ave at Oxford St</td>
<td>400 m</td>
</tr>
<tr>
<td>Fanshawe College (Terminus)</td>
<td>500 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>South-and-West Corridor (West to Downtown to South)</th>
<th>Distance from previous stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capulet Ln north of Oxford St W (Terminus)</td>
<td></td>
</tr>
<tr>
<td>Wonderland Rd and Oxford St W</td>
<td>EB 720m / WB 620 m</td>
</tr>
<tr>
<td>Oxford St at Beaverbrook Ave</td>
<td>1000 m</td>
</tr>
<tr>
<td>Oxford St at Cherryhill Blvd</td>
<td>450 m</td>
</tr>
<tr>
<td>Oxford St at Wharncliffe Road</td>
<td>1000 m</td>
</tr>
<tr>
<td>Wharncliffe Rd at Riverside Dr</td>
<td>1000 m</td>
</tr>
<tr>
<td>EB: King St at Talbot St / WB: Queens Ave at Talbot St</td>
<td>EB 1100m / WB 900 m</td>
</tr>
<tr>
<td>EB: no stop / WB: Queens Ave at Clarence Ave</td>
<td>EB 550m / WB 400 m</td>
</tr>
<tr>
<td><strong>Central Transit Hub (King St at Wellington St)</strong></td>
<td>EB no stop / WB 500 m</td>
</tr>
<tr>
<td>Wellington St at Horton St</td>
<td>450 m</td>
</tr>
<tr>
<td>Wellington St at South St</td>
<td>550 m</td>
</tr>
<tr>
<td>Wellington Rd at Bond St</td>
<td>850 m</td>
</tr>
<tr>
<td>Wellington Rd at Base Line Rd</td>
<td>900 m</td>
</tr>
<tr>
<td>Wellington Rd at Commissioners Rd</td>
<td>400 m</td>
</tr>
<tr>
<td>Wellington Rd at Wilkins St</td>
<td>800 m</td>
</tr>
<tr>
<td>Wellington Rd at Southdale Rd</td>
<td>950 m</td>
</tr>
<tr>
<td>Wellington Rd at Montgomery Gate</td>
<td>500 m</td>
</tr>
<tr>
<td>White Oaks (Terminus)</td>
<td>950 m</td>
</tr>
<tr>
<td><strong>Average (All Corridors)</strong></td>
<td><strong>705 m</strong></td>
</tr>
</tbody>
</table>
2.2.2 Site Specific Design Considerations

Nine focus areas (Exhibit 2-9) were identified in the RTMP. These areas were highlighted due to the complex nature of the design decisions that had to be made, which warranted additional design review and consultation in order to identify a preferred design. During the design development, the original focus areas were revised and some additional areas added to the list.

The preferred design for these areas is described in the following sections, and design plates for the entire BRT network are provided in Appendix A:

1. North Turnaround;
2. Western University;
3. Richmond Street North;
4. Richmond Row;
5. Downtown;
6. Wellington Road Curve;
7. Wellington Road South;
8. South Turnaround;
9. Dundas Street;
10. East Turnaround;
11. Oxford Street West from Platt’s Lane to Wharncliffe Road; and,
12. West Turnaround.

2.2.2.1 North Turnaround

The north turnaround is located near the intersection of Richmond Street at Fanshawe Park Road. Traffic and transit operations through the intersection of Richmond Street and Fanshawe Park Road is currently constrained during peak periods, and the City is conducting a separate environmental assessment to improve this intersection.

There is an existing transit terminal (Masonville Terminal) located off-street in the Masonville Place west parking lot. Buses access the terminal from Richmond Street and from Fanshawe Park Road mixed with traffic generated by the mall.
Various options for on-street platforms and off-street terminals were considered. The preferred design is to expand the existing off-street terminal to the north to best integrate local service with BRT buses.

The north turnaround is located within the Transit Village Place Type. The London Plan’s policies encourage high-density, mixed-use developments in the Transit Villages to transform these areas into highly-urban, transit-oriented environments. To achieve this vision, future opportunities to integrate the turnaround with transit-oriented development will be sought.

The preferred design:
- Offers the most reliable BRT service;
- Provides the most balanced walking distance to existing and future developments;
- Allows for easy transfers from local to Rapid Transit service;
- Has a lower cost than a new terminal; reducing throw away costs;
- Is the easiest to implement for opening day; and,
- Allows for integration of Rapid Transit with future Transit Village development.

2.2.2.2 Western University

Various options were considered for routing, lane configurations, and stop locations in consultation with Western University. The preferred design follows existing private roads on campus: Lambton Drive and University Drive.

Centre-running BRT lanes will approach campus from the north along Western Road. From the Richmond Street and Western Road intersection to the Lambton Drive university access, the BRT lanes will continue as centre-running, with two lanes of through traffic maintained in each direction. There will be far side platforms for the stops at Elgin Road and the University Hospital driveway, and two platforms on the north side Western Road at Lambton Drive. These stops also serve Huron University College and Brescia University College.

From Western Road to Alumni Circle, the BRT lanes will be centre-running, with one lane of general traffic in each direction, and the existing landscaped boulevard generally maintained. East of Alumni Circle, based on Western University’s on-going Open Space Strategy of their Campus Master Plan, Lambton Drive may become restricted to BRT and authorized campus vehicles only. Limited local service may be allowed to serve the hospital. The Alumni Circle roundabout will remain, and provide turnaround movement for general traffic back to Western Road.

At the intersection of Lambton Drive and University Drive there will be a stop with both platforms on the south side of the intersection. The BRT lanes will turn east onto University Drive, and continue over the University Drive bridge. The cycle track west of the intersection will continue into bike lanes on either side of the BRT/authorized vehicle lanes.

East of Sunset Drive, University Drive will be widened and transition to a centre-running BRT configuration with one general traffic lane on each side. Bike lanes will be maintained along University Drive from the bridge to Richmond Street, and some additional street parking/loading areas will be added along both the north and south sides. The Sunset Drive intersection will be realigned and provide turnaround movements for general traffic.

The concrete structures of the University Gates will be preserved and moved to accommodate the widening of University Drive at Richmond Street. The stop will be located just inside the gates on University Drive with two platforms, along with one westbound lane, an eastbound right-turning lane, and an eastbound left-turning lane.

The preferred design:
- Offers the most reliable BRT service;
- Offers direct BRT connections at either end of campus serving students, faculty and staff for both main campus and the affiliate colleges; and,
- Supports a reduction of car traffic on the Western University campus, consistent with Western University’s Open Space Strategy.

2.2.2.3 Richmond Street North

The Richmond Street North focus area is located on Richmond Street from University Drive to Oxford Street East. The preferred design for this section of Richmond Street will have two centre-running BRT lanes, with one general traffic lane in each direction.

Various options were considered for lane configurations with consideration for constraints. The recommended design reflects balancing impacts on the neighbourhood, with reliable service and managed traffic flow. It offers the most reliable BRT service, fewer impacts to trees, less property impacts than the 4 traffic lane options, safer design, and a lower cost.

Left-turn lanes will be included at all signalized intersections, and right-turn lanes will be included at some intersections, where appropriate based on traffic demand and/or the need for a local bus bay.

Far-side platforms will be used for stops at Victoria Street and Grosvenor Street. Both platforms will be on the north side for the Oxford Street stop due to the narrow ROW south of the intersection.

The preferred design:
- Offers the most reliable BRT service;
- Has fewer impacts to trees;
- Has limited impacts to property;
- Offers safer conditions for drivers due to protected left turns;
- Offers the most efficient option for winter maintenance and waste removal; and,
• Offers emergency services the opportunity to use BRT lanes.

In response to concerns raised during the RTMP over converting existing through lanes to dedicated bus lanes on Richmond Street, the area was studied with enhanced traffic modelling. The model considered the larger area from Masonville to south of Oxford Street accounting for other parallel improvements planned by the City, such as removing the bottleneck on Western road at the Rail bridge, plans for an underpass at the Adelaide rail crossing and closure of through traffic across University Drive bridge. The modelling demonstrated a decrease in traffic volumes on Richmond Street, reflecting increased options for north-south movement into the core that comes with removal of bottlenecks on parallel roads.

Today, there are two lanes in each direction on Richmond Street, but there are no left or right turn lanes, and buses frequently stop in the curb lane, which obstructs through-lane traffic. The design for BRT in this corridor will include both turning lanes and local service bus bays, to ensure the single through lane provided in each direction will be free flowing.

2.2.2.4 Richmond Row

The Richmond Row focus area is located along Richmond Street between Oxford Street East and Central Avenue.

Both centre-running and curbside options were considered. Widening to maintain two lanes of general traffic in each direction was deemed unfeasible due to property constraints. Therefore, the preferred design for this section of Richmond Street will have two centre-running BRT lanes, with one general traffic lane in each direction. The recommended design provides for reliable BRT service, while maintaining important on street parking and loading areas. Due to the constrained ROW, dedicated left turn lanes will only be provided at Pall Mall Street and Oxford Street.

The preferred design:
• Offers the most reliable BRT service;
• Has the potential to accommodate some on-street parking and loading in the form of bays;
• Offers consistency with transit lane configuration north of Oxford Street;
• Offers the most efficient option for winter maintenance and waste removal; and
• Offers emergency services the opportunity to use BRT lanes.

2.2.2.5 Downtown

The Downtown Couplet

The Couplet focus area includes Queens Avenue, King Street, Ridout Street, Clarence Street and Wellington Street. As defined in the RTMP, these streets create a “couplet” operation for the BRT routes. This operation will be integrated with local transit service that will share the BRT platforms and dedicated transit lanes:

- Queens Avenue: one dedicated transit lane on the north side, for westbound buses;
- Ridout Street: one dedicated transit lane on the west side, for southbound buses;
- King Street: one dedicated transit lane on the south side, for eastbound buses;
- Clarence Street: one dedicated transit lane on the west side, for southbound buses; and,
- Wellington Street: one dedicated transit lane on the east side, for northbound buses.

The Downtown Couplet includes the following six BRT platforms, serving buses travelling in the directions noted:
• Queens at Clarence – westbound & northbound;
• Clarence at Queens – southbound;
• Queens at Talbot – westbound;
• King at Talbot – eastbound;
• King at Wellington – eastbound & southbound; and,
• Wellington at King – westbound & northbound.

The impacts to traffic, on-street parking, and loading and associated mitigation measures are described in Section 4.

Forks of the Thames

The Forks of the Thames focus area includes the Queens Avenue Bridge, which currently provides two one-way westbound traffic lanes from Queens Avenue to Riverside Drive, with a sidewalk on the both sides and a westbound bike lane.

Various options were considered for the reconfiguration of this bridge to accommodate dedicated transit lanes, active transportation facilities, and maintain the movement of general traffic on this important link over the Thames River. Due to the current age and design of the Queens Avenue Bridge, the preferred option is to widen the deck and reconfigure the space to accommodate two curb-running BRT lanes (one eastbound, one westbound), and maintain two lanes of westbound traffic. The sidewalk on the north side of the bridge will be maintained. The westbound bike lane and the south sidewalk will be removed to accommodate the BRT lanes.

The preferred design:
• Offers reliable BRT service;
• Minimizes environmental impacts to the Thames River due to re-use of existing bridge piers; and,
• Maintains westbound traffic flow on this important link over the Thames River.
2.2.2.6 Wellington Road Curve
The Wellington Road Curve focus area is located along Wellington Road south of the crossing of the Thames River to Base Line Road. This section of the road has an existing reverse horizontal curve which requires improvement.

Various alignments and configurations were considered for this section of Wellington Road. The preferred design is to lengthen the horizontal curves, improving the safe movement of all vehicles. The road will have two centre-running BRT lanes, and maintain two general traffic lanes in each direction.

The preferred design:
- Offers safer movement of all vehicles due to longer horizontal curves and protected left turns;
- Has fewer impacts to trees;
- Offers the most efficient option for winter maintenance and waste removal; and,
- Reduces grading impact to the existing Lutheran Church, and avoids impact to the Anglican Church’s primary place of worship.

2.2.2.7 Wellington Road South
The Wellington Road South focus area is located south of Base Line Road to Bradley Avenue. Both curbside and centre-running BRT lanes were considered for this section of the south corridor. The preferred design is to have two centre-running BRT lanes.

The preferred design:
- Offers the most reliable BRT service;
- Reduces potential for conflict between general traffic and transit; and
- Offers the most efficient option for winter maintenance and waste removal.

2.2.2.8 South Turnaround / Park-and-Ride
Today, there are existing bus stops for local transit located off-street within the White Oaks Mall property mixing with traffic generated by the mall.

Various options for on-street platforms and off-street terminals were considered. The preferred design is to replace the existing stops on the mall property with on-street integrated RT/local service platforms on Wellington Road at the existing signalized access. The platforms are extended to accommodate both local and BRT bus stops.

Buses, including BRT and the local service, will continue south from these platforms into mixed traffic and turn around using Holiday Avenue and a new transit-only driveway from Holiday Avenue to Wellington Road at an existing signal for the Wellington Commons commercial area. A bus lay-by will be provided for scheduling and driver break purposes. The provision of a driver facility has been identified at the Holiday Avenue turnaround.

To maximize transit route flexibility, a new off-street park-and-ride facility on the south side of Exeter Road at Bessemer Road is also proposed. Buses will operate in mixed traffic on Wellington Road and Exeter Road to the existing signal at Bessemer Road. A driver facility is also planned at this location. The City is working with the Ontario Ministry of Transportation, Hydro One, and UTRCA to develop the park-and-ride on Exeter Road.

The preferred design:
- Best facilitates transfers from local to Rapid Transit service near White Oaks Mall;
- Offers simple operation for up to 6 local routes and BRT service to turn around using Holiday Avenue and the existing signalized access;
- Maximizes transit route flexibility with both the Holiday Avenue turnaround and the park-and-ride facility;
- Allows for integration of Rapid Transit with future Transit Village development; and,
- Allows for the provision of a driver facility at this end-of-route.

2.2.2.9 Dundas Street
The Dundas Street focus area covers the portion of Dundas Street from Ontario Street to Highbury Avenue, and includes area within the Old East Village Community.

Various options for routing, lane configurations and stop locations were considered. The preferred design for this area is to have two curb-running BRT lanes on Ontario Street, and two centre-running BRT lanes on Dundas Street. One general traffic lane will be maintained in each direction.

Curb-running BRT along Dundas Street was determined to result in significant conflicts with the underground high voltage hydro facilities, resulting in considerable costs and schedule risk. As such, a centre-running BRT configuration will be used on this section of Dundas Street.

The recommended design also reconfigures Ontario Street from King Street to Dundas Street to two-way traffic and incorporates a traffic signal, which will support future redevelopment in this vibrant growing community.

The preferred design:
- Offers reliable BRT service;
- Minimizes potential impacts on underground utilities; and,
- Minimizes potential impacts to existing properties.

2.2.2.10 East Turnaround - Fanshawe College
There is an existing off-street terminal (Fanshawe College Terminal) located on London Lane, a private street within the Fanshawe College campus. Buses access the terminal...
from Oxford Street East. Other bus stops are located near Building F, accessing campus from Second Street.

Various options for on-street platforms and off-street terminals were considered. The preferred design is to create a new integrated off-street terminal for BRT buses and local transit on Fanshawe College property, just west of Fanshawe College Boulevard. Buses will enter the site at a new signalized intersection, and turn around before stopping at one of several bays.

The design also include provision for on-street platforms on Oxford Street East, to protect for future extension of the BRT network to the east.

This design consolidates existing transit routes to one location, and provide the best transfer from local service to the BRT. The new driveway into the campus, and bus turnaround, will be for transit-only. Both BRT and local service will be consolidated into an updated terminal located at London Lane just east of its current locations.

The preferred design:

- Offers the most reliable BRT service;
- Allows for easy transfers from local to Rapid Transit service;
- Reduces pedestrian crossings of Oxford Street East;
- Offers direct connections for Fanshawe College students, faculty and staff to the BRT network;
- Offers direct connections to local service, serving the east end of London and;
- Maintains local transit service to the airport, which can be expanded in the future.

### 2.2.2.11 Oxford Street West – Platt’s Lane to Wharncliffe Road

The Oxford Street West focus area includes Platt’s Lane to Wharncliffe Road. Overall, centre-running BRT lanes are the preferred configuration for Oxford Street West. Various options were considered for lane configurations on this segment, with consideration for property constraints, utilities and grading.

For westbound buses, the preferred design is a centre-running dedicated transit lane for westbound buses with two lanes for general traffic. For eastbound buses, Transit Signal Priority at Platt’s Lane and a transit-only receiving lane provides a queue-jump for buses to transition into two lanes of mixed traffic. A dedicated curbside transit lane is developed on approach to Wharncliffe Road to serve a curbside platform for eastbound BRT.

The preferred design:

- Offers the most reliable BRT service;
- Reduces potential for conflict between general traffic and transit;
- Has balanced impacts to property, utilities and trees with transit and traffic operations; and,
- Offers the most efficient option for winter maintenance and waste removal.

### 2.2.12 West Turnaround

The west turnaround is located near the intersection of Oxford Street West and Wonderland Road.

There is an existing on street turnaround used by LTC buses on Capulet Walk and Capulet Lane, north of Oxford Street West, just west of Wonderland Road. There is also an existing bus stop on Capulet Lane.

Various options for on-street platforms and off-street terminals were considered. The preferred design is to expand and formalize the existing transit stop and turnaround on Capulet Lane, south of Capulet Walk. One southbound platform will be provided on the west side of Capulet Lane to serve both local and BRT buses.

To access the turnaround, westbound buses will merge into mixed traffic on Oxford Street west of Wonderland Road, and turn onto Capulet Walk and then onto Capulet Lane and access the platform. There will also be a bus driver facility at this location.

From the stop on Capulet Lane, the BRT buses would continue south in mixed traffic, turn left onto Oxford Street West, then continue into the centre-running BRT Lanes.

The preferred design:

- Offers the most reliable BRT service;
- Provides an additional Rapid Transit stop that shortens the walking distance to existing high density residential area;
- Allows for easy transfers from local to Rapid Transit service;
- Has a lower cost than a new terminal; reduces throw away costs;
- Is the easiest to implement for opening day;
- Allows for integration of Rapid Transit with future Transit Village development; and,
- Allows for the addition of a driver facility at this end-of-route.

### 2.2.3 BRT Stop Design

#### 2.2.3.1 Conceptual Platform Design

The conceptual stop design focuses on providing a safe, efficient, intuitive and accessible experience. Right-hand-flow principles have been implemented to organize the standing and resting areas on the right, with a progression of activity to the left, or edge, of the platform. Right-hand-flow principles are standard good practice of passenger flow models.
for transit, where passengers tend to stop to the right to either pause on their journey or access service areas, such as maps, while other passengers can continue on the left.

The platforms have been organized to follow a logical sequence for passengers arriving and departing for efficient navigation. As illustrated in Exhibit 2-10, the elements have been organized into three main areas:

1. Entrance area;
2. Waiting area; and,
3. Boarding area.

The entrance area is the first section a passenger reaches after accessing the stop from the ramp or sidewalk. This area may also be used for boarding if two buses are at the platform at once. This area features a low signage wall featuring the name of the stop.

The waiting area may include a fully transparent glazed enclosure with door openings, providing a fully enclosed area for passengers to wait, protected from wind and precipitation, with the option of including a source of heat. The area will have a bench and a designated accessible seating area. The layout allows for enough corridor space so that passengers can go directly to the next area or board/exit a bus if needed.

Shelter design can be customized depending on ridership volumes at the stop. For example, as illustrated in Exhibit 2-10, the waiting area could be an open waiting area, with or without a canopy, windscreens or sidewalls to provide weather protection.

The boarding area includes benches, waste receptacles and leaning bars. This is the space of the platform that will be most frequented. The area will feature a low signage wall, similar to the wall at the entrance area, which can serve as a communications and systems’ closet, if required.

The functional layout has been designed to adapt to the needs determined in the next design phase. Wall amenities were consolidated onto two solid panels centrally located on the entrance and boarding areas. This design will maximize glazing and visibility along the platform and keep services clearly organized for the passenger.

The columns have been spaced every 3.6 m within a 1.2 m module so glazing and solid panels remain the same size. This design is cost efficient and easy to store and replace.

**Exhibit 2-10: Typical Functional Plan Layout of the Platform (Not to Scale)**

2.2.3.2 Shelter Design Concept

The design of the shelter seeks to provide an iconic stop with a strong functional layout easy to maintain. The platform floor will be flat, smooth finished and free of obstacles, to maximize passenger flow. The backpanel provides the main structural support, while accommodating all amenities, resulting in a stop that is easy to read and intuitive to use.

With this organized layout at grade, it is the canopy that provides an opportunity for variation by “angling up and down” echoing the residential gabled roofs of London.

During the design process several canopy variations were explored until a more rationalized solution to highlight the three main areas of the platform: entrance, waiting and boarding.
Exhibit 2-11: Concept Study for Canopy Design

The canopy folds at the entrance with a large fold at the edge signaling and celebrating the transition from the street. This section of the canopy will be the most iconic and recognizable part of the shelter. The canopy continues flat along the enclosed area (no canopy with the open option). The canopy folds again, though with fewer creases, indicating and closing off the extent of canopy within the boarding area.

This design feature on the canopy will be the same for all shelters along the line, so passengers will be able to identify the stops throughout the City. This concept establishes a unique identity for London’s new transit of a higher order, which is consistent with the vision of Design Excellence. It will create a consistency along the line, while guiding the passenger through the platform. Exhibit 2-12 and Exhibit 2-13 illustrate the stop design concept with both an enclosed and open area, respectively.

For Rapid Transit passengers, the gabled areas of the canopy at the entrance and end of canopy, will be able to announce and anticipate the arrival to the stop. Overall it will be an uplifting passenger experience where amenities are clearly organized at grade, with maximized transparency to the street, and a canopy giving new meanings to the urban environment as well as adding to the civic brand of London.

Exhibit 2-12: Concept Render for Stops – with Enclosed Area

Exhibit 2-13: Concept Render for Stops – with Open Area

2.2.3.3 Amenities

The design of the shelter shows all wall amenities consolidated on two main solid backpanels, the next bus arrival information hanging from canopy ceiling for best view, and seating to be supported by the back curb. There is enough head clearance (3.5 m) from the underside of the soffit to hang other elements such as signage and/or additional information panels. Conduits shall be concealed by embedding them along the back curb of the centre platforms acting as a “spine” and for curbside platforms they shall also be embedded on this curb and the floor where interrupted for passenger access. These conduits can go up/down the solid panels and columns to the canopy structure with the lighting and signage.
Exhibit 2-14 shows a summary of the amenities and design considerations deemed a priority for the City and the Public. This information was collected during the various public events hosted by the City.

Exhibit 2-14: Top Amenities and Design Principles Collected from City and Public workshops

- Protection from the weather.
- Adequate lighting.
- Provide map information.
- Enclosed heated area.
- Protection from road splashes.
- Next bus information panel.
- Resilient, high quality materials.
- Designated areas with adequate corridor widths for accessibility.
- Area for Public Art or Heritage.
- Provide seating.
- Ease of maintenance from platform side.
- Panel separations to be transparent with a distraction pattern.
- Canopy design contemporary and unique.
- Advertising panels for additional revenue.
- Provide space for conduits.
- Supportive of all types of mobility.

2.2.3.4 Accessibility

The following platform and shelter design elements have been considered to assist in spatial orientation, as well as to follow AODA accessibility guidelines, London Accessibility Guidelines, and typical universal design strategies for transit design:

- **Stops access and circulation path:** the pedestrian route to reach the platform area is clear and simple by having it at right angles with the crosswalks. The main access will be clearly signalized and as close as possible to the intersection. Typical access to centre platform stops is illustrated in Exhibit 2-15;
- **Platform access and circulation path:** the platform area complies with the AODA minimum 1.5 m of unobstructed exterior corridors, 1.1 m for the enclosed area and the 1.7 m turning radius areas. There is also a minimum 3.0 m headroom below signage at all times. In addition, there are designated seating areas beside benches, so those with wheelchairs or travelling with a stroller or mobility device can stop beside a companion seated on a bench. All platform ramps will have a maximum slope of 1:20 to meet AODA requirements;
- **Floor finishes:** Non-slip concrete finish following AODA requirements. Contrasting tactile strip will act as the required guidance strip and to warn passengers of the ramp edge. The ramp should have a dark grey coloured concrete on its entirety to ensure passengers with visual impairment can anticipate the slope change. Additionally, wherever there is a Passenger Assistance Intercom on a backpanel, there shall be a textured and contrasting floor pad (1.0 m x 0.6 m approximately) so its location stands out to the visually impaired, as recommended by accessibility guidelines;
- **Protruding objects:** Objects are integrated onto the back wall to eliminate tripping hazards. Side panels and benches do not exceed the minimum height of 0.685 m for cane detectability;
- **Benches:** The benches should include high armrests for those who need assistance sitting down. The height of the seat shall be between 0.45 m and 0.48 m with a minimum 0.45 m depth. The backrest will be provided by the back panel or glazing; and,
- **Handrail:** A continuous handrail is provided on both sides of the ramp. The shape and colour of the handrail will be defined during detail design, to comply with accessibility guidelines.

Typical accessible features at stops are illustrated in Exhibit 2-16.
Exhibit 2-16: Accessibility Features of a Centre Platform

2.2.3.5 Illumination

In order for the platform to maintain clear sightlines and a clutter-free design, the lighting fixtures should be integrated onto the shelter canopy. This placement will keep shelter elements organized and the lighting out of reach for vandal-resistance. The Illuminating Engineering Society of North America (IESNA) minimum light levels should be satisfied in the detail design process.

The lighting design will have a uniform lighting level, while emphasizing the location of the fare information, passenger assistance equipment and the platform edge. The platform area should act as a beacon at night, but not create a glare on passengers, drivers or bus drivers. Lighting should be contained within the boundaries of the platform to avoid “light spills.” No up-lighting will be included to avoid wasting light and energy and adding light pollution.

2.2.3.6 Materials and Colour Considerations

- The materials’ palette will be developed during the next design phase in conjunction with the definition of BRT branding and naming. The following conceptual recommendations are provided based on good practice and universal standards for BRT.
- The platform floor should be concrete, which is a durable floor material and easy to maintain and repair. The concrete should be light coloured to enhance light during the day, and reduce light energy usage at night. A platform floor design for curbside platforms has been developed in particular for the Downtown stops. This concept will be refined during detail design and may be considered for centre platforms.
- Maximizing glazing panels on the back wall is recommended. Back wall panels that are solid are recommended to be a neutral colour to enhance light and to allow the platform amenities to stand out. The canopy colour can be customized, either at the soffit, the underside or the nose edge or some combination.
- Furniture selection, glazing specifications, canopy design and support columns are all considerations during detail design that have associated cost implications.

2.2.3.7 Rapid Transit Stop Customization

While the Rapid Transit stops are to be easily identifiable and consistent, there are some elements that can be customized to suit a specific location, including:

- Art and location-specific information (i.e. maps);
- Platform length to accommodate additional buses, as described above;
- Extent of the stop amenities, such as sheltered area, length of the canopy, size and presence of the enclosed heated area, and height and number of glass panels along the back of the platform. For curbside platforms, some panels are recommended to be open to allow pedestrians to access the platform at multiple locations along the length and not just from the ends;
- Placement and amount of furniture such as benches, leaning bars, and waste bins;
- The colour of certain elements can be modified through wraps or paint such as the underside of the canopy and the back wall panels, however, it should not take away from the overall brand and identify of the Rapid Transit system;
- Amount of bicycle parking, which will be provided within the boulevard, not on the centre platform; and,
- Width of the curbside platform, which could be integrated with the sidewalk in space-constrained areas where passenger volumes are expected to be lower.

2.2.3.8 Heritage and Public Art

Heritage plays an essential role in preservation and on the ongoing creation of the cultural identity of a community. Public feedback showed that Londoners wanted heritage to be reflected in the stop design. At the same time, Londoners want a contemporary design that will contribute to tomorrow’s heritage. Exhibit 2-17 proposes four options of acknowledging the shared stories and images of the City of London into the shelter design:

1. Natural heritage image on back panel;
2. Historic photo/image on back panel;
3. Story/Event text imprinted on the paving; and,
4. QR code to access video and audio.
Exhibit 2-17: Options to integrate Heritage or Public Art into BRT Stops

Public art should be included in the detail design process to allow some or all stops to be customized. Public art could be integrated into the glazing and/or the platform floor area of the Rapid Transit stops. As noted in the conceptual design, there is the potential for the low entrance concrete wall with the name of the stop to be developed with input from a local artist. The earlier an artist or group of artists is engaged, the more likely customized features will be able to be integrated into the architectural design. It may be beneficial to consolidate the public art and heritage onto the same piece.

The conceptual design of the shelter acknowledges heritage by reflecting the gabled roof typology of many of London’s houses, which was identified during the public consultation process. Inspired by the peaks and valleys, the shelter canopy design folds up and down announcing the entrance and folds again at the opposite edge to indicate the other end, as illustrated Exhibit 2-18. This architectural gesture will become a welcoming contemporary element on the streetscape, while amplifying the importance of the Rapid Transit stop.

Exhibit 2-18: Studies of Canopy Design on Residential Contexts

2.2.3.9 Safety and Security

The stop design fosters a safe and secure environment by embedding principles from the “Crime Prevention Through Environmental Design” (CPTED) approach. This involves implementing a series of strategies to deter criminal activity at the outset of the project so it does not become a financial or maintenance burden.

The following lists the CPTED principles incorporated in the conceptual design:

- **Natural surveillance**: maximize visibility with transparent glazing, so passengers can see and be seen. No dark corners nor hiding places. Adequate illumination at night and a surveillance system visible to potential offenders; and,

- **Natural access control**: discourage access to dangerous or private areas by having the entrance and exit areas, as well as boarding areas clearly designated. Although there is one main entrance/exit for all platforms, there are differences for the centre and curbside stops. For the centre platform, to discourage jay-walking, a continuous guardrail is placed on the street side. There is also an end gate so the passenger does not have the option to leave the platform through the road area, only through the one exit that connects her/him safely to the street. For the curbside platform, there are several openings on the backpanel to encourage free movement between sidewalk and platform area so the passenger is not “trapped” unnecessarily. Typical curbside platform
access points are illustrated in Exhibit 2-19, and the typical centre platform was shown previously in Exhibit 2-15.

Exhibit 2-19: Curbside platform showing access points from the ends and the sides

2.2.4 Road Network and Traffic Management

For the majority (64%) of the network, the BRT lanes will be centre-running with traffic lanes on either side. There are also sections which will be either curb-running, dedicated or mixed-use. Exhibit 2-21 illustrates the BRT lane configurations for the network.

The centre-running BRT design incorporates a raised median in between the opposing BRT lanes, resulting in right-in and right-out only access for unsignalized side streets and driveways. Auxiliary left-turn lanes are provided at signalized intersections to accommodate U-turn traffic to access these driveways.

A review of auxiliary right-turn lanes was completed where existing lanes are converted to BRT. This assessment is detailed in Appendix E. Based on this review, auxiliary right-turn lanes were provided, with consideration for existing land uses. In areas with curbside transit lanes, including Downtown and on King Street, general traffic will be permitted to turn right from the dedicated transit lane.

On the majority of the proposed BRT network, dedicated BRT lanes will be added by widening the road, and the existing number of traffic lanes will be maintained. However, in some areas, due to existing constraints, dedicated BRT lanes are accommodated by converting a general traffic lane or an on-street parking lane. These changes to traffic capacity are illustrated in Exhibit 2-22. Of the 24 km network, only 5 km involve converting existing lanes of traffic to dedicated bus lanes.

The City is planning capacity and operational improvements to other arterial roads. These improvements will provide additional capacity to the network. It is expected that some drivers will adjust their travel patterns to use these parallel arterial roads.

The intersection of Richmond Street and Western Road will be realigned to become a three-way signalized intersection, as shown in Exhibit 2-20, where:

- Southbound traffic along Richmond Street will need to turn left to continue southbound on Richmond Street, or continue straight to go southbound on Western Road;
- Northbound traffic along Richmond Street will need to turn right to continue northbound on Richmond Street, or left to go southbound on Western Road;
- Northbound traffic along Western Road will continue straight to go northbound on Richmond Street, or turn right to go southbound on Richmond Street; and,
- BRT lanes will continue as centre-running lanes from Richmond Street to Western Road, with far side platforms for the stop at the intersection.

Exhibit 2-20: Western Road/Richmond Street Intersection Realignment
Exhibit 2-21: BRT Lane Configurations

Exhibit 2-22: Changes to Lane Configurations
### 2.2.5 Structures

There are existing structures along the corridor that require modification in support of BRT. Exhibit 2-23 provides a list of these structures and identifies the modifications required.

**Exhibit 2-23: List of Structures along the Corridors and Required Modifications**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Location</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>North Corridor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Road Bridge</td>
<td>Over Medway Creek, south of Windermere Road</td>
<td>Widening to the east to accommodate two dedicated Rapid Transit lanes and two 1.5 m bike lanes, while maintaining the existing general traffic lanes and sidewalks. Additionally, the grade of Western Road over the Medway Creek structure will be raised by approximately 300 mm, to be accommodated through the use of additional lightweight concrete on the existing structure. Work is required along the western limit of the structure to accommodate modifications to the sidewalk/bike lane configuration and parapet wall.</td>
</tr>
<tr>
<td>Western University Pedestrian Tunnel</td>
<td>Under Western Road north of Lambton Drive</td>
<td>The existing concrete box culvert structure will need to be widened by approximately 4.7 m to the east, and approximately 1.7 m to the west, to accommodate two dedicated Rapid Transit lanes and two multi-use pathways.</td>
</tr>
<tr>
<td>University Drive Bridge</td>
<td>University Drive on Western University’s campus, over the North Thames River</td>
<td>The existing bridge will be replaced. The new bridge will remain oriented along the same axis, but the overall footprint will be approximately 11.3 metres wider than the existing structure to accommodate the Rapid Transit lanes.</td>
</tr>
<tr>
<td><strong>East Corridor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highbury Avenue Bridge</td>
<td>Over CP Rail north of Dundas Street</td>
<td>The existing Highbury Avenue bridge will have to be widened by approximately 10.2 m to the west in order to accommodate the proposed BRT lanes. The widening would require modification to the embankment on the west side of the existing structure, and the introduction of retaining walls on both the south and north sides of the rail corridor to minimize the impacts of the widening on adjacent properties.</td>
</tr>
<tr>
<td><strong>South Corridor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CN Bridge</td>
<td>Wellington Street under the CN rail corridor, south of York Street and north of Horton Street</td>
<td>No changes to the existing bridge. Minor road widening will result in reconstruction of existing retaining walls on the south side of the CN bridge.</td>
</tr>
<tr>
<td>Queens Avenue Bridge</td>
<td>North bridge over the Thames River connecting Riverside Drive to Queens Avenue</td>
<td>Minor widening (approximately 0.4 m) to accommodate two-way BRT traffic in dedicated lanes, two westbound general traffic lanes and a sidewalk on the north side. The existing parapet wall, sidewalk and deck will be removed and replaced as part of the proposed construction. The bridge sub-structure is not impacted.</td>
</tr>
<tr>
<td>Mud Creek Culvert</td>
<td>Crosses Oxford Street West, east of Proudfoot Lane</td>
<td>As a result of the Mud Creek Subwatershed Environmental Assessment, Mud Creek will be realigned and a new crossing is proposed approximately 190 m east of the existing crossing. Oxford Street West is to be widened to accommodate two dedicated BRT lanes and wider sidewalks, as a result, the new skewed culvert will be sited to tie into the upstream channel section, and designed to accommodate the wider cross-section and slopes required to support the BRT works. This work will proceed independently in advance of the BRT project west leg.</td>
</tr>
</tbody>
</table>

### 2.2.6 Bicycle and Pedestrian Facilities

The BRT system is designed with key consideration given to “complete streets” principles, in recognition of the fact that every transit trip begins and ends with walking or cycling. The quality of this “first mile / last mile” is dependent on the integration of Rapid Transit with the active transportation network. Through the development of the BRT corridor, the quality of infrastructure for pedestrians and cyclists will be improved across the BRT network. These improvements can generally be grouped into three categories:

- Upgrades to existing sidewalks and enhanced amenities including furnishings and public art surrounding BRT stops to provide an improved pedestrian realm (refer to Section 2.2.7 for details);
- The bundling of new and upgraded cycling facilities with the delivery of the BRT corridor wherever possible; and,
- End-of-trip facilities for cyclists to further reinforce the first / last mile relationship between transit & bikes.

Bicycle posts and/or racks should be incorporated throughout the BRT corridors within the Planting and Furnishing Zone, clustering about popular destinations such as schools,
community and service centres, and retail. Bicycle parking shall be provided in close proximity to the BRT stops.

With respect to cycling facilities along the corridor, the starting point for the design was to incorporate existing or proposed cycling facilities into the design of the BRT corridor where the facility could be included without substantial negative impacts to property or natural features. The cycling master plan, London ON Bikes, provides a blueprint for the future of the cycling network, and provided the starting point for identifying the proposed cycling corridors. There are generally five possible outcomes along any of the BRT corridors with respect to cycling facilities:

- A cycling facility is proposed in the cycling master plan and can be accommodated through the design of the BRT. In these cases, the bundling of the proposed cycling facility with the BRT corridor is likely to accelerate the delivery of this cycling infrastructure;
- 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 has been added to the overall network to provide continuity to major destinations, or to tie into a connecting facility;
- 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 (refer to Section 4); and,
- A cycling facility is proposed 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 (refer to Section 4).

Exhibit 2-24 summarizes the cycling facilities that are proposed along BRT corridors and identifies their relationship with the cycling master plan and current network, as illustrated in Exhibit 2-25.

In addition to the inclusion of cycling facilities along BRT corridors, the design also protects for future cycling connections on the majority of intersecting signalized streets. The integration of these connections into the cycling master plan will be reviewed in a future study. Section 4 and Appendix A provide details on the cycling facilities and connections that are protected for in the preliminary engineering design. These elements will be refined in the next design phase including cyclist signals, pavement markings through intersections, bike boxes, and two-stage lift-turns for cyclists.

<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</td>
</tr>
<tr>
<td>North</td>
<td>Western Road</td>
<td>Lambton Drive to Richmond Street</td>
<td>Raised bike lanes</td>
<td>Upgrade of existing facility (on-road bike lane to raised bike lane)</td>
</tr>
<tr>
<td>North</td>
<td>Western Road</td>
<td>Richmond Street to Fanshawe Park Road</td>
<td>Raised bike lanes</td>
<td>Upgrade of existing facility (signed bike route with sharrow to raised bike lane)</td>
</tr>
<tr>
<td>East</td>
<td>King Street</td>
<td>Wellington Street to Rectory Street</td>
<td>Raised bike lane (eastbound)</td>
<td>Upgrade of existing facility (on-road bike lane to raised bike lane)</td>
</tr>
<tr>
<td>East</td>
<td>King Street</td>
<td>Rectory Street to Ontario Street</td>
<td>Raised bike lane (eastbound)</td>
<td>New cycling network link (not previously proposed in Cycling Master Plan) to improve network connectivity</td>
</tr>
<tr>
<td>East</td>
<td>Ontario Street</td>
<td>King Street to Dundas Street</td>
<td>Raised bike lane (northbound)</td>
<td>New cycling network link (not previously proposed in Cycling Master Plan) to improve network connectivity</td>
</tr>
<tr>
<td>East</td>
<td>Dundas Street</td>
<td>Ontario Street to Egerton Street</td>
<td>Raised bike lane (eastbound)</td>
<td>Upgrade of existing facility (signed bike route to raised bike lane)</td>
</tr>
<tr>
<td>East</td>
<td>Oxford Street</td>
<td>Highbury Avenue to First Street / Second Street</td>
<td>MUP (south side)</td>
<td>Upgrade of existing facility (in-boulevard facility/bike lanes to MUP)</td>
</tr>
<tr>
<td>South</td>
<td>Wellington Road</td>
<td>Front Street to South Street</td>
<td>MUP (east side)</td>
<td>New/upgraded barrier crossing</td>
</tr>
<tr>
<td>South</td>
<td>Wellington Road</td>
<td>Commissioners Road to Base Line Road</td>
<td>MUP (east side)</td>
<td>New cycling network link (not previously proposed in Cycling Master Plan) to improve access to Victoria Hospital &amp; commercial developments in the area</td>
</tr>
<tr>
<td>South</td>
<td>Wellington Road</td>
<td>Bradley Avenue to Commissioners Road</td>
<td>MUP (east side)</td>
<td>Proposed in cycling master plan</td>
</tr>
</tbody>
</table>
The Streetscape Elements Design strategy is provided in Appendix C. Segments of the BRT network will require a modified streetscape design to accommodate specific constraints along the corridor. These segments are discussed in Section 2.2.7.3.

In order to achieve the BRT corridor vision and a complete street, the following elements should be incorporated into BRT streetscapes where context-appropriate and/or possible:

### Sidewalks:
A continuous pedestrian clearway will be provided along both sides of the street along all BRT corridors. Pedestrian priority should be provided through the continuation of sidewalk materiality through all driveways and clearly marked crosswalks at intersections. All sidewalks must meet AODA requirements.

### High Pedestrian Areas:
A consistent sidewalk banding pattern is recommended in areas with high pedestrian volumes, such as Downtown Place Types, and around curbside BRT stops. Coloured concrete banding is recommended on sidewalks around BRT platforms. Specialized unit pavers may be considered with accent unit paving banding. Accent banding should correspond with tree placement.

### Intersections:
Pedestrians will have priority to encourage safe crossing. Other features that will contribute to safe crossings at intersections include; clearly delineated crosswalks that are a minimum of 3 m in width and comprised of a slip-resistant material, tactile warning strips, and a ramped pedestrian clearway.

### Planting and Furnishing Zone:
These zones are to be located between the sidewalk and curb to provide extra buffer space between the pedestrian clearway and the roadway, where space permits. The planting and furnishing zone will consist of hardscape material with street trees planted in grates, or in planters. The Zone will also contain lighting and street furniture such as: benches, waste receptacles, and bike parking. Along less urbanized areas of the corridor, such as residential neighbourhoods, amenities will typically be limited to sod and street trees.

### Planting Zone:
Along less urbanized areas of the corridor, such as residential neighbourhoods, where there is space in the right of way, a Planting Zone will be implemented in place of the Planting and Furnishing Zone. The Planting Zone shall be a minimum width of 1.5 metres, and typically consist of sod with street trees.

### Streetscape Furnishing:
Benches and waste receptacles will be situated in the planting and furnishing zone where context-appropriate. The placements of streetscape furniture should respond to the unique needs of the areas along the corridor, with clusters of furniture placed in close proximity to major intersections, and community destinations.

### Street Lighting:
Existing street light locations will be maintained wherever possible, and be reviewed and enhanced where applicable. In the Downtown and Transit Village Place Types, pedestrian lighting will be considered. Pedestrian lighting can be in the form of pedestrian luminaires integrated with street lights, stand-alone pedestrian lighting, and/or accent lighting. Street lighting is discussed in Section 2.2.8.

### Public Art:
Public art is to be used in significant locations where there is available room within the ROW to aid in establishing a strong sense of place along the Rapid Transit corridor. Vertically oriented public art will likely provide the most visual impact in most circumstances.

### Medians:
Medians provide opportunities to incorporate placemaking elements such public art, planters, and street trees, depending on the width available. The median’s surfaces should be paved with unit pavers or stamped concrete.
2.2.7.1 Materials and Finishes

A visual identity for the Rapid Transit Streetscape corridors should be reinforced through a cohesive and unique material palette along the corridor, including hardscape materials such as concrete (with consistent finishes, coloured concrete banding, patterned concrete etc.), unit paving and asphalt, as well as softscape materials including the planting palette. Lighting and street furnishings should also carry through a cohesive identity.

Visual Identity and Focused Investment: Due to the length of the BRT corridors, investments in higher caliber materials will be concentrated in key areas, such as the King Street and Wellington Street intersection, major destinations, and the Downtown Place Type. Cohesive and unique materials will aid in developing a visual identity for the BRT systems, with visual interest focused around the stop areas.

Durability and Maintenance: Durability is a key consideration for the BRT streetscape design. The materials and construction details should be able to withstand harsh winter conditions, including snow and salt. Maintenance considerations should be included throughout the design process to ensure the viability of the streetscape design.

Context Responsive: The BRT corridor context, including Place Type, amenities, and built form, should inform the materials used in the streetscape. The materiality of the streetscape should respond to the unique context of the corridor, while also maintaining a cohesive visual identity.

Sustainability and Resilience: Resilient streetscapes can be achieved by optimizing planting, selecting native, drought tolerant, and salt tolerant plant species wherever possible, and using light coloured materials to reduce the heat island effect. There is potential to incorporate permeable paving and/or rain gardens to optimize sustainability in the future.

Hardscape: In close vicinity to BRT stops, charcoal coloured concrete accent stripes should be implemented at regular intervals. Continuing a consistent hardscaping pattern, with differing materials, throughout the corridor the BRT corridors will preserve a consistent visual identity throughout while maintaining a context-driven design.

2.2.7.2 Planting

Planting should be optimized along the BRT corridors, with street trees, shrubs and ornamental grasses being incorporated into medians wherever there is space.

Planting: A consistent planting palette should be employed in order to foster visual identity along the corridor. However, monocultures are to be avoided to mitigate the risk and impact of disease. Bloom times and seasonal colouring and maintenance requirements, including irrigation and pruning, shall also inform the planting selection. Where possible, plants species should be native, drought tolerant, and salt tolerant. Adequate soil volumes must be provided through a continuous soil trench or soil cells.

Street trees will be incorporated into the streetscape wherever there is room within the ROW. Different contexts will require different types of street trees, which are to be approved by the City of London.

Exhibit 2-26 provides a brief overview of the appropriate street trees for differing contexts.

Exhibit 2-26: Street Trees by Context

<table>
<thead>
<tr>
<th>Context</th>
<th>Tree Treatment</th>
<th>Species Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Urban Environment and Significant Intersections</td>
<td>Tree in Grate with Soil Trench / Soil Cells</td>
<td>Salt Tolerant Species</td>
</tr>
<tr>
<td>Urban Environment (Midblock)</td>
<td>Tree in Planter with Ornamental Grasses / Planting</td>
<td>Salt Tolerant Species</td>
</tr>
<tr>
<td>Under Hydro Poles</td>
<td>Hydro Form Tree in Grate / Planter / Sod</td>
<td>Salt Tolerant Species Trees with less height capacity</td>
</tr>
<tr>
<td>Non-Urban Environments (Residential/ Employment, etc.)</td>
<td>Trees in Sod</td>
<td>Salt Tolerant Species</td>
</tr>
<tr>
<td>Medians (3.5m +)</td>
<td>Trees in Planters</td>
<td>Salt Tolerant Species Trees with less height capacity</td>
</tr>
</tbody>
</table>
2.2.7.3 Areas of Conceptual Demonstration

There are eight segments of the BRT corridors which have specific streetscape design elements, based on the London Plan Place Types, RTMP vision, principles, and Streetscape Types, as well as the above noted design elements. Details are provided in Appendix C:

- King Street and Wellington Street Intersection;
- White Oaks;
- Oxford Street and Wonderland Road Intersection;
- South Street and Wellington Street Intersection;
- Western Fair;
- Richmond Street and Grosvenor Street;
- Fanshawe College; and,
- Western Road and Lambton Drive.

King Street and Wellington Street Intersection

The intersection of King Street and Wellington Street is within land designated as Downtown Place Type in The London Plan, and as a Downtown Streetscape in the RTMP. The intersection is significant within the City of London as a central, urbanized area. This is also a significant intersection of the BRT network, the only intersection where all four directions of travel on the BRT service can be accessed.

The stretch of King Street between Wellington Street and Clarence Street is unique, as King Street is covered in large part by the canopy of Citi Plaza. The Streetscape design should work towards establishing a strong and vibrant sense of place in this important intersection that can accommodate a large volume of pedestrian activity. Exhibit 2-27 illustrates the proposed streetscape concept.

Wellington Road south of Bradley Avenue

This area is designated as a Transit Village Place Type in The London Plan, and as a Rapid Transit corridor in the RTMP.

The area currently consists of a large mall, and big box land uses with surface parking fronting the streetscape. Beyond the big box land uses is low density residential. There are some parks nearby, including St. Stephen's Park and White Oaks Park.

Identified as a Transit Village in the London Plan, this area is identified as a target intensification area within the city. The streetscape should respond to the vision for a Transit Village, and the accompanying needs. Exhibit 2-28 illustrates the proposed streetscape concept.
Oxford Street and Wonderland Road Intersection

The intersection of Oxford Street West and Wonderland Road is within land designated as a Transit Village Place Type in The London Plan, and as a Rapid Transit Corridor Place Type in the RTMP.

As a result of the Oxford Street and Wonderland Road area being designated as a Transit Village, mixed-use intensification can be expected marking a shift from the current predominantly big box urban fabric. The streetscape design in the area should reflect the Transit Village principles.

Due to property constraints, there is currently limited areas for street trees to be accommodated within the ROW at the Oxford Street and Wonderland Road intersection. Trees have been added within the current ROW wherever possible. Measures should be put in place for street tree planting to be incorporated in with future development in the area. A rendering illustrating the proposed streetscape concept is provided below:

Due to the limited ROW available, the streetscape design is limited within this area. There are opportunities to create an extended public realm with future intensification.

South Street and Wellington Street Intersection

The intersection of South Street and Wellington Street is within land designated by the Rapid Transit Corridor Place Type in The London Plan with Neighbourhoods and Green Space Place Types nearby. The area is designated as a Rapid Transit Corridor Streetscape in the RTMP.

The area currently consists of predominantly low density residential with some small scale commercial/ mixed-use establishments along Wellington Street. The area contains significant green connections with the Thames River, Richard B Harrison Park and the Thames Valley Parkway.
Regeneration South of Horton Street: A Community Improvement Plan (CIP) for London’s SoHo District (2011) provides a vision, principles and strategic directions for future projects in the area. The CIP sets out a vision that “our SoHo will be a vibrant and healthy urban neighbourhood that celebrates its rich sense of community and heritage. With its unique links to the Downtown and Thames River, SoHo will be a great place to live, work, shop and play.” The plan delineates Wellington Street as a Mixed-use Mainstreet District. The streetscape design should consider this Mainstreet classification. The CIP document should be consulted throughout the design process.

**Exhibit 2-30: Wellington Road (Clark’s Bridge), looking north**

The Dundas Street / King Street and Ontario Street area is designated as Rapid Transit Corridor Place Type in The London Plan, and is surrounded by the Neighbourhood Place Type. The corridor is identified as a Rapid Transit Corridor Streetscape in the RTMP.

The Old East Village Community Improvement Plan (CIP) (2005) for the Western Fair neighbourhood and surrounding areas provides a vision, principles and strategic directions for future projects in the area. The CIP sets out a vision that fosters a “pedestrian-oriented streetscape while not excluding the automobile”. The plan designates the Western Fair area as an Entertainment and Recreation Zone, whereby any developments should support the entertainment and recreation “flavour” of the corridor. The CIP document should be consulted throughout the design process.

All intersection quadrants except the north-east have issues with property constraints. In an existing agreement with the owner of the Western Fair lands, the City of London maintains 50% land ownership. The agreement allows for land dedication as required.

**Exhibit 2-31: King Street at Ontario Street, looking west**

**Richmond Street and Grosvenor Street Intersection**

The intersection of Richmond Street and Grosvenor Street is designated as a Rapid Transit Corridor Place Type in The London Plan, and is surrounded by the Neighbourhood Place Type. The corridor is identified as a Rapid Transit Corridor Streetscape in the RTMP.

The area is institutional, with St. Joseph’s Hospital and Mount Hope Centre for Long Term Care in close proximity to the BRT stops. The streetscape design is focused on optimizing the green canopy in the area.
Fanshawe College

The Fanshawe College BRT stop and turnaround is located off of Oxford Street East, just east of Second Street/Fanshawe College Boulevard. The area is designated as a Rapid Transit Corridor and an Institutional Place Type in the London Plan. The corridor is identified as a Transit Village Streetscape in the RTMP.

The area is also a route terminus and will have several connections to local LTC services and active transportation connections. There is a great opportunity to create a high quality public space that creates a connection between various connecting modes, the Rapid Transit stop and the surrounding college property.

The stop design itself will also be reflective of the character of the college and celebrate Fanshawe College's contribution to the community through public art and other unique stop features. The stop should serve as a transportation hub for Fanshawe students, faculty and staff. The BRT streetscape design contains the following:

- 2.5 metre wide concrete sidewalks;
- BRT signature coloured concrete banding in the stop vicinity that extends through the stop platform and nearby campus area;
- Trees in grates in the waiting area;
- Signature street print crossings;
- Signature coloured asphalt in the intersection and turn around;
- An ample median with trees, shrubs and ornamental grass;
- Trees in sod in landscaped area;
- Planters with integrated seating;
- Potential for public art.

Western Road and Lambton Drive

The intersection of Western Road and Lambton Drive is designated as Institutional Place Type in The London Plan, and the streetscape design will be developed in consultation with Western University, Brescia College and Huron College.

2.2.8 Illumination

Street lighting that is not impacted by road widening or modifications will remain in place. Where roadway widening conflicts with the existing light poles, street light standards will be updated to new light standards with new poles, bracket arms and LED fixtures. Intersection safety lighting will be provided for all intersections that are affected by widening.
Depending on hydro pole relocation, street light bracket arms and fixtures can be installed on proposed hydro poles. This will be done where feasible, in coordination with London Hydro. Spacing will be determined based on the proposed hydro alignment design and roadway lighting analysis.

Existing street light fixtures shall be upgraded to City’s approved LED fixtures that are also dark sky compliant. Existing street lighting equipment that will not be re-used, shall be removed and salvaged/disposed of per coordination with the City.

Street lighting upgrades in the affected areas shall adhere to the City of London standards (SCD-2018 Edition). The lighting design will follow RP-8-14 criteria for both permanent and temporary lighting. Minimum lighting criteria levels will be determined based on roadway classification confirmed by the City during the detail design phase.

All new lighting controls shall be compatible with the existing infrastructure unless requirements from the City specify otherwise. Existing underground conduits and power supplies will be removed and replaced, where required, to support the new permanent design.

Bus shelter lighting will be provided. This will be selected in coordination with the architects’ during detail design.

2.2.8.1 Corridor Design

Any light standards that are affected by the hydro pole relocation will be updated as per City standards. In some areas, street lighting is proposed to be in a joint use system with the hydro poles. Pole spacing will be determined in coordination with London Hydro, but spacing will typically be approximately 50 m. Pedestrian lighting will be considered at a spacing of 30 – 35 m. New bracket arms and LED fixtures may be installed on new/relocated hydro poles, or remain if deemed to be in good condition.

2.2.9 Intelligent Transportation System

An Intelligent Transportation System (ITS) is an integral part of Bus Rapid Transit to support reliable, frequent transit service, and enhance safety and security. Integrating ITS technology along the BRT corridors will benefit transit as well as general traffic, reducing congestion and travel times for all modes. Final technology designs will be determined during the detailed design of the BRT system.

The ITS technologies to be considered to support BRT are described in this section. A more detailed ITS strategy report can be found in Appendix E.

2.2.9.1 Communication System

The communication system is critical to the function of any ITS technologies. Most transit ITS technologies on the RT vehicles will rely on wireless communications for data exchanges with the transit control centres, runningway, and roadway ITS devices. Data and voice communication networks are important for supporting transit operations, maintenance, and incident management. The communication system includes various combinations of equipment to support communication with RT vehicles and non-revenue vehicles (e.g. supervisor and maintenance vehicles), as well as fixed-end equipment at RT stops, transit control centres, and garages. In addition, the communication system can also support the traffic signal control and operation, as well as coordination with other City’s agencies (e.g. City’s Roadway Lighting & Traffic Control division and emergency services). CCTV camera images, incident records, and transit vehicle locations can be exchanged among centres. For these purposes, wired communication, such as fibre network and leased services could be considered.

A new installation of fibre optic communications along the RT corridors is recommended in order to meet the needs of all the new ITS elements for both RT stops and roadways.

2.2.9.2 CAD/AVLC System

CAD/AVLC System assists with the real time monitoring and dispatch of the RT vehicles. It analyzes service data from the vehicles in order to improve service performance, and the efficiency of system operations. This system includes:

- AVLC, a computer-based vehicle tracking system that monitors the position of a transit vehicle and relays its location to a central system. Positioning information can be transmitted in real-time using wireless communications infrastructure to provide a tracking capability for RT vehicles; and,
- CAD, software that allows the core AVLC function to display the position of every RT vehicle for dispatchers. This information is updated every 15 seconds on a map or schematic along with additional data on operational status.

CAD/AVLC system also includes other on-board components on RT vehicles, including GPS antenna, OBC, and MDT, which serve as the information link between transit control centres and the RT vehicles.

LTC has recently upgraded the existing CAD/AVLC system in order to support dispatchers with prioritizing issues and providing more efficient responses to incidents. For the RT system, the enhanced CAD/AVLC used for LTC’s fixed route services will be integrated for use on RT vehicles and dispatch.

2.2.9.3 Fare Collection System

Fare Collection System has a number of components that include:

- A central server handles fare management activities in back office, such as fare transaction processing and reporting; and,
- Field devices such as smart fare card readers, ticket vending machines, and cash fareboxes can be deployed on-board RT vehicles or off-board at RT stops. While the off-board fare collection can reduce passenger boarding times and increase passenger convenience, fare enforcement will be required. In addition, as a benefit, fare collection technologies such as smart fare card and ticket vending machine can eliminate the acceptance of cash, coins, and paper transfers by the RT vehicle operators.
The fare collection system for the RT system will integrate with the existing LTC fare collection and smart fare card systems in order to provide a single fare system across the City.

### 2.2.9.4 Security System

Security System consists of a variety of technologies that communicate with the transit control centres and emergency services to provide safety for both operators and passengers of the RT system. These technologies include:

- CCTV Cameras (on vehicles and at RT stops) which can capture raw video data for either local monitoring (i.e. for processing), remote monitoring, or for local storage (e.g. DVR). Microphones can also be integrated with CCTV cameras to capture audio. Security features can also be connected to the AVL system and pass on vehicle location along with the surveillance data to the transit control centres. The CCTV cameras and microphones can enhance the safety of the RT system as incidents can be monitored in real-time and/or also reviewed historically;

- Covert Alarms allow RT vehicle operators to notify transit control centres and/or emergency services of an incident on RT vehicles. Combined with the communication system and AVL system, covert alarms can automatically notify the dispatchers, via the CAD system, that an emergency has arisen along with exact location of the vehicle. This improves the safety of the RT vehicle operator and the passengers on the vehicle in an event of an emergency where no other communication methods are possible; and,

- Emergency Call Boxes at RT stops which contain a communication system that connects the passengers with the transit control centres and/or emergency services in an event of an emergency. It can also be integrated with the CCTV camera system at RT stops so the passengers who are using the emergency call box can be seen by the dispatchers. The emergency call boxes typically have a connection with the Uninterruptible Power Supply (UPS) and backup communication systems to ensure that these devices work even in event of a power or communications failure.

LTC currently has a CCTV camera security system deployed on their fixed route service buses with a central video software at the transit control centre at Highbury. These existing systems could be enhanced and will be integrated with the RT system.

### 2.2.9.5 Transit Signal Priority

Transit Signal Priority (TSP) allows transit vehicles to attain better mobility at traffic signal intersections by providing expedited treatment over general traffic. This system can improve transit travel time and reliability. A TSP system includes CAD/AVLC with OBCs, traffic management system (traffic signal central system and traffic signal controllers), and transit vehicle detection system. Depending on the design of the TSP system, the TSP functionalities can reside in the central system or local traffic signal controllers. The functionalities include TSP strategies and processing, parameter setup, and event logging.

The transit vehicle detection system is used to identify the transit vehicle in general traffic. In response to transit vehicles being detected, active priority will temporarily alter the timings of traffic signal phases at one or more downstream intersections to accommodate the priority call from the vehicle through a communication system. Active transit priority can be split into two (2) groups, conditional and unconditional priorities. Note that an active TSP algorithm that requests priority only if specific predetermined conditions are satisfied (e.g. schedule adherence, passenger loading, door status). Active TSP strategies typically include phase insertion, phase skipping, phase rotation, green extension, and red truncation. The exact location of TSP enabled intersections and the strategy will be determined based on the traffic operations impact to road users (e.g. transit, general traffic, pedestrians, and cyclists) and the needs of the RT system.

In addition to the infrared TSP detection system that is currently deployed for LTC fixed services, other TSP detection and communication systems could be considered and applied to the RT system, such as radio, GPS, and Wi-Fi.

### 2.2.9.6 Transit Traveller Information System

Transit Traveller Information System provides traveller information in different ways to enhance passenger experience including visually or hearing impaired passengers. The traveller information subsystems are currently integrated with the CAD/AVLC system to ensure the information to be more accurate and reliable. With this integration, the system disseminates information such as schedule information, expected vehicle arrival or departure time, as well as passenger information such as incidents, service advisories, and other ad-hoc messages. The different traveller information subsystems include:

- VMS and ASA Displays that provide static and/or real-time information to passengers on vehicles (ASA Display) and at RT stops (VMS) through text and picture based changeable electronic signs. This subsystem also supports hearing impaired passengers. LTC currently has some VMSs deployed at major transit terminals and ASA Displays on their fixed route service buses;

- ASA and Public Address (PA) System that performs similar functions as the VMS and ASA Displays, however provide this information audibly rather than through text. The ASA system announces the next stop on a RT vehicle through text-to-speech or pre-recorded messages. The PA system allows the dispatchers/supervisors/operators to provide ad-hoc messages at RT stops and RT vehicles. Both these systems help and improve the experience for visually impaired passengers riding RT vehicles. LTC currently has audible ASA displays on all fixed route service buses; and,

- Other transit traveller information subsystems that can be applicable for the RT system such as Internet websites (e.g. LTC’s existing InfoWeb), IVR, and Mobile Phone Applications. Currently, LTC’s fixed route service also provides trip planning information to Google through the GTFS. All existing LTC subsystems could be enhanced for the RT system.
• Maintenance Management System (MMS) supports the tracking, monitoring, and management of the RT fleet, facilities, assets, and inventory. Some of the items that are tracked by the MMS can lead to maintenance work, scheduled maintenance, and fuel monitoring. The MMS enhances the reliability of the RT system, improves the efficiency, reduces fuel consumption, and minimizes maintenance costs;

2.2.9.7 Other Key Systems and Components
Some additional recommended and optional ITS systems and components include:
• ITS Elements Cabinet at the RT stops houses ITS devices and their supporting communication devices such as modems. UPS are typically used to ensure ITS elements have backup power when there is a power failure;
• Reporting System includes Business Intelligence (BI) tools and data warehouses that support data analytics from various sources across the RT system such as APC ridership data, fare collection information, and the bus operation data from the CAD/VLC system (e.g., schedule adherence). The reporting system helps service planning team to understand the performance of the RT system, support future planning to improve passenger experience, and identify solutions to increase the efficiency of the system; and,
• Wi-Fi System can be provided on-board RT vehicles and at RT stops to allow passengers to connect to Wi-Fi using their mobile devices. This service would improve the passenger experience throughout the RT system.

2.2.9.8 Traffic ITS Technologies
The traffic ITS technologies communicate with the traffic signal control centre to help improve traffic flow along the RT corridors. This is done using real time and historical traffic performance monitoring and data gathered through ITS technologies. This information leads to better allocation of traffic signal green time, traffic signal progression, and a more efficient use of roadway capacity to serve RT vehicles and general traffic. These signal timings can be changed in real time or with pre-planned signal timings (e.g. by time of day, day of week, and/or event). In order to support these efforts, a variety of monitoring, detection, and traffic signal control elements can be used that include:
• Traffic Signal Controllers and Traffic Signal Central System. The traffic signal controllers take inputs from the TSP and vehicle detection system in order to operate and change traffic signal timing. The traffic signal controllers are connected with the traffic signal central system so that the signals can be updated with new signal timing plans on a regular basis or in real time. The system can improve travel times and reliability by reducing delay and increasing progression along corridors through the proper allocation of green time at traffic signals. The existing City traffic signal controllers could be enhanced or upgraded to meet the RT system needs;
• CCTV Cameras that help traffic dispatch operators monitor and validate the roadway traffic conditions. The captured images can be viewed through a dispatch workstation or on a display wall at the traffic management centre. Depending on the needs of these images and City’s privacy policy, DVR can be deployed to store the images. The CCTV cameras are typically found along the roadway or at intersections;
• Real-Time Data Feeds that provide information through a variety of mediums including third party data providers (e.g. Google Traffic, Inrix, Waze, etc.), 511 services, or other third party providers (e.g. in-vehicle navigation systems). The information provided to these data feeds could include travel times, route planning, and event information (e.g. construction, incidents, special events etc.). Depending on the outcome of the City’s assessment of these technologies, they can be integrated as part of the RT systems to minimize the impacts to non-RT users;
• VMS that provide advance notification and warning of traffic pattern changes. The messages displayed on the VMS will be either travel time, pre-planned route change messages, or ad-hoc messages created by the traffic dispatch. They are generally found at mid-block of the roadway before traffic hot spots or locations with frequent disruption (e.g. at-grade rail crossings), so that general traffic drivers can make driving decisions before the next intersection. However, this technology is less commonly used on arterials due to limited road space and high maintenance costs;
• Vehicle Detection Systems are used in order to detect the performance of RT corridor and nearby arterials as well as detect the presence of a vehicle in order to trigger a movement at a signalized intersection. By detecting vehicles at signalized intersections, they improve the efficiency of an intersection by only allocating a green signal when a vehicle is present. Additionally, they can report on the performance of a corridor and relay this information back to traffic dispatch in real time. Vehicle detection systems usually encompass two (2) methods of data collection. These technologies include:
  o Sensor technology, that can be intrusive (e.g. inductive loop detectors, magnetometers, micro-loops) or non-intrusive (e.g. radar, video, microwave, laser). This technology is used for both performance measurement and vehicle detection at signalized intersections. Currently, radar detection systems are one of the sensor types that are commonly used in the City to detect vehicle and bikes. Furthermore, the City’s existing inductive loop will need to be enhanced for the use on the RT corridors and nearby arterials so that they can detect multiple vehicle types, including bikes; and,
  o Automatic vehicle identification technology, such as MAC address readers can capture and measure the travel metrics (e.g. travel time, origin-destination trends, etc.) of a vehicle travelling within a sensor network. The City’s existing Bluetooth MAC address readers could be integrated and/or enhanced and provide travel information to the general traffic through VMS or other real time data feeds.
• Train Detection Systems can be used at railroad crossings to detect the presence of an oncoming train. This system would trigger the modification of signal timings at surrounding intersections to better manage capacity constraints at the railroad crossing during a train crossing event. As well, this could be integrated with the TSP system to limit the delay of RT vehicles at railroad crossings. Train detection systems can be applied using intrusive or non-intrusive means similar to sensor based vehicle detection
systems. For the RT system, this technology would be applicable at the Canadian Pacific railroad crossing on Richmond Street;

- **Bike Detectors** are used to detect the presence of a bike within a defined zone, actuate bike signal, and differentiate it from other traffic. The bike detection system improves the safety and encourages active transportation in the City. The existing bike detection system could be integrated into the RT system;

- **Accessible Pedestrian Signals (APS)** provides audible sounds (either through consistent sounds or messages) to indicate that the walk signal is on. The APS technology is installed at intersections in order to support visually impaired pedestrians. The City APS standard could be used for the intersections along the RT corridor; and,

- **Traffic Signal Control Cabinets and Assemblies** house ITS elements found on the roadway. They can be outfitted with a UPS to provide power to intersections in an event of a power loss. The City currently has several UPS being installed at the high traffic volume corridors.

### 2.2.9.9 ITS System Framework

An ITS systems concept was developed for the RT system based on the technologies identified in this section. Exhibit 2-34 presents the overall RT system architecture design. Key system interfaces identified are:

- Integration between on-board RT devices (CAD/AVLC, MDT, Fare Collection System, Destination Signs, ASA, etc.) and the OBC, to improve transit operation, and enhance passenger safety and experience;

- Interface between ITS devices at the RT stops (e.g. VMS, PA, Transit Traveller Information System) and the CAD/AVLC system to provide updated information to passengers to enhance their experience on the RT system;

- Interface between all transit vehicles (RT and LTC fixed route services) and the traffic signal central system and controllers for TSP;

- Interface between the transit control centre and other City’s operation centres for traffic, transit, and emergency coordination purposes using a wired communication system; and,

- Interface between roadside traffic control equipment (i.e. intersection and mid-block) and traffic signal control system to maintain general traffic operations.

### 2.2.10 Considerations for Electric Buses

[NTD: to be added based on LTC input and CUTRIC analysis]

### 2.2.11 Operations, Maintenance and Storage Facilities

The London Transit Commission currently operates two operations, maintenance and storage facilities:
The facility at 450 Highbury Avenue is 23,045 m² (248,060 sq ft) and occupies 7.1 ha (17.5 acres). The facility has capacity for 180 standard (12 m, 40 ft) buses, and is currently approaching capacity; and,

The facility at 3508 Wonderland Road is 12,700 m² (136,500 sq ft) and occupies 4.1 ha (10.2 acres). The facility was purpose built for LTC, opening in 2011. The facility has capacity for 100 standard buses, and is currently operating at about 50% capacity. The facility can be expanded to accommodate 110 standard buses.

The London Transit Commission (LTC) began a facility needs assessment in 2017. The assessment includes a 30-year projection of LTC’s bus fleet size, number of employees and associated employee vehicle parking requirements as the basis for developing preliminary space programming and concept design requirements.

Current analysis indicates that by 2047, LTC’s fleet size will reach 312 buses, including up to 30 articulated BRT buses. The BRT fleet to 2034 is planned to be 28 vehicles, and with a horizon year of 2047, a BRT fleet of 30 was assumed to account for potential fleet expansion after 2031.

It is anticipated that the Highbury facility will be expanded to accommodate up to 250 standard buses. This facility would continue to house all key functional areas of General and Administration, Operations, Vehicle Maintenance, Vehicle Servicing and Vehicle Storage.

2.3 Local Transit Integration

The proposed BRT routes will not to replace the current LTC bus system. Combining BRT and local service into an integrated transit network will restructure local service to enhance the effectiveness of feeder routes and expand service to peripheral areas of the City.

Adding dedicated lanes for Rapid Transit along the designated corridors with integrated local stop locations for convenient connections will make transit more reliable, improve travel times and enhance the user experience. The resulting integrated transit system will be a more attractive transportation choice.

The combination of BRT and LTC local buses will result in an increase in transit service of 35% between 2015 and 2035.

The increase in transit service will result from modifications over time to the current local transit network to create more fluid connections and integration with the BRT corridors. The following guidelines for the integration of local and Rapid Transit are recommended, building on the LTC’s Rapid Transit Integration Framework (August 2016):

- Where dedicated transit lanes are curbside-running, local buses will use the dedicated lanes and stop at BRT platforms. This will reduce the impact of general traffic on transit travel time as well as the impact of on-street bus stops on the flow of general traffic. This also provides convenient connections between BRT and local buses at the platforms;

- Where dedicated transit lanes are centre-running, with four lanes for general traffic (two lanes per direction), local buses may use either in the dedicated lanes, or the curb lane. This provides flexibility for connecting local routes with the BRT service and stopping at the BRT platforms, as well as providing local coverage in the curb lane between BRT stops;

- Where dedicated transit lanes are centre-running, with two lanes for general traffic (one lane per direction), local buses may use either the dedicated lanes, or the curb lane for a short section where no other roadway option exists, with bus bays provided for local transit stops. This provides flexibility for connecting local routes with the BRT service and stopping at the BRT platforms, as well as providing local coverage in the curb lane between BRT stops;

- Reorientation of some current local transit routes will provide more efficient connections between the BRT corridor and major destinations and reduce redundancies within the transit network;

- When reviewing possible routing modifications for local routes, connectivity to Rapid Transit corridors needs to be balanced with the ability to maintain direct and convenient travel options between where people live and their destination;

- The introduction of Rapid Transit service and the resulting restructuring of local routes should not take a customer too far out of their way to complete their journey or increase their overall travel time; and,

- Curbside stops on roads that connect to the BRT corridors will be relocated as appropriate to reduce crossing distances from local stops to the BRT platform locations. The following sections discuss preliminary concepts of how local LTC services plans to operate in the proposed BRT corridors, considering the configuration of the proposed bus-only infrastructure.

The details set out in the service descriptions below represent the integration framework as currently envisioned in the 2016 Integration Framework and will be subject to a complete review subsequent to approval of the draft EPR, as well as ongoing annual review and modification based on operational and service coverage considerations.

2.3.1 Downtown

The downtown area is the hub where many existing transit routes interconnect, and will continue to be following the implementation of the BRT system. In this area, the BRT is proposed to operate on King Street (eastbound), Queens Avenue (westbound), Ridout and Clarence Streets (Southbound), and Wellington Street (northbound).

Local transit services will operate in dedicated curbside-running lanes shared with BRT (with the exception of Clarence Street which currently is not planned to have a local transit service). The proposed BRT stops at King Street / Wellington Street, Queens Avenue / Clarence Street, and Queens Avenue / Talbot Street will be larger than the typical BRT stop (60 m) to accommodate both BRT and local transit services, providing additional stop
capacity and resulting in more convenient transfers for passengers. The potential route structure for Downtown London with BRT fully operational is illustrated in Exhibit 2-35.

Exhibit 2-35: Downtown Bus Routes with Operational BRT

2.3.2 North Corridor

The north corridor currently serves as a major transit spine, with up to seven LTC routes operating in the corridor south of Oxford Street, and six routes operating north of Oxford Street, three of which provide service on University Campus and two continue to the local transit hub at Masonville Mall, connecting to eight additional local routes at the terminal. These routes currently provide connectivity between the Downtown area, Richmond Row, the health care facilities on Richmond Street north, the University, and Masonville Place.

The planned BRT service will duplicate some of these local routes with a higher service frequency and more reliable operation. To optimize the network, some local routes will be removed and/or modified with the existing resources reallocated to increase the frequency and coverage of local services.

South of Oxford Street, local bus service is planned to operate in the Rapid Transit lanes and service only Rapid Transit stops on Richmond Street to Central Avenue. Local buses will use Richmond Street south of Central Avenue. The BRT route will stop at Richmond Street & Oxford Street, and just south of Central Avenue beside Victoria Park.

North of Oxford Street, local bus services are planned to operate in the curb lane in mixed traffic in order to reduce the distance between transit stops, and maintain connectivity to the Health Care facilities on Richmond Street north. These services would supplement the BRT service by stopping curbside at: St. James Street, Cheapside Street, Huron Street, and University Drive, noting the local routes will also use the Rapid Transit stops at Grosvenor and Victoria to connect to the Rapid Transit network.

From University Drive to the Western Road / Richmond Street intersection, limited local services will share the bus-only lanes on University Drive and Lambton Drive through campus, diverging from the BRT route to provide continued service directly to the University Hospital.

At the Western Road and Richmond Street intersection, additional local routes are planned to enter the corridor, operating in both the dedicated centre-running transit lanes for express routes, and in curb lanes for local services. Routes will converge at the Masonville Place bus terminal.

2.3.3 East Corridor

Local bus routes are currently focused on Dundas Street east of Wellington Street. Local services are planned to be modified to operate on King Street between Wellington and Waterloo Streets. King Street is not planned to have local service east of Waterloo Street; local service will be maintained on Dundas Street.

On Dundas Street east of Ontario Street, local services are planned to operate in the dedicated centre-running transit lanes and stop only at BRT stops (McCormick Street and Highbury Avenue).

On Highbury Avenue between Dundas Street and Oxford Street East, local routes are planned to operate in curb lanes.

All services operating in this corridor would stop at a modified Fanshawe College terminal, combining the two existing terminals at the College with BRT near Oxford Street East and Second Street.

2.3.4 South Corridor

The south corridor currently serves as a major transit spine connecting the downtown with the southern transit hub at White Oaks Mall, serving businesses and residences, health care facilities, and commercial areas.
The planned BRT service will duplicate an existing express bus route and some local routes with higher frequency and more reliable operation. To optimize the network, some local routes are planned to be eliminated or modified with existing resources re-allocated to increase the frequency and coverage of local services.

Local bus services are planned to operate in the curb lane in mixed traffic for short sections in order to provide more frequent stops between the Rapid Transit stops and maintain connectivity to the Health Care facilities. These services would integrate with the BRT service by stopping curbside at intersections with BRT platforms to allow transit riders to transfer between services.

South of Bradley Avenue to the White Oaks Mall access, local routes will enter the dedicated centre-running transit lanes in order to share the centre platforms. This provides convenient passenger transfers between local and BRT services. At the White Oaks Mall access south of Bradley Avenue, the proposed BRT stop would be larger (75 m) to accommodate the anticipated bus and passenger activity.

2.3.5 West Corridor

Oxford Street is currently a significant east-west transit corridor with both express and local routes. The planned BRT service will duplicate the express service on Oxford Street West between Capulet Lane and Wharncliffe; however it is planned that the Oxford Express bus route will remain, and use the dedicated centre-running transit lanes and platforms in this section, continuing in mixed use traffic east of Wharncliffe, rejoining dedicated lanes east of Highbury continuing on to Fanshawe College.

The local service will be refined and stop locations may be relocated to better integrate with the BRT platform locations.

On Wharncliffe Road, all buses would operate in mixed traffic. Local buses will serve curbside bus stops.

On Riverside Drive, from Wharncliffe Road to Downtown, local services will operate in the curb lanes. Local buses are planned to share the dedicated curbside-running lanes and stop only at the BRT platforms at Wharncliffe Road.

2.3.6 Summary

The table below (Exhibit 2.36) details the planned configuration for dedicated transit lanes along all segments of each of the BRT corridors, along with details on how local buses are planned to operate, as set out in the Post 2019 Framework. The details with respect to local service changes will be subject to a complete review subsequent to approval of the draft EPR, as well as ongoing annual review and modification based on operational and service coverage considerations.

This plan will be reviewed by LTC during the next design phase to confirm stop locations, bus bay design, and other amenities for local bus operations.
## Exhibit 2-36 Local bus operations on BRT corridors

<table>
<thead>
<tr>
<th>Street</th>
<th>Between</th>
<th>Technically Preferred Busway Design</th>
<th>Local Bus Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>North Corridor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richmond St. &amp; Western Rd.</td>
<td>Hillview Blvd. - Lambton Dr.</td>
<td>Centre running BRT</td>
<td>1. Local services operating in curb lane, and 3. Express services operating in centre-running bus-only lane</td>
</tr>
<tr>
<td></td>
<td>Lambton Dr. - University Dr.</td>
<td>Centre running BRT (Western Rd. - Oxford Dr.) Bus-Only (Oxford Dr. – University Dr.)</td>
<td>3. Local service in centre-running bus-only lanes</td>
</tr>
<tr>
<td></td>
<td>University Dr. - Richmond St.</td>
<td>Bus Only (Lambton Dr. – Sunset Dr.) Centre running (Sunset Dr. - Richmond St.)</td>
<td>3. Local service in centre-running bus-only lanes</td>
</tr>
<tr>
<td>Richmond St.</td>
<td>University Ave. - Oxford St. E</td>
<td>Option A - Centre running BRT</td>
<td>1. Local in curb- bus bays for local stops</td>
</tr>
<tr>
<td>Richmond St.</td>
<td>Oxford St. E - Central Ave.</td>
<td>Option A - Centre running BRT</td>
<td>Under Evaluation</td>
</tr>
<tr>
<td>Clarence St.</td>
<td>Central Ave. - Queens Ave.</td>
<td>Central Ave. – Angel St.: Bus only, two-way Angel St. – Dufferin Ave.: Side running BRT – two-way bus on the east side of Clarence Dufferin St. – Queens Ave.: Centre running BRT, two-way</td>
<td>N/A (no local buses operating in corridor)</td>
</tr>
<tr>
<td><strong>Downtown</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarence St.</td>
<td>Queens Ave. - King St.</td>
<td>Side running BRT, one-way southbound, buses along the west side of Clarence St.</td>
<td>N/A (no local buses operating in corridor)</td>
</tr>
<tr>
<td>King St.</td>
<td>Ridout St. N - Wellington St.</td>
<td>Side running BRT, one-way eastbound, buses along the south side of Clarence St.</td>
<td>2. Local services operating in curb-side bus-only lane.</td>
</tr>
<tr>
<td>Wellington St.</td>
<td>King St. - Queens Ave.</td>
<td>Side running BRT, one-way northbound, buses along the east side of Wellington St.</td>
<td>2. Local services operating in curb-side bus-only lane.</td>
</tr>
<tr>
<td>Queens Ave.</td>
<td>Wellington St. - Clarence St.</td>
<td>Side running BRT, one-way westbound, buses along the north side of Queens Ave.</td>
<td>2. Local services operating in curb-side bus-only lane.</td>
</tr>
<tr>
<td>Ridout St.</td>
<td>Queens Ave. - King St.</td>
<td>Side running BRT, one-way southbound, buses along the west side of Ridout St.</td>
<td>2. Local services operating in curb-side bus-only lane.</td>
</tr>
<tr>
<td>Queens Ave.</td>
<td>Clarence St. - Ridout St.</td>
<td>Side running BRT, one-way westbound, buses along the north side of Queens Ave.</td>
<td>2. Local services operating in curb-side bus-only lane.</td>
</tr>
<tr>
<td><strong>East Corridor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>King St.</td>
<td>Wellington St. - Ontario St.</td>
<td>Side running BRT, two-way</td>
<td>2. Local services operating in curb-side bus-only lane (Wellington to Waterloo Only)</td>
</tr>
<tr>
<td>Ontario St.</td>
<td>King St. - Dundas St.</td>
<td>Side running BRT, two-way</td>
<td>N/A (no local buses operating in corridor)</td>
</tr>
<tr>
<td>Dundas St.</td>
<td>Ontario St. - Highbury Ave. N</td>
<td>Centre running BRT, two-way</td>
<td>3. Express and Local service in centre-running bus-only lanes</td>
</tr>
<tr>
<td>Highbury Ave. N</td>
<td>Dundas St. - Oxford St. E</td>
<td>Centre running BRT, two-way</td>
<td>1. Local services operating in curb</td>
</tr>
<tr>
<td>Oxford St. E</td>
<td>Highbury Ave. N - Second St.</td>
<td>Centre running BRT (two-way) to/from Fanshawe College Terminal access (east of Jim Ashton St.)</td>
<td>1. Local service in curb, and 3. Express in centre busway</td>
</tr>
<tr>
<td>Street</td>
<td>Between</td>
<td>Technically Preferred Busway Design</td>
<td>Local Bus Operation</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>West Corridor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxford St. W</td>
<td>Capulet Walk - Wonderland Rd.</td>
<td>No dedicated bus facilities, buses operate in mixed-traffic lanes.</td>
<td>All buses operating in mixed traffic</td>
</tr>
<tr>
<td></td>
<td>Wonderland Rd. - Wharncliffe Rd.</td>
<td>Centre running BRT, two-way (potential for mixed traffic from Platt’s Lane to Wharncliffe)</td>
<td>1. Local services operating in curb lane, and 3. Express services operating in centre-running bus-only lane</td>
</tr>
<tr>
<td>Wharncliffe Rd.</td>
<td>Oxford St. W - Riverside Dr.</td>
<td>No dedicated bus facilities, buses would operate in mixed-traffic lanes.</td>
<td>All buses operating in mixed traffic</td>
</tr>
<tr>
<td>Riverside Dr.</td>
<td>Wharncliffe Rd. - Queens Ave.</td>
<td>Side running BRT for westbound buses. Mixed traffic eastbound from Riverside to the Thames River, then side running BRT</td>
<td>2. Local in curb-side BRT</td>
</tr>
<tr>
<td>Queens Ave.</td>
<td>Riverside Dr. - Ridout St.</td>
<td>Side running BRT, two-way</td>
<td>2. Local in curb-side BRT</td>
</tr>
<tr>
<td><strong>South Corridor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wellington St.</td>
<td>King St. - York St.</td>
<td>Side running BRT, two-way</td>
<td>1. Local service in curb</td>
</tr>
<tr>
<td></td>
<td>York St. - Horton St. E</td>
<td>No dedicated bus facilities, buses would operate in mixed-traffic lanes through the CN Rail underpass.</td>
<td>All buses operating in mixed traffic</td>
</tr>
<tr>
<td></td>
<td>Horton St. E - Wellington Rd.</td>
<td>Centre running BRT, two-way</td>
<td>1. Local service in curb</td>
</tr>
<tr>
<td></td>
<td>Wellington St. - Bradley Ave.</td>
<td>Centre running BRT, two-way</td>
<td>1. Local service in curb</td>
</tr>
<tr>
<td></td>
<td>Bradley Ave. to White Oaks stop</td>
<td>Centre running BRT, two-way</td>
<td>3. Express and Local service in centre-running bus-only lanes</td>
</tr>
<tr>
<td></td>
<td>White Oaks to Holiday Ave turnaround</td>
<td>No dedicated bus facilities, buses would operate in mixed-traffic lanes</td>
<td>All buses operating in mixed traffic</td>
</tr>
<tr>
<td></td>
<td>Holiday Ave turnaround to potential Exeter Park-and-ride</td>
<td>No dedicated bus facilities, buses would operate in mixed-traffic lanes</td>
<td>All buses operating in mixed traffic</td>
</tr>
</tbody>
</table>

Notes:
1: Local service in the curb general lane where BRT is in the centre
2: Local service in the curb-side lane which is dedicated for BRT and stopping only at BRT platforms
3: Express service and/or local service using the BRT lanes and stopping only at BRT platforms
2.4 Land and Property Requirements

The BRT network follows existing municipal roads. The project design approach was to fit within the existing municipal road allowance where possible. This approach minimizes land and property requirements and associated impacts to existing neighbourhoods and natural features.

During the preliminary engineering design process, approximately 500 properties were identified as having impacts; the majority of these are frontage impacts, with approximately 100 properties that likely require full acquisition. Temporary easements will be required in several areas during construction, including areas where grading is required to match existing ground, or for construction laydown and staging. Permanent easements may also be required for utility relocations, such as guy wires for poles supporting overhead utilities.

Publicly owned (Infrastructure Ontario) land is required for the park-and-ride facility south of Exeter Road near Bessemer Road. The City will work with MTO in developing a park-and-ride facility in this location.

Additional details of the property requirements are provided in Section 4, and on the design plates in Appendix A.

2.5 Project Implementation

The RTMP identified an implementation program for the project, which remains valid in light of the updated analysis undertaken as part of the Transit Project Assessment Process (TPAP) and preliminary design. The following sections discuss, at a high level, the key elements of the project implementation related to the TPAP process and project schedule.

2.5.1 Planning Issues

Official Plan and By-Law Amendments

As discussed in the RTMP document, the proposed BRT network corridors vary slightly from the corridors identified in the Official Plan. Mapping included in The London Plan identified the four BRT corridors radiating from the Downtown to the four Transit Villages. While the alignment of the BRT corridors shown in The London Plan is similar to the approved network, there are some minor changes. These changes are as follows:

- North Corridor: The London Plan shows Rapid Transit operating along Richmond Street north of University Drive to Windermere Road, then westerly on Windermere Road to Western Road. This will be updated to reflect the proposed alignment along University Drive/Lambton Drive, and Western Road;
- East Corridor: The London Plan shows Rapid Transit operating eastbound on King Street and westbound on Dundas Street west of Ontario Street. This will be updated to reflect two-way Rapid Transit operating on King Street alone, from Downtown to Ontario Street;
- South Corridor: No changes; and,
- West Corridor: The London Plan shows Rapid Transit extending westerly from the Downtown along King Street only. This will be updated to reflect the current concept of operating westbound on Queens Avenue to Riverside Drive. Further, the Plan indicates a Rapid Transit turnaround on Proudfoot Lane / Farrah Road, rather than the currently-proposed loop via Capulet Lane.

These changes will need to be incorporated into The London Plan as an amendment to the Official Plan. As identified in The London Plan, City Council can initiate amendments where further study has resulted in the refinement of the assumptions and conditions on which the policies were based, in accordance with the Planning Act.

2.5.2 Project Funding

The RTMP included an order-of-magnitude cost estimate for the project of $500M. This cost estimate was based on the conceptual design as prepared for the Rapid Transit Master Plan, generally representing a 5-10% level design. At the Master Plan stage, there were still a number of uncertainties with respect to alignment, property required, private utilities, underground municipal services and environmental mitigation. As the project moves from the planning stage through to formal Environmental Assessment (TPAP), preliminary engineering level and capital cost estimates will continue to be refined and updated. The updated estimates for the preliminary engineering design outlined in this report show the capital cost can be managed within the $500 million funding envelope.

The funding program is based on an assumed shared cost structure between the City of London, Provincial Government, and Federal Government. The City is to provide $130M in funding for the project, largely coming from development charges. To date, the $170M provincial portion of the funding has been committed. The City is currently working through the application process with the federal government to submit the Business Case and secure the additional $200M required to complete the project under the Public Transit Stream.

2.5.3 Construction Issues

Property Acquisition

The City of London has initiated a comprehensive property acquisition process, including purchasing of available required properties from willing sellers as they become available.

All properties within 50 m of the RT corridors received a notice at each stage of the project. Where full property acquisition is anticipated to be required, the City of London sent notification and a detailed information package directly to the corresponding property owners and offered one-on-one meetings. Some impacted property owners attended one or
more of the Public Information Centre (PIC) meetings or Public Open Houses. Meetings were arranged with impacted property owners upon request. The City will continue to liaise with potentially affected property owners to obtain rights to construct the transit project within their lands. The preliminary property requirements identified on the drawings in Appendix A will be confirmed during the detailed design phase of the study.

The key steps that the City will undertake in the property acquisition process (including permanent property requirements and temporary construction easements) are as follows:

- Conduct a Property Protection Study to confirm the property requirements upon substantial completion of the detailed design study;
- Continue property negotiations for publicly-owned property; and,
- For privately-owned properties within the City of London, the City will acquire property by negotiation or expropriation, as required.

The availability of property and timing of acquisitions may have a direct impact on the project implementation being proposed. At this time it is assumed that property will be available in a timely manner as not to unduly impact project implementation and proposed construction phasing.

**Utility Relocation Coordination**

Most of the rights-of-way that Rapid Transit will utilize have numerous infrastructure elements other than transportation that will all compete for the same space within a very limited road allowance. Of these elements, utilities form the most significant concern and have the greatest potential to impact the project cost and schedule. These include:

- Subsurface public utilities;
- Above ground public utilities;
- Subsurface private utilities;
- Above ground private utilities; and,
- District heating and cooling.

The spatial and separation requirements for each of these elements have been defined as they will have an impact on the determination of running lines and potential property requirements. The objective in dealing with municipal services and private utilities under the current BRT design is to minimize potential operational disruptions due to the maintenance, repair or replacement of these services.

The City has been working with the potentially impacted utility owners throughout the development of the conceptual design and preliminary design, and has identified preliminary relocation schemes to address utilities in conflict with the proposed BRT infrastructure. These preliminary utility relocation schemes will be further detailed throughout subsequent design phases of the project and will inform the development of the final construction phasing schedule for the project. At this time it is assumed that utility relocations can be delivered as required to optimize project implementation and construction phasing.

### 2.5.4 Construction Phasing

Preliminary engineering design (30% design) of the BRT network will be completed as part of the TPAP. Detail design will progress through 2019, with the possibility of advancing some “quick start” elements of BRT in 2019. Initial plans could include a prototype BRT stop, streetscape improvements or some smart traffic signals.

Implementation of the BRT network will be phased, beginning with the construction of dedicated lanes in the downtown core starting in 2020 and advancing eastward. Between 2022 and 2028, BRT construction will continue through the north, south and west corridors, with Londoners able to begin riding BRT as each leg of the system is complete.

### 2.5.5 Commitments and Future Work

#### Design and Construction Issues

While this document presents a thorough assessment of the proposed undertaking, it is based on the level-of-detail currently available in the project description. As the plan progresses further in design and construction stages of the project, additional investigations and assessments will be required. The following presents recommended commitments to conduct further research and analysis for the construction of the BRT, including, but not limited to the following activities:

- Prepare a monitoring plan in accordance with subsection 9.2.8 of Ontario Regulation 231/08 to verify the effectiveness of mitigation measures;
- Include noise, vibration and air quality monitoring and mitigation measures and construction site maintenance/upkeep requirements in construction contract documents;
- Develop traffic, parking, transit, cycling and pedestrian management strategies to be included in construction contract documents;
- Develop utility, pipeline and municipal servicing relocation plans in consultation with service providers (including but not limited to Bell Canada, Enbridge Gas Distribution, Rogers Cable, London Hydro, Hydro One, and Start Communications);
- Develop emergency response plans with emergency service providers to maintain fire, police and emergency medical services during construction;
- Prepare and implement arborist reports, tree protection plans, edge management and streetscape plans;
- In consultation with the UTRCA, determine areas where compensation for vegetation loss will be required; determine quantity and type of species to be used; and, identify sites where restoration efforts would be maximized;
• Undertake Designated Substances Surveys for any buildings or structures which require demolition and to reflect the findings in construction contract documents;

• Develop procedures for disposal of excavated materials, including excess soils, in accordance with Ministry of the Environment requirements;

• Prepare an erosion and sedimentation control plan, which complies with prevailing UTRCA and City of London water guidelines and requirements;

• Undertake buildings, structures, and railway protection and monitoring;

• Prepare Cultural Heritage Evaluation Reports and/or undertake Heritage Impact Assessments at select sites in consultation with the Ministry of Tourism, Culture and Sport, City of London / LACH as appropriate;

• Manage any brownfield sites in accordance with Ontario Regulation 153/04 as amended;

• Conduct a Phase 1 and 2 Environmental Site Assessment for any areas of existing contamination prior to property acquisition for the BRT and consult with MOE as appropriate;

• Prior to construction, the contractor will submit a comprehensive environmental controls and methods plan to address, among other elements, effluent (water) control;

• The disposal of contaminated materials will be directed to an MOE approved soil treatment site or waste disposal site. The monitoring of these facilities is the jurisdiction of the MOE; and,

• Should previously unknown or unassessed deeply buried archaeological resources be uncovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the Ontario Heritage Act. Any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries, Ministry of Consumer Services.