Part III
IMPLEMENTATION

Section 9
Implementation Plan
9.1 Official Plan and By-Law Amendments

As discussed in Section 7, The London Plan incorporates supportive land use policies to help RT flourish. The London Plan is the future playbook for city-building over the next 20 years and was developed after a two-year conversation with the community about their vision for London’s future to 2035. The plan was approved by City Council on June 23, 2016 and by the province on December 28, 2016.

Developing the RTMP and The London Plan concurrently has meant that the planning policy framework for the RT corridors already reflects the shared vision for the future. The higher density, pedestrian-oriented environment vision of the plans will capitalize on the opportunities that the new RT system will create. The key directions proposed in The London Plan include:

- Growing inward and upward;
- Shaping our city around RT;
- Building a city of great places and spaces;
- Offering real and attractive mobility choices;
- Becoming one of the greenest cities in Canada;
- Creating a cosmopolitan city;
- Building strong and vibrant neighbourhoods;
- Planning a smart city; and,
- Regenerating our urban neighbourhoods and main streets.

Currently, the City has three years from the date of ministerial approval to implement revisions to Zoning By-Law Z-1 to ensure it conforms to The London Plan. This includes the major Urban Place Type policies relevant to this Master Plan that were discussed in Section 7.

Mapping included in The London Plan identified RT corridors radiating from the Downtown to four Transit Villages. While the alignment of the RT corridors shown in The London Plan is similar to the Final Preferred Network, there are some changes. 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.

Under Section 41 of the Planning Act, R.S.O. 1990, c.P.13 where a Municipality names an area within an official plan (such as The London Plan) as a proposed site plan control area, the Municipality may designate by by-law the whole or any part of that area as a site control area. Given this circumstance, the council of the municipality may define by by-law any class or classes of development that may be undertaken without approval of plans or drawings.

Also under Section 41 of the Planning Act, the Municipality may place conditions on approvals of plans submitted, including the conveyance of part of the land for a public transit right of way to the Municipality (provided it is shown or described in an official plan), to the satisfaction of and at no expense to the Municipality.
9.2 Community Improvement Plans

An important element in achieving the regeneration objectives are Community Improvement Plans. A Community Improvement Plan Area (CIPA) is permitted under the Planning Act to stimulate reinvestment and redevelopment, inspire appropriate infill and intensification, improve the physical infrastructure, support local economic development and preserve the heritage and cultural value of an area. These plans enable municipalities to implement financial incentives to eligible property owners.

There are three CIPAs in place along the RT corridors: Downtown, Old East Village and SoHo. These are illustrated in Exhibit 9.1. The City should consider reviewing each of the Community Improvement Plans (CIP) in effect within each area to reflect the updated Urban Place type visions defined in The London Plan, and the urban typologies developed in this RTMP. Consultation with the local communities can be conducted to complete the update of the CIP documents. The City may also wish to examine if additional communities along the RT corridors could benefit from the application of CIPAs, particularly in terms of streetscaping and urban design objectives.
9.0 IMPLEMENTATION PLAN

Downtown London CIP
The Downtown London CIP (1996) provides coordinated municipal initiatives to achieve five goals for the Downtown, as well as increase the supply of residential units, encourage the provision of unique or specialized attractions and public facilities, and improve the public realm to make Downtown an attractive place for these types of investments to occur.

There are also three incentive programs for improvements in place for the area:

- **Facade Restoration Loan Program**, that serves to encourage building owners to enhance building facades to improve the streetscape;

- **Upgrade to Building Code Loan Program**, that is meant to assist building owners to upgrade their facilities to meet current Building Code and Fire regulations; and,

- **Tax Increment Grant Program**, which provides an economic incentive for the rehabilitation of commercial and residential properties.

Old East Village CIP
The Old East Village CIP (2005) aims to provide a coordinated municipal effort to improve the physical, economic and social climate in the area. The vision embraces Old East Village as pedestrian-oriented, mixed-use area that will be the focal point of the surrounding community. The plan roughly encompasses the buildings fronting onto Dundas Street from Adelaide Street in the west to Charlotte Street in the east.

Three incentive programs (as described above) are also available in the area: the **Facade Restoration Loan Program**, **Upgrade to Building Code Loan Program**, and **Tax Increment Grant Program**.

SoHo CIP
The South of Horton Street (SoHo) CIP (2014) envisions that the district will be a vibrant and healthy urban neighbourhood that celebrates its rich sense of community and heritage. The community-led initiative aims to enhance the current neighbourhood and sets a vision and parameters for future development of the Old Victoria Hospital Lands. This prominent site presents an exciting opportunity to promote economic development within Central London.

The plan sets out key initiatives separated into four themes: Old Victoria Hospital Lands, Neighbourhood Places, Neighbourhood Movement and Neighbourhood Public Spaces. The plan encompasses the lands south of Horton Street, west of Adelaide Street and northeast of the Thames River.

Two incentive programs (as described above) are in place in the area: the **Facade Restoration Loan Program**, and **Upgrade to Building Code Loan Program**.

9.3 Approval and Design Process
This Rapid Transit Master Plan for SHIFT: London’s Rapid Transit Initiative, was undertaken in accordance with the requirements of the MCEA (2000, as amended to 2015). Through this process, Phases 1 and 2 of the Class EA have been addressed for RT by this document, documenting the need and justification for rapid transit, and recommending strategies to implement the project.

Once this RTMP is adopted by City Council, the next phase of study is proposed to follow the Transit Project Assessment Process (TPAP), under Ontario Regulation 231/08. The TPAP provides an improved approvals process upon study completion for transit projects, and has been successfully followed by many transit authorities across the province since its introduction in 2008.

The study will continue into pre-planning for the TPAP, to develop a preliminary engineering design, conduct public and stakeholder consultation, identify impacts and propose mitigation measures. The entirety of the preferred RT network will be assessed in detail, with additional focus on nine areas, shown in Exhibit 9.2. Before initiating the TPAP process, consultation with the MOECC, Environmental Assessment and Approvals Branch, is planned to review work completed for the study to date.

When the City is ready to initiate the TPAP, a Notice of Commencement will be issued to start the prescribed 120-day process. This is followed by a 30-day public review period for the Environmental Project Report, and a 35-day period for the Minister of the Environment and Climate Change to respond to any objections submitted by the public.

Upon completion of the TPAP, the RT project can proceed to detailed design, implementation and construction. Discussion of alternative delivery methods that the City may consider is provided in Section 9.8.
Exhibit 9.2: Focus Areas for the Transit Project Assessment Process
9.4 Impacts and Mitigation

In the next study phase, additional assessment of impacts to natural, cultural, archaeological, and socio-economic environments will be conducted. Appropriate mitigation measures will be developed and recommended as part of the implementation strategy, including monitoring.

9.4.1 Natural Heritage

The Subject Lands Status Report (Appendix C) summarized available data from past studies and current field investigations to help understand the existing environmental conditions and potential constraints within the Study Area. This report focused on natural heritage features adjacent to the preliminary transit corridors and was used in the determination of the preferred network.

Additional ecological field investigations will be completed as part of an Environmental Impact Study during the pre-planning for the TPAP to:

- Address the areas of the RT corridors that have changed;
- Describe and assess areas where the proposed infrastructure is likely to extend beyond the existing road allowance into natural heritage features as identified on Schedule B-1 of the City of London Official Plan, or as identified through this process;
- Describe and assess the existing environmental conditions and potential for negative impacts associated with the approved RT corridors; and,
- Provide measures to avoid, minimize and/or mitigate identified impacts.

9.4.2 Cultural Heritage and Archaeological Assessment

The Cultural Heritage Constraints (Appendix D1) and Stage 1 Archaeological Assessment Reports (Appendix D2) respectively provided a preliminary evaluation of the cultural heritage and archaeological features in the study area, based on background research and available data. These reports are based on the preliminary preferred network and require updates to reflect the final BRT network.

Proximity to built heritage structures along the route may require that an assessment of impacts be completed through either a Heritage Impact Assessment and/or Cultural Heritage Evaluation Report(s). These would be completed as part of the pre-planning for the TPAP.

A Stage 2 archaeological assessment is required for areas of archaeological potential within the impact area, as identified in the Stage 1 report. Areas where there have been changes to the preferred alternative will require updates to the Stage 1 assessment to determine Stage 2 requirements.

A Stage 3 assessment is recommended for all lands to be impacted within 10m of cemetery boundaries, or other areas with known potential for buried artifacts, such as Victoria Park. This assessment must be preceded by a Stage 2 survey as warranted, regardless of the level of disturbance noted in the area adjacent to the cemetery.

Updates to the Stage 1 assessment and Stage 2 and 3 assessment, as needed, will be completed as part of the pre-planning for the TPAP.

Should previously undocumented archaeological resources be encountered during development, they may represent a new archaeological site. The proponent or person discovering the archaeological resources must cease alteration immediately and engage a consultant archaeologist to carry out archaeological fieldwork.

9.4.3 Property Access and Business Continuity Plan

To support businesses in construction work zones and maintain existing or equivalent vehicle and pedestrian access to all buildings and properties, the following plans may be developed, subsequent to completion of the TPAP and preliminary engineering design:

- Property Access and Business Continuity Plan;
- Door Closure Management Plan.

The Property Access and Business Continuity Plan could demonstrate the following:

- Coordination of communications within the project team, in communicating with businesses, property owners and communities along the Project corridor;
- Planning for public access, including access to properties, maintenance of the corridor, and temporary parking provisions;
- Maintenance of front door pedestrian access to all properties. Should front door pedestrian access not be able to be maintained, provision of a minimum of sixty (60) days’ notice to the affected property owner and tenants;
- Maintenance of existing or provision of equivalent vehicle access (i.e., maintenance of existing driveway location and width, maintenance of rear laneway width and configuration);
9.0 IMPLEMENTATION PLAN

• Minimization of delay for vehicles and pedestrians accessing retail stores;
• Identification of on-site traffic management personnel will be provided, such as off-duty police officers or trained flag persons where appropriate, to maintain safe and adequate vehicle and pedestrian access;
• Maximization of visibility of business frontages, including front doors;
• Maintenance of locations and visibility of current business signage. Where this is not feasible, provide relocation or design, supply and installation of new signage at locations which continue to provide high visibility and clear sightlines. This would be conducted in consultation with the affected businesses;
• Design, supply and installation of additional signs to direct pedestrians and vehicles to business access routes; and,
• Maintenance of all signage as described above throughout the construction period.

The Property Access and Business Continuity Plan could also outline detailed framework of community liaison which would ensure that the needs of the area residents and business owners are met to their satisfaction. This could include regular updates to affected public about the construction activities according to the following communications requirements:

• On-going community liaison during construction;
• Sufficient and specific notice to affected property owners and tenants for each stage of construction, including anticipated impacts and durations;
• Sufficient and specific notice to affected business owners for each stage of construction, including the identification of potential impacts, allowing businesses to take actions to offset and/or mitigate business loss;
• Maintenance of records of all notices;
• Prompt, formal written responses to complaints and documentation of specific follow-up actions; and
• Provision of contacts for a Construction or Community Liaison staff member available outside of normal business hours who would be responsible for proactively engaging with property owners and tenants throughout the corridor and the Business Improvement Areas throughout the duration of the project. This staff member would inform these groups of upcoming changes in construction activity, facilitate mitigation of any construction-related access or parking issues between the properties and the proponent, and assist in ensuring that the proponent maintains access for each relevant mode and keeps the street clean to the extent possible.

The Property Access and Business Continuity Plan could be supported by a Door Closure Management Plan, which could include:

• Methods to be used to minimize closures during construction;
• Communication of door closures;
• Anticipated door closures; and,
• The monitoring process for door closures, including calculation methods, and the recording and reporting method.

9.5 Construction Phasing

With a total length of approximately 24km, the RT corridors will be constructed in phases. The timing of construction phases requires coordinating of several factors including: identifying short-term solutions to start attracting new riders, coordinating with other planned construction, maintaining transportation network connectivity and access, providing lead time for utility relocations and improvements to existing structures, and determining feasible construction targets.

The consideration of alternative forms of governance may affect the construction phasing sequence. The following sections assume a traditional design-bid-build scenario.

9.5.1 Quick Start

There are many benefits to implementing short-term improvements to build transit ridership along the RT route. A Quick Start service is proposed on the North corridor utilizing buses in mixed traffic, with transit signal priority, localized intersection improvements, and rapid transit station spacing and service headways. Enhancements have not been detailed but could also include queue jump lanes and enhanced shelters. The Quick Start service would be designed to minimize throw-away costs. Existing route operations may also benefit from corridor upgrades. To accelerate the construction timing, Quick Start capital improvements would be limited to intersections where property is not required and utility impacts are very limited.

Upon completion of the TPAP process, the Quick Start improvements would be designed by the City and constructed accordingly, potentially starting in 2019. In addition to physical improvements along the RT routes, operational changes to local routes could be considered as part of a Quick Start program. While there are current LTC routes that cover most of the proposed RT routes, there are none that follow along their entirety. In concert with LTC, consideration could be given to adding new service to run local busses along some or all of the RT routes. A new route emulating the North corridor (Western University to Downtown) is currently proposed. This option requires further exploration with LTC, and funding approvals.

Other transit system improvements could include:

• Transit signal priority at key locations, triggered by Transit Control when a particular route is behind schedule by a pre-determined amount.
• Designating existing general traffic lanes as bus only lanes either full-time or during peak traffic periods for routes emulating the RT routes.
9.0 IMPLEMENTATION PLAN

- Avoid use of bus bays along roadways where conditions warrant, to avoid delays from buses attempting to re-enter the flow of traffic.
- By-laws, signage and enforcement of restrictions on traffic stopping or parking near bus stops.
- Marking stop bars at intersections to avoid conflict between turning buses and stopped vehicles.
- Locating bus stops at intersections to better accommodate rider transfers and access to activity centres.
- Exempting buses from prohibited movements (e.g. no left turns – except buses).

9.5.2 Construction Phasing

The City has planned improvements on adjacent roads which will influence the phasing of RT construction. At the time of writing, relevant planned capital projects and their respective planned construction periods are noted below, subject to funding and approvals:

- Western Road from Oxford Street West to Sarnia Road: 2017-2019
- Dundas Street from Wellington Street to Ridout Street: 2018-2019
- Wharncliffe Road from Thames River to Horton Street: 2019-2021
- Wonderland Road from Springbank Drive to Sarnia Road: 2022-2027
- Adelaide Street / CPR rail grade separation: 2021-2025

In addition to the above, Western University has on-going capital improvements and the timing of construction on campus requires co-ordination and approvals from the University.

Following the completion of the RTMP and TPAP, the project will move to detailed design. This stage is expected to take up to two years, depending on the delivery model selected, meaning that some segments of RT could commence construction in 2019.

The current implementation plan, as shown in Exhibit 9.3, anticipates that construction would start on the east and north corridors first as these corridors are expected to have the highest ridership. Construction on the west and south corridors would then commence in 2023. These timelines are contingent on funding approvals and a final delivery plan.

One of the challenges with this phasing plan is that initial service, targeted to start in 2023 will be impacted by construction on the final segments of the corridors.

The phasing plan accounts for the City’s commitment to deliver other transportation projects, including improvements on other corridors which are a pre-requisite for Rapid Transit. The phasing plan will be refined during the TPAP process.

Exhibit 9.3: Proposed Construction Phasing of Rapid Transit

---

9.5.3 Construction Timing

A review of other RT projects in Ontario provides a comparison on the time from planning to funding, design, procurement and construction of similar projects, and is summarized in Exhibit 9.4.

This supports the estimated time to construct London’s RT corridors in 7 to 10 years.

9.6 Interim Transit Service

The LTC completed a Rapid Transit Integration Strategy and Financial Plan (June 2016) to identify modifications to their route network and confirm high-level costs and revenue projections between 2020 and 2035.

This strategy assumes RT is implemented between 2019 and 2027, and provides 10 minute headways on the both the North + East and South + West routes, with additional buses to provide 5 minute headways on the North + East route during AM and PM weekday peak periods.

As the construction phasing is refined in subsequent stages of implementation, the proposed modifications and timing of modifications to the LTC route network should be reviewed and updated accordingly.

9.7 Risk Assessment

A complete risk assessment is beyond the scope of this master plan. However, elements that are beyond the control of the City can be identified at this stage for future consideration. Additional risk assessment and a detailed risk management plan should be developed in future stages of implementation. Risk elements for consideration include:

- Third party approvals, including government agencies and other levels of government
- Internal and external stakeholders and public relations, to build and maintain positive interactions with the community
- Unknown site conditions, such as utilities and subsurface conditions, which can be further resolved as the design progresses
- Property acquisition, which can be supported by the expropriation process if needed but can result in delays and added costs

9.8 Overview of Delivery Methods

Recommending a preferred delivery model for RT implementation in London is beyond the scope of this study. However, a review of available options is provided in this section to support ongoing discussions within the City. The term “project delivery” refers to the type of contractual relationship to bring together an Owner needing something built and the tradespersons who can carry out the project construction.

Several factors should be considered in deciding which project delivery method to follow, including:

- Project size and type
- Legislative and regulatory requirements
- Tolerance for risk
- Schedule
- Local market knowledge
- Desired level of City involvement
- City resources and capabilities
These interdependent factors can be evaluated to inform the City’s decision on the selection of a project delivery method to best fit the goals and requirements of the City and the Shift Rapid Transit project. The City may also choose to deliver different elements of the RT project following different approaches.

Project delivery can take a range of forms, as illustrated in Exhibit 9.5, from the most familiar traditional design-bid-build, to newer alternative project delivery (APD) methods. Different project delivery models vary in terms of the amount of responsibility and risk taken on by the Owner. The role of design and construction providers also varies with each method of procurement and delivery.

9.8.1 Traditional Design Bid Build (DBB)
This traditional form of construction contract involves three distinct parties: an owner, a design professional (engineer or architect) and a contractor. The owner retains a design professional to design the project, and then the owner hires a contractor to complete the project in accordance with the designer’s plans and specifications. The design professional and the contractor parties might involve one or several firms or subcontractors, but each remains contractually responsible for the obligations undertaken in design and construction, respectively.

In this model, the owner certifies or warrants to the contractor the sufficiency of the designer’s plans and specifications, and assumes any liability for defects. The contractor may request “extras” from the owner to remedy any inadequacies in the plans, the result of which usually gives rise to increased costs.

The contractor is responsible only for those defects that occur in relation to the construction of the project (i.e. it is limited to its compliance with the dictates of the specifications and drawings), and assumes the liability of its subcontractors, the cost of the work, indemnification for casualties, and the responsibility for the coordination of the work.

The design professional is responsible for the design but does not assume any liability for defective construction other than that which should have been obvious in the course of field services provided during construction.

9.8.2 Construction Manager/General Contractor (CM/GC)
The term construction manager (CM) refers to the firm that is responsible for managing the entire construction process. Over the last three decades, the scope of the CM’s legal responsibilities has generally expanded as design professionals have attempted to minimize or avoid liability by deleting responsibility for inspection and supervision from their contracts.

Employed at the same time as the design professional, the CM works as a team member and shares construction experience as the design evolves. Additional duties of the CM include responsibility for the project budget and project schedule, both during the design and documentation phases (traditionally the designer’s responsibility), and during the bidding and construction phases (traditionally the Owner’s and general contractor’s responsibility). These include detailed budgeting, cost estimating, scheduling, constructability reviews and value engineering studies.

There are two commonly used project management approaches for a CM: (1) “Pure” Construction Manager (CM “Not-at-Risk” or CM-as-Agent) and (2) Construction Manager at Risk (CM “At-Risk”).
CM-as-Agent (Not-at-Risk)
In this approach, the owner ultimately carries the risk of the construction project, despite the fact that the CM is responsible for the scheduling and controlling of the project’s cost. This is in addition to retaining responsibility for all of the actions of the CM. If the schedule or costs are negatively impacted through some fault of the trade contractors, or the trade contractors fail to perform the work, the risk lies with the owner, if the owner has opted for a structure where he/she performs as the general contractor.

Nonetheless, the CM has a duty to use reasonable care in the performance of its services, whatever they may be. From an owner’s perspective, the CM contract should address the CM’s liability for cost overruns and trade contractors’ claims resulting from the CM’s failure to carry out their work competently, in particular their duty to co-ordinate and schedule the work of the trade contractors.

The risks associated with this approach also include the risks of the owner becoming a “constructor” under Occupational Health and Safety legislation. The owner, as “constructor”, will be responsible for the relevant provisions of health and safety legislation once it enters into more than one construction contract.

CM-at-Risk
The CM-at-Risk approach is a hybrid between the Traditional and the Construction Management project structures, and is often called “Contractor/Construction Manager Project Structure”. The CM in this project structure typically takes on construction management responsibilities together with the direct responsibility for the work that is normally taken on by a general contractor.

The CM is brought on during the design phase of the project to be part of the design team, and to work with the architect (or engineer) in developing drawings that will minimize the final construction cost. Towards the end of the design development phase, the CM assumes the obligation to construct the project for a stipulated sum or a guaranteed maximum price (GMP).

In this approach, unlike the “CM Agency,” the CM-at-Risk is the company that builds the project, holds the subcontracts and is responsible for guaranteeing the work, its cost and completion date.

9.8.3 Design Build (DB)
The Design Build (DB) form of project delivery is a system whereby the owner hires a single consortium or team to design and construct the project. The majority of the project risks are passed on to the design-builder to provide a completed project to the owner. This obligation can include land assembly, design, construction, supervision of construction, and commissioning of a fully operative facility.

In this approach, the design-builder is ultimately responsible for any defects or deficiencies in the building of the project, as well as any defects or deficiencies in the design. The design-builder must also absorb any additional cost that occurs as a result of design or construction.

The owner has reduced responsibility and input into the design and construction in this delivery system. Since the owner must operate and maintain the finished product, it is advisable to take extra precaution and a more of active role in ensuring that they are receiving a valuable asset at the completion of the contract.

9.8.4 Design Build Finance (DBF)
The Design Build Finance (DBF) approach is similar to the DB, in that the owner hires a single consortium or team to design and construct the project. The finance risks are also passed on to the DBF team to finance the asset until the completion of the project and handover to the owner.

Typically, the DBF model is applied where there is little to be gained from involving the private sector in the operating phase, or where projects involve assets where it is difficult to transfer maintenance and lifecycle risks of the asset over the long-term.

9.8.5 Design Build Finance Operate and Maintain (DBFOM)
The Design Build Finance Operate and Maintain (DBFOM) project delivery method places additional responsibility on the DBFOM consortium who is designing and building to also finance the capital and operating requirements of the project, ideally without reliance on the owner’s capital funds. There are variations on this model, where either operation or maintenance can be performed by the owner, which is Design Build Finance Maintain (DBFM) or Design Build Finance Operate (DBFO), respectively.

A public-private partnership entails an arrangement between government and private sector entities for the purpose of financing and delivering infrastructure with a public purpose and service. The DBFOM team, generally a consortium of several companies, covers all expenses and construction costs. Normally, repayment of the debt is accomplished through a lease or contract purchase obligation with the owner.

Where an owner is the government, the lease or contract purchase obligation must be properly authorized by those responsible for imparting the “power of Parliament.” Most importantly, steps must be taken to ensure that the government acquires the necessary authorizations to provide a commitment to the DBFOM consortium for the duration of the outstanding obligation (i.e. beyond the current government’s term in office).

The DBFOM consortium bears any cost overruns in respect of the construction and maintenance of the assets and the operation of services. The DBFOM consortium may also pass on construction risk by entering into fixed-term and DB construction contracts with other contractors. The risks relating to financing are unlike those risks of the contractor or designer because while the designer and contractor are concerned with risks associated with the efficiency of construction, the lender is primarily concerned with threats to cash flow and cash flow projections. To be attractive to financiers, the completed project has to have resilient cash flows over its long life (e.g. 30 years or more).
This page was intentionally left blank.
10.0 COSTS

As identified in Section 3.10, a business case was developed in parallel with this RTMP to compare the economic and financial impacts of the four network alternatives over the project lifecycle. Both the financial and economic outputs from the business case were used to help evaluate the network alternatives. The preferred BRT Network is described in Section 5. The full business case is provided in Appendix F. The following sections summarize the cost components of the business case, including the costing methodology of operating and capital costs of the BRT Network.

10.1 Operating Costs

10.1.1 Service Levels

Service levels were developed based on ridership forecasts and assumed capacities of 70 to 110 passengers per vehicle for BRT. The resultant peak period service levels and capacities are provided below. For off-peak periods, a minimum policy service frequency (policy headway) of 10 minutes was assumed if not otherwise governed by ridership. Initially service during off peak periods may be provided every 15 minutes, and as ridership grows, the 10 minute policy service frequency would be initiated.

These figures were used to develop estimated operating and maintenance costs based on per revenue service hour or per revenue service kilometre measures derived from other BRT operations. The assumed service levels are identified in Exhibit 10.1.

10.1.2 Vehicle and Rolling Stock Requirements

Based on route length, revenue service hours, and the need for spare vehicles, the estimated fleet size for the BRT Network is 28 articulated vehicles, including spare vehicles.

10.1.3 Annual Operating Costs

Operating cost estimates are based on unit values obtained from 2014 LTC operations and supplemented from other sources where required. A breakdown of each variable used to estimate operating costs, including the input value, unit, and reference source can be found in Exhibit 10.2.

From these assumptions, single year operating costs were developed, and annualized operating costs were determined for every year until 2050. Annual operating costs were developed to account for a phased implementation of RT, and timelines for construction. Exhibit 10.3 summarizes the gross annual operating costs by project phase (in real 2017$ dollars).

The operating costs that are used for the Business Case are the Present Value (2017$) of the sum of all the annualized operating costs.

Exhibit 10.1: Full BRT - Assumed Service Levels

<table>
<thead>
<tr>
<th>Attribute</th>
<th>East Corridor</th>
<th>West Corridor</th>
<th>North Corridor</th>
<th>South Corridor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus Rapid Transit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Frequency (min)</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Capacity per vehicle</td>
<td>70-110</td>
<td>70-110</td>
<td>70-110</td>
<td>70-110</td>
</tr>
<tr>
<td>Capacity Provided passengers/hr</td>
<td>840-1320</td>
<td>420-660</td>
<td>840-1320</td>
<td>420-660</td>
</tr>
</tbody>
</table>

Exhibit 10.2: Operating Cost Assumptions

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
<th>Unit</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour Cost</td>
<td>55</td>
<td>$/Service Hour</td>
<td>LTC</td>
</tr>
<tr>
<td>Administrative Cost</td>
<td>0.12</td>
<td>$/Service Hour</td>
<td>LTC (CUTA 2014)</td>
</tr>
<tr>
<td>Vehicle Operating Speed (Vo)</td>
<td>25</td>
<td>km/h</td>
<td>Synchro model</td>
</tr>
<tr>
<td>Electricity Cost</td>
<td>0.102</td>
<td>$/kwh</td>
<td>Ontario Energy Board – 2015</td>
</tr>
<tr>
<td>Diesel Cost</td>
<td>1.05</td>
<td>$/L</td>
<td>LTC (CUTA 2014)</td>
</tr>
<tr>
<td>BRT Diesel Consumption</td>
<td>0.6316</td>
<td>L/KM traveled</td>
<td>LTC (CUTA 2014)</td>
</tr>
<tr>
<td>BRT Vehicle Maintenance</td>
<td>1.084</td>
<td>$/km traveled</td>
<td>LTC (CUTA 2014)</td>
</tr>
<tr>
<td>RT Plant Maintenance</td>
<td>0.26</td>
<td>Portion of Veh. Maintenance</td>
<td>LTC (CUTA 2014)</td>
</tr>
<tr>
<td>BRT Alignment Maintenance</td>
<td>50,000</td>
<td>$/km</td>
<td>Casello, 2014</td>
</tr>
<tr>
<td>Auxiliary hours</td>
<td>1.076</td>
<td>rate</td>
<td>LTC 2015-2019 Service Plan</td>
</tr>
<tr>
<td>Spare Vehicle Ratio</td>
<td>4.1</td>
<td>ratio</td>
<td>LTC</td>
</tr>
</tbody>
</table>
Exhibit 10.3: Rapid Transit Operating Costs between 2019 and 2031 (In 2017$)

<table>
<thead>
<tr>
<th>Year</th>
<th>RT Operating Cost (2017$)</th>
<th>North To East Route</th>
<th>West To South Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>$860,000</td>
<td>Quick Start</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>$860,000</td>
<td>Quick Start</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>$860,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>$4,785,818</td>
<td>Quick Start and East Corridor</td>
<td></td>
</tr>
<tr>
<td>2023</td>
<td>$3,925,818</td>
<td>East Corridor</td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td>$3,925,818</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>$3,925,818</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>$10,361,784</td>
<td>South Corridor</td>
<td></td>
</tr>
<tr>
<td>2027</td>
<td>$10,361,784</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2028</td>
<td>$12,866,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2029</td>
<td>$12,866,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td>$12,866,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2031</td>
<td>$12,866,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10.2 Capital Costs

Capital costs were estimated using a combination of cost per kilometre taken from a review of other RT projects in Canada, and preliminary costs were applied to major network items and structures. New BRT vehicles were assumed to cost $1,000,000 each based on recent purchases by LTC.

Each route segment was costed by applying these input assumptions. A provision for Quick Start improvements in the north corridor was developed. The totals for each segment were then summed and a 15% engineering cost and 10% project management cost were applied. Given the current phase of the project and limited design effort that has been considered at this time, a 50% contingency was also applied to the capital cost.

Exhibit 10.4: BRT Capital Cost Summary (Real 2017$)

<table>
<thead>
<tr>
<th>Summary of BRT Capital Costs in Real 2017$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment Total (including quick start)</td>
</tr>
<tr>
<td>Maintenance Facility</td>
</tr>
<tr>
<td>Engineering (15%)</td>
</tr>
<tr>
<td>Project Management (10%)</td>
</tr>
<tr>
<td>Contingency (50%)</td>
</tr>
<tr>
<td>Vehicles</td>
</tr>
<tr>
<td>Quick Start</td>
</tr>
<tr>
<td>Total (Rounded – Real 2017$)</td>
</tr>
</tbody>
</table>

Note: These costs are not reflective of future year costs based on inflation.
10.3 Life Cycle Costs

Lifecycle costs include the total cost of a project over its life after implementation including replacement and major refurbishment costs, ongoing operating costs, and maintenance and minor rehabilitation costs. This was completed for this project up to 2050.

In order to establish an order of magnitude for these costs, a lifecycle costing analysis was completed. The analysis examined each component of the RT system including runningways, stations, vehicles, maintenance facilities and control systems. Each component was assigned a lifespan and replacement cost. Interim refurbishment costs at typical timespans were also included. Replacement periods for buses were assumed to be 14 years with refurbishment every seven years.

The unit costs assumptions for the life cycle cost analysis and the life cost for the BRT Network is summarized in Exhibit 10.5.

### Exhibit 10.5: Life Cycle Unit Costs and Life Cycle Cost Summary

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Cost/Unit</th>
<th>unit</th>
<th># of Units</th>
<th>Schedule (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Rehab (runningway)</td>
<td>$45,000</td>
<td>lane-km</td>
<td>47.4</td>
<td>7</td>
</tr>
<tr>
<td>Major Rehab (runningway)</td>
<td>$90,000</td>
<td>lane-km</td>
<td>47.4</td>
<td>20</td>
</tr>
<tr>
<td>Stations</td>
<td>$143,750</td>
<td>station</td>
<td>34*</td>
<td>24</td>
</tr>
<tr>
<td>Control Systems/ITS</td>
<td>$575,000</td>
<td>km</td>
<td>23.7</td>
<td>15</td>
</tr>
<tr>
<td>BRT Vehicles (refurb)</td>
<td>$120,000</td>
<td>vehicles</td>
<td>28</td>
<td>7</td>
</tr>
<tr>
<td>BRT Vehicles (replace)</td>
<td>$1,000,000</td>
<td>vehicles</td>
<td>28</td>
<td>14</td>
</tr>
<tr>
<td><strong>Life Cycle Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td>$34,257,822</td>
</tr>
</tbody>
</table>

Note: * Split Station of Talbot Street on King Street and Queens Avenue is counted as one station for life cycle costing
Part III
IMPLEMENTATION

Section 11
Conclusions and Next Steps
London’s Rapid Transit Initiative Master Plan identifies a BRT network and multi-modal transportation strategies to the City’s mobility, city building, and economic development objectives that is the best overall value solution.

Building on previous RT studies by the City and LTC, the BRT network supports the vision, goals and objectives of The London Plan, Smart Moves 2030: The New Mobility Transportation Master Plan, and several other plans and policies in place. The implementation of the BRT network is a central component of London’s land use and transportation policy which will help shape London for decades to come.

The preferred BRT network was developed through the identification and evaluation of potential corridors and RT technologies, consideration for benefits and impacts, and a business case analysis, following Phases 1 and 2 of the Municipal Class Environmental Assessment. The BRT network addresses the needs and opportunities identified in this RTMP.

Consultation was conducted with technical and government agencies, municipal advisory committees, Indigenous communities, major institutions and property owners, Business Improvement Associations, community groups, and the general public. To consult with the wide array of people, a variety of consultation mechanisms were used to obtain feedback, including: public open houses, pop-up discussions, online surveys, and stakeholder meetings, among other tools aimed at gaining valuable input throughout the study. The Rapid Transit Master Plan has evolved and been refined based on feedback received.

Based on the evaluation completed to date, implementation of the BRT network will be the most sustainable RT solution for London. At a capital cost of $500 million in nominal dollars, and annual operating cost of approximately $12.8 million, this alternative is expected to produce over $724 million in transportation, environmental and economic benefits over the project lifespan. This includes approximately $19.7 million of GHG emissions savings.

The BRT network can be implemented in a phased approach and can be transitioned to rail-based technologies over the longer term, where supported by ridership demand, subject to additional business case and environmental analyses.

The Notice of Completion for the Master Plan, including details on the public review period, is provided in Appendix A-A and available on the project website: www.shiftlondon.ca.

Exhibit 11.1 shows a proposed project timeline. The proposed next steps for the project include preparing for and completing the Transit Project Assessment Process (TPAP; Ontario Regulation 231/08). TPAP is a proponent-driven environmental assessment process intended specifically for transit-related projects. Pre-planning is undertaken, prior to the formal notice of commencement of the TPAP, to develop and evaluate design alternatives, complete technical studies to assess potential impacts, identify mitigation and monitoring requirements, and consult with stakeholders. Recommended pre-planning phase exercises include:

- Contacting the Director of the Ministry of the Environment and Climate Change, Environmental Assessment and Approvals Branch;
- Preparing a Communications and Engagement Plan;
- Conducting additional technical studies, such as more detailed natural environment, archaeological and built heritage assessments; stormwater management; noise assessment; and traffic analysis;
- Meeting with Municipal Advisory Groups and the Rapid Transit Implementation Working Group;
- Consultation activities, including but not limited to meetings with property and business owners along the RT corridors; public open houses; design charrettes; outreach to community groups, business improvement, and neighbourhood associations; social media and project website; electronic newsletters and surveys;
- Identifying potential matters of provincial importance;
- Preparing a preliminary engineering design, which will refine the conceptual design included in this report (Appendix J) including intersection lane configurations, on-street parking, property impacts, streetscape design, utility impacts, station locations and design; and,
- Preparing a draft Environmental Project Report including preliminary engineering design, supporting technical documents, and a pre-planning consultation summary.
Exhibit 11.1 Project Timeline

Rapid Transit Master Plan

- 2015: Project Start

Rapid Transit Corridors

- 2015: Project Start

Rapid Transit Routes

- Q2 2017: Council Approval

Conceptual Design

- Q2 2017: Council Approval

Preliminary Engineering Design

- Q1 2018: Construction Begins

Detailed Design & Construction

- 2018: One Route Complete

- 2025: System Complete

- 2028: System Complete

Transit Project Assessment Project

Delivery