The Corporation of the City of London

Core Area Servicing Study (CASS): Water
FINAL

Prepared by:

AECOM
410 – 250 York Street, Citi Plaza
London, ON, Canada N6A 6K2
www.aecom.com

519 673 0510 tel
519 673 5975 fax

December, 2017

Project Number: 60515664

Distribution List

# Hard Copies	PDF Required	Association / Company Name
	1	City of London

Revision History

Revision #	Date	Revised By:	Revision Description
1	May 10’17	M. Simons	Initial Draft for City Review
2	July 7’17	N. Awde	Final Draft for City Review
3	Dec 28’17	T. Fediw, N. Awde	Final

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("AECOM") for the benefit of the Corporation of the City of London ("Client") in accordance with the agreement between AECOM and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report (collectively, the "Information"):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations");
- represents AECOM's professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to AECOM which has not been independently verified;
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time.

AECOM shall be entitled to rely upon the accuracy and completeness of information that was provided to it and has no obligation to update such information. AECOM accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

AECOM agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but AECOM makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

Without in any way limiting the generality of the foregoing, any estimates or opinions regarding probable construction costs or construction schedule provided by AECOM represent AECOM's professional judgement in light of its experience and the knowledge and information available to it at the time of preparation. Since AECOM has no control over market or economic conditions, prices for construction labour, equipment or materials or bidding procedures, AECOM, its directors, officers and employees are not able to, nor do they, make any representations, warranties or guarantees whatsoever, whether express or implied, with respect to such estimates or opinions, or their variance from actual construction costs or schedules, and accept no responsibility for any loss or damage arising therefrom or in any way related thereto. Persons relying on such estimates or opinions do so at their own risk.

Except (1) as agreed to in writing by AECOM and Client; (2) as required by-law; or (3) to the extent used by governmental reviewing agencies for the purpose of obtaining permits or approvals, the Report and the Information may be used and relied upon only by Client.

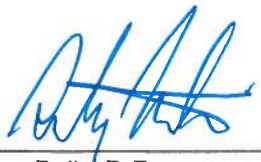
AECOM accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information ("improper use of the Report"), except to the extent those parties have obtained the prior written consent of AECOM to use and rely upon the Report and the Information. Any injury, loss or damages arising from improper use of the Report shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of the Report and any use of the Report is subject to the terms hereof.

AECOM: 2015-04-13

Authors

Report Prepared By:



Tony Fediw, P. Eng
Manager Transportation

Stephen Romano, M. Eng
Water EIT

Report Reviewed By:

Neil Awde, P. Eng
Project Manager

Executive Summary

In general, the redevelopment of central areas of the City of London will require growth needed infrastructure to be placed in neighborhoods that already have some pre-existing services. Typically, these redevelopment zones are characterized by congested right-of-ways, old buildings and require new infrastructure designed for higher density population loadings that are prepared using contemporary Design Criteria. Applying Council adopted policy direction of "growth paying for growth" these infill areas will have infrastructure needs that should be recoverable from the Development Charges By-law & Fund. This report lists the infrastructure projects required to facilitate intensification of the City's core area, explains the modelling of the water distribution system required to meet infill growth needs over the next 20 years, estimates costs of projects, reviews amendments to current growth policies that may be undertaken by the City of London, assigns a financial benefit to existing (BTE) growth for service replacements, and distributes cost over different growth sectors (Residential, Institutional, Commercial and Industrial; commonly referred to as Res ICI).

This study was originally envisioned to cover a discrete central area defined by certain geographical road and river boundaries. Through discussion with stakeholders it was recommended that the suggested amendments to the Development Charges By-law & Fund policies be applied to the existing built boundary. Further refinement of those specific policy changes will be reviewed during the 2019 Development Charges By-law which will likely begin in the spring of 2018.

Prior to undertaking the creation of the modelling work to estimate the growth impacts of this intensification, the City of London asked AECOM and Watson Associates to review how other municipalities have planned and organized the payment for redevelopment in their central core areas. Specifically, we reviewed current City of London technical design parameters and Growth Policies with eight (8) comparator municipalities to ensure best management practices are followed, analyzed other jurisdictions level of service for water distribution systems, and summarized emergent policy needs and requirements for asset management principles laid out within Bill 73. This information is presented in **Table 1** in **Appendix A**.

Generally, the City of London is similar to comparator municipalities for technical parameters used for design standards and design criteria of the water distribution system and London provides a level of service consistent with other municipalities throughout Ontario with two exceptions:

- Regarding the minimum hydrant spacing, London meets the MOECC guidelines but several municipalities require hydrants to be spaced closer together. As such, London provides less of a level of service in this regard.
- For the maximum pipe velocity at normal and fire flow conditions, London provides a high level of service as they require relatively low velocities during normal and fire flow conditions in comparison to other municipalities.

As such, no significant changes to the existing technical standards have been recommended for adoption. However, changes to Development Charge and Growth Policies may be undertaken if Municipal Council chooses to:

- create partitions breaking the City into two or more zones;
- recognize different levels for local servicing definition for application of funding eligibility under the Development Charges by-law; and
- develop a more refined formula for BTE definition to recognize an asset condition of an existing infrastructure element that is not purely aged based are all possible refinements

Council may wish include these possible refinements when they make amendments during the next Development Charges by-law update study (2019). The proposed 2019 Development Charges by-law amendments are presented in **Table 2** in **Appendix A**.

Our analysis suggested that work performed in the core area trends above other Greenfield projects, based on several City of London tenders for both downtown and Greenfield projects and the 2014 Development Charges estimates by at least 20-50%. This suggests a short fall in funding compared to the mostly Greenfield 2014 DCBS

projects. For this reason, we recommend the application of 30% contingency over the traditional 20%, and increasing the Engineering Fee from 15% to 20% used in Greenfield project. Unit rate costs for watermains are presented in **Table 3** in **Appendix A**.

The impact of new growth in built up areas on the existing water distribution system was modelled using growth assumptions provided by the City of London Planning staff based on Draft Plan & Site plan applications, development inquires, the Vacant land Inventory and developer assembled parcels. The modelling of water infrastructure needs for the next twenty years was prepared by updating the 2014 Master Plan model after calibrating for the growth that occurred in the last 3 years. Specifically, the water demand model was updated for both existing and forecasted future demands and input into the hydraulic model. The new water demand model consists of the following components:

- An update of future growth population for each five year planning horizon to 2034 and ultimate for both the core area and beyond the core area based on available planning information. Design per capita water usage and peaking factors based on criteria applied to the growth population based on land use to obtain the future growth demand. As the demands in areas outside of the core areas will impact the level of service within the core areas, these were also included;
- Future growth average day demand for each five year planning horizon were determined based on planning data and consumption design criteria determined and added to the existing baseline demands;
- Non-Revenue Water (NRW) is estimated based on spatial distribution for various components, including: estimated usage for flushing, firefighting, street sweeping, and new construction. These would be estimated based on data assumed to be available from the City, and applied uniformly across the system; The remaining NRW volume was assumed to be attributable to breaks and leaks and will be assigned proportionally to the system based on the estimated leakage propensity, inferred from pipe material, diameter and age. For example, CI mains are assumed to have a higher leak / break component of NRW than new PVC mains;
- Peaking factors for maximum day demand were applied;
- Recent SCADA records were used to develop the Diurnal demand patterns for Elgin Middlesex Pumping Station (EPS), and were also used to develop the land use based diurnal demand patterns for each land use category. If growth intensification involved reassignment of land use to different categories, (e.g. institutional to residential), it is likely that this will have an impact on the temporal water use patterns within the study area, which were reflected in the model. We reviewed the use of land use based versus global diurnal demand patterns;

The modelling exercise provided a comprehensive evaluation of existing and future water infrastructure needs to accommodate the future growth of the Core Area and allows the City of London to identify water infrastructure upgrades associated with the future residential and non-residential growth in the Core Area for inclusion in the City's Growth Management Implementation Strategy (GMIS), 2019 Development Charges By-Law update study and for capital budgeting purposes; as provided in **Table 4** in **Appendix A**.

In keeping with a focus on Asset Management a new methodology to assign a value to an existing pipe in situ was developed for use as a measure of Benefit to Existing (BTE). Condition ratings were taken from the City of London Asset Management ratings which are compiled based on age, visual inspection of defects, performance factors for pipe pressure and flow.

In the 2014 Water DCBS an age based formula was presented to "value an existing in situ pipe" that was predicated on the assumption that a typical pipes life expectancy is 80 years.

However, given the nature of infill development, growth works in the core area will likely replace or supplement existing utilities to meet intensification loading needs. This is different from previous Greenfield growth projects that installed new services in typically unserved areas that were considered in the 2014 DCBS study.

The maximum usable life assumption of 80 years can be exceeded by 20-40 years, and a fairly new pipe may have performance issues leading to its premature replacement prior to it reaching 80 years of age. The new valuation uses performance factors that better evaluate the condition of an existing pipe.

The BTE represents an advantage that the City would realize by reduction of future cost by a pipe replacement. The better the condition of the existing pipe the lower the BTE and less of an advantage is assigned. Conversely, the loss of pipe residual life is greater for a pipe in good condition and is represented by (1-BTE). This then captures the fact that a poor performing pipe would have a low condition rating, high BTE and low residual life.

The infrastructure works were reviewed holistically on a system wide basis with alternate routes considered and an implementation plan was developed that coordinates needs of Water Servicing, Sanitary Servicing, Storm Servicing, the Rapid Transit Project and other downtown initiatives (e.g. Dundas Place) that is financially responsible and viable. This staging plan is consistent with the London Plan in terms of development of growth areas.

This study is intended to provide the policy changes required for updates in the 2019 Development Charge Background Study. City-staff can apply growth and non-growth splits to projects currently funded by the DC14-WD01002 Infill and Intensification Nodes noted in the 2014 Development Charge Background Study. An amendment in the 2019 update study will be subject to a formal public review process and City Council adoption.

There are distinct cost savings to both the rate payer and Development Charges reserve funds when undertaking one construction project that is sized appropriately for both growth and the existing user. The extent of Local Servicing policy changes recommended for immediate project funding allocations and for the 2019 Development Charges Study are outlined **Appendix A - Table 2**.

As a means of showing relevancy of the study and potential impacts of draft policy on future developments, a review of several potential publically declared development applications without current status or draft status in the development process (subdivision or site plan) was undertaken. This report estimated the trigger servicing thresholds of these potential developments on the infrastructure needs suggested by this report. It being noted that the defined servicing requirements for these large tower developments will be submitted by the proponents and reviewed in detail by City staff and will be based on exact size, location zoning and usage of the built form. Variation in servicing needs is expected between the actual development and our servicing needs estimated in this is report.

The proponent developers are expected not to rely upon this study, which is solely provided as an illustrative example of how policies and procedures may be applied with recognition that it is subject to the changes and amendments of the pending 2019 Development Charge Background Study.

Table of Contents

Appendices

Appendix A. Tables:

1. Introduction

The City of London is undertaking the Core Area Servicing Studies (CASS) to determine the infrastructure servicing requirements that will support the City's vision and official plan objectives for the core area of the City. The CASS is the City's first servicing study to evaluate growth-related infrastructure needs associated with infill and intensification in the downtown core area.

CASS is comprised of a family of servicing studies that includes water, wastewater and stormwater. These studies will be a critical component in the delivery of the City of London's growth aspirations. AECOM was retained to undertake the stormwater and water components of the CASS. Coordination with the wastewater CASS consultant and several other ongoing/planned City initiatives has been undertaken.

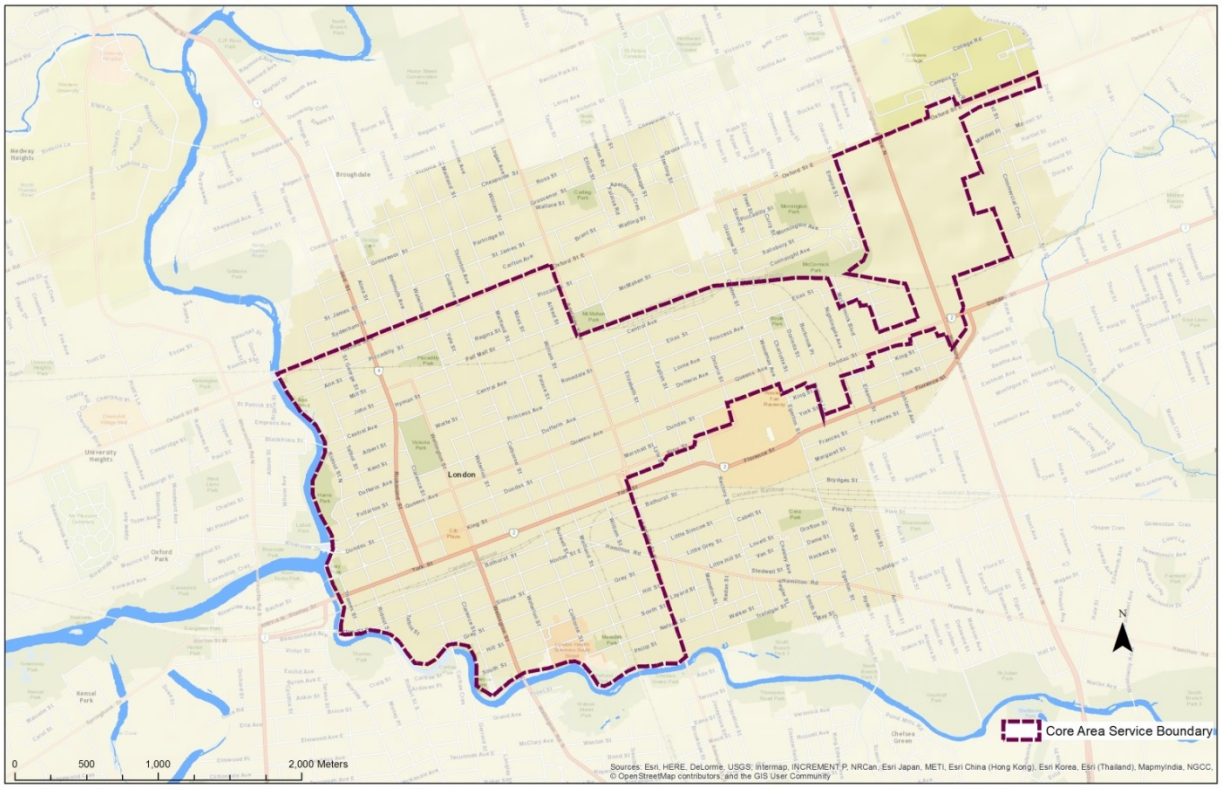
Relevant provincial guidelines and municipal water design criteria have been reviewed as best practice and compared with City of London practices.

To analyze the City of London's Core Area existing water system and recommend improvements, a comprehensive hydraulic model was developed for the study area.

Works required to satisfy future water demand driven by growth over a 20 year period have been identified. Costs have been developed and growth / non-growth determination and Res/ICI allocations have been completed.

This study was originally envisioned to cover a discrete central area defined by certain geographical road and river boundaries. Through discussion with stakeholders it was recommended that the suggested amendments to the Development Charges By-law & Fund policies be applied to the existing built boundary. Further refinement of those specific policy changes will be reviewed during the 2019 Development Charges By-law which will likely begin in the spring of 2018.

Figure 1.1: Study Area (Terms of Reference)



1.1. Background

The City of London, like other cities in North America, is undergoing several societal and demographical changes. These changes are leading to a shift in the way it lives, grows, travels, works and plays. The development of new transportation choices both inside, between adjacent cities and new “Smart Growth” design philosophies are changing patterns of development.

On December 3, 2015, the Ontario Ministry of Municipal Affairs and Housing passed Bill 73, "Smart Growth for Our Communities Act, 2015". According to the Ministry, the intent of Bill 73 is to give Ontario's residents a greater say in how their communities grow, provide municipalities with more opportunities to fund growth-related infrastructure and community services, give municipalities more independence to make local decisions and make it easier to resolve disputes. These amendments include the following:

- Requiring municipalities to follow reporting requirements that reflect best practices and detail to the community how money from development charges is spent;
- Requiring municipalities to better integrate how development charges fit with long-term planning;
- Creating clearer reporting requirements for the collection and use of money paid by developers for higher and denser developments, as well as for parkland;
- Making development charges payable at the time the first building permit was issued for a building, or at the beginning of each stage in the case of multi-phased development, so that developers can be certain of the cost;
- Helping municipalities identify and share their best practices on using development charges to address local planning and financial objectives; and,
- Providing for more stringent reporting and greater oversight of any funds or municipal charges on new developments.

Additionally, Bill 73 proposed changes under Section 2 of the Planning Act, in that decision-makers must have regard for matters of provincial interest, including the protection of ecological systems and agricultural resources, the supply, efficient use and conservation of energy and water, and the protection of public health and safety. Bill 73 adds the promotion of built form that is "well-designed, encourages a sense of place, and provides for public spaces that are of high quality, safe, accessible, attractive and vibrant" to this list of matters of provincial interest. This essentially is “Smart Growth” or intensification.

In London, Municipal Council has provided significant direction to staff to embrace these changes to the City’s built form and supporting infrastructure through the acceptance of several planning and engineering plans, policies, and programs. As a result, the City of London is well positioned to manage this transition of future growth as it has undertaken the necessary background studies and created policies to ensure that this intensification adheres to a common vision, shaped to enhance the quality of life, health sustainability, and the economic future of its citizens.

This supportive strategic direction of policy change started with:

- 2009 and 2014 Development Charges Background Studies;
- The London Plan;
- The annual update to the Growth Management Implementation Strategy;
- Smart Moves 2030 Transportation Master Plan;
- The Rapid Transit Business Case; and
- The Strategic Plan 2015 to 2019.

The City of London 2015 to 2019 Strategic Plan sets out tangible actions and auditable projects/programs that will be coupled to the new multi-year budget to bring about a higher quality of life in the City. The strategies for Building a Sustainable City set out the City’s mandate to manage and improve servicing infrastructure through water and wastewater business plans, and to build new infrastructure as London expands based on the policies of the GMIS

and the London Plan. Growing the City's economy is defined in the Strategic Plan through investment in downtown core as the heart of the City, through various design and development plans and infrastructure upgrades.

This CASS water report and two other companion reports are an integral part of this migration towards "smart growth" into the 21st century. These studies will ensure that the existing water, wastewater, and stormwater management systems can accept new loadings brought about by higher growth densities and ensure that growth pays for growth.

- Capacity restrictions in the existing and future system;
- Identify opportunities of excess capacity;
- Identify any benefit to existing development;
- Calculate any deferred benefits to future growth;
- Compare best practices on using development charges; and,
- Ensure growth pays for growth.

1.2. Study Objectives

The primary objectives of the CASS is to determine the necessary infrastructure to deliver water servicing for the Core Area of the City, based on ultimate build-out population projections. Subsequently, using the City's growth allocation for the Core Area, establish the phased infrastructure costs for a 20 year period, to 2034. This objective is being achieved through:

- Review Current City of London Policy and design criteria with comparator municipalities to ensure best management practices are followed;
- Provide a comprehensive evaluation of water infrastructure needs to accommodate the future growth of the Core Area in order to provide a basis for future capital budgets;
- Identify water infrastructure upgrades associated with the future residential and non-residential growth in the Core Area for inclusion in the City's Growth Management Implementation Strategy (GMIS) and for capital budgeting purposes;
- Develop an implementation plan which coordinates needs of water servicing, wastewater servicing, and stormwater servicing with ongoing City initiatives that is financially responsible and viable.
- Assign Development Charges funding to growth-related water infrastructure (per DC14-WW02002 "Infill and Intensification Nodes Sanitary Sewer Servicing"); and,
- Serve as a foundation document/background data for review as part of the City's 2019 Development Charge Master Plan Update and Development Charge Background Study (DCBS), meeting the statutory requirements of the Development Charges Act.

2. Review of Master Planning Policy and Design Criteria Work in Comparator Municipalities

2.1. Planning Policies

The Development Charges Act lays out Ontario's regulatory and legislative framework which municipalities must follow to levy development charges. This legislation resulted from many years of negotiations with municipalities and developers and is based on the core principle that development charges are a primary tool in ensuring that "growth pays for growth." While the legislation provides for deductions and adjustments, for some services in some instances the Act does not specify how these are determined by municipalities. For example, municipalities must account for the impact of growth-related infrastructure benefits on existing development but the Act does not prescribe a specific methodology of how this impact is to be calculated. This results in each municipality undertaking a different rationale/ formulae for defining Development Charges growth eligibility, benefit to existing (Non-growth splits), local servicing polices, future growth benefits and appropriate levels of service. Ultimately, each municipality defines its own policy (rules) in separate Development Charge By-Laws adopted by Individual Municipal Councils with correspondingly different unit rates charged to different forms of development over differing time periods and differing areas of growth for differing infrastructure needs.

This section of the report provides a review of current practices undertaken by comparator Ontarian municipalities to help the City of London compare its Local Servicing Policies and Development Charges Eligibility policies, Benefit to Existing procedures (Growth/ Non-growth split rules), compartmentation of the Development Charge into sub growth areas and the ways others interpret, collect and administer their own Development Charges By-Laws.

Eight municipalities were studied and compared to London across Ontario; specifically, Windsor, Ottawa, Barrie, Hamilton, Kitchener, Waterloo, Guelph, and Brantford. Although a lot of information exists for Development Charges policies and rates within the GTA these were avoided due to the complexity of upper and lower tier responsibility issues and need to compare overlapping infrastructure networks.

2.2. Subdivision of Growth into Discrete Areas within one Municipality

Under the current Development Charges Act, municipalities may apply development charges in ways that best suit their local growth-related needs and priorities. A number of municipalities use local development charges as an incentive for directing land and building development through reductions and exemptions of development charges in areas such as downtown cores, industrial and commercial areas and in transit nodes and corridors, where higher-density growth is desired.

Municipalities may also set area-rated development charges that reflect the higher cost of infrastructure needed to service lands that are distantly located outside of higher density, serviced areas. These charges reflect a localized need for development-related capital additions to support anticipated development. On a province wide basis, there is significant interest in using development charges more strategically by discounting development charges where growth and development is preferred, while setting maximum payable charges in areas outside of existing service areas (e.g. Greenfields).

In a recent consultation exercises undertaken by the province of Ontario, questions were raised over whether this strategy is being fully utilized to achieve intensification in areas such as transit, nodes and corridors. There is general concern that levying development charges halts growth in areas targeted for intensification and that waiving development charges in these areas should be considered to stimulate development.

Of the 8 municipalities studied 4 had subdivided there urban growth areas with Kitchener being subdivided into two areas, Ottawa into three, Windsor into two and Barrie into two. Reduction of Development Charges rate is specifically mentioned in the By-Law text as follows:

Kitchener

The City is divided using mapping within the Development Charges By-Law into three areas with varying charges applicable to each. This is a two tier municipality that also requires a regional (upper tier) Development Charges rate.

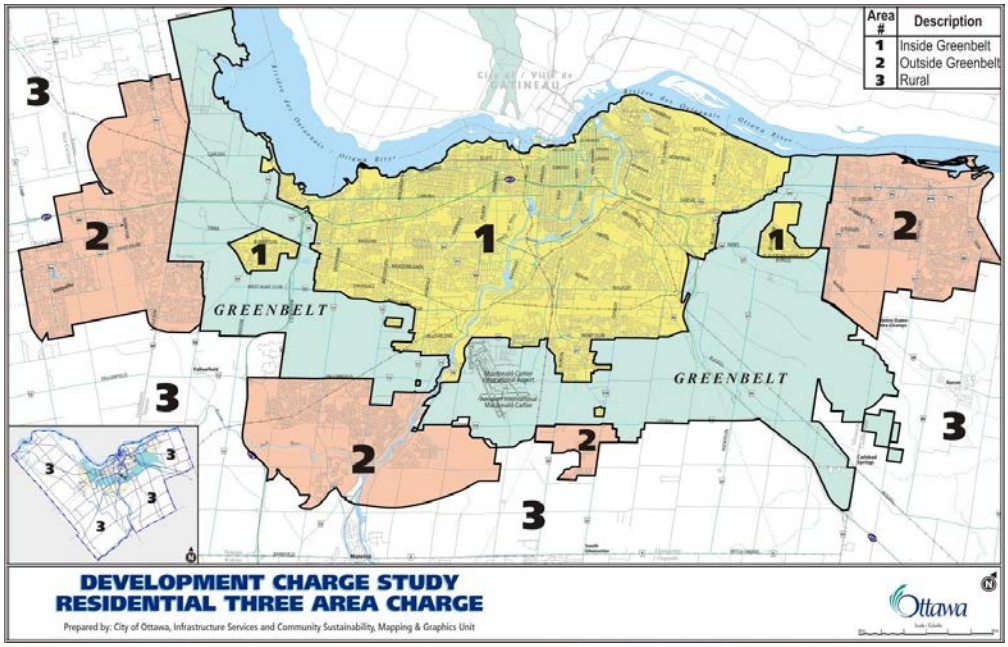
Water and Stormwater Development Charges rates are not calculated in the Central area, and an Industrial subsidy is being phased in, charging 50% of the non-residential rate until 2019. The rate is also subdivided further for outlying rural areas with 1) Partial Services Suburban Area (no sanitary sewer services) and 2) Partial Services Suburban Area (no sanitary sewer services and no water service).

Ottawa

The subdividing of the Development Charges By-Law into three areas as shown in **Figure 2.1** below adds an additional Stormwater charge to the City Wide Calculation to specifically cover Area Specific Charges in Greenfields for the following areas (ponds and other SW management works)

- Cardinal Creek Erosion Works
- Gloucester Urban Centre
- Inner Greenbelt Ponds
- Leitrim - South Urban Centre
- Monahan Drain
- N5 and Channelization
- Nepean Ponds in Parks
- Nepean South Urban Centre
- Riverside - South Urban Centre

Figure 2.1: Differential Service and Collection Zones used for the City of Ottawa Development Charge Background Study 2014



Windsor

In general the overall City wide Development Charges By-Law covers: Roads, Water Service Facilities & Facility Related Debt, Wastewater Service Facilities & Facility Related Debt some Stormwater Drainage and Control Services, Water Services Distribution Systems and Wastewater Services Collection Systems. A Development Charges exemption area exists as mapped in the Development Charges By-Law.

Exemptions exist for Industrial development, a brownfield subsidy up to a maximum of 60%, and a residential infill subsidy that provides an incremental subsidy of 25%,50% and 75% in Area 1, Area 2 and Area 3 on the linear component of engineered services (i.e. roads, sewers, etc.). Similar to Ottawa the mapping is placed in the Development Charges By-Law.

All exemptions and subsidies are funded from property tax levy and user fees.

Barrie

In general the overall City wide Development Charges By-Law covers: Roads, Water Service Facilities & Facility Related Debt, Wastewater Service Facilities & Facility Related Debt some Stormwater Drainage and Control Services, Water Services Distribution Systems and Wastewater Services Collection Systems.

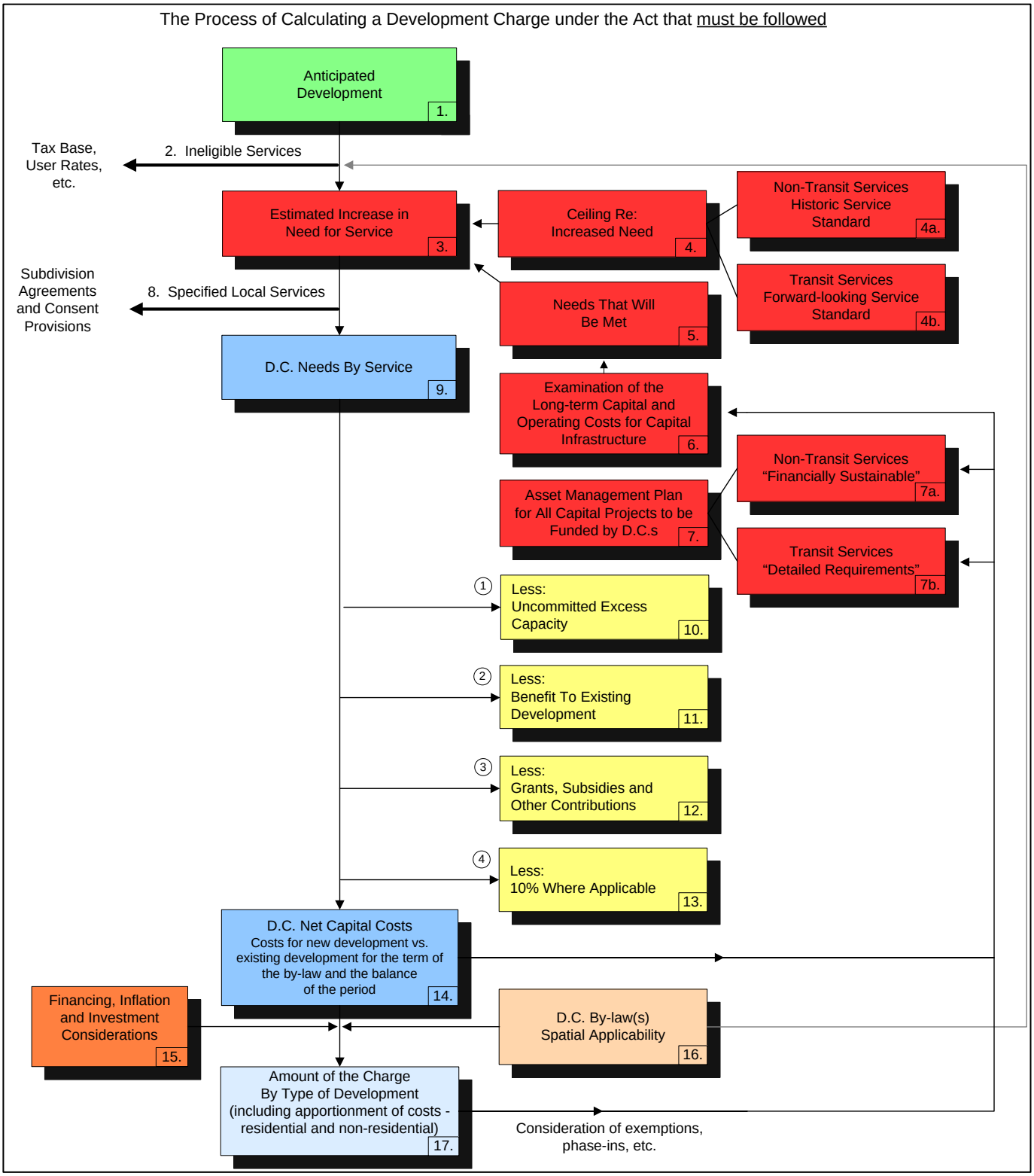
The subdividing of the Development Charges By-Law adds an additional Stormwater charge to the City Wide Calculation to specifically cover Area Specific Charges in a Greenfield area for the ponds and other SW management works.

- Stormwater management pond W5 (Pond A)
- Stolp Pond quality improvements
- Bryne Drive culvert
- Hannel works (53m east of Pond A to Bryne Drive)
- Harvie Road culvert
- Harvie storm sewer oversizing (from outlet of Pond B)
- Highway 400 culvert crossing

2.3. Local Servicing Definitions - Explicit or Implied

In general the Development Charges Act lays out a methodology with key issues for each municipality to consider during the creation of their own Development Charges By-Law. **Figure 2.2** below shows the process and it is taken from the last completed Development Charge Background Study (DCBS) for Guelph in 2014.

Figure 2.2: General Procedure for Calculating DCBS



(Guelph 2014 Development Charge Background Study)

The structure provided guides the municipality through the process, and sets aside areas for definition of municipal policy such as (local servicing, benefit to existing, future growth benefits, and levels of service). London specifies its policies or rules in the DCBS and Development Charges By-Laws explicitly; other municipalities provide tables defining the eligible works without explicitly defining the rules of claims. If all works undertaken are City managed tenders then adjustments may not be necessary. However, if some works are developer tendered and constructed then explicit definitions will be an administrative necessity.

2.4. Water Supply versus Distribution & the Joint Board of Management

The City of London receives its treated water from both the Lake Huron Water Supply System (approximately 85% of the daily consumption) and the Elgin Area Water Supply System. The water treatment of London's two primary water sources falls under the jurisdiction of two Boards: the Lake Huron Primary Water Supply System Joint Board of Management and the Elgin Area Primary Water Supply System Joint Board of Management. This system of intake, treatment and transmission infrastructure is classified as Water Supply. Water Distribution is the network of pipes, pump stations and reservoirs inside the City required to maintain pressure, quality and quantity of potable water needs.

Funding of Water Supply and Water Distribution is split between the City of London and the two Boards with the City responsible for undertaking works delineated as being south of the Arva Pumping Station, where the City of London's water distribution system begins. Similarly, Lake Erie water is also delivered to the Elgin-Middlesex Pumping Station.

The consideration of a Water Development Charge for Water Supply in London has been controversial over the last three development charge studies and may be difficult to administer and will not be reviewed in this report except to note that the Water Distribution Development Charges By-Law may seem unrepresentative when compared to other municipalities as it does not include long transmission pipes, large diameter pipes, water towers or treatment plant upgrades.

2.5. Local Service Definition for Development Charge Issues & Eligible Services

Of the nine municipalities sampled London, Hamilton, Guelph, Brantford, Ottawa and Barrie specifically provided a Local Servicing policy cutoff for Development Charges funding eligibility with in the DCBS. The DCBS for Kitchener, Waterloo and Windsor did not specifically note a local minimum pipe size. However, review of the lists of water infrastructure works in the DCBS showed only regionally strategic supply mains listed leading us to use actual project diameters of 450 and 600mm. This situates the London Policy to be one of the most inclusive of the sample set. More Information can be found in **Table 1** in **Appendix A.**

Figure 2.3: Watermain Cut Off Size for Local Service Definition

If the intention of the By-Law is to only collect and build what is specifically listed in the tables of the DCBS then an explicit local service definition may not be required. However, if substitution of works or like-for-like works with overbuilding is expected then a local service definition will be an essential component of DCBS. For the CASS, a definition for local serving costs has been identified as follows:

CASS W-5: Local Service Costs (Developer Cost)

Any watermain or portion of a larger watermain that is less than or equal to 250mm in diameter located on the public ROW is referred to as “local works”, and undertaken at the Developer’s expense in the CASS zone if the work is required to address an upgrade, not mentioned in the CASS Master Plan, within any of the following trigger distances:

- four Hydrants on the same line;
- two value chambers on the same line;
- one city block; or,
- 150 m radius around the centroid of the development measured from the center of the proposed development frontage.

2.6. Variation of Cost with Depth Issues

At the request of stakeholders of the DCBS process the City of London asked for a review of comparator policies for inclusion of smaller diameter pipes placed deeper than typical nominal depth (<1.2 m). Caution seems to have been exercised in the other comparable DCBS’s with respect to this issue specifically noting the exclusion of depth cost as in the excerpt below:

> Watermains within the development that are larger than 300mm are to be included in the development charge calculation. The amount of cost contribution for watermains within a development shall be calculated using tendered unit prices and shall be the difference between the cost of the actual pipe diameter and the cost of a 300mm pipe diameter including a 12% engineering fee. Only watermain and valves will be included in the calculation. Any costs related to the depth of pipe are the responsibility of the developer.
>
> Water mains within the development that are 300mm and under are deemed to be a local service and are a direct funding responsibility of the developer.
>
> Connections to trunk mains and pumping stations to service specific areas are to be a direct developer responsibility.

(Guelph 2014 Development Charge Background Study)

It is conceivable that deeper routings could be required in areas of congested Right of Way, rapid transit infrastructure or to avoid specific conflicts with tall building foundations or underground parking facilities. Should a desire to fund deeper water mains be required in core area or other areas of the City then two options are available in the DCBS:

1. Justification on a case by case basis at the direction and approval of the City Engineer; or
2. Set aside a specific allowance based on previous development experience. The Riverbend area in London experienced a case study that could be used as an example project. The Local servicing policy will require some minor editing for this undertaking.

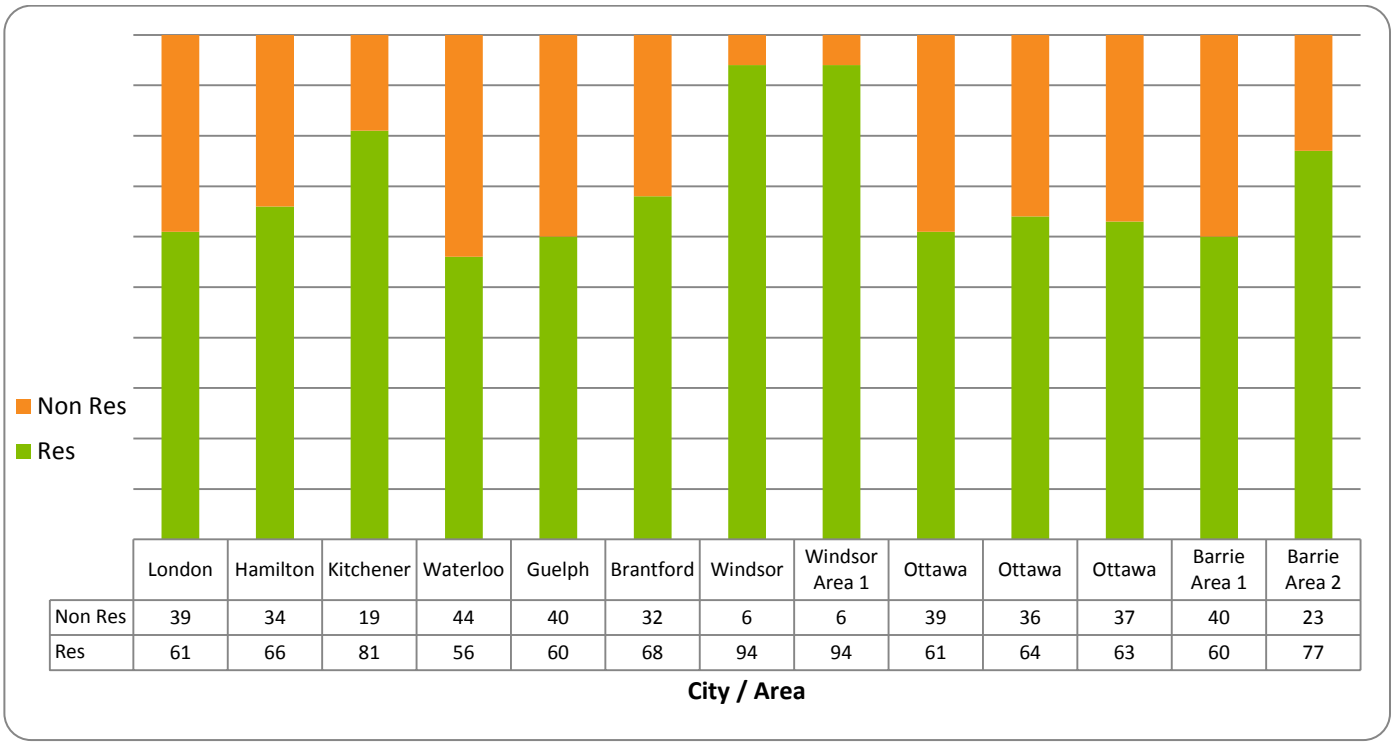
2.7. Cost Split Determination (Res/ICI)

In London the apportionment of cost across each specific growth sectors is done using a population growth study that predicts the total average demand of each sector and future growth in population and institutional, commercial and industrial business activity discretely populated into the City's transportation planning zones. In general, water projects required to meet growth needs are split accordingly across Residential/ Industrial/ Commercial and Institutional sectors as per geographic or service area.

Some municipalities use a global growth factor to split costs on a City-wide basis. Other municipalities split using similar sectors or using Residential/ Non-Residential delineation. For example in Guelph, the allocation between residential and non-residential growth is calculated based on incremental growth in population to employment, for the build out forecast period for the urban serviced areas (city wide), resulting in a 60% residential and 40% non-residential allocation.

Each municipality has its own distinct growth prediction, pipe system and existing patterns of growth for each sector so direct comparison is somewhat problematic as each municipality is defining its own needs in different ways. However, the City of London's methodology seems to me more sophisticated than most with allocations of specific pipe rationalized as to use. **Figure 2.4** shows the variation in cost distribution between various municipalities for residential and non-residential growth.

Figure 2.4: Comparison of Res/ Non-Res



	London	Hamilton	Kitchener	Waterloo	Guelph	Brantford	Windsor	Windsor Area 1	Ottawa	Ottawa	Ottawa	Barrie Area 1	Barrie Area 2
Non Res	39	34	19	44	40	32	6	6	39	36	37	40	23
Res	61	66	81	56	60	68	94	94	61	64	63	60	77

2.8. Benefit to Existing (Non-growth Policies)

The primary considerations involved in establishing an appropriate Benefit To Existing (BTE) development deduction include:

1. Is the project a capacity expansion, necessary to maintain the existing level of municipal service?
2. Is the primary service area municipal-wide, large area or small area and how much growth is located in the relevant area?
3. Was the project included in previous Development Charges studies and with what level of deduction?
4. Is the capital program well beyond the service level cap and to what extent do these projects benefit existing development (rather than representing oversizing for post period recovery)?
5. Does the capital expenditure simply represent more of what is already being provided or does it instead offer a broader range of service?
6. What is the estimated value of the service change being provided re user proximity, for example?
7. Does the project involve a new facility or an existing replacement plus expansion?

Clause s.s.5 (1) of the DCA (and associated Regulations) Commentary 6 requires that a DCBC must have regard for “The increase in the need for service must be reduced by the extent to which an increase in service to meet the increased need would benefit existing development.”

Most municipalities recognize that existing development benefits from growth via four basic principles brought about by the placement of new services:

- the repair or unexpanded replacement of existing assets;
- an increase in average service level or existing operational efficiency;

- the elimination of a chronic servicing problem not created by growth; and
- providing services where none previously existed (e.g. water service).

In the City of London growth has previously occurred in Greenfield locations and BTE issues very limited as existing services were not available. The 2014 DCBS was the first study to recognize the potential shift of growth from Greenfield into pre-existing growth areas in the form of intensification.

In the previous 2014 DCBS, the City brought forward a formula to consider residual life expectancy, as shown below.

$$\text{Unused Life Credit} = \frac{80 - \text{Age}}{80} \text{ x } (\text{Cost of pipe})[\text{minimum value} = 0]$$

This report develops a new methodology to include issues of asset management and performance.

When compared with other municipalities, the City of London is generally more sophisticated than our sample. The inclusion of the formula and use of flow data with discrete population distributed over traffic zones is more complex than other comparators.

For application to the core area and as noted in the previous unit cost memorandum, the City should consider any double counting of restoration / excavation / complex excavation / additional consultation with the public or other cost issues.

2.9. Level of Service from Water Servicing Quality and Quantity Perspective.

Design Criteria

In general, the City of London like other North America jurisdictions is required to meet minimal acceptable guidelines, policies and standards for potable water supply and water quality. In Ontario, a variety of levels of service / design criteria are applied over discrete performance factors of the Ministry of Environment and Climate Change (MOECC), Ontario Fire Code (OFC), and Ontario Building Code (OBC). These codes often refer to relevant industry standards where “best practices” are documented. These standards include but are not limited to: American Water Works Association (AWWA), National Fire Protection Association (NFPA), the Ten State Standards, American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), Ontario Provincial Standards for Roads and Public Works (OPS), Technical Standards and Safety Authority (TSSA), National Sanitation Foundation (NSF), Hydraulics Institute (HI), Ontario Electrical Safety Code (OESC) and the Chlorine Institute. Additional, guidance is provided by the Insurance sector in the form of Fire Underwriters Surveys, and locally significant performance factors are provided by each jurisdiction for practical adaptation to meet local conditions and required maintenance and operational concerns.

Ontario municipalities usually stay close to these prescribed minimum guidelines set by North American, federal and provincial agencies leading to some degree of uniformity throughout the province. Locally significant performance factors / design criteria are added on the supplemental basis as enhancements or clarifications to help engineers / designers adapt or improve guidelines and apply them to the individual site in question. In London, staff have developed locally significant performance factors related to their water distribution system to enhance or describe:

- Specific topographical issues have produced various pressure zones
- Minimum pipe sizing
- Water quality
- Typical permitted maximum land use density’s
- Peaking factors associated with maximum daily demand (MDD), peak hour demand (PHD)
- Fire flow requirements

2.10. Comparing Levels of Service

In order to compare London's technical level of service / design criteria to other similar Ontario municipalities, data from six comparable size municipalities have been collected. These include: York Region, Windsor Utilities Commission, Niagara Region, Peel Region and City of Toronto. Additional criteria from Ontario and British Columbia's Ministries of Environment and Climate Change were also used for comparison purposes.

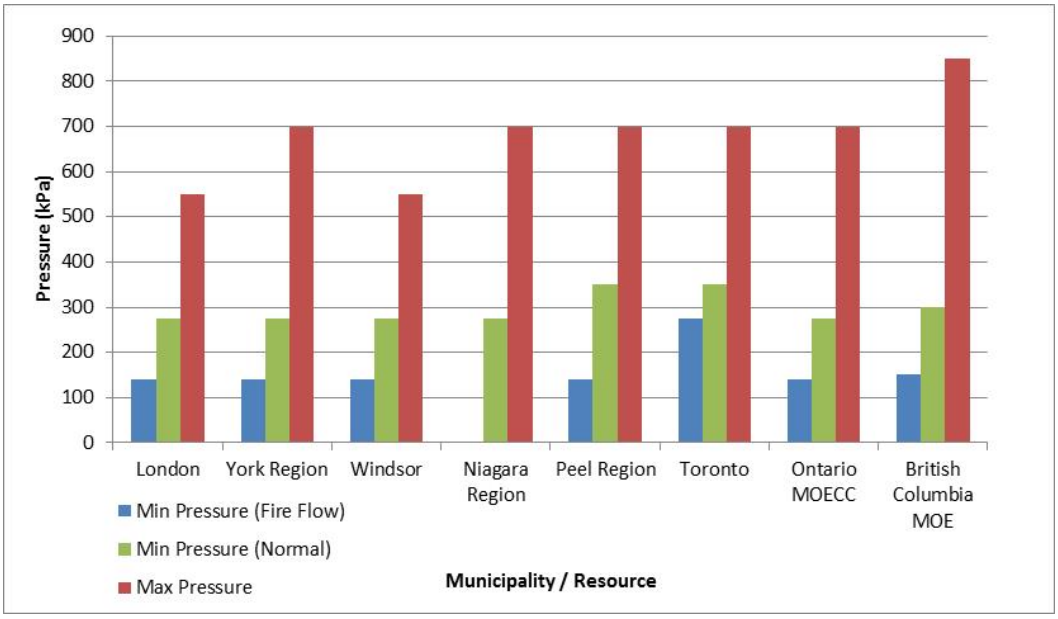
To compare the various municipalities, the following performance factors were utilized:

- Pressure
- Pipe Velocity
- Water Consumption Rates
- Water Storage
- Water Quality
- Minimum Pipe Diameter
- Fire Flow Requirements

Pressure

To compare the pressure requirements between municipalities, the minimum and maximum pressures stipulated within each of the municipalities' design guidelines were reviewed. **Figure 2.5** below illustrates the results in a bar chart format.

Figure 2.5: Comparison of Municipal Pressure Requirements



As can be seen above, the majority of the municipalities follow the MOECC guidelines. The City of London varies slightly for the maximum pressure requirement from the MOECC guidelines. This means that some services need to be equipped with a pressure reducing valve at a lower limit sooner than in other municipalities. The topography within London does not vary as much as other Ontario municipalities on this list and it likely the reason why other municipalities have a high maximum allowable pressure for a water service.

For the minimum pressure requirement, the City of London meets the standard level of service provided by most municipalities. Peel Region and Toronto provide a higher level of service with ensuring a higher minimum pressure within their distribution system.

2.11. Water Consumption Rates

To appropriately size water distribution infrastructure, water consumption rates are used to quantify the amount of flow going through the pipe. Higher per capita flow rates can be considered a higher level of service as they are a contributing factor to ensuring the pipes have sufficient capacity. To estimate flows at maximum daily demand and peak hour demand, peaking factors are used to scale the flow. **Figure 2.6** shows the residential per capita water consumption rates amongst various Ontario municipalities while **Figure 2.7** shows the respective peaking factors.

Figure 2.6: Per Capita Water Consumption Rates amongst Various Municipalities

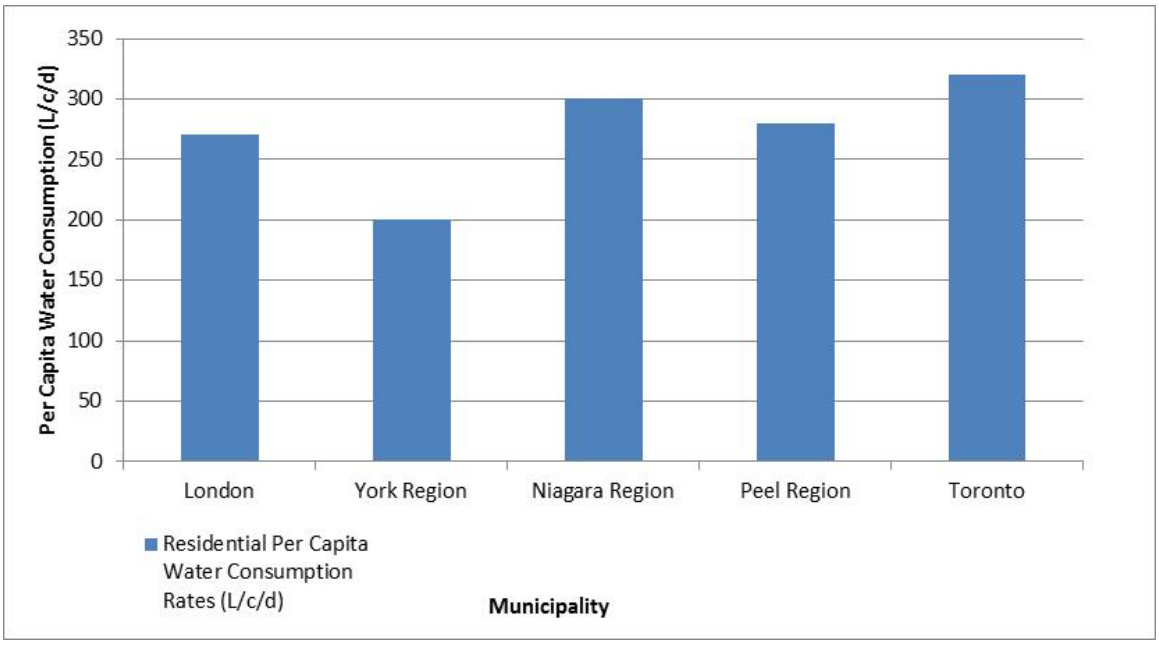
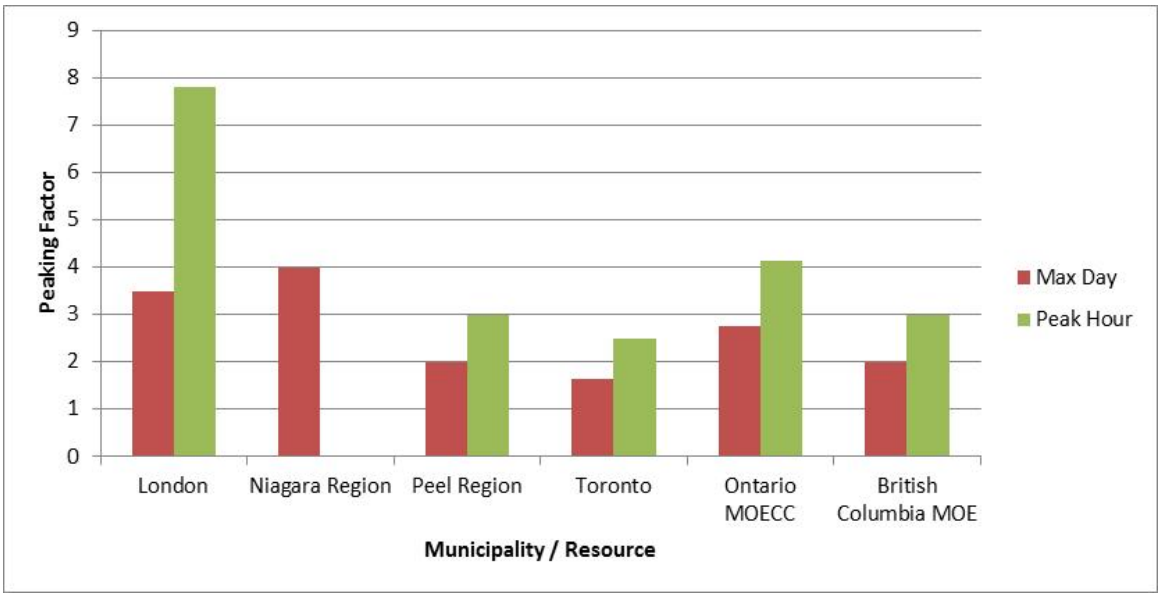


Figure 2.7: Comparison of Residential Peaking Factors



Based on the above graph, London has a slightly lower than average residential water consumption rate but much higher peaking factors for maximum daily and peak hour demands.

2.12. Water Storage

A high amount of water storage within a system provides a higher level of service as there is more water readily available in the event of an emergency (ie. pipeline break). Of the municipalities and resources reviewed, all municipalities utilize the MOECC's guidelines to provide water storage. Since London provides water storage to the MOECC guidelines, they provide an equivalent level of service as other Ontario municipalities.

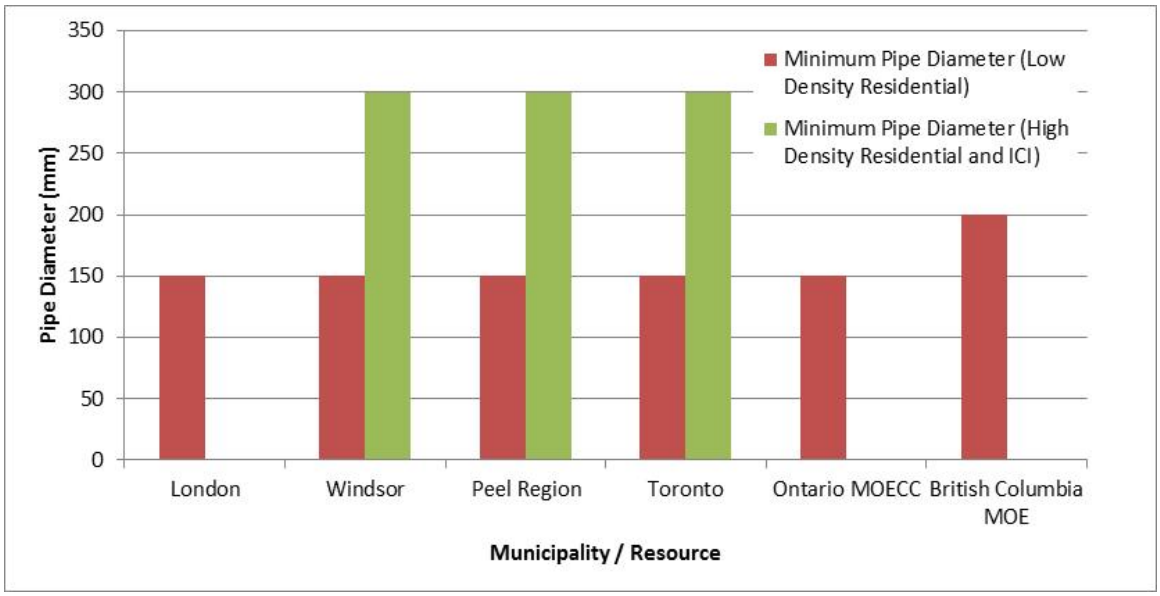
2.13. Water Quality

A high water quality within a water distribution system provides a high level of service in a municipality. Typically, each operating authority is licensed by the MOECC and each municipality has a drinking water permit for each potable water system. The requirements are quite consistent and stringent across Ontario. All piping in the water distribution systems is to remain clean and free of bacteria. All municipalities are required to provide safe drinking water to all customers. Because of this the level of service that London provides is equivalent to other municipalities in Ontario.

2.14. Minimum Pipe Diameter

A large minimum pipe diameter provides a high level of service as it prevents flow to be locally throttled (or bottlenecked) during emergency situations. **Figure 2.8** provides a summary of the minimum pipe diameter requirements of various municipalities. Similar to other large municipalities, a minimum pipe size of 300mm in diameter should be applied for areas within the core area.

Figure 2.8: Comparison of Minimum Pipe Diameter Requirements



From the above graph, it can be seen that while London meets the MOECC requirements, many municipalities have more stringent requirements for the minimum pipe diameters of watermains.

2.15. Fire Flow Requirements

Across Ontario, municipalities are required to meet requirements of the Fire Underwriters Survey, Insurers' Advisory Organization and Ontario Building Code as well as utilize the and AWWA standards as guidelines for fire protection. The City of London meets these requirements as well as minimum fire hydrant spacing and low maximum velocities under normal and fire flow operations. **Figure 2.9** and **Figure 2.10** illustrate comparisons of these requirements.

Figure 2.9: Comparison of Maximum Pipe Velocity at Normal and Fire Flow Conditions

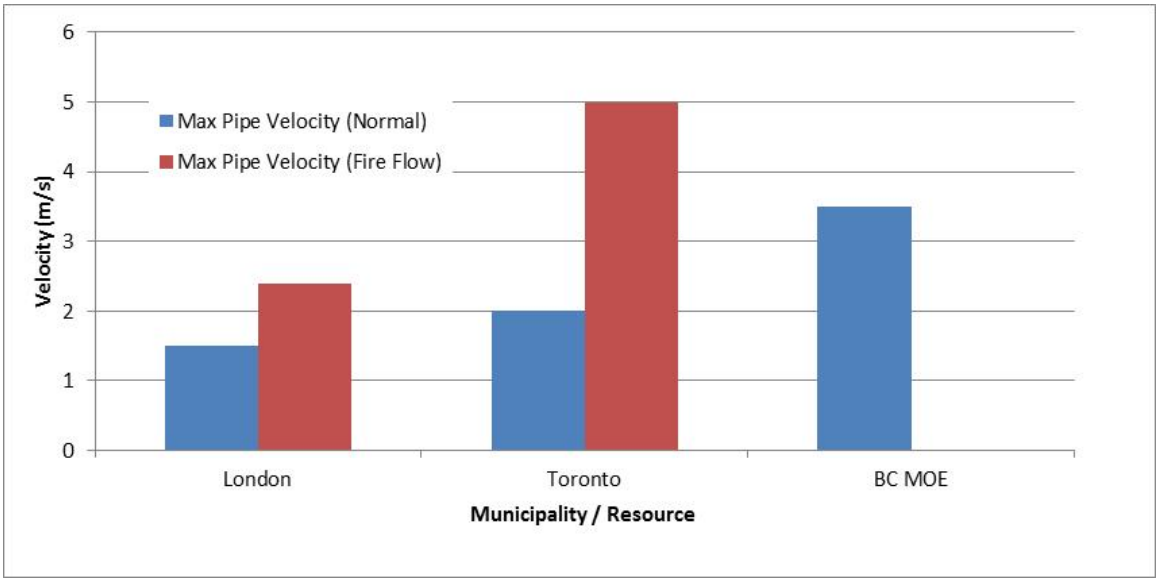
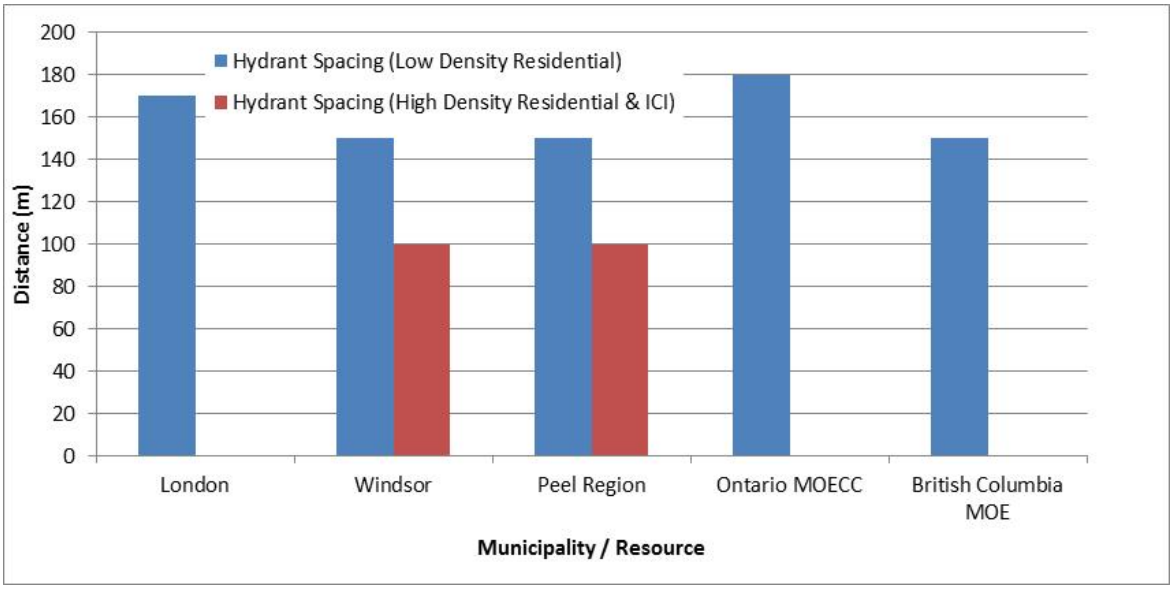


Figure 2.10: Comparison of Minimum Hydrant Spacing



Further to the figures above, the City of London has a specific water design standard for servicing of buildings with sprinklers and standpipes. Water Design Standard Clause 7.8.1.2 states "For use with sprinkler or standpipe systems the hydrant must be located not more than 45m from the Fire Department connection". Therefore, if an existing hydrant does not exist within 45m of a new development equipped with sprinkler or standpipe services, the addition of a new hydrant would be required under local servicing.

2.16. Level of Service from a Development Charge Perspective

The Development Charge Act (DCA) provides that the increase in the need for service attributable to anticipated development must not include an increase that would result in the level of service exceeding the average level of that service provided in the municipality over the 10-year period immediately preceding the preparation of the background study.

Historic 10-year average service levels thus form the basis for development charges. A review of the City's capital service levels for infrastructure has been prepared in many previous DCBS for the calculation so that the portion of future capital projects that may be included in the development charge can be determined.

Work within the core area is no different functionally than previous DCBS undertakings and water mains, appurtenances, road work, sanitary sewers, storm water management facilities and storm pipes have long been undertaken. A review of comparator municipalities shows similar trends in calculation of Levels of Service.

3. Modelling

As part of the Transportation Master Plan 2030, AECOM, with the City of London, brought initiatives for nodes and draft Official Plan (OP) amendments to identify minimum density targets in the core area and Rapid Transit hub areas. Recognizing that the Rapid Transit (RT) study may have significant impact on the CASS –Water component study as:

- Intensification populations near transportation nodes may require large water infrastructure be placed to serve the newly created developments;
- Placement of RT infrastructure may require deep excavations with tunnel work on Clarence/ Richmond Street between Angel Street and Grosvenor Street may lead to several relocations to eliminate conflicts at intersections for the proposed RT tunnel.

Prior to the creation of the new CASS Water growth InfoWater model, the existing 2014 water DCBS model was updated by calibrating for the growth and works undertaken in the last 3 years and updating the existing condition model to better reflect existing population data using:

- Growth information in traffic zone (or smaller polygon format);
- Latest water system GIS shapefiles;
- As-built drawings for recent works not yet incorporated to GIS or design drawings for committed works;
- Recent tender information;
- Latest water customer billing records;
- Daily water supply records, past five (5) years;
- Available hydrant test data;
- Watermain Oversizing Policy;
- Rapid Transit info (mapping, standard cross-sections, timing, etc.); and,
- Proposed land use in GIS format.

This up to date (2017) model was used as a base for extrapolations of the new growth areas and populations (CASS and RT hubs), and used to identify growth related infrastructure required to achieve specific levels of service for various future time horizons. Future works were forecast 20 years (starting in the year 2014 and extending to 2034) broken into 5 year increments corresponding to the timing of the breakdown in growth forecast information which are available.

Specifically, the water demand model was updated for both existing and forecasted future demands and input into the hydraulic model. The water demand model consists of the following components:

- Assignment of existing average day demand will be determined based on a review of daily water supply records to the City for the past 5 years to establish the baseline existing demand for use in the analysis;
- Update future growth population for each planning horizon to 2034 and ultimate for both the core area and beyond the core area based on available planning information. Design per capita water usage and peaking factors based on criteria discussed in Task 1a (Design criteria) will be applied to the growth population based on land use to obtain the future growth demand. As the demands in areas outside of the Core Areas will impact the level of service within the Core areas, these must also be included;
- Future growth average day demand for each planning horizon will be determined based on planning data and consumption design criteria determined and added to the existing baseline demands;
- Non-Revenue Water (NRW) - The review of metering data above will be compared with the supply records to estimate the total non-revenue water. NRW is typically assigned to models using a simplistic approach, assigning uniformly across the system. AECOM's approach to estimate NRW spatial distribution based on

components including estimated usage for flushing, firefighting, street sweeping and new construction, based on estimates assumed available from the City, and applied uniformly across the system; The remaining NRW volume will be assumed to be attributable to breaks and leaks and will be assigned proportionally to the system based on the estimated leakage propensity, inferred from pipe material, diameter and age. For example, CI mains are assumed to have a higher leak / break component of NRW than new PVC mains;

- Peaking factors for maximum day demand were applied as determined under Task 1a (Design criteria);
- Diurnal demand patterns for EPS modelling. AECOM developed land use based diurnal demand patterns based on SCADA data for each land use category. This was updated based on more recent SCADA records. If growth intensification involved reassignment of land use to different categories, (e.g. institutional to residential), it is likely that this will have an impact on the temporal water use patterns within the study area, which will be reflected in the model. We reviewed the use of land use based versus global diurnal demand patterns;
- In order to refine the allocation of future demands, AECOM utilized development applications, target land use densities and a multi-level prioritization of parcels. This approach allows for more refined assignment of long-term population projections to identify local infrastructure requirements. This is assumed to be provided in GIS format in the form of polygons such as traffic zones; and,
- Assignment of fire flow requirements determined as part of design criteria (RFP Task 1a) to model nodes. In AECOM's study System Wide Hydrant Capacity Analysis, hydrants were assigned land use using a GIS spatial join based on the 'Land Use' shapefile based on most critical land use type within the area serviced by each hydrant. This will be updated based on proposed land use.

The InfoWater hydraulic model was updated for water infrastructure to ensure that it represents current infrastructure based on the latest GIS.

3.1. Growth Related Works and System Upgrades

The servicing requirements for intensification required a more detailed look at the system, and leverage the full pipe model to determine impact on existing infrastructure and need for system upgrades. Replacement of existing mains to accommodate future growth was assessed.

A system analysis using the updated hydraulic model was be completed. This will be based on both single step and EPS hydraulic modelling for each design horizon, including fire flow assessments.

AECOM generated the hydraulic analysis with the ultimate build out scenario to assess the impacts of future growth on the existing infrastructure, and identified the future infrastructure requirements including the sizing. The phasing was confirmed by undertaking the modelling from ultimate build out scenario down to 2014, until the level of service is being met without the upgrades.

Based on land use based fire flow criteria any existing (baseline) deficient hydrants where identified. Capital works requirements to address these deficiencies were then determined (non-growth). The analysis was completed for the future design horizons and proposed fire flow requirements, and the resultant further upgrade requirements due to both increased growth demands and revised fire flow requirements due to and land use changes.

Coordination of recommended water works was considered with other infrastructure improvements, including wastewater, storm roadworks or other projects. Required watermain relocations due to the rapid transit construction were also considered in the assessment, which was given a higher priority for replacement in the optimization.

As the review of the future servicing requirements progressed, all alternative solutions were presented graphically (e.g., location/concept plans) and described to a level of detail that allowed for an understanding of potential impacts from construction and operations and an assessment of those impacts based on evaluation and mitigation.

The impact of the proposed capital works was tested for water quality to ensure there is no impact to quality or risk to public safety as a result of the proposed works. The water age models developed by AECOM were used to

compare existing (baseline) water quality with that with the proposed works in place. This was completed for the minimum week demand condition.

Based on a thorough review of these parameters, the completion of the modelling analysis and through consultation with City staff, AECOM develop a system upgrade plan, including cost estimate and time schedule. A listing and written description of the works will be provided.

Alternative solutions were also presented graphically and described to a level of detail that allows for an understanding of impacts from construction and operations and an assessment of those impacts based on evaluation and mitigation. Each servicing alternative was developed in sufficient detail to be able to have an acceptable level of accuracy in terms of:

- Capital costs;
- Phasing;
- System redundancy;
- Existing system utilization;
- Future growth potential;
- Community impacts; and,
- Ability to meet implementation schedule.

Discrete project limits were provided for each project and have been included in individual project sheets presented in **Appendix B**.

3.2. Prioritize Project and Timing

AECOM prepared infrastructure needs tables, cost estimates, timing, phases, and mapping based on:

- Work with City staff to prioritize and establish timing/ related costing / impacts on growth/ non-growth for the works to support growth for a 20 year and ultimate build out periods;
- Investigated ways of creating synergies – economies of scale, implementation phasing of similar projects;
- Adjusted timing of works required to meet growth needs in order to coordinate with other infrastructure in draft City budget and Lifecycle renewal programs such as (Dundas Place, York Street sewer separation, Rapid Transit, etc.); and,
- Potentially re-classify Growth Related and Required System Upgrades to partial lifecycle renewal projects if economy of scale benefits was proven.

4. Cost Estimation of Projects In CASS

Cost of CASS Water projects were generated using three independent sources. Namely, first principles for pipes using supplier information and previous City tenders, comparator costs from similar Ontarian municipalities, historic benchmark costs from previous Development Charges master plan and Growth studies. Adjustments were made using the BTY for market analysis of Construction Price indices per quarter to predict 2017 unit prices.

- Work with past City of London and area tenders, including 2014/2015 retrieved from the Wastewater and Drainage Engineering (WADE) isolated unit costs for linear infrastructure from other items such as: large lump sum pump items, architectural elements, road works, sewers, bonding, mobilization, and insurance. Front ending and weighted bias must also be removed from individual tenders.
- Comparison to historical Development Charges tender unit items were made in a graphical manner, isolating high and low statistical outliers and increase to proposed Unit Rates were be compared to relevant Statscan Indices to show reasonability.
- Independent cost estimates were created by aggregating items using RS Means data bases and publications. This data came from Construction costs in other similar Canadian markets.

This study reviewed the applicability of a variable unit rate table to predict cost based upon components such as; pipe material, pipe size, depth, restoration, engineering fees, construction contingencies, construction complexity, availability of contractors within the labor market, need for shoring, vibration studies, pedestrian protection, night work and working around other utilities requiring support, relocation and/ or isolation.

To be completely compatible with the upcoming DCBS, costs were prorated to 2017 prices using an extrapolation of 3%, based on Statistics Canada Infrastructure Construction Price Index for Q3, and Q4 of 2016 as shown in **Table 3** in **Appendix A**.

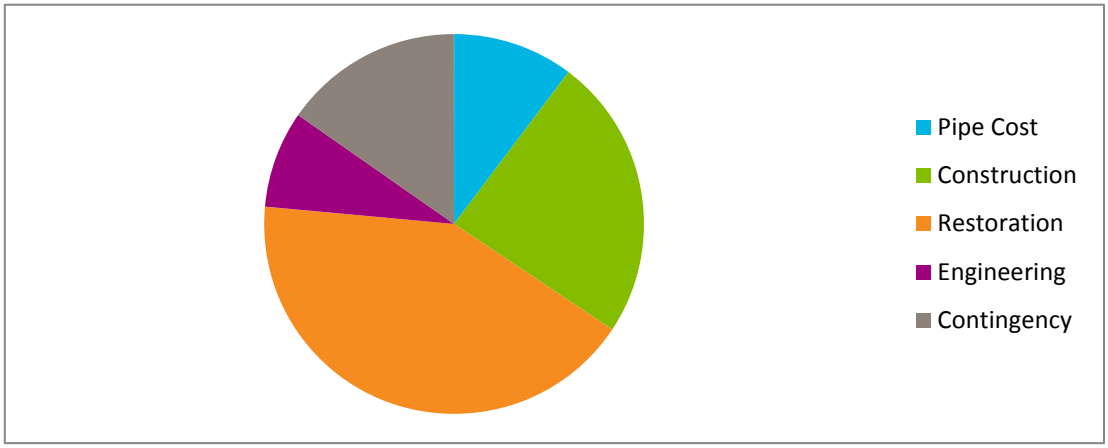
4.1. Producing Realistic Unit Rates

Previous service studies, master plans and development charge studies have generated the cost of projects based on a combination of six factors:

- Raw pipe sizing used to convey theoretical flows
- Pipe Material
- Construction depth
- Restoration simplified into 5 types (Open, Landscaped, Rural, Urban, Ecosystem)
- Engineering
- Contingency

In the 2014 Water Servicing DCBS the costs range from between $905/m to $3140/m and were individually generated based upon each projects location. Typically, the impact of the six cost inputs range as shown below. Variation in cost distribution occurs from site to site. **Figure 4.1** below shows that raw pipe cost contributes less than 10% to the final total cost of projects.

Figure 4.1: Typical Cost Breakdown of a 400mm Concrete Pipe in Urban Setting in the Previous Study



The cost of construction for “new” services in the downtown core is more expensive than similarly sized Greenfield infrastructure. AECOM reviewed several past Infrastructure renewal projects in London’s downtown core and others in Greenfield areas that were in a variety of expected ROW complexity factors such as multiple watermains, storm sewers, sanitary sewers, steam heating pipes, gas mains, underground hydro, bell, fibre optic and other utilities. Significant project restrictions were also considered include night work, pedestrian protection schemes, extra business signage, trenchless technologies, and full street closures and detours.

Specifically, several tenders for projects undertaken in the downtown area were reviewed to develop trends, in an attempt to estimate the typical cost encountered with core area works. Tenders from; Project 1 T15-21 Dufferin Avenue between Wellington and Richmond, Project 2 T16-69 2016 Local Improvement from08Eastgate Crescent and Perkins, Project3 T 16-08 Bond Street, Raywood Ave, Alexandra and Lincoln Place, Project 4 Life Cycle Renewal Contract D Adelaide St South of Dundas have been compared to prior Development Charges cost estimates.

.

Figure 4.2: Watermain Costs (Pipe & Construction) Comparison

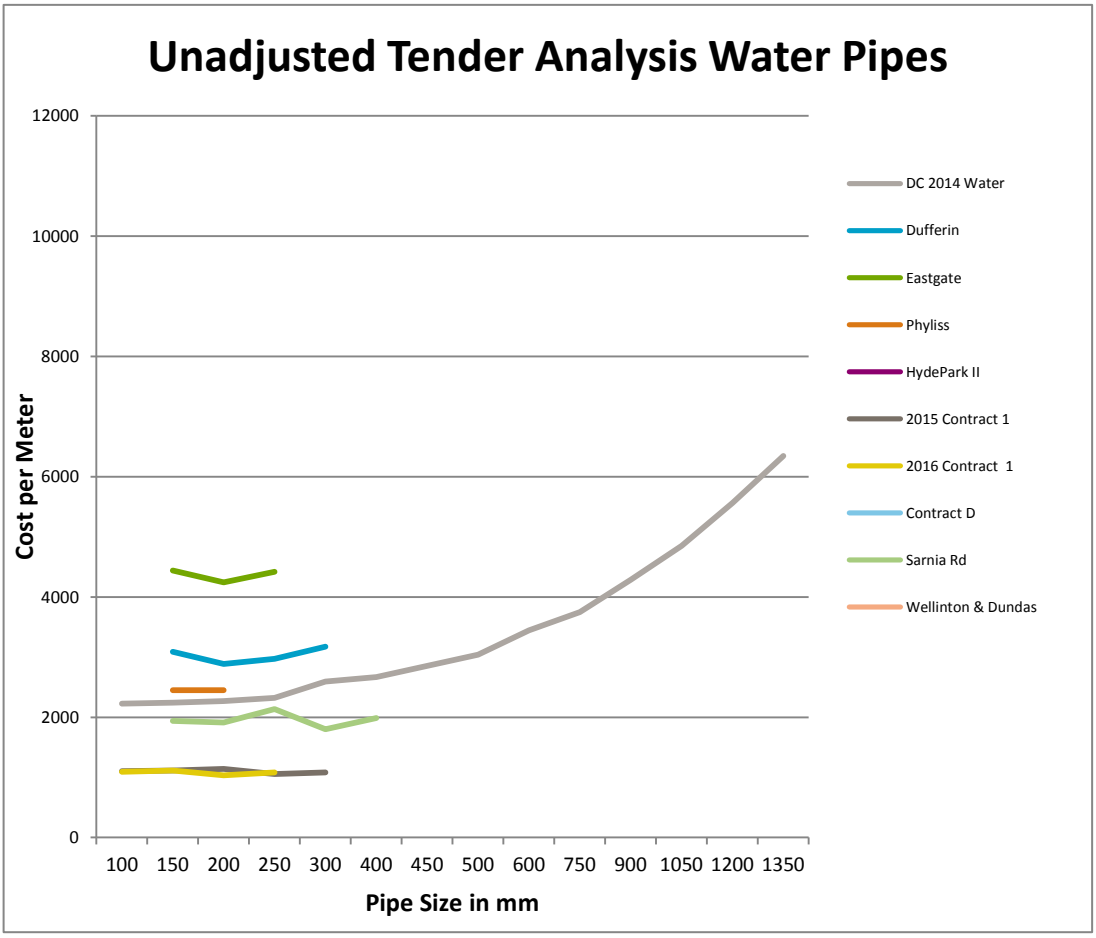


Figure 4.2 suggests a short fall in funding compared to the mostly Greenfield 2014 DCBS numbers. Application of 30% contingency over the traditional costing items, instead of the 20% used in Greenfield project is recommended until a sufficient data base for core area projects can be accrued. These unit costs are provided for in **Appendix A Table 3.**

4.2. Engineering Fees

The changes brought about by undertaking the works above in a congested urban environment will require more engineering effort. The increase in cost due to the each individual item increases the allowance through application of a 15% engineering fee will likely not be enough to capture the total required. Application of a 20% engineering fee for these projects total cost is suggested.

5. Costs Allocations to Growth and BTE

In the current 2014 Development Charges By-Law, the adopted formula assumes a typical pipe life expectancy of 80 years. This approach is commonly used across Ontario by other municipalities. However, there are cases where the maximum usable life assumption can be exceeded by 20 to 40 years. Conversely, a fairly new pipe may have performance issues leading to its premature replacement prior to it reaching 80 years of age.

Given the nature of infill development, growth works in the core area will likely replace or supplement existing utilities to meet intensification needs. This is different from Greenfield growth projects that install new services in unserved areas. This creates an opportunity to review amendments to the methodologies for assigning benefit to existing (BTE).

Benefit to Existing Factor (BTE Factor)

By using the asset value of a pipe to calculate BTE many different measurement factors, including residual life, are taken into account to establish the performance of a pipe. This approach also aligns more closely with best practices for asset management. **Table 5.1** below represents a new methodology to assign an asset value to an existing pipe in situ. Condition ratings are taken from the City of London Asset Management ratings and are compiled based on age, visual inspection of defects, and performance factors for the pipe.

The residual life expectancy represents an advantage to the City by the reduction in future pipe replacement costs. The better the condition of the existing pipe, the lower the BTE 1 and less of an advantage is assigned. Conversely, the loss of pipe residual life is greater for a pipe in good condition and is represented by (1 - BTE). This then captures the fact that a poor performing pipe would have a low condition rating, high BTE and low residual life.

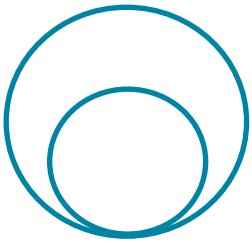
Table 5.1: BTE Factor

Condition	Condition Rating	BTE	Inverse Condition Credit
Very Good	1	0.1	0.9
Good	2	0.25	0.75
Fair	3	0.5	0.5
Poor	4	0.75	0.25
Very Poor	5	0.9	0.1

Growth Need (Upsizing)

When service expansion requires pipe upsizing growth needs will be compared with existing system needs. The beneficial contribution of a pipe upsizing due to a growth need is defined as being the removal of an existing deficiency diameter (D2) from the growth need diameter (D3).

Existing – D1 (BTE Factor)	
Existing System Improvement (G/ NG) - D2	

Growth Need (G/NG) - D3	

This approach conservatively does not account for the greater relative flow capacity provided by D3 over D2, thereby assigning more costs as BTE.

Total servicing cost is calculated utilizing the formulas below including pipe, construction, and restoration costs for each portion:

- Total servicing cost = Growth need for service expansion
- Existing system improvement cost = Existing need service expansion

There is a growth and non-growth component for each of the above elements:

- Existing system improvement cost (Non Growth) = Existing system improvement x BTE
- Existing system improvement cost (Growth) = Existing system improvement – Existing Improvement NG
- Upsizing (Growth) = Total servicing cost - Existing System Improvement cost

6. The List of CASS Water Projects & Co-ordination of Services and Other Works

Coordination of recommended CASS water projects was considered with other infrastructure improvements, including wastewater, stormwater and roadwork projects. An overlay map including CASS stormwater, wastewater, water and 2018-2022 downtown capital projects is provided in **Appendix C**. Through completion of the water, wastewater and stormwater studies, all potential solutions were presented graphically (e.g. location/concept plans) and described to a level of detail that allowed for an understanding of potential construction and operation impacts. While the CASS studies provide the funding approach based on the growth projections in the 2014 Development Charges Study, the 2019 Development Charges Master Plans will synthesize the infrastructure needs based on the completed supplemental studies (i.e. CASS, PPCP, RT, EA, etc.). Each potential servicing alternative was developed in sufficient detail to provide an acceptable level of accuracy in terms of:

- Capital costs;
- Phasing;
- System redundancy;
- Existing system utilization;
- Future growth potential;
- Community impacts; and
- Ability to meet implementation schedule.

Through the completion of the water modelling analysis and consultation with City staff, AECOM developed a system servicing plan to summarize the infrastructure needs and costs as presented in **Table 6.1** below. These projects are also listed in greater detail in **Table 4 - List of CASS Water Projects** in **Appendix A** and written descriptions of the works are presented as CASS Project Description Record (PDR's) in **Appendix B**.

Table 6.1: Summary of Water Infrastructure Needs

Project		Description	Total Cost ($000s)	City Cost ($000s)	Growth Cost ($000s)
1	Colborne St. from Horton St. E to Bathurst St.	300 mm WM (152 m) and hydrant	$529	$397	$132
2	Hwy. 401 east of Wellington Rd.	Potential Upsize of 300 mm to 400 mm (105 m)	$380		$380
3	Exeter Rd. @ Bessemer Dr.	Potential Upsize of 300 mm to 400 mm (18 m)	$65		$65
A	Adelaide St. N (westside) between York St. and King St.	150 mm WM (145 m) with 1 hydrant	$484		$484
B	Maitland St. between Grey St. and South St. & Hill St. east of Maitland St.	200 mm WM (260 m + 102 m) and 3 hydrants	$1,216		$1,216
C	Richmond St. between Horton St. E and Grey St.	200 mm WM (281 m) and 2 hydrants	$944		$944
D	Bathurst St. between Wellington St. and Waterloo St.	200 mm WM (221 m) and hydrant	$743		$743
E	Thames St. from York St. to King St. and across parcel to Dundas St.	200 mm WM (362 m) and 2 hydrants	$1,216		$1,216
F	Talbot St. between Dufferin Ave. and Fullarton St.	200 mm WM (128 m) and hydrant	$430		$430
G	Talbot St. between Dufferin Ave. and	200 mm WM (135 m) and hydrant	$454	$227	$227

	Kent St. (including E-W connection at Dufferin Ave.)				
H	Talbot St. between Kent St. and Albert St. (including connection at Kent St.)	200 mm WM (132 m) and hydrant	$444		$444
I	Central Ave. between Richmond St. and St. George St.	Additional Hydrant	$15		$15
J	Wellington St. South of Wolfe St.	Hydrant connected to existing 450 mm.	$15		$15
K	Talbot St. between Central Ave. and Ann St.	200 mm WM (372 m) and 2 hydrants	$1,250		$1,250
L	Bathurst St. between William St. and Adelaide St. N	Additional hydrant	$15		$15
M	Bathurst St. between Colborne St. and Burwell St. S	200 mm WM (114 m) and hydrant	$383		$383
N/A	Dundas St. @ Maitland St.	Potential upsize of 200mm to 300mm	$20		$20
		Total	$8,603	$624	$7,979

As a means of showing relevancy of the study and potential impacts of draft policy on future developments, a review of several potential publically declared development applications without current status or draft status in the development process (subdivision or site plan) was undertaken. This report estimated the trigger servicing thresholds of these potential developments on the infrastructure needs suggested in **Table 6.1** above.

These ten potential developments are:

1	515 Richmond St./Dufferin	175-unit, 101-metre residential tower
2	505 Talbot St.	200 units. Under construction.
3	183 King St.	25 storey, 200-unit development.
4	560 and 562 Wellington St.	188 units, 25-storey, just north of Centennial Hall.
5	50 King St.	200 units.
6	96 Ridout St. South	22-storey condo tower, 191 units one-bedroom, two-bedroom and penthouse.
7	455 Clarence St.	32-storey, 182-unit project.
8	100 Fullarton St. & 475 Talbot St.	multi-tower development would see 700 apartments added to the downtown.
9	195 Dundas St.	2 towers, 35 & 32 storey, Total 698 units; 3rd low-rise building with retail & commercial space and some residential.
10	809 Dundas Street	No application, 2 large 2 small towers.

As presented in the CASS Sanitary Study, each of the above potential developments will trigger several sanitary sewer upgrades. Similarly, the first two potential developments listed above will trigger CASS Stormwater works. Unlike gravity systems such as sanitary and stormwater, water servicing is a pressurized system that can be accessed along most road frontages. With the exception of potential developments 1, 5 and 6, the above developments are within traffic zones allocated with future planned growth. In addition, these potential developments were included within this water modelling assignment to identify potential water infrastructure needs. However, detailed water modeling with inputs into exact water demands (# of units) for each development is required to do an in depth review of triggers for the individual developments.

Based on the information available to date, the following infrastructure triggers have been ascertained:

- Projects 2 and 3 may be required should all 10 potential developments proceed,
- Potential development 4 (560 & 562 Wellington St.) is the primary trigger of Project J,
- Potential development 5 (50 King St.) is the primary trigger of Project E, and
- Potential development 8 (100 Fullarton St.) is the primary trigger of Projects F, G and H.

As noted previously herein, CASS projects are typically attributed 100% Growth.

It should be noted that the defined servicing requirements for these large tower developments will be submitted by the proponents and reviewed in detail by City staff and will be based on exact size, location zoning and usage of the built form. Variation in servicing needs is expected between the actual development and our servicing needs estimated in this is report. The proponent developers are expected not to rely upon this study, which is solely provided as an illustrative example of how policies and procedures may be applied with recognition that it is subject to the changes and amendments of the pending 2019 Development Charge Background Study. Precise cost splits will also depend upon the final development submission servicing needs.

7. Recommended Changes to Development Charges Policy

The unique nature of the core area will require amendments to the existing Development Charges By-Law to address the outcomes of this study. **Table 2** in **Appendix A** summarizes the proposed Development Charges By-Law amendments.

Appendix A

Tables

TABLE 1

London CASS Survey of Policies - Water Development Charge

Municipality	DC Rate Effective Date	Residential Singles/Semis Water DC	Non-Residential Commercial Water DC (per sq.ft)	Non-Residential Industrial Water DC (per sq.ft)	Notes Regarding DC Rates	Res/Non-Res Split %	Res/Non-Res Split Basis	Items Included in the DC	Local Service Policy Inclusions and Comments
London - Inside Urban Growth Area	January 1, 2016	$ 1,544	$ 0.75	$ -	Industrial development are exempt from DCs as per the DC by-law and the Industrial Lands Community Improvement Plan.	Approximately: 61% Res/ 4% Commercial / 7% Institutional / 29% Industrial	Based on 20 year total average daily demands from Altus growth projections.	All major watermains required to service future development greater than or equal to 400mm in diameter. Watermains oversizing with all of the following attributes: - The watermain services external developable areas, and - The watermain is greater than 250mm in diameter and less than 400mm in diameter. The oversized portion (>250mm) is eligible based on an average oversizing cost and is stated in terms of a $/m of pipe constructed. - Upgrading or construction of new public water booster pumping stations and reservoir projects are designed to increase capacity or improve service to acceptable standards and as a result of growth.	Temporary Facilities (Developer Cost) - Where a temporary facility precedes the construction of a permanent facility, the developer that requires the temporary facility will be required to also assist in making provision for the permanent facility (e.g. secure land for permanent facility) as a condition of approval for the temporary facility. Local Service Costs (Developer Cost) - Any watermain or portion of a larger watermain that is less than or equal to 250mm in diameter is referred to as "local works", and undertaken at the Developer's expense
Hamilton	June 6, 2016	$ 4,338	$ 1.23	n/a	New Commercial/Institutional Development - 1st 5,000 sq.ft. - 50% of total DC charge	66% Res / 34% Non-Res	based on flow requirements.	Should the size of the local infrastructure be required to be greater than the minimum local servicing sizes (i.e. to support external development), Development Charges contributions shall be made.	The minimum sizes are provided from the City's Development Policies: - Watermain 300 mm diameter At intersections, the number of valves required is one less than the number of intersecting watermains (i.e. minimum 2 valves on a 3 way tee). Where a valve is required on an existing main as a result of a connection of a main to service a development, this is considered a local service and not eligible for development charges.
			$ 1.84	n/a	New Commercial/Institutional Development - 2nd 5,000 sq.ft. - 75% of total DC charge				
			$ 2.45	n/a	New Commercial/Institutional Development - 10,000+ sq.ft. - 100% of total DC				
			$ -	n/a	Existing Commercial/Institutional Development as of July 6, 2009 - 1st 5,000 sq.ft.of expansion is exempt				
			$ 2.45	n/a	Existing Commercial/Institutional Development as of July 6, 2009 - 5,000+ sq.ft.of expansion - 100% of total DC				
			n/a	$ -	New Industrial development - under 10,000 sq.ft Non-Res Industrial Water DC is not included in the discounted recovery				
			n/a	$ -	New Industrial development - 10,000+ sq.ft Non-Res Industrial Water DC is not included in the discounted recovery				
			n/a	$ -	Existing Industrial development - exempt up to 50% of existing floor area Non-Res Industrial Water DC is not included in the discounted recovery				
			n/a	$ -	Existing Industrial development - over 50% of existing floor area Non-Res Industrial Water DC is not included in the discounted recovery				
Kitchener - Central	January 1, 2016	$ -	$ -	$ -	Water DC was not calculated for the Central Area				Local Service Policy not included in Background Study
Kitchener - Suburbs	January 1, 2016	$ 215	$ 0.13	$ 0.07	For the period of July 1, 2014 to March 1, 2019, industrial development will be charged 50% of the non-residential development charge rate. After March 1, 2019, industrial development will be charged the non-residential development charge rate.	81% Res / 19% Non-Res	Based on population to employment in suburban area.	- Watermains	Local Service Policy not included in Background Study
Waterloo	January 1, 2016	$ 733	$ 0.64	$ 0.64	Charge has been converted from sq.m to sq.ft.	56% Res / 44% Non-Res	Based on population in new housing units and employment	- Watermains (New and Upsized)	Local Service Policy not included in Background Study
Guelph	March 2, 2016	$ 8,912	$ 3.75	$ 3.75	For residential plans of subdivision, development charges for water, wastewater, stormwater, roads and related services are required to be paid upon entering into the subdivision agreement.	60% Res / 40% Non-Res	Based on incremental growth in population to employment (build out forecast period for the urban serviced areas)	Pipes greater than 300mm.	The costs of the following items shall be direct developer responsibilities as a local service: - providing all underground services internal to the development, including water services; - providing service connections from existing underground services to the development; - providing new underground services or upgrading existing underground services external to the development if the services are required to service the development, and if the pipe sizes do not exceed 300mm for water. If external services are required by two or more developments, the developer for the first development will be responsible for the cost of the external services and may enter into frontending/cost-sharing agreements with other developers independent of the City; - water booster pumping stations, reservoir pumping stations serving individual developments
Brantford	January 1, 2016	$ 1,559	$ 0.80	$ 0.80	The charge for industrial developments is calculated on the basis of gfa to a maximum of 25% building coverage multiplied by the non-residential development rate. (For example, an application for 20% industrial lot coverage would be calculated based on 20% lot coverage. However, an application for 30% lot coverage would be charged based on the maximum charge of 25% lot coverage.)	68% Res / 32% Non-Res	Based on population and employment over the planning period.	- All water supply, storage, treatment facilities and booster pumping stations may be included in the DC. - Pipes larger than 250mm. - Watermain projects required for intensification growth or strategic projects that benefit growth beyond the local development area will be included in the development charges calculation. - Trunk watermains, generally outside the development area, identified by a Class Environmental Assessment, Servicing Study or by City staff will be included in the development charge calculation.	- Any costs related to the depth of pipe are the responsibility of the developer. - Water mains 250mm and under are deemed to be a local service and are a direct funding responsibility of the developer. - Connections to trunk mains and pumping stations to service local areas are to be a direct developer responsibility.

London CASS Survey of Policies - Water Development Charge

Municipality	DC Rate Effective Date	Residential Singles/Semis Water DC	Non-Residential Commercial Water DC (per sq.ft)	Non-Residential Industrial Water DC (per sq.ft)	Notes Regarding DC Rates	Res/Non-Res Split %	Res/Non-Res Split Basis	Items Included in the DC	Local Service Policy Inclusions and Comments
Windsor - City-Wide	June 1, 2016	$ 1,676	$ 0.69	$ -	Industrial is exempt Windsor also has a designated DC exemption area, see link below for a map of the exemption area:	94% Res / 6% Non-Res	Based on population (in new units) and employment to 2024	- Watermains - Feedermains - Pump Upgrades - Reservoir - Treatment Plant	Local Service Policy not included in Background Study
Windsor - Area 1	August 2, 2016	$ 1,257	$ 0.52	$ -	http://www.citywindsor.ca/residents/building/Building-Permits/Documents/SCHEDULE%20A%20TO%20SCHEDULE%20A3.pdf				Local Service Policy not included in Background Study
Ottawa - Area 1 - Inside the Greenbelt	August 1, 2016	$ 364	$ 0.34	$ 0.15		61% Res / 39% Non-Res	Based on population/employment ratio for the period 2014-2031.	- Watermains, having a nominal diameter equal to or greater than 610 mm, are considered to be development charges projects - The contribution towards "oversizing" through development charges for pipes greater than 610 mm shall be the cost in excess of the cost of a 405 mm watermain and shall increase as the pipe size increases, as follows: Watermain Size Charged to DCs 405 mm NIL 610 mm (cost of 610mm less cost of 405mm) 750 mm (cost of 750mm less cost of 405mm) 900 mm (cost of 900mm less cost of 405mm) 1050 mm (cost of 1050mm less cost of 405mm) 1200 mm (cost of 1200mm less cost of 405mm) - Where identified in an approved serviceability study, off-site feeder mains of any size required to provide network integrity or reliability to the distribution network, or to correct health-related water supply concerns having a growth-related component, are considered development charges projects and 100% recoverable. Booster Pumping Stations - Upgrades to, or construction of, permanent water booster pumping stations and reservoir projects are considered to be development charges projects	Watermains of 405 mm or less are considered a developer's responsibility, subject to the criteria below. Feedermains are typically located on Arterial or Major collector roads or easements where lot frontage is not normally permitted. Since a watermain of any size located within this right of way has no direct servicing benefit but is required by the developer for local services. - All other watermains are considered a direct developer responsibility, including all required looping to service the development lands. - One price per nominal pipe diameter shall apply to all over-sizing costs as set out in the corresponding table in the DC by-law. Booster Pumping Stations and Reservoirs - Upgrades to, or construction of, temporary water booster pumping stations and reservoir projects are considered to be the developer's responsibility.
Ottawa - Area 2 - Outside the Greenbelt	August 1, 2016	$ 3,123	$ 0.34	$ 0.15		64% Res / 36% Non-Res			
Ottawa - Area 3 - Rural Serviced	August 1, 2016	$ 178	$ 0.34	$ 0.15		63% Res / 37% Non-Res			
Barrie - Former City Municipal Boundary Areas	January 1, 2016	$ 7,984	$ 5.19	$ 3.61		60% Res / 40% Non-Res	Based on incremental growth in population to employment, in the former city municipal boundary areas, over the 18-year forecast period.	- Includes all watermains equal to or greater than 400 mm, with the exception of a few smaller watermains as listed in this study; all other watermains are a "local service". - The DC calculation includes booster pumping stations and water storage projects as listed in this study; any other projects determined to be required for a development to proceed would be a "local service".	- Watermains 400mm and smaller - Any other water distribution projects determined to be required for a development to proceed would be a "local service".
Barrie - Salem & Hewitt's Secondary Plan Areas	January 1, 2016	$ 9,863	$ 6.20	$ 4.06		77% Res / 23% Non-Res	Based on incremental growth in population to employment, in Salem and Hewitt's Secondary Plan Areas, over the build out forecast period for these areas.	- Includes all watermains equal or greater than 400 mm, with the exception of a few smaller watermains as listed in this study. The DC calculation includes booster pumping stations and water storage projects as listed in this study.	- Watermains 400mm and smaller - Any other water distribution projects determined to be required for a development to proceed would be a "local service".

TABLE 2
Proposed 2019 DC By-Law Amendments
CITY OF LONDON
2017 CASS POLICIES

GENERAL

G-1. Claimability
Any item listed as claimable, subsidizable, or eligible for funding from a development charge reserve fund must also be provided for in the approved DC rates. To the extent that specific cost sharable works and projects cannot be identified as to location or timing, there should be a contingency provided for in the estimates that is incorporated into the rates.

It is important that the City continue to monitor between DC Background Studies, the accuracy of the estimates and assumptions used to establish the rates. To the extent that substantial variations are identified, Council should be advised and will need to consider whether to increase or decrease the rates in accordance with the monitoring observations.

G-2. DC Fund reimbursements for Exempted Development
The City currently exempts Industrial development, and certain specified forms of Institutional development from the payment of development charges. These exemptions support economic development and not-for-profit development initiatives.

With respect to any non-statutory exemptions the City approves in its DC policy, the City will pay for these exemptions through non-DC supported contributions to the respective DC reserve funds. This meets the legislative requirement that exemptions or reductions to charges otherwise payable not be recovered from other, non-exempt forms of development (DCA s.5 (6)3.)

G-3. Non-Growth Works that Benefit the Existing Population (BTE)
Where minor works funded in part from the CSRF are subject to this policy and also include a non- growth component in the DC Background Study, funding of that portion of the works must wait until the City has approved sufficient funds in its Council approved capital budgets, or Council makes provision for a Reserve Fund designated for use in funding the non-growth share of DC funded works, to pay for that non-growth portion of the works. The non-growth portion of the funding shall be identified in the City's Capital Works Budget and approved by Council.

The benefit To Existing (BTE) will be calculated based on the Asset Condition of the current infrastructure element as defined by the relevant Asset Management data base as defined by condition parameters and maintained by the City of London

G-4. Use of Contingencies
Works listed as eligible in the Development Charges Background Study, or with the approval of the City Engineer, in consultation with the Director, Development Finance, drawn from a contingency and/or an alternative to a work listed in the Background Study may be funded from the CSRF. The claimability of such a work would be subject to inclusion in the development agreement (for works less than $50,000 subject to approved funding in the Capital Budget) or subject to execution of a Municipal Servicing and Financing agreement prior to commencement of the work. The works funded from the CSRF under this paragraph would be subject to rules similar to those described for minor CSRF eligible works contained in this section with respect to eligibility, tender and claim completeness and submission.

G-5. Exceptions
The Development Charge By-law allows for exceptions to projects listed in the DC Background Study for works listed as eligible in the Development Charges Background Study, or with the approval of the City Engineer, in consultation with the Director, Development Finance, drawn from a contingency and/or substituted for a work listed in the Background Study may be claimable.

G-6. Work in the Right of Way and Distribution of Costs
Given the congested nature of the ROW in the CASS study area it is unlikely for one Infrastructure element requiring a growth need upgrade can be improved without impacts upon other services in close proximity. In these cases:

- The City shall undertake the management of the required construction project (unless previous written permission by the City Engineer to do otherwise is secured)

- The claimable costs for the infrastructure upgrade will include Pipe, construction, engineering and related utility relocations with appropriate identification and deductions for Local Servicing portions(defined elsewhere in this document)) Restoration will be split between the City owned services being reconstructed (i.e. if all 3 services are impacted then restoration will be shared ,water 1/3, sanitary 1/3, stormwater 1/3) and BTE split generated using the City's asset rating is applied to corresponding portion of restoration.

G-7. Distribution of Growth Costs
The infill and intensification projects are to be considered Community Growth and a standard split is applied across several growth types in the CASS boundary as determine by the City's growth predictions and intensification policies.

G-8. Restoration and Damage
When an infrastructure upgrade is not deemed a Local Service then of any utility cuts, shoring, vibration monitoring & protection, pedestrian hoarding, signage, and or restoration of damage created by construction activities and /or construction traffic in and out of the development area. including but not limited to daily removal of mud tracking, daily dust suppression, milling and paving of deteriorated asphalt caused by construction traffic, grading of gravel shoulders to remove rutting caused by construction traffic shall be claimable as restoration;

G-9. Utility Upgrades
When an infrastructure upgrade is not deemed a Local Service then the costs related to the upgrading of any utility plant, or the relocation of the same, unless necessitated by the roadwork will not be covered by the Development Charges unless those upgrades pertain to City Owned services;

G-10. Relocation and Replacement Costs
When an infrastructure upgrade is not deemed a Local Service then the relocation and/or replacement costs of any encroachment on the City's road allowance or easement including but not limited to trees, art, signage, planters, paving stones, parking meters, bus bays, street trees, hedges, sprinklers systems and fences shall be part of the claimable work as restoration;

WATER DISTRIBUTION IN CASS AREA

CASS W-1. Major Watermains (CSRF-Water Distribution)
Claims against the CSRF Water Distribution fund may be made if:

a. the watermain is required to service future development on the Public ROW or in an Easement that are greater than or equal to 250mm in diameter are considered to satisfy a network wide benefit to growth and are identified separately as projects in the Development Charges Background Study, Growth Management Implementation Study (GMIS), or referred to in the CASS study and are eligible for a claim from the *CSRF*- Water Distribution Fund.

b. The claims shall be limited to the conditions mentioned herein, and limited to the reimbursements in the current Development Charges Background Study for oversizing are subject to reduction for Local Service components and council approval

Claims against the CSRF – Infill and Intensification Program if:

a. The works occur inside or service lands inside the CASS boundary as shown by Figure 1.1: Study Area.

b. Any watermain is deemed required to address an upgrade at a distance greater than the smallest of the following four conditions:

1) four Hydrants on the same line;
2) two valve chambers on the same line;
3) one city block or;
4) 150 m radius around the centroid of the development measured from the center of the proposed development frontage.

c. The claims shall be limited to the conditions mentioned herein, and limited to the reimbursements mention in the current Development Charges Background Study for oversizing are subject to reduction for Local Service components and council approval

CASS W-2. Watermain Oversizing (CSRF-Water Distribution)
Watermains with the all of the following attributes are eligible for a subsidy from the CSRF-Water Distribution:

- The watermain services external developable areas, and
- The watermain is greater than 250mm in diameter and less than 400mm in diameter.

The oversized portion (>250mm) is eligible for a subsidy payable based on an average oversizing cost and is stated in terms of a $/m of pipe constructed. The oversizing subsidy amounts will be identified in a schedule provided in the approved Development Charges By-law from the City Services Reserve Fund. Payment of claims from the City Services Reserve fund is subject to budget approval.

CASS W-3. Water Facilities *(CSRF*-Water Distribution*)*
Where the upgrading or construction of new public water booster pumping stations and reservoir projects are designed to increase capacity or improve service to acceptable standards and as a result of growth, these works are eligible for a claim from the CSRF-Water Distribution. These projects must also be identified in the Development Charges Background Study. This does not include privately owned water boosting devices.

CASS W-4. Temporary Facilities (Developer Cost)
Where a temporary facility precedes the construction of a permanent facility, the developer that requires the temporary facility will be required to also assist in making provision for the permanent facility (e.g. secure land for permanent facility) as a condition of approval for the temporary facility. Approval of temporary works is at the discretion of the City Engineer. In order for a temporary work to proceed there must first be provisions for the permanent work within the current Development Charge Background Study.

CASS W-5. Local Service Costs (Developer Cost)
Any watermain or portion of a larger watermain that is less than or equal to 250mm in diameter located on the public ROW is referred to as “local works”, and undertaken at the Developer’s expense in the CASS boundary if the work is required to address an upgrade, not mentioned in the CASS Master Plan, within any of the following trigger distances::

1) four Hydrants on the same line;
2) two value chambers on the same line;
3) one city block or;
4) 150 m radius around the centroid of the development measured from the center of the proposed development frontage.

WASTEWATER IN CASS AREA

CASS SS-1. Regional Trunk Sewers (CSRF- Sanitary Sewerage)
Claims against the CSRF Sanitary Sewage Fund may be made if:

a. the Sanitary Sewer is required to service future development on the Public ROW or in an Easement that are greater than or equal to 300mm in diameter are considered to satisfy a network wide benefit to growth and are to be identified separately as projects in the Development Charges Background Study, Growth Management Implementation Study (GMIS), or referred to in the CASS study.

b. The claims shall be limited to the conditions mentioned herein, and limited to the reimbursements mention in the current Development Charges Background Study for oversizing are subject to reduction for Local Service components and Municipal Council approval.

c. All sewers of any diameter required to service future development that satisfy a regional benefit to growth and are identified as a strategic need by the City Engineer are considered to satisfy a regional benefit to growth and are to be identified as separate projects in the DC Background Study and are eligible.

d. In order to be eligible for a claim as a Regional Trunk Sewer, the sewer must have no Private Drain Connections to individual residential units otherwise the “Sewer Oversizing” policy applies.

e. This work will be undertaken by the City unless authorized prior by the City Engineer in writing.

CASS SS-2. Sewer Oversizing (CSRF - Minor Sanitary Sewers)
Sanitary Sewers, which are not Regional Trunk Sewers, with all of the following attributes are eligible for a subsidy from the CSRF - Minor Sanitary Sewers:

- The sewer services external developable areas, and
- The sewer is greater than 250mm in diameter.

The oversized portion (>250mm) is eligible for a subsidy payable based on an average oversizing cost and is stated in terms of a $/m of pipe constructed. The oversizing subsidy amounts are to be reflected in an appendix of the DC Bylaw. The oversizing subsidy amounts cover the cost per meter of all associated eligible costs including engineering, manholes, restoration, etc.

CASS SS-3. CSRF – Infill and Intensification Program
Claims against the CSRF – Infill and Intensification Program if:

a. The works occur inside or service lands inside the CASS boundary.

b. Any Sanitary Sewer that is greater than 250 mm in diameter is deemed required to address a required upgrade at a distance of greater than the smallest of the following two conditions:

1) one city block or;
2) 150 m radius around the centroid of the development measured from the center of the proposed development frontage.

c. The claims shall be limited to the conditions mentioned herein, and limited to the reimbursements mention in the current Development Charges Background Study for oversizing are subject to reduction for Local Service components and Council approval.

d. The BTE shall be based on the City of London’s asset rating of existing pipe.

e. This work will be undertaken by the City unless authorized prior by the City Engineer in writing.

CASS SS-4. Combined Sewers (CS)
Claims against the CSRF – Infill and Intensification Program for combined sewers are eligible if:

a. The work is required to service future development on the Public ROW or in an Easement and are considered to satisfy a network wide benefit to growth and outside the greater distance of either one city block or 150 m radius around the centroid of the development measured from the center of the proposed development frontage.

b. Work on CSO pipes will be similar to as noted in SS-8 for local service, however the BTE shall be based on the arithmetical sum of the individually calculated sanitary and storm BTE based on the City of London’s asset rating of the existing sanitary and storm portions of the CSO pipe. This will be applied to the individual replacement costs of the new sanitary and storm pipe respectively to generate the total BTE split for the new service(s) (sanitary and storm).

c. This work will be undertaken by the City unless authorized prior by the City Engineer in writing.

CASS SS-5.
All planned works noted in the CASS study as growth needs or upgrades will use the table in the 2014 DCBS/MP –for oversizing calculation. BTE will be generated using tables based on asset rating and be applied across construction costs for pipe, construction cost, engineering, utilities, land and restoration as a DC eligible cost. If there is deemed to be a local servicing costs then an appropriate share shall be allocated by the individual contributing developers.

CASS SS-6. Regional Pumping Stations (CSRF- Sanitary Sewerage)
The upgrading or construction of new regional pumping stations are to be identified as separate projects in the DC Background Study and are eligible for a claim from the CSRF- Sanitary Sewerage. These projects must also be identified in the Development Charges Background Study. A figure showing the location of all of these pumping stations is provided in the Sanitary Master Servicing Study.

CASS SS-7. Temporary Pumping Stations (Developer Cost)
The cost of any temporary pumping stations and/or forcemains is borne by the developer. Approval of temporary works is at the discretion of the City Engineer. Where a temporary facility precedes the construction of a permanent facility, the developer that requires the temporary facility will be required to make provision for the permanent facility (e.g. provide land for permanent facility at the developer’s cost) as a condition of approval for the temporary facility. In order for a temporary work to proceed there must first be provisions for the permanent work within the current Development Charge Background Study.

CASS SS-8. Local Service Costs (Developer Cost)
Any pipe or portion of a larger pipe that is less than or equal to 250mm in diameter are referred to as local works, and undertaken at the Developer’s expense
Any work or portion of a larger sewer that is on the public ROW or easement and undertaken at the Developer’s expense in the CAS zone if the work is required to address an upgrade not mentioned in the CASS Master Plan and within the lesser distance of either one city block or 150 m radius around the centroid of the development measured from the center of the proposed development frontage.

STORMWATER IN CASS AREA

CASS SWM-1. Regional Trunk Sewers
Claims against the CSRF Storm Sewage Fund may be made if:

a. the Storm Sewer is required to service future development on the Public ROW or in an Easement that are greater than or equal to 900mm in diameter are considered to satisfy a network wide benefit to growth and are to be identified separately as projects in the Development Charges Background Study, Growth Management Implementation Study (GMIS), or referred to in the CASS study.

b. The claims shall be limited to the conditions mentioned herein, and limited to the reimbursements mention in the current Development Charges Background Study for oversizing are subject to reduction for Local Service components and Municipal Council approval.

c. All sewers of any diameter required to service future development and that are identified as a strategic need by the City Engineer are considered to satisfy a regional benefit to growth and are to be identified as separate projects in the DC Background Study and are eligible.

d. In order to be eligible for a claim as a Regional Trunk Sewer, the sewer must have no Private Drain Connections to individual residential units otherwise the “Sewer Oversizing” policy applies.

e. This work will be undertaken by the City unless authorized prior by the City Engineer in writing

Claims against the CSRF – Infill and Intensification Program if:

a. The works occur inside or service lands inside the Built Urban Boundary January 2018.

b. Any storm sewer or combined sewer is deemed required to address a required upgrade at a distance of greater than the smallest of the following two conditions:

   1) one city block or;
   2) 50 m radius around the centroid of the development measured from the center of the proposed development frontage.

c. The claims shall be limited to the conditions mentioned herein, and limited to the reimbursements mention in the current Development Charges Background Study for oversizing are subject to reduction for Local Service components and council approval

This work will be undertaken by the City unless authorized prior by the City Engineer in writing.

CASS SWM-2. Regional Open Channels (CSRF- Major SWM Works)
Any open channel works identified through the Environmental Assessment process that are considered to satisfy a regional benefit to growth are to be identified as separate projects in the DC Background Study and are eligible for a claim from the CSRF- Major SWM Works.

CASS SWM-3. Storm Sewer Oversizing (CSRF- Minor Storm Works inside CASS)
Storm Sewers with all of the following attributes are eligible for a subsidy from the CSRF - Minor Storm Works:

- The sewer services external developable areas, and
- The sewer is greater than 900mm in diameter.

The oversized portion (>900mm) is eligible for a subsidy payable based on an average oversizing cost and is stated in terms of a $/m of pipe constructed. The oversizing subsidy amounts are to be reflected in an appendix of the DC Bylaw. The oversizing subsidy amounts cover the cost per meter of all associated eligible costs including engineering, manholes, restoration, etc.

CASS SWM-4. Open Channel Oversizing (CSRF- Minor Storm Works)
Open Channels with all of the following attributes are eligible for a subsidy from the CSRF - Minor Storm Works:

- An open channel design is required for the reason of inherent site drainage constraints and the design has been accepted by the City Engineer,
- The open channel services external developable areas, and
- The open channel has a 2-year storm design flow cross-sectional area greater than a 900mm sewer using the City’s minimum design standards.
- The oversized portion represents the cross-sectional area required in excess of a 900mm sewer for a 2-year storm design. The oversizing subsidy will be calculated based on the additional cost of oversizing beyond an area equivalent to a 900mm pipe size using the City’s minimum design standards for a 2-year storm design flow. The oversizing subsidy is payable based on an average oversizing cost in the form of a $/m of channel constructed as calculated by the Owners consulting engineer and as accepted by the City Engineer (or designate). An allowance of 15% will be added to the calculated oversizing amount to cover applicable engineering costs.

CASS SWM-5. Stormwater Management Works (CSRF- Major SWM Works)
Environmental Assessment Complete
Any municipally owned or operated stormwater management works designed to provide capacity to facilitate growth that are identified through the Environmental Assessment process and are considered to satisfy a regional benefit to growth are to be identified as separate projects in the DC Background Study and are eligible for a claim from the CSRF- Major SWM Works.

Environmental Assessment Not Complete
Stormwater Management Works for which an Environmental Assessment has not been completed that are anticipated to satisfy a regional benefit to growth are to be identified as separate area specific contingencies in the DC Background Study and are eligible for a claim from the CSRF- Major SWM Works.

Upon completion of the applicable Environmental Assessment (i.e. no outstanding Part 2 orders), a review of the related area specific contingency and the development charge rate will be undertaken and, if required, a revision to the development charge by-law will be made.

CASS SWM-6. Stormwater Management Facility Land Costs (CSRF- Major SWM Works)
Land will be reimbursed at a specific rate, with different land values assigned to different categories as outlined in the Development Charges By-law.

CASS SWM-7. Major SWM Facility Inlet and Outlet Sewers within the SWM Block(CSRF- Major SWM Works)
Any storm sewers within a Major SWM Facility block that are either upstream or downstream of a facility are considered to satisfy a regional benefit to growth and are eligible for a claim from the CSRF- Major SWM Works.

CASS SWM-8. Major SWM Facility Outlet Sewers outside the SWM Block (CSRF- Major SWM Works or CSRF- Minor Storm Works)
Any major SWM facility outlet sewer that extends outside the SWM block facility is considered to satisfy a regional benefit to growth and is eligible for a claim from the CSRF- Major SWM Works if the outlet sewer is not also used to provide drainage to a development adjacent to the outlet sewer.

In the event that all or a portion of the outlet sewer outside the SWM block is used to provide drainage to a development adjacent to the outlet sewer then the portion of the outlet sewer downstream from the adjacent development is eligible for “Storm Sewer Oversizing” as described in the DC By-law.

CASS SWM-9. Local Service Costs (Developer Cost)
Any pipe or portion of a larger pipe that is less than or equal to 900 mm in diameter are referred to as local works, and undertaken at the Developer’s expense and/or if the work is required to address an upgrade not mentioned in the CASS MP within the greater distance of either one city block or 150 m radius around the centroid of the development measured from the center of the proposed development frontage.

CASS SWM-10. Temporary Storm Sewers (Developer Cost)
Costs of all storm sewer systems that are temporary or not defined in the DC Background Charge Study shall be borne by the Developer. In order for a temporary work to proceed there must first be provisions for the permanent work within the current Development Charge Background Study.

CASS SWM-11. Temporary Stormwater Management Works (Developer Cost)

Any temporary works or works not included in the approved Development Charges Background Study are at the sole expense of the Developer including operation, maintenance and decommissioning. Approval of temporary works is at the discretion of the City Engineer. Where a temporary facility precedes the construction of a permanent facility, the developer that requires the temporary facility will be required to also assist in making provision for the permanent facility (e.g. secure land for permanent facility) as a condition of approval for the temporary facility. In order for a temporary work to proceed there must first be provisions for the permanent work within the current Development Charge Background Study.

Best management practices or private drainage systems are not claimable unless identified through the Environmental Assessment process as being required to meet a regional benefit to growth.

The construction of road side ditches, swales, and overland flow routes are not eligible for claim from the City Services Reserve Fund - Stormwater Management.

TABLE 3
CITY OF LONDON
CASS WATER UPDATE 2016
UNIT RATE COSTS FOR WATERMAINS
(Revised December 21, 2016)

PIPE COSTS

150mm to 600mm dia. pipe cost based on 2012 vendor pricing for PVC pipe, including pipe and gaskets.

Pipe equal to and greater than 750mm dia. based on vendor pricing for concrete pressure pipe, including pipe and gaskets.

All pipe prices inflated to 2017 using Statistics Canada Infrastructure Construction Price Index. As it only provides data to 2015 Quantity Survey estimating resource (BTY) was used for 2016-2017 At 2.5% per annum.

Diameter

Type	150	200	250	300	400	450	500	600	750	900	1050	1200	1350	1500
CPP	N/A	N/A	251	305	349	392	480	523	665	807	1014	1221	1570	1918
PVC	60	71	87	109	169	223	278	392	N/A	N/A	N/A	N/A	N/A	N/A

CONSTRUCTION COSTS - Open Cut - Pipe Cost NOT Included

Based on tender costs as provided by the City over the past 5 years and indexed to 2014.

Includes trenching labor and equipment, installation, bedding, backfill, compaction, chambers, valves, hydrants, etc.

Diameter

Depth	150	200	250	300	400	450	500	600	750	900	1050	1200	1350	1500
1.8	736	741	752	785	818	850	948	1090	1352	1515	1842	2202	2562	2998

RESTORATION COSTS

Referenced from 20-year (LSSSS) plan (2003), and updated as per 2016 tender and transportation costs for rural and urban restoration.

Open - no restoration; Landscape - minor/boulevard (no roadway restoration); Rural - cross section as per transportation cost table; Urban - cross section as per transportation cost table.

Ecosystem - applies to areas adjacent to or within environmentally significant areas.

Condition / Depth	Open	Landscape	Rural	Urban	Ecosystem	
1.8	0	327	1341	1428	719	0

CASS Cost Factors

It is recognized that an increased cost may be encountered and applied to total cost of project due to location of works and to account for extra efforts for shoring, traffic control, additional utilities, slower construction progress, etc.

Project specific cost in CASS to include 20% Engineering Fees and 30% Contingency.

TABLE 4
CITY OF LONDON
LIST OF CASS WATER PROJECTS WITH ASSET RATING

Project	Location Detail		CASS Number	Existing (A)						Existing System Improvement (B)								Growth Improvement (C)							Growth / Non-Growth				Cost Allocation			Implementation						
	Location	Description		Pipe Size (mm)	Average Rating	Rating Description	Pipe Length (m)	Asset value of existing Pipe only ($000s)	BTE Factor	Pipe Size (mm)	Pipe Length (m)	Total Cost (Pipe + Const + Rest) ($000s)	20 %Engineering ($000s)	30 % Contingency ($000s)	Grand Total ($000s)	Growth ($000s)	Non Growth ($000)	Pipe Size (mm)	Pipe Length (m)	Total Cost (Pipe + Const + Rest) ($000s)	20 %Engineering ($000s)	30 % Contingency ($000s)	Grand Total($000s)	Oversizing For Growth	Growth ($000s)	Non Growth ($000)	Individual Project BTE Split %	Individual project Growth Split %	Residential 82.6% (thousand)	Commercial 10% (thousand)	Institutional 7.4% (thousand)	Reason	Timing	2014 - 2018 (thousands)	2019 - 2023 (thousands)	2024 - 2033 (thousands)	Build Out (thousands)	
1	Colborne St. from Horton St. E to Bathurst St.	300 mm WM (152 m) and hydrant	AECOM-WATER-001	150	4	Poor	152	$9.1	0.75	300	152	$353	$71	$106	$529	$132	$397	300	152	$353	$71	$106	$529	$0	$132	$397	75.0%	25.0%	$109	$13	$10	Velocity	Immediate	2017	$529			
2	Hwy. 401 east of Wellington Rd.	Potential Upsize of 300 mm to 400 mm (105 m)	AECOM-WATER-002	300	1	Very Good	105	$11.4	0.10				$0	$0	$0	$0	$0	400	105	$254	$51	$76	$380	$380	$380	$0	0.0%	100.0%	$314	$38	$28	Velocity	Build Out	Build Out				$380
3	Exeter Rd. @ Bessemer Dr.	Potential Upsize of 300 mm to 400 mm (18 m)	AECOM-WATER-003	300	1	Very Good	18	$2.0	0.10				$0	$0	$0	$0	$0	400	18	$43	$9	$13	$65	$65	$65	$0	0.0%	100.0%	$54	$7	$5	Velocity	Build Out	Build Out				$65
A	Adelaide St. N (westside) between York St. and King St.	150 mm WM (145 m) with 1 hydrant	AECOM-WATER-004	N/A	2	No Rating	145	$8.7	0.25				$0	$0	$0	$0	$0	150	145	$322	$64	$97	$484	$484	$484	$0	0.0%	100.0%	$399	$48	$36	Fireflow	York Dev. (Post-2034)	Build Out				$484
B	Maitland St. between Grey St. and South St. & Hill St. east of Maitland St.	200 mm WM (260 m + 102 m) and 3 hydrants	AECOM-WATER-005	150	2	Good	362	$21.7	0.25				$0	$0	$0	$0	$0	200	362	$811	$162	$243	$1,216	$1,216	$1,216	$0	0.0%	100.0%	$1,005	$122	$90	Fireflow	Maitland Dev. (Post-2034)	Build Out				$1,216
C	Richmond St. between Horton St. E and Grey St.	200 mm WM (281 m) and 2 hydrants	AECOM-WATER-006	100	3	Fair	281	$16.8	0.50				$0	$0	$0	$0	$0	200	281	$629	$126	$189	$944	$944	$944	$0	0.0%	100.0%	$780	$94	$70	Fireflow	Richmond Dev. (Post-2034)	Build Out				$944
D	Bathurst St. between Wellington St. and Waterloo St.	200 mm WM (221 m) and hydrant	AECOM-WATER-007	150	4	Poor	221	$13.2	0.75				$0	$0	$0	$0	$0	200	221	$495	$99	$149	$743	$743	$743	$0	0.0%	100.0%	$613	$74	$55	Fireflow	Bathurst Dev. (Post-2034)	Build Out				$743
E	Thames St. from York St. to King St. and across parcel to Dundas St.	200 mm WM (362 m) and 2 hydrants	AECOM-WATER-008	150	2	Good	362	$21.7	0.25				$0	$0	$0	$0	$0	200	362	$811	$162	$243	$1,216	$1,216	$1,216	$0	0.0%	100.0%	$1,005	$122	$90	Fireflow	TZ 506 Dev. (Post-2034)	Build Out				$1,216
F	Talbot St. between Dufferin Ave. and Fullarton St.	200 mm WM (128 m) and hydrant	AECOM-WATER-009	150	3	Fair	128	$7.7	0.50				$0	$0	$0	$0	$0	200	128	$287	$57	$86	$430	$430	$430	$0	0.0%	100.0%	$355	$43	$32	Fireflow	Talbot Dev. (2019)	2019		$430		
G	Talbot St. between Dufferin Ave. and Kent St. (including E-W connection at Dufferin Ave.)	200 mm WM (135 m) and hydrant	AECOM-WATER-010	150	3	Fair	135	$8.1	0.50	200	135	$302	$60	$91	$454	$227	$227	200	135	$302	$60	$91	$454	$0	$227	$227	50.0%	50.0%	$187	$23	$17	Fireflow	Immediate at Dufferin and Talbot	2017	$454			
H	Talbot St. between Kent St. and Albert St. (including connection at Kent St.)	200 mm WM (132 m) and hydrant	AECOM-WATER-011	150	1	Very Good	132	$7.9	0.10				$0	$0	$0	$0	$0	200	132	$296	$59	$89	$444	$444	$444	$0	0.0%	100.0%	$366	$44	$33	Fireflow	Talbot Dev. (Post-2034)	Build Out				$444
I	Central Ave. between Richmond St. and St. George St.	Additional Hydrant	AECOM-WATER-012	N/A	2	No Rating		$0.0	0.25				$0	$0	$0	$0	$0			$10	$2	$3	$15	$15	$15	$0	0.0%	100.0%	$12	$2	$1	Fireflow	Central Ave. Dev. (Post-2034)	Build Out				$15
J	Wellington St. South of Wolfe St.	Hydrant connected to existing 450 mm.	AECOM-WATER-013	N/A	2	No Rating		$0.0	0.25				$0	$0	$0	$0	$0			$10	$2	$3	$15	$15	$15	$0	0.0%	100.0%	$12	$2	$1	Fireflow	Wellington St. Dev. (Post-2034)	Build Out				$15
K	Talbot St. between Central Ave. and Ann St.	200 mm WM (372 m) and 2 hydrants	AECOM-WATER-014	150	1	Very Good	372	$22.3	0.10				$0	$0	$0	$0	$0	200	372	$833	$167	$250	$1,250	$1,250	$1,250	$0	0.0%	100.0%	$1,032	$125	$92	Fireflow	Talbot Dev. (Post-2034)	Build Out				$1,250
L	Bathurst St. between William St. and Adelaide St. N	Additional hydrant	AECOM-WATER-015	N/A	2	No Rating		$0.0	0.25				$0	$0	$0	$0	$0			$10	$2	$3	$15	$15	$15	$0	0.0%	100.0%	$12	$2	$1	Fireflow	Bathurst Dev. (Post-2034)	Build Out				$15
M	Bathurst St. between Colborne St. and Burwell St. S	200 mm WM (114 m) and hydrant	AECOM-WATER-016	150	1	Very Good	114	$6.8	0.10				$0	$0	$0	$0	$0	200	114	$255	$51	$77	$383	$383	$383	$0	0.0%	100.0%	$316	$38	$28	Fireflow	Bathurst Dev. (Post-2034)	Build Out				$383
N/A	Dundas St. @ Maitland St.	Potential Upsize of 200 mm to 300 mm (6 m)	AECOM-WATER-017	200	1	Very Good	6	$0.4	0.10				$0	$0	$0	$0	$0	200	6	$13	$3	$4	$20	$20	$20	$0	0.0%	100.0%	$17	$2	$1	Velocity	Build Out	Build Out				$20

Condition	Condition Rating	BTE
Very Good	1	0.10
Good	2	0.25
No Rating	2	0.25
Fair	3	0.50
Poor	4	0.75
Very Poor	5	0.90

Assumptions and Footnotes

1 Asset condition as inspected, weighted, calculated, and inventored by City of London Asset Management Office
2 Growth is the Trigger for all projects as the work is being undertaken as a result of development

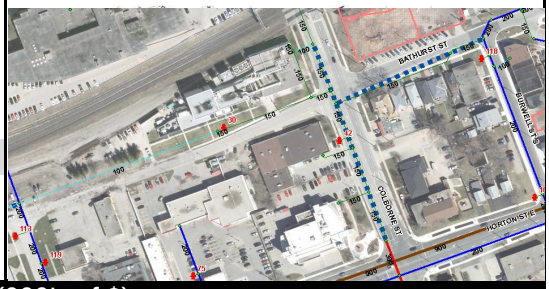
	Total Program Cost		Total Growth Costs	Total Non-Growth Costs		Res.	Comm.	Inst.		2014 - 2018	2019 - 2023	2024 - 2033	Build Out
Totals	$8,603		$7,979	$624		$6,591	$798	$590		$983	$430	$0	$7,190
Percentages			92.7%	7.3%		82.6%	10.0%	7.4%		11.4%	5.0%	0.0%	83.6%

Appendix B

Project Sheets

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET			
GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Colborne St. from Horton St. E. to Bathurst St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY	
DESCRIPTION:	LOCATION:
300mm Watermain (152m) and hydrant	
LANDS IMAPCTED BY PROJECT:	

DEVELOPMENT CHARGE ESTIMATE (000's of $)			
TOTAL COST:	$550,593.0	AMOUNT ELIGIBLE FOR DC:	$545,087.1

	G	nG
G/Ng SPLIT:	99%	1%
G/Ng DESCRIPTION:	Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)	

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	
RICI DESCRIPTION:	City wide basis. Industrial have own work program.			

PREVIOUS STUDIES:	None.
OTHER INFORMATION:	None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

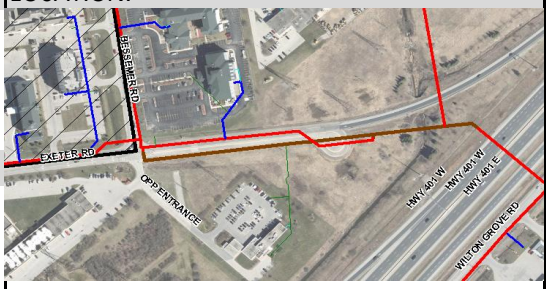
GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Hwy 401 east of Wellington Rd.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:

Potential Upsize of 300 mm to 400 mm (105m)

LOCATION:



LANDS IMAPCTED BY PROJECT:

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$349,934.0	AMOUNT ELIGIBLE FOR DC:	$346,434.7

	G	nG
G/Ng SPLIT:	99%	1%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

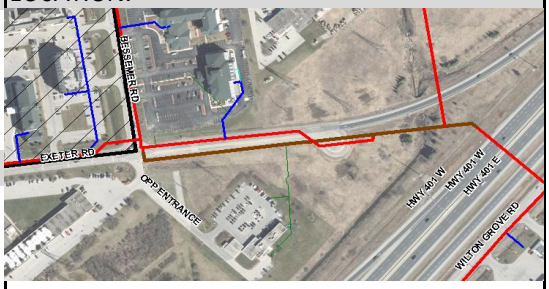
GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Exeter Road at Bessemer Road	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:

Potential Upsize of 300 mm to 400 mm (18m)

LOCATION:



LANDS IMAPCTED BY PROJECT:

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$67,813.0	AMOUNT ELIGIBLE FOR DC:	$67,813.0

	G	nG
G/Ng SPLIT:	99%	1%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

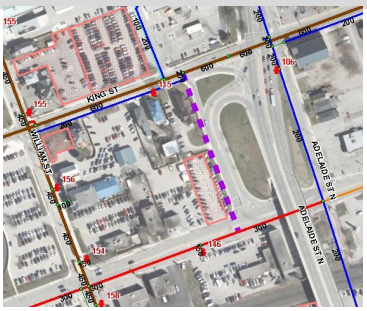
GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Adelaide Street North (west side) between York Street and King Street	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:

150 mm Watermain (145 m) with 1 hydrant.

LOCATION:



LANDS IMAPCTED BY PROJECT:

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$503,069.0	AMOUNT ELIGIBLE FOR DC:	$500,893.8

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Maitland Street between Grey St. and South St. and Hill St. east of Maitland St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

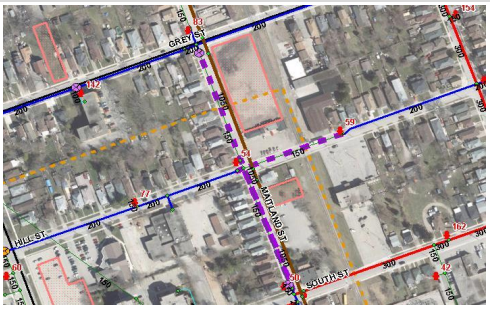
PROJECT SUMMARY

DESCRIPTION:

200 mm Watermain (260 m + 102 m) and 3 hydrants.

LANDS IMAPCTED BY PROJECT:

LOCATION:



DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$1,264,973.0	AMOUNT ELIGIBLE FOR DC:	$1,259,542.8

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

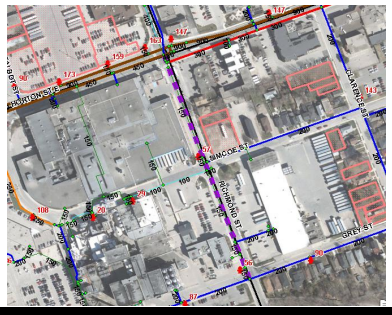
OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Richmond St. between Horton St. East and Grey St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:	LOCATION:
200 mm Watermain (281 m) and 2 hydrants	
LANDS IMAPCTED BY PROJECT:	

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$981,926.0	AMOUNT ELIGIBLE FOR DC:	$973,496.4

	G	nG
G/Ng SPLIT:	99%	1%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

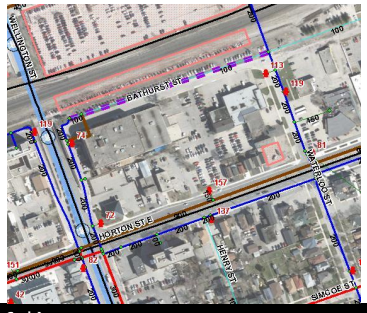
GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Bathurst St. between Wellington St. and Waterloo St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:

200 mm Watermain (221 m) and hydrant.

LOCATION:



LANDS IMAPCTED BY PROJECT:

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$772,262.0	AMOUNT ELIGIBLE FOR DC:	$762,317.4

	G	nG
G/Ng SPLIT:	99%	1%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

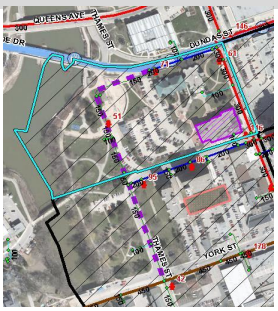
GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Thames St. from York St. to King St. and across parcel to Dundas St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:

200 mm Watermain (362 m) and 2 hydrants.

LOCATION:



LANDS IMAPCTED BY PROJECT:

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$1,264,973.0	AMOUNT ELIGIBLE FOR DC:	$1,259,542.8

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

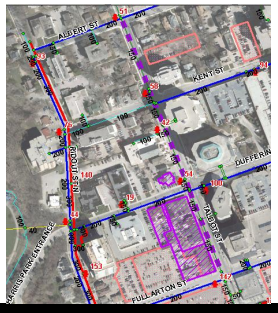
OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Talbot St. between Dufferin Ave. and Fullarton St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:	LOCATION:
200 mm Watermain (128 m) and hydrant.	
LANDS IMAPCTED BY PROJECT:	

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$447,283.0	AMOUNT ELIGIBLE FOR DC:	$443,443.2

	G	nG
G/Ng SPLIT:	99%	1%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

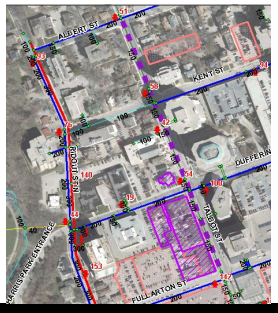
OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Talbot St. between Dufferin Ave. and Kent St. (including E-W connection at Dufferin Ave.)	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:	LOCATION:
200 mm Watermain (135 m) and hydrant.	
LANDS IMAPCTED BY PROJECT:	

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$471,744.0	AMOUNT ELIGIBLE FOR DC:	$467,694.0

	G	nG
G/Ng SPLIT:	99%	1%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

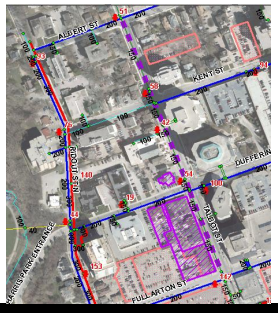
OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Talbot St. between Kent St. and Albert St. (including connection at Kent St.)	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:	LOCATION:
200 mm Watermain (132 m) and hydrant.	
LANDS IMAPCTED BY PROJECT:	

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$461,261.0	AMOUNT ELIGIBLE FOR DC:	$460,468.8

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

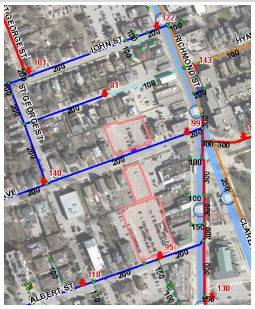
OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Central Ave. between Richmond St. and St. George St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:	LOCATION:
Additional hydrant.	
LANDS IMAPCTED BY PROJECT:	

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$10,000.0	AMOUNT ELIGIBLE FOR DC:	$10,000.0

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

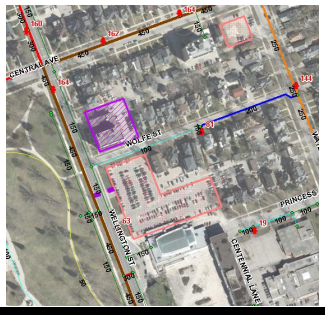
OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Wellington St. South of Wolfe St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:	LOCATION:
Hydrant connected to existing 450mm watermain	
LANDS IMAPCTED BY PROJECT:	

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$10,000.0	AMOUNT ELIGIBLE FOR DC:	$10,000.0

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Talbot St. between Central Ave. and Ann St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:

200 mm watermain (372 m) and 2 hydrants.

LANDS IMAPCTED BY PROJECT:

LOCATION:

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$1,299,917.0	AMOUNT ELIGIBLE FOR DC:	$1,297,684.8

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

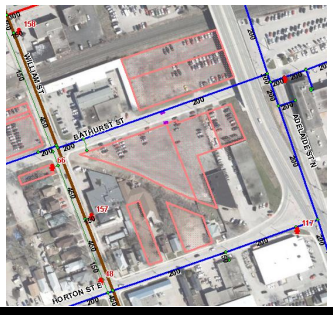
PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET			
GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Bathurst St. between William St. and Adelaide St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:	LOCATION:
Additional hydrant.	
LANDS IMAPCTED BY PROJECT:	

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$10,000.0	AMOUNT ELIGIBLE FOR DC:	$10,000.0

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

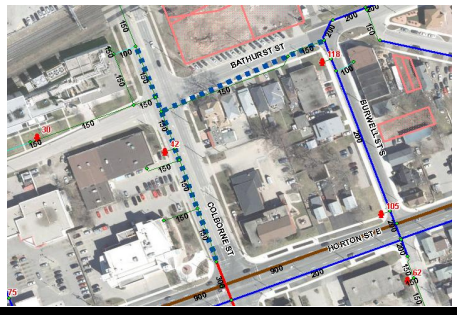
GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Bathurst St. between Colborne St. and Burwell St. South	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

PROJECT SUMMARY

DESCRIPTION:

200 mm watermain (114 m) and hydrant.

LOCATION:



LANDS IMAPCTED BY PROJECT:

DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$398,362.0	AMOUNT ELIGIBLE FOR DC:	$397,677.6

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

DEVELOPMENT CHARGE PROJECT DESCRIPTION - COMPLIMENT TO PDR's

DEVELOPMENT CHARGE PROJECT SHEET

GMIS AREA:	CASS	DC PROJ #:	
PROJECT:	Dundas St. at Maitland St.	CAPITAL #:	
		DATE:	July 10, 2017
LEAD:	City, EES - Water Engineering	SOURCE:	2014 DC
CONSTRUCTION YR:			

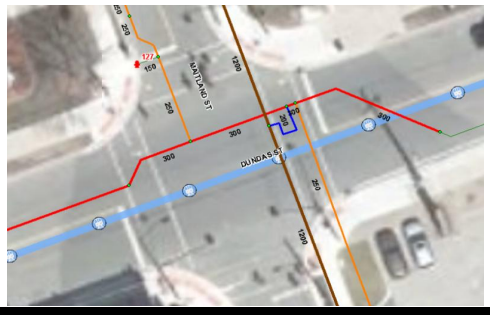
PROJECT SUMMARY

DESCRIPTION:

Potential upsize of 200 mm watermain to 300 mm watermain (6 m)

LANDS IMAPCTED BY PROJECT:

LOCATION:



DEVELOPMENT CHARGE ESTIMATE (000's of $)

TOTAL COST:	$20,966.0	AMOUNT ELIGIBLE FOR DC:	$20,930.4

	G	nG
G/Ng SPLIT:	100%	0%

G/Ng DESCRIPTION: Growth/Non-Growth derived from formula defined in 2017 CASS work. (Asset condition and asset credit determine BTE1, BTE2 = 0 as no oversizing determined.)

	Res.	Comm.	Inst.	Ind.
RICI SPLITS:	82.7%	10.0%	9.4%	

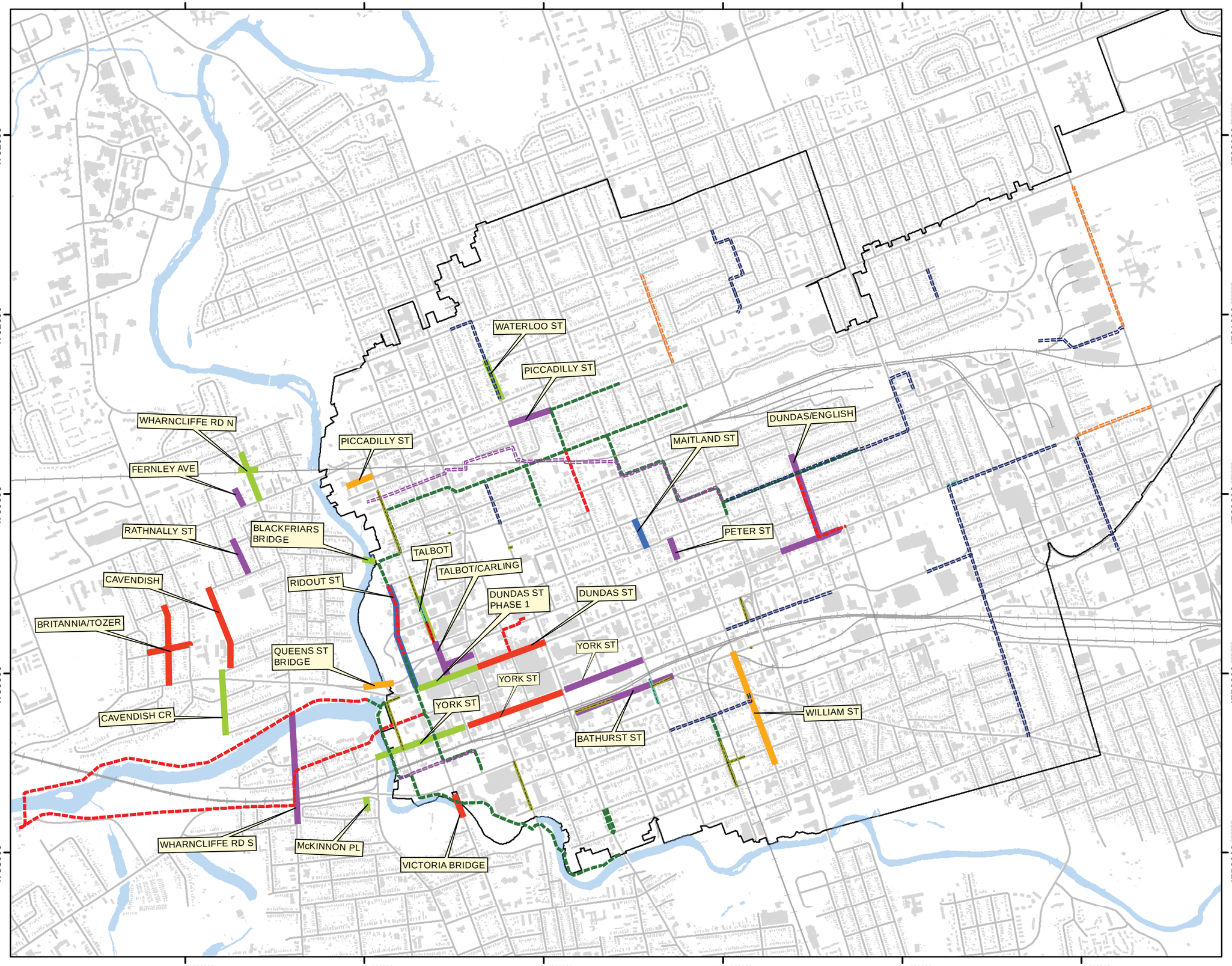
RICI DESCRIPTION: City wide basis. Industrial have own work program.

PREVIOUS STUDIES: None.

OTHER INFORMATION: None.

Appendix C

Consolidated CASS Mapping and 2018-2022 Downtown Capital Projects



Core Area Servicing Studies (CASS)

City of London, Ontario

AECOM

Legend

Stormwater Project
- 2020
- 2022
- Beyond 2022

Water Project
- Immediate
- 2019
- Beyond 2022

Wastewater Project
- Commenced
- 2019
- Beyond 2022

Downtown Capital Projects (2018-2022)
- 2018
- 2019
- 2020
- 2021
- 2022

CASS and Capital Project Overlay

Project NO.: 60515664
Date: July 2017

N W E S

1:20,000

0 165 330 660 990 1,320 Meters

Basemap: City of London
Additional Sources: