APPENDIX B

BENEFIT TO EXISTING (BTE) POSITION PAPER

Benefit to Existing Position Paper

Technical Memorandum

2019 Regional Development Charge

Prepared by GM BluePlan for:

The Halifax Regional Water Commission

Project No. 719008

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1 Introduction

1.1 Background and Context

Halifax Regional Water Commission (HRWC) retained GM BluePlan to undertake the West Region Wastewater Infrastructure Plan (WRWIP) project. The scope of the project included the development of a position paper regarding infrastructure costs resulting from development growth providing a Benefit to Existing (BTE) customers and ‘Out of Period’ oversizing of projects where the beneficiary of new infrastructure is beyond the 20 year time frame of the Regional Development Charge (RDC).

The regional infrastructure projects identified through Long Term Planning studies that are triggered by growth, should be paid for by growth. However, in some cases the projects and infrastructure that are recommended could provide tangible benefit to the existing population. For the initial RDC implementation this assessment was based on a review of the individual projects and an estimated reduction percentage BTE, generally 5%, 10% or 15%, was applied accordingly.

Further to understanding BTE and oversizing calculations in a regional infrastructure and greenfield development context, there is a lack of definition regarding intensification, brownfield developments and the appropriate split of costs, especially where existing capacity constraints are identified.

1.2 Development Charges

Many cities and towns face development pressure, which requires the expansion of existing or the installation of new infrastructure systems to support new development and its demand on utilities and services. However, the costs associated with these infrastructure requirements create significant public sector burden. Increasingly all governments are facing significant constraints in the use of general purpose taxation and have placed greater emphasis on the “user pay”, or “benefiter pay”, principle. In response to these pressures, Development Charges (DCs) have been utilized by municipal governments and utility providers as a cost recovery mechanism for apportioning infrastructure project costs amongst developers of land who will benefit from and require the servicing.

DCs allow monies to be pooled from many developers so that funds can be raised to construct the necessary services in an equitable manner. Simply, the municipality or utility owner can be considered to be the coordinator of the capital program and administrator of the funds collected. (Development Cost Charge Best Practices, British Columbia, Ministry of Community Services, 2000)

1.3 Purpose, Aims and Objectives

The purpose of this Memorandum is to provide a position paper to inform and provide decision support for Halifax Water to identify the approach to the cost splits of capital projects regarding growth, BTE and oversizing.

The paper will review and document industry best practices regarding the application of BTE and oversizing calculation, present options and recommend a preferred position.

The primary aim of the task is:

- To recommend preferred approaches to the identification of Benefit to Existing and 'out of period' oversizing infrastructure project cost allocation.

To achieve the aim, the objectives of the task are:

- To review and document industry best practice
- Document the key components of BTE and oversizing
- Consider the differences between greenfield and brownfield/intensification development.

2 Current Situation

2.1 Historic Overview

The following section summarizes the history of development charges in HRM.

In August 2000 Halifax Regional Municipality (HRM) undertook to develop a policy for implementing Infrastructure Charges in the Municipality. The result was the INFRASTRUCTURE CHARGES BEST PRACTICE GUIDE:

2.1.1 Capital Cost Contribution Policy (CCC)

This Guide addresses the legislation, policies and practices relevant to cost apportionment for new infrastructure in the Municipality on a site specific level. It proposes a policy for recovery of infrastructure charges in the Municipality. The charge recovered under the policy is intended to capture costs directly attributable to the subdivision of land - rather than all costs associated with new infrastructure required for the “core” area of the Municipality. The policy is designed to allow the Municipality to apportion the costs associated with new infrastructure without unduly impacting normal market forces and conditions.

The CCC Policy relates to specific areas or sites. The definition of the areas are confirmed through infrastructure planning studies. Once identified the cost of infrastructure required to service the site is calculated which is then apportioned amongst the developers of the site. The CCC does not include provision of costs related to regional infrastructure such as large trunk sewers, regional pumping stations or regional treatment facilities.

2.1.2 Regional Development Charge

In 2014 the Nova Scotia Utility and Review Board (NSUARB) approved Halifax Water’s application for approval of amendments to the *Schedule of Rates, Rules and Regulations for Water, Wastewater and Stormwater Services*, to establish separate Regional Development Charges (RDCs) for water and wastewater, and to eliminate the charges for trunk sewer and sewer redevelopment. The RDC is a regional charge and is separate to the site specific CCC. The key premise of the RDC is to ensure that growth will pay for growth and is focused on the recovery of costs of only those infrastructure needs which are defined as regional.

The RDC charge for water and wastewater infrastructure was based on the Integrated Resource Plan (IRP) project list. The BTE of those projects was estimated based on the hydraulic modelling results, engineering judgement and industry averages. This resulted in many of the projects being allocated a BTE as a percentage of total project cost, generally between 0% and 15%. The approach was acknowledged as high-level and traceable although simplistic and provided an initial consideration of BTE. The NSUARB RDC hearing decision included the following summary and direction regarding BTE:

> “*The Board has considered the evidence and it appears that no one is opposed to the concept of BTE, but it is the amount and accuracy of the BTE which is questioned.*

[204] HRWC has calculated the BTE based on how other municipalities (particularly in Ontario) have calculated the BTE and whether the existing population will benefit. In addition, HRWC also considered the level of service and flooding improvements as factors in determining the BTE.

[205] HRWC reviewed each project considering these factors and assigned BTE values of 0% to 15% based on its judgement. HRWC also indicated that these values will be updated for each project when it prepares detailed engineering design and tender documents for each project. No contrary evidence was led about the BTE percentages or their application to specific projects.

[206] Based on the above understanding, the Board approves the BTE as calculated by HRWC in the Application. The Board expects HRWC to update the BTE amounts during the engineering and tendering process when more accurate information becomes available. The updated BTEs will be incorporated into the calculation of the RDC in the five year reviews."

The approach to the calculation of BTE for the RWWFP was made more appropriate by the Regional context of the plan. The majority of the growth areas assessed consisted of greenfield areas, which generally have a limited impact on the existing system users. However, in an intensification context, such as Peninsula Halifax the impact of BTE could be more pronounced. Peninsula Halifax is fully developed, has older infrastructure and has existing capacity constraints. Any new, improved, upsized infrastructure or measures to recapture capacity will most likely create a benefit to existing users. A key aim of this paper is to provide feasible options to approach this situation resulting in an equitable and transparent approach to BTE apportionment.

3 Definitions

The following sections provide detailed descriptions of the various terms that are relevant to Development Charges policies. Some terms, such as oversizing and post period are similar in context but should be distinct in application. For the purposes of this position paper and future discussion it is recommended that these definitions remain and are understood by all involved stakeholders. It is imperative that the final agreed terminology adopted is used consistently by Halifax Water in all long term infrastructure planning and development charge discussions.

3.1.1 Local and Regional Service Policy

A Local and Regional Service Policy sets out the fundamental criteria for what infrastructure is eligible for Development Charges.

For Halifax Water two charges are applicable. The area master infrastructure development charge, administered through the Capital Cost Contribution (CCC) policy and the regional infrastructure development charges, administered through the Regional Development Charge (RDC). Both have definitions of what infrastructure is eligible. The following text relates to the definition of regional infrastructure and by virtue of this definition all other infrastructure is considered local infrastructure.

For Halifax Water Regional Infrastructure is defined in the SCHEDULE OF RATES, RULES & REGULATIONS FOR WATER, WASTEWATER, and STORMWATER SERVICES
Effective July 1, 2013, as amended.

Wastewater Infrastructure means core regional wastewater treatment facilities and trunk sewer systems directly conveying wastewater to, or between, such facilities, including:

i. existing wastewater treatment facilities (WWTF) that provide a regional service including the facilities generally known as the Halifax WWTF, Dartmouth WWTF, Herring Cove WWTF, Eastern Passage WWTF, Mill Cove WWTF and Beechville/ Lakeside/ Timberlea WWTF,

ii. trunk sewers and related appurtenances which directly convey wastewater to regional treatment facilities, and

iii. trunk sewers and related appurtenances which divert wastewater from one regional treatment facility to another due to environmental concerns, capacity constraints or operational efficiency but does not include infrastructure within or directly adjacent to approved or planned development areas which is required to directly support development within an approved or planned development area;

Regional **Water Infrastructure** means core regional water supply facilities and the water transmission systems directly conveying water from such facilities to the various distribution systems, including:

i. existing water supply facilities that provide a regional service including the facilities generally known as the J.D. Kline water supply facility at Pockwock Lake and the
Lake Major water supply facility at Lake Major,

ii. water transmission mains and related appurtenances which directly convey water from regional treatment facilities to the distribution system, and

iii. water transmission mains and related appurtenances which divert water from one regional treatment facility supply area to another due to environmental concerns, capacity constraints or operational efficiency but does not include infrastructure within or directly adjacent to approved or planned development areas which is required to directly support development within an approved or planned development area;

3.1.2 Benefit to Existing (Non Growth)

Benefit to Existing (BTE) represents the non-growth components identified for certain projects which benefit the existing service area. These components are typically associated with upgrade to the existing systems or facilities necessary to continue to meet Level of Service targets for existing residential and ICI users. These projects may also involve or be triggered by upgrades or expansions which provide additional capacity to meet growth in the service area.

The premise is that any costs associated with BTE should be removed from the Regional Development Charge rate calculation. There are several ways to calculate BTE, each with advantages and disadvantages, which in many cases are dependent on the situation within which they are applied.

3.1.3 Post period benefit

Development charge planning horizons typically matches infrastructure master planning study horizons and are generally not less than 20 years. For Halifax Water's RDC a rolling 20 year horizon is required, as directed by the NSUARB. The RDC is to be updated every five years and supported by updated infrastructure master plan studies. The infrastructure master planning horizon is currently 30 years. It is good engineering and infrastructure planning practice to provide sufficient capacity to meet infrastructure servicing requirements beyond the RDC horizon (20 years), particularly for large diameter trunk piping and major structural components of facilities, based on assumed asset life, future projected growth beyond the RDC horizon and to mitigate impact of construction.

Post-period benefit is taken into account with projects that provide an additional allowance to service growth beyond the 20 year RDC horizon. The difference in cost for the recommended size of infrastructure to meet the RDC horizon (e.g. 20 years) and the size of infrastructure selected that would serve post period growth (e.g. to the 30 year master plan horizon) would be front end funded by Halifax Water and collected through future RDC updates as the rolling RDC horizon captures and justifies the need. Master plan 30 year horizon growth projections can be used to indicate the extent of additional flows beyond the planning horizon and used to assess the need and relative risk of oversizing.

4 Industry Review

4.1 Overview

To provide insight into the approach adopted by other utility providers the following provides a review of industry best practice. In particular, examples are taken from providers that have long established approaches, often substantiated with legislation to support them.

4.2 Ontario Development Charge Act (DCA)

Subsection 5(1) of the DCA sets out the method that must be used to determine development charges with the first step stating that:

"*The anticipated amount, type and location of development, for which development charges can be imposed, must be estimated.*"

Further steps refer to "*the increase in need for service attributable to the anticipated development.*" Therefore, the estimate of anticipated residential and non-residential development is a critical starting point to the process. Such development will generate increased servicing needs through its occupancy and use.

In Ontario the DCA requires that the amount, type and location of development be estimated. "Timing" is not referenced, other than indirectly, in Section 8 para 3 of O. Reg. 82/98, where capital costs to be incurred during the term of the proposed development charge by-law, must be set out. Also, s.s.5(1)4 of the Act restricts the estimate of the need for services other than water supply, wastewater, highways, storm water drainage and control … to a maximum of 10 years following the preparation of the Development Charges Background Study.

It is common practice in Ontario that water, wastewater and road service requirements are based on projected growth beyond the 10 year horizon to better capture the extended benefit, life and construction costs associated with longer term servicing requirement in a more equitable manner. The DC horizon is often based on Best Planning Estimates associated with Regional and Local Municipal Official Plans that are in conformity with Provincial Growth Targets. These horizons have been historically tied to projected census data years thus at 5 year intervals and out to Provincial target horizons of 2021, 2031 and 2041.

4.2.1 Development Charge Background Study

The Ontario Development Charges Act (DCA) requires that a Development Charge Background Study must be completed by Municipalities prior to passing a development charges by-law in an open and transparent manner. The Background Study should include:

- Anticipated amount, type and location of development
- Calculations for each service to which the development charge would relate to
- An examination, for each service to which the development charge by-law would relate, of the long term capital and operating costs for capital infrastructure required for the service
- Allocation of the estimated capital costs relating to each service between costs that would benefit new development and costs that would benefit existing development

- Total estimated capital costs relating to the service
- Total of the estimated capital costs relating to the service that will be incurred during the term of the proposed development charge
- Allocation of the total estimated capital costs between costs that would benefit new development and costs that would benefit existing development
- Estimated and actual value of credits that are being carried forward relating to the service

4.3 Best Practices: British Columbia

4.3.1 Program Time Frame

The appropriate time frame for the Development Cost Charges (DCC) program should be considered when developing a DCC bylaw. A certain time period is needed for looking at the estimation of new development and the capital projects required to service that new development. To this end, DCC programs can be established on either a “build out” or a “revolving” basis.

4.3.2 A Build-out Program

A build-out program, by definition, includes all the DCC projects which will need to be constructed to allow development to occur to the full extent and level defined by the Official Community Plan (OCP). The OCP usually involves a long time horizon, and the plan may not be fully realized for 20 or 25 years.

4.3.3 A Revolving Program

A revolving program is also consistent with the OCP, but consists of only those projects which are necessary to support development that is expected to occur in some defined time period such as five or ten years. In effect, a number of sequential revolving time windows together make up a build out program.

4.3.4 Criteria for Decision Making

Considerations regarding the decision to establish a build out or revolving program include:

- The type of capital projects in the DCC program (e.g., a sewage treatment plant would probably be constructed to build out service population);
- Cash flow requirements for DCC project construction, as monies may be collected faster with a shorter term program;
- The availability of long range plans for municipal servicing and land use;
- Cost-sharing equity between developers over time;
- DCC rate stability over time, as a revolving program may result in sharp increases/decreases;
- Flexibility to use DCC funds for projects where the timing has been advanced;
- Time and location sensitivity of development projections; and,
- Co-coordinating the time frame of the DCC program with the interval of time between major reviews of the OCP or the time period for a major amendment of the DCC and Zoning Bylaws.

4.3.5 Recommended Best Practice

The time frame for a DCC program should be tied into the time frame of a Financial Plan.

Beyond these considerations, reference is made to two other DCC issues: DCC recoverable costs and future bylaw administration. With respect to the former, the capital cost component should be consistent with the DCC time period. For example, the full costs associated with and the ultimate standard of construction (e.g., a multi-phased arterial road project) to be achieved within the next 20 years should not be included in a five year revolving DCC program. In this case, only the interim standard envisioned to be constructed in the next five years should be included in the immediate revolving program. Regarding the future administration of the bylaw, the time frame of the DCC program may impact how the various projects are monitored and tracked.

The inability to estimate future project costs adequately often makes creation of a build out program difficult. For road DCCs, long range corridors have to be sufficiently defined in the Master Transportation Plan. The level of information available from background stormwater management plans and studies, from sanitary sewer modelling and master sewerage plans, from water modelling studies, and from the Parks Master Plan and park policies in the OCP will affect whether compiling a build out program is feasible. However, a build out approach offers the most flexibility in relation to development sequencing and project construction timing, since all the projects needed to support build out of the entire OCP are included in the DCC program.

4.3.6 Development Charge Apportionment

It is acknowledged that the allocation of benefit may be difficult to quantify, especially if projects are being proposed for construction in ten or twenty years. Although an element of subjectivity will always exist, the rationale for apportionment of capital costs in the DCC bylaw should include supporting documentation, technically-based where possible.

Two approaches to allocating benefit are suggested below: a general “rule of thumb” approach, and a method based on some technical means. Either approach could be applied on a project by project basis or on the total value of the DCC program, depending on the types and nature of the capital improvements.

One way is to use the following “rule of thumb.” if construction of the proposed works would not proceed at all if there was no new development, then it would be fair to say that none of the costs should be paid by existing users. In other words, 100% of the costs would be attributable to new development and eligible for DCC recovery. In some cases, the marginal costs associated with “oversizing” may be assessed in this manner.

If it is evident that the existing public gains at least some benefit from new capital works and infrastructure improvements and that some benefit will be received by a component of growth that will not be reflected in new development units (and thus will not be subject to DCCs), then equitable assessment of that benefit is dependent upon selection of a suitable means for apportionment. For example, in the case of an arterial road, the capital costs could be apportioned according to traffic capacity, while for trunk sewers, costs could be split according to flow. Service population could also be a way of allocating benefit. If only a planning level of engineering analysis is available at the time of bylaw development, general ranges of benefit could be assigned based on technical data accompanied by good engineering judgement.

Example 1 Allocating Benefit	
Given: Sanitary Sewer Project Assumptions: • 250mm diameter pipe presently 50% full, good condition, no service issues. • 300mm diameter pipe required for new development	Using “rule of thumb” rationale, project would not proceed if it was not for new development needs. Therefore, benefit to new development = 100% and full cost for 300mm diameter sewer project are Developer funded through DCC.

Example 2 Allocating Benefit	
Given: Sanitary Sewer Project Assumptions: • 250mm diameter pipe presently leaking • replace with 300mm diameter pipe required for new development • 250mm diameter pipe replacement to cost $50,000 • 300mm diameter pipe replacement to cost $60,000	Allocating benefit according to the following rationale. The argument is that the sewer needs to be replaced anyway. Only apportion marginal cost between installation of 250mm diameter and 300mm diameter pipe to new development. Therefore benefits to new development = $10,000/ $60,000 = 17%

4.4 Cost Recovery Mechanism

4.4.1 British Columbia

Section 933 (5) of the Local Government Act states that DCCs are payable at the time of approval of subdivision or at the issuance of a building permit, as the case may be. In practice, DCCs are commonly collected:

- At the subdivision approval stage, or at the building permit stage for single family DCCs;
- Upon issuance of a building permit for multi-family, commercial and institutional DCCs; and,
- At subdivision approval or building permit issuance for industrial DCCs.

4.4.2 *Ontario Development Charges Act*

A development charge is payable for a development upon a building permit being issued for the development unless the development charge by-law provides otherwise under subsection (2). 1997, c. 27, s. 26 (1).

As a special case, for the approval of plan of subdivision a municipality may, in a development charge by-law, provide that a development charge for services set out in paragraphs 1, 2, 3, 4 or 5 of subsection 5 (5) for development that requires approval of a plan of subdivision under section 51 of the *Planning Act* or a consent under section 53 of the *Planning Act* and for which a subdivision agreement or consent agreement is entered into, be payable immediately upon the parties entering into the agreement. 1997, c. 27, s. 26 (2).

4.5 Review of Other Municipal Practices

GM BluePlan completed a review of other municipality's publically available information regarding Development Charges policy. Generally, the Development Charge rates are available but the specific details of approach, such as how was BTE actually calculated, was not readily available.

The case studies below, for the most part, are based on working knowledge and not publically available information. The examples have been chosen to highlight specific features relevant to the municipalities, such as: area specific DCs, approach to intensification DCs, inclusion of capacity gain projects (I/I reduction) and pre-defined DC growth/non growth splits.

4.5.1 *Halton Region*

4.5.1.1 Halton's Area Specific DC

The Region serves as an example of a municipality that has used an area specific approach to DCs in the past. One of the drivers for this was the "big pipe" transfer of lake-based water supply to the Town of Milton. The premise of separating the DCs for Milton from those of its neighbouring municipalities to the south, was based on the question of "*why should development outside of Milton help front the costs of infrastructure purely needed to meet growth in Milton?"* As a result, the Region adopted an area-specific DC for Milton.

4.5.1.2 Halton's Approach to Intensification Projects

Halton Region provides a good example of a municipality that demonstrates evolving DC policies over time. In 2012, the Region of Halton's DC Background Study identified specific intensification projects included in the DC. A new DC Eligibility Policy also included pipes smaller than the standard minimum size as defined through the Local Servicing Policy.

In the latest 2017 DC Background Study, projects have changed and Benefit to Existing review has been undertaken to include intensification projects. The Region of Halton's current DC policy framework accounts for residential versus employment growth, benefit to existing users of water and wastewater services, and benefit to growth beyond the Region's planning period (e.g. 2031). The Region recently underwent a process to review the need for infrastructure projects, which ranged from security/redundancy requirements, growth related, and non-growth related needs.

A Benefit to Existing (BTE) ratio was calculated as the ratio of the existing capacity deficiency, relative to the total increase in capacity required for both existing and growth needs. BTE was calculated as:

BTE = Existing deficiency / (growth flow + existing deficiency)

When considering intensification, critical security/redundancy requirements and impacts on critical existing trunk infrastructure were also considered. For projects involving construction in intensification areas, additional cost escalation factors were applied to project costs, providing additional provisions for utility coordination/relocation, urban reinstatement, and urban construction impacts.

The Region has adopted a capital implementation plan containing projects being classified into the following three categories:

1. ***Capacity:*** Projects related to Region-wide needs of water supply/wastewater treatment or supporting the transfer/conveyance of capacity.
2. ***Distribution – Greenfield:*** Projects that support service to Greenfield growth outside the current urban built boundary
3. ***Distribution – Built Boundary:*** Projects that support service to growth within the current urban built boundary, including infill and intensification within urban growth centres and corridors

Figure 1 illustrates the application of the above concept to a water distribution network. This simplified schematic shows a booster pumping station transferring water supply via a transmission watermain to the next subsequent pressure zone filling a reservoir within a greenfield area. The transmission watermain and pumping stations are Category 1 projects as they provide Region-wide capacity to the system. The reservoir is a Category 2 project as it supports growth to a greenfield area outside the built boundary. The local distribution watermains are Category 3 as they provide local distribution within the built boundary.

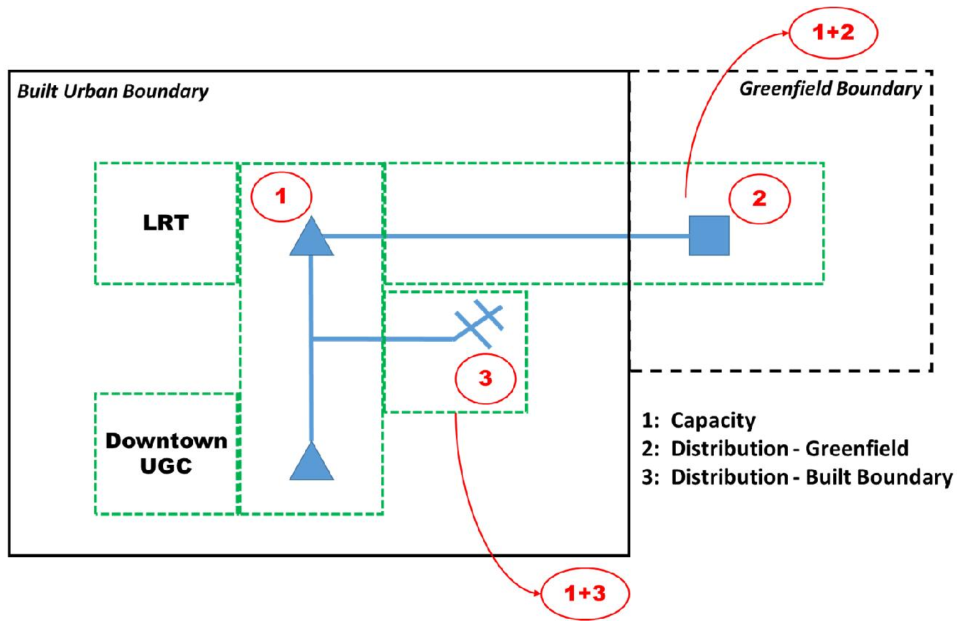

Figure 1. Project DC Classification Schematic

The cost of the distribution watermains will be split among Categories 1 and 3, as those projects benefit from the increased Region-wide capacity (Project 1) and from growth within the current urban built boundary (Project 3). Similarly, the cost of the reservoir will be split among Categories 1 and 2.

4.5.2 City of Hamilton: Pre-defined Growth/Non Growth Splits

The City of Hamilton identifies projects throughout the City and rolls the costs up into a uniform DC in order for the City to ensure securing DC funding for the budget year. The City now applies an intensification lump sum allowance, where the split is 50% development and 50% rate base.

The City of Hamilton has received full capital funding from the Province for a Light Rail Transit (LRT). Currently, the City is looking to initiate a study that will consider implications of the LRT on existing services, including relocation of existing infrastructure and sewer separation. This study will present an opportunity for the City to update the BTE approach specifically for intensification areas.

4.5.3 Region of Peel: Inclusion of I/I reduction costs in DCs

The Region of Peel's 2014 DC program resulted in additional programs that included $100 million for inflow and infiltration reduction mitigation measures and initiatives. The latest DC update includes a distribution and collection system review that will be used to identify further local water and wastewater projects. The Region, like the City of Hamilton, identifies all the projects and rolls them up into a uniform DC. However, with increased pressure for intensification growth and increased costs of infrastructure to extend services into greenfield areas, the Region is now undertaking area-specific cost reviews to assess value and cost of area-specific development (i.e. cost of infrastructure vs DC revenue).

4.5.4 City of Ottawa: Incentivizing Intensification Growth

DC rates sometimes reflect a municipality's desire to effect or promote more efficient land use. For instance, the City of Ottawa levies a lower DC ($16,447 / unit) for development within the inner boundary of the city's designated Greenbelt than areas beyond the outer boundary of the Greenbelt ($24,650 / unit).[1]

[1] *Development Charge Consultation Document. Development Charges Act.*

5 Approaches to Calculation of BTE, Oversizing and Post Period Benefit

5.1 Benefit to Existing (BTE)

Benefit to Existing (BTE) represents the non-growth components identified for certain projects which benefit the existing service area. These components are typically associated with upgrades to the existing systems or facilities necessary to continue to provide or improve level of service to existing residential and business users. These projects may also involve upgrades or expansions which provide additional capacity to meet growth in the service area.

Described below are five approaches to the calculation of benefit to existing cost associated with infrastructure costs. Each has advantages and disadvantages in concept and application.

Method 1 – Age of Pipe

This approach is based on cost of pipe replacement, discounted for any residual life. The approach requires an assumption of pipe life expectancy, typically around 80 years. Where the existing pipe has exceeded the assumed life expectancy a default minimum percentage remaining (e.g. 10%) can be applied to acknowledge the fact that whilst the pipe has exceeded expected age it is still in serviceable condition and to acknowledge that infrastructure may exceed the estimated life in reality.

$$Unused\ life\ Credit = \frac{\text{Estimated Life} - \text{Current } Age}{\text{Estimated Life}}\ X\ (Cost\ of\ replacement)$$

The following provides a simplified hypothetical example to highlight the potential impact on the cost split calculation:

- Assume existing pipe is 300mmØ
- Assume existing pipe is 60 years old
- Assume life expectancy of 80 years
- Like for Like replacement value of 300mmØ is $800 k
- Under growth conditions a 400mmØ is required at a cost of $1 million

Cost of pipe replacement approach calculation:

Total growth project cost	= $1 million
$1m - $800k (growth component only cost)	= $200k (DC Cost)
80-60 = 20/80 = 0.25 (age factor) * $800k (cost of replacement)	= $200k (DC Cost)
$800k (replacement cost) - $200k (BTE)	= $600k (Total Rate Base Cost)
$200k (growth component cost) + $200k (age remaining cost)	= $400k Total DC Cost

Advantages and disadvantages of using this approach to calculate BTE are summarized as follows:

Advantages	Disadvantages
Unused life credit provides estimate of BTE and allocates costs to Development	In downtown core many pipes exceed assumed life ages; no unused life credit but sewer still serviceable; does not take account of condition
Relatively easy to apply	Assumed life age definition subject to challenge
Understandable concept easy to communicate to stakeholders	Reliable pipe age data required to identify age of pipe
No specialist tools (e.g. hydraulic modelling software) required	Does not address new technologies that extends life expectancy of pipe infrastructure (i.e. structural pipe lining)

Method 2 - Level of Service Range Approach

The calculation of benefit to existing can be complicated. The following approach seeks to apply simplified rules that align with a utility's recognized levels of service. The simplicity of the approach provides transparency and understanding to all stakeholders.

The following defines suggested categories and associated cost splits that could apply for the varying potential circumstances.

Category	B.T.E. %	Description
B.T.E.1	5% B.T.E.	These projects are driven by growth and would not otherwise be considered. They could address some very limited minor existing deficiencies potentially related to level of service, security of supply, age, operational flexibility, condition or performance. **EXAMPLE**: • A replacement and upsizing is required to support growth in a new greenfield area • Replacement provides new service to new users and a replacement of the existing watermain • *Minor condition/age deficiency is addressed by construction of new watermain, therefore, 5% B.T.E. is applied*
B.T.E.2	25% B.T.E.	These projects are driven by growth and would not otherwise be considered. They will address some known existing deficiencies potentially related to operational issues or significant level of service, security of supply, age, operational flexibility, condition or performance. **EXAMPLE:** • A new development within an intensification area is to be serviced by an existing sewer which has known capacity deficiencies and modelled surcharging • A larger sewer is required to address the existing capacity constraint as well as to service growth

<table>
<tr><td></td><td></td><td>Level of service / capacity deficiency is addressed by construction of new watermain, therefore 25% B.T.E. is applied</td></tr>
<tr><td>B.T.E.3</td><td>50% B.T.E.</td><td>These projects <u>equally</u> provide additional capacity for growth as well as enhanced level of service in existing service areas. These projects address known existing deficiencies but also improve servicing conditions including security of supply/service.
<u>EXAMPLE</u>:
A new development within an intensification area is to be serviced by an existing sewer which has significant known condition issues and significant capacity constraints including modelled surcharging and occasional observed surcharging and capacity constraints
A larger, new sewer is required to address the existing deficiencies as well as to service growth
Level of service, capacity and condition/age deficiencies are addressed by construction of new sewer, therefore 50% B.T.E. is applied</td></tr>
<tr><td>B.T.E.4</td><td>75% B.T.E.</td><td>These projects primarily provide enhanced level of service in existing service areas as well as provide additional capacity for growth. These projects address known existing deficiencies and also improve servicing conditions including security of supply/service.
<u>EXAMPLE</u>:
A new development within an intensification area is to be serviced by an existing sewer which has significant known condition issues and significant capacity constraints including modelled flooding and occasional observed flooding and capacity constraints
A larger, new sewer is required to address the existing deficiencies as well as to service growth
Level of service, capacity and condition/age deficiencies are primarily addressed by construction of new sewer, therefore 75% B.T.E. is applied</td></tr>
<tr><td>B.T.E.5</td><td>Other</td><td>These projects do not fall within B.T.E.1-B.T.E.4 categories and may require a unique split based on project specific factors.
<u>EXAMPLE</u>:
An existing sewage pumping station is deficient in pumping capacity, wet well storage capacity and standby power. Additionally, pumps and other mechanical equipment require replacement due to condition
Modifications to the station are recommended to address all issues, including pump replacement
The new pumps will be re-sized to accommodate both the increase in required existing flow as well as an additional marginal increase in capacity to accommodate small potential intensification developments
Major capacity and level of service and condition constraints trigger the need for S.P.S. upgrade; only marginal increase in capacity is required, therefore an estimated 90% B.T.E. is applied to the project cost</td></tr>
</table>

This approach applies cost splits as a predefined range based on Level of Service. Advantages and disadvantages are summarized as follows:

Advantages	Disadvantages
Provides a defined range of BTE estimates	High level rule of thumb methodology not supported by unique calculations
BTE splits relate directly to Level of Service	Open to some subjectivity
Understandable concept easy to communicate to stakeholders	Because of ranges applied some specific scenarios may not be accurately calculated
Allows for BTE differentiation between projects and scenarios	Requires availability of hydraulic modelling tools

Method 3 - Deficiency Ratio Approach

This approach requires the use of a hydraulic model to assess existing flows and existing capacity deficits to provide a ratio with proposed growth flows. The approach has been used by other municipalities for DC rate allocation. The analysis of capacity, in terms of which pipe to assess, can create some subjectivity and challenge to the approach. In addition, the technical nature of the method means that non-technical stakeholders can find it difficult to fully understand.

BTE share is ratio of the existing capacity deficiency, relative to the total increase in capacity required for both existing and growth scenarios.

BTE calculated as existing deficiency / (growth flow + existing deficiency)

An Example: an existing sewer has a pipe full capacity of 100l/s. Peak flows in the existing sewer are 120l/s. This results in an existing deficiency of 20l/s (120l/s – 100l/s = 20l/s). New proposed growth flows equate to 40l/s. The resulting equation is 20l/s (existing deficiency) / 60l/s (growth flow + existing deficiency) = 0.33 BTE factor.

*Could be applied on a sewershed basis

Advantages and disadvantages of using this approach to calculate BTE are summarized as follows:

Advantages	Disadvantages
Provides specific project by project BTE estimates	Requires and relies on availability and quality of hydraulic modelling tools and resources
Result is not skewed by proportion of existing flow in relation to growth flow	Requires significant technical assessment to identify existing capacity deficit, especially in a combined system
Deficiency ratio calculation provides equitable split of costs	Open to some subjectivity during assessment; what pipe, pipes etc. are included?
	Complex concept not easy to communicate to stakeholders
	Does not consider the end of life factor (e.g. If there is remaining capacity in the pipe (existing flow is 95 L/s) then there is no BTE, even if the pipe is 79 years old.)

<u>Method 4 - Flow Ratio Approach</u>

This approach is very similar to method 3. The difference is that existing capacity deficit is not calculated. It is just the existing versus growth flows that are assessed.

This is conceptually a very simple approach although requires an accurate hydraulic model or monitor data. BTE is calculated as the ratio between the existing sewer flows and the existing plus proposed growth flows.

BTE Calculated as existing flows / (growth flow + existing flows)

An Example: Peak flows in the existing sewer are 120l/s. New proposed growth flows equate to 40l/s. The resulting calculation is 120l/s (existing flows) / 160l/s (growth flow + existing flows) = 0.75 BTE factor.

Advantages and disadvantages of using this approach to calculate BTE are summarized as follows:

Advantages	Disadvantages
Provides a defined range of BTE estimates	Requires and relies on availability and quality of hydraulic modelling tools and resources
Potentially accurate calculation; project by project specific assessment	Concept and derivation of flow rates not easy to communicate to stakeholders
Easier to apply than the deficiency ratio approach	Not appropriate for combined systems where existing flows far exceed proposed growth flows.
Addresses the fact that the rate base is getting some benefit from the renewal of the existing pipe	If the existing pipe were only 5 years old, it does not address the fact that rate base doesn't need a new pipe (over charging the benefit to existing)

Method 5 – Default Percentage

This approach is the most simple and therefore requires the least amount of analysis. This approach has been used by municipalities for lump sum line items on DC programs before specific projects are defined.

An example could be that all projects within the regional centre are 50% development charges and 50% rate base.

Advantages and disadvantages of using this approach to calculate BTE are summarized as follows:

Advantages	Disadvantages
Most simple approach	Oversimplifies BTE calculation
No analysis required	No differentiation between different project scenarios
Understandable concept easy to communicate to stakeholders	Arbitrary split may not be equitable for individual projects but likely reasonable as an average.
Stakeholders more aware of eligible amounts	

The table below summarizes the advantages and disadvantages for each approach and assigns a score to each key criteria listed, where '✓' is the lowest or worst and '✓✓✓' is the highest or best score.

The categories used are described as follows:

- Simple concept: the ease of the approach to be understood by non-technical stakeholders
- Easy to apply: how easy and quickly the approach can be applied and the BTE calculation completed
- Technical Resources: the extent of technical staff and tools (software) required to complete the approach
- Potential Accuracy: how likely on a project by project basis the approach is able to calculate the most accurate BTE calculation
- Subject to Challenge: how many variables are used in the approach that could be subject to challenge by stakeholders
- Versatility: the ability of the approach to produce equitable results for various scenarios, project types and system types (i.e. combined, sanitary).
- Overall: a general assessment of the approach considering all criteria.

Method	Simple Concept	Easy to Apply	Technical Resources Required	Potential Accuracy	Subject to Challenge	Versatility	OVERALL
Method 1 – Age of Pipe	✓✓	✓✓	✓✓	✓✓	✓✓	✓	✓✓
Method 2 – Level of Service Range Approach	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓✓
Method 3 – Deficiency Ratio Approach	✓	✓	✓	✓✓✓	✓✓	✓✓✓	✓✓
Method 4 – Flow Ratio Approach	✓	✓	✓	✓	✓✓	✓	✓
Method 5 – Default Percentage	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓✓	✓✓✓

6 Summary and Recommendations

6.1 Regional Development Charge

Halifax Water are committed to regular five-year reviews of the Regional Development Charge. It is recommended that aspects such as the calculation of Benefit to Existing that are presented in this memo be tested through application in the WRWIP project and finalized and documented in the upcoming RDC review. This will help ensure a robust and transparent RDC approach.

6.2 Benefit to Existing Calculation

It is recommended that each project be assessed individually to identify the BTE and RDC splits. No one method is applicable to every project and various data and tool limitations negate the effectiveness of others. New, all-pipe wastewater hydraulic models and updated water models are expected to be completed and available for use prior to the next full RDC application, expected in the fall of 2019.

Method 1: Age basis creates issues in the older systems where pipes are beyond service life assumptions but still provide adequate service. This issue highlights the need to look at some projects from an asset condition and performance or level of service rating perspective. Method 2: level of service overcomes the age and service life issues but mainly relies on a rule of thumb methodology which could be open to some subjectivity. Method 3: deficiency ratio and Method 4: flow ratio approach requires detailed hydraulic model tools and the approach does not allow flexibility for unique project factors.

During the 2013 RDC hearing the NSUARB commented favourably on the relationship of BTE to level of service. The goal of the approach is to create the most equitable splits of cost.