Community Lifecycle Infrastructure Costing (CLIC) Tool: User Guide

(Version 2.0)

Ministry of Municipal Affairs and Housing

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BRITISH COLUMBIA

Prepared for the Ministry of Municipal Affairs and Housing by Stantec Consulting Inc.

COMMUNITY LIFECYCLE INFRASTRUCTURE COSTING (CLIC) TOOL

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KEY CONTACTS

Ministry of Municipal Affairs and Housing

Please contact the Ministry of Municipal Affairs and Housing for answers to questions about the material contained in this guide.

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DISCLAIMER

This is one tool of a number of tools designed to assist local governments with development decision making. The Province of British Columbia and its consultants assume no responsibility for the use of this Tool or any changes made by users.

The information contained in this guide is provided as general reference and while all attempts have been made to ensure the accuracy of the material — the guide is not a substitute for provincial legislation.

CLIC and User Guide can be accessed from the Ministry Website.

This User Guide is for the Version 2.0 release of CLIC.

1 INTRODUCTION

There has been much debate in recent years about the costs of development, both in terms of the true costs of different development forms, as well as how development impacts asset management objectives, private user costs, and environmental costs in the short and long-term.

There is mounting evidence that more compact, mixed-use development is a more cost-efficient and environmentally and financially sustainable form of development compared to low-density sprawling development. However, there are very few readily available tools to demonstrate the degree to which this is true, or to effectively compare different types of development.

The Community Lifecycle Infrastructure Costing Tool (CLIC) was created to allow local governments to estimate the major costs of residential development and to compare the costs of different development patterns (e.g. sprawl vs. compact).

CLIC focuses on estimating "planning-level" costs and revenues related to residential development such as roads, water and sewage infrastructure and schools. The tool is not intended as a budgeting or 'pro-forma' tool, but provides 'order of magnitude' costs during the land use planning stages when costing information is typically absent.

CLIC is well suited to assessing development projects ranging in size from a collection of houses, to a block-by-block infill development, to a large subdivision. A good measure of the applicability of CLIC to a given project is whether or not alternatives can be conceived that would result in significantly different densities or infrastructure requirements.

CLIC includes costing variables to allow the user to estimate costs for the following major categories:

- **Potential Community Services,** including: roads, water, sanitary, stormwater, parks & open space, community facilities, transit, schools, fire, police, and solid waste;
- **Private User Costs,** including driving costs and home heating costs;
- **External Costs,** including air pollution, climate change and vehicle collisions; and,

Revenues from development charges, property taxes, non-residential development, and user fees can also be included. Users can easily estimate and compare costs and revenues among a variety of development scenarios. This tool allows users to consider the **lifecycle costs** of development, which are calculated over a **100-year** time horizon. Lifecycle costs include initial capital, annual operating and maintenance, and replacement costs.

This User Guide provides guidance on all aspects of Tool operation from installation, to development of scenarios, to outputting results. The Guide can be read from "cover to cover" or can be referred to as necessary as specific questions arise. This User Guide is also accessible from CLIC's Main Menu. CLIC and the User Guide can be accessed from the Ministry's Website.

Key Web Links:

CLIC website:
www2.gov.bc.ca/gov/content/governments/local-governments/planning-land-use/local-government-planning/community-lifecycle-infrastructure-costing

CLIC Tool:
www2.gov.bc.ca/assets/gov/british-columbians-our-governments/local-governments/planning-land-use/lifecycle_costing_tool.xlsm

CLIC User Guide:
www2.gov.bc.ca/assets/gov/british-columbians-our-governments/local-governments/planning-land-use/decision_support_tool_user_guide.pdf

2 INSTALLING AND OPENING CLIC

CLIC was developed in Microsoft Excel™ 2010. To install and launch CLIC, follow the steps below:

1. Ensure Microsoft Excel™ is installed on the computer.
2. Save a copy of CLIC to the desired location on the computer as well as a backup copy.
3. Open Microsoft Excel™ and Enable Macros. If the Macros are not enabled, CLIC will not run properly.

Option A – Enable Macros When the Message Bar Appears

When a file that has macros is opened, the yellow Message Bar appears with a shield icon and the Enable Content button. On the **Message Bar**, click **Enable Content**.

Option B – Enable Macros in the Backstage view

Another method to enable macros in a file is via the Microsoft Office Backstage view. This is the view that appears after you click the File tab, when the yellow Message Bar appears.

- Click the **File** tab and select "**Info**" from the file tab.
- In the Security Warning area, click "**Enable Content**".
- Under Enable All Content, click "**Always enable this document's active content**".

Notes to User: The CLIC Tool is a Macro-Enabled Workbook file (.xlsm) compatible with Excel 2007 (v12.0) or newer. It contains macros that rely on a Visual Basic platform. Earlier versions of Excel and Mac users might not be able to run this Tool.

Notes to User: Information entered into this release of CLIC cannot be automatically transferred to future updates of CLIC. Manual re-entry of data from one version to another will be required, should the user wish to upgrade to future versions.

3 TOOL BASICS

3.1 Structure

CLIC is based on a step-by-step process consisting of the following steps (as detailed in the main menu):

Step 1 –Users must select or enter a new scenario

Step 2 – Provides the option of changing assumptions on unit costs

Step 3 – Provides the option of changing revenue variables

Step 4 – Entering the development characteristics for scenarios

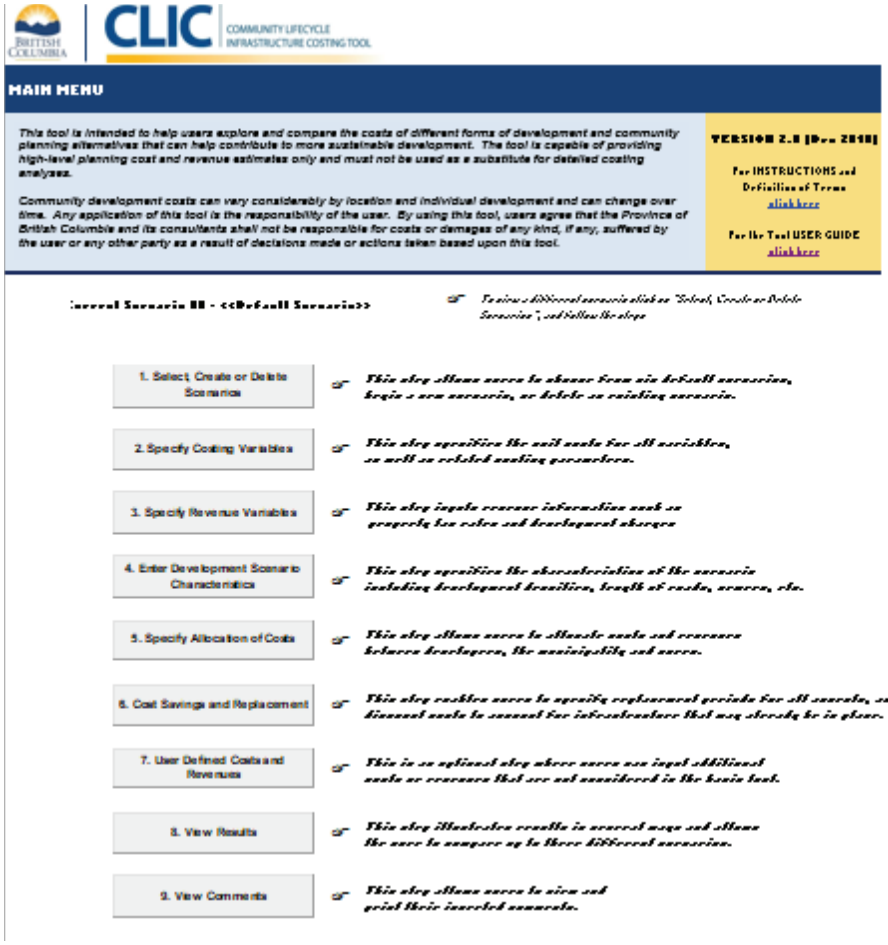
Step 5 – Provides the option of allocating costs to others

Step 6 – Provides the ability to account for existing infrastructure and define replacement periods

Step 7 – Provides the ability to incorporate additional costs and revenues specified by the user

Step 8 – Presents the results in various output formats

Step 9 – Compiles the user's notes / comments for the current scenario



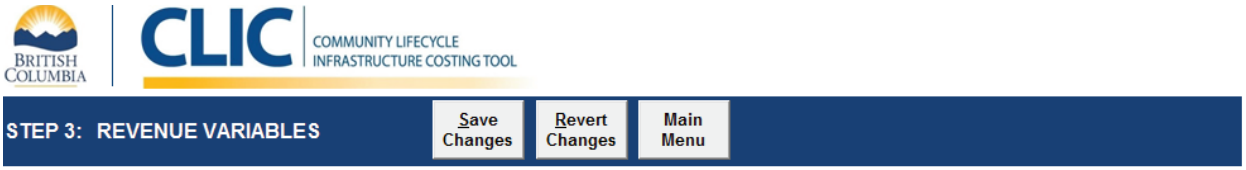
3.2 Navigation

Navigation through the nine steps is facilitated by the Main Menu. After completing a step, users can simply select the button at the top right of each screen to **go back to the Main Menu and proceed to the next step**, review previous steps, or proceed to the results.

In each of the steps that change input, the **navigation bar at the top** of the screen (see image below) allows users the option to a) Save Changes to the input or b) revert to the last saved values for the current scenario, using the Revert Changes button at the top of each step, or c) go back to the Main Menu. Note that **users are not permitted to change parameters for built-in scenarios.**

If users exit a step without saving changes, values are replaced with the most recent saved values upon returning to the Main Menu.

The navigation bar also provides an indication of which scenario is current, i.e. which one the user is editing. To change the scenario, the user would need to return to Step 1.



After completing a step, using the buttons on the navigation bar at the top right of each screen, users can Save Changes or Revert Changes to previously saved values, and then go back to the Main Menu.

A number of visual cues are provided within CLIC to assist users:

☞ Provides specific information on the input assumptions, type of data to be entered, or cautionary notes.

🕮 Provides reference to additional resources.

Denotes default scenario values that can be changed by users.

Denotes cells where the default scenario values have been modified and saved.

Denotes default scenario values that may be changed, but where information might require further research from outside sources.

Denotes cells where the values that represent default research values have been modified and saved.

Denotes cells where values have been modified but not yet saved. **NOTE that once these values are saved, the user can no longer revert to the initial values.**

Denotes cells with errors.

Denotes cells that are dependent on other cells and therefore cannot be modified.

Notes to User: Deleting cell values will display an 'N/A', causing the results to do the same. If a value does not apply, please enter 0.

3.3 Inserting Comments / Notes

CLIC is locked, allowing the user to only input information in the designated cells. The user might want to keep notes on the source of inputs, assumptions etc., so that these are available for later reflection and interpretation. A section for inputting User Comments are available at the end of each step. The combined comments can be viewed and printed in Step 9.

3.4 Glossary

Capital costs are fixed, one-time expenses incurred to construct assets and bring them into operation — such as land acquisition, materials, machinery, etc. Capital costs also include labor costs for design and engineering. Payment for capital infrastructure may be spread out over many years.

External costs represent the costs to society at large and include air pollution, climate change, motor vehicle collisions.

Lifecycle costs are the total costs of an asset throughout its life, expressed on an annual basis and calculated as initial capital costs, annual O&M costs and replacement costs amortized over the 100-year time-horizon.

O&M costs are operating and maintenance costs.

Operating costs are the recurring expenses related to the ongoing operation of the asset or delivery of the service, such as salaries, energy, chemicals, and materials.

Maintenance costs are the expenses associated with retaining assets in good condition so as to maximize its service life but exclude rehabilitation or renewal.

Private costs represent the costs to the individual and include driving costs and home heating costs.

Replacement cost is the total lifecycle investment needed, in today's dollars, to replace the infrastructure at its end of life.

Replacement period is the useful life of an asset i.e. how long an asset is expected to last, from construction to its end of life when it needs to be replaced.

4 UNDERSTANDING SCENARIOS (STEP 1)

A scenario represents a unique combination of both development characteristics and costing variables, and is the basic structure used for evaluation and comparison. The first step in the Main Menu is to Select/Create/Delete Scenarios.

The CLIC Tool was initially designed to analyze neighbourhood / subdivision scale developments, but has since been applied for smaller site-scale and larger OCP-scale analyses. At the individual site scale, the analysis provides a narrow view of costs and many inputs will likely be excluded from the analysis (e.g. schools, transit, community facilities, police, trunk lines, etc.). At this scale, the intent is typically to analyze the lifecycle cost of on-site linear infrastructure (roads and pipes), but for interpretation the user is encouraged to note the other cost drivers that are excluded.

At the Official Community Plan scale, the user has two options to compare the incremental increase between the existing community and the future proposed community. The first option is for the user to only compare neighborhoods with substantially proposed change (such as density increases in downtown, or new greenfield growth in the north). This essentially reverts to using the tool at the neighbourhood scale, but then considers the cumulative impact to represent a community-wide impact. The second option at the OCP scale, is for the user to model the entire community as a scenario. This generally works only when there is substantial growth, otherwise the incremental change can be limited. The user would complete one scenario for the existing community, or sometimes it is useful to break the community into 'zones' that represent the general age of infrastructure and running these as separate scenarios that would then be manually added together for the whole community. A second scenario (or sets of 'zone' scenarios) can then be created representing the future proposed community. Beyond an understanding of the land use patterns and density, there will have to be dialogues and an estimate of the number of new roads, facility expansion etc. that might be required due to the new growth. This can be the most powerful use of the tool, in prompting planners to engage in these key questions as part of growth management planning.

Note to User: CLIC consider non-residential land uses at a cursory level only. The tool is therefore mostly applicable to scenarios with significant residential components.

4.1 About the Six Built-in Scenarios

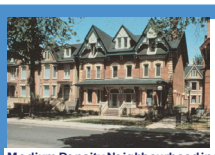
CLIC contains **six built-in scenarios** ranging from High-Density, Mixed-Use in the Inner area to Low-Density, Residential in the Outer Area as described below. These scenarios are provided to help users learn how to use CLIC, to illustrate a range of possible inputs, and to provide a basis for user-defined scenarios.

The following characterizes each scenario in terms of development characteristics. These built-in scenario values can be used as a guide, but can be highly variable so should be customized with local inputs for more contextualized results.

DEFAULT BUILT-IN SCENARIOS - DESCRIPTION

Scenario 1

Higher Density Mixed Use Neighbourhood in the Inner Core characterized by:
- Primarily low rise and high rise apartments
- Mixed-use development
- Grid road network
- High level of transit service



Scenario 2

Medium Density Neighbourhood in the Inner Core characterized by:
- Mix of townhouses, apartments and single-detached housing
- Mixed-use development
- High level of transit service
- Possible brownfield development

Scenario 3

Medium Density Neighbourhood in Inner Suburbs characterized by:
- Mix of townhouses, low rise apts and single-detached housing
- Mixed-use development
- Mainly Grid road network
- Good level of transit service

Scenario 4

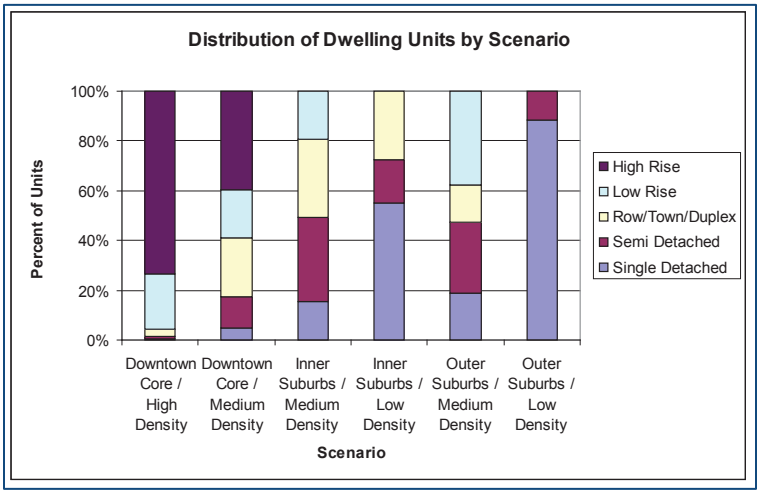
Low Density neighbourhood in Inner Suburbs characterized by:
- Primarily single detached with some semi-detached/townhouses
- Primarily single-use (residential) development)
- Curvilinear road network
- Moderate transit service

Scenario 5

Medium Density Neighbourhood in Outer Suburbs characterized by:
- Mix of townhouses, low rise apts and single-detached housing
- Mixed-use development
- Mainly Grid road network
- Good transit service

Scenario 6

Low Density neighbourhood in Outer Suburbs characterized by:
- Primarily single detached housing
- Primarily single-use (residential) development)
- Curvilinear road network
- Low levels of transit service

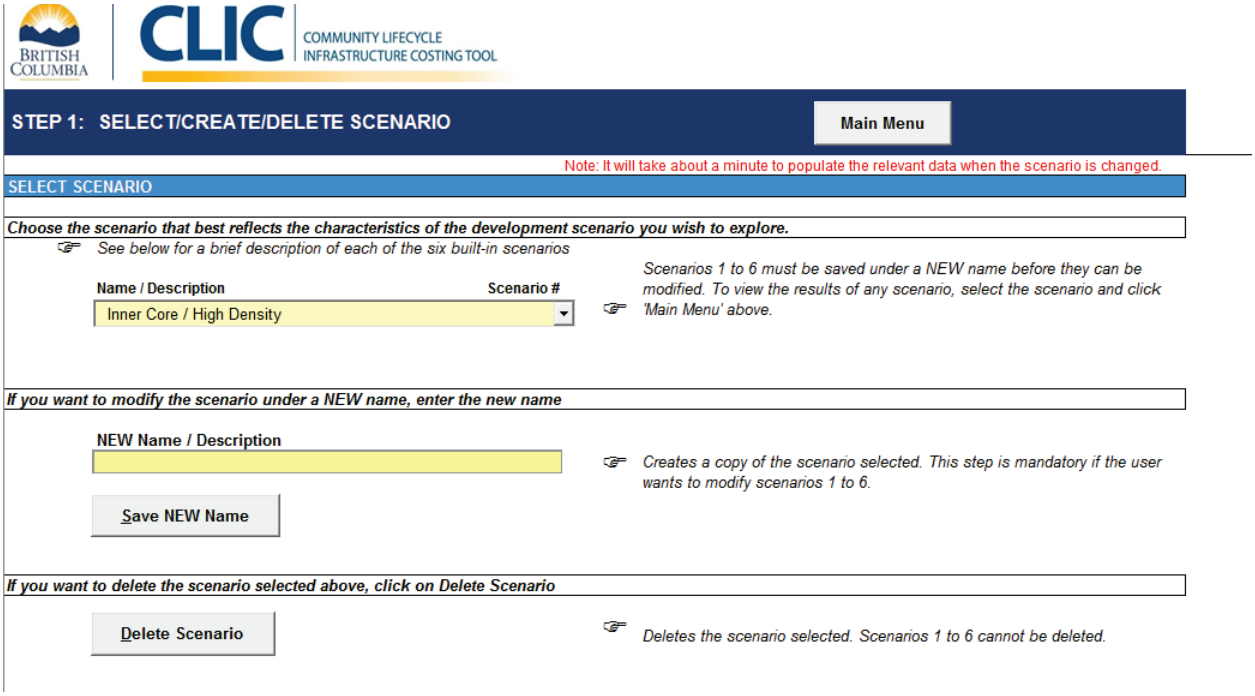


Scenario	Gross Area	Residential Area	Units	Residential Density (units/ha)		Distance to CBD[1]
	(ha)	(ha)	#	Gross	Net	(km)
Inner Core / High Density	40	20	5,430	136	272	1.6
Inner Core / Medium Density	40	24	2,436	61	102	1.6
Inner Suburbs / Medium Density	40	28	1,442	36	52	8.7
Inner Suburbs / Low Density	40	28	812	20	29	8.7
Outer Suburbs / Medium Density	40	32	1,696	42	53	25
Outer Suburbs / Low Density	40	40	860	22	22	25

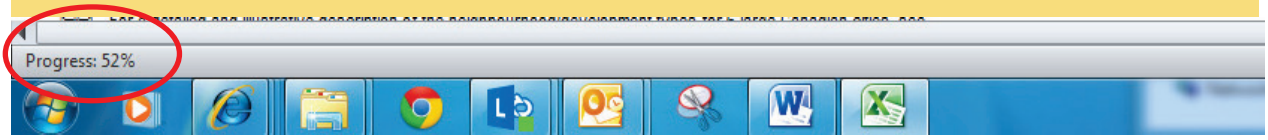
[1] Central Business District (CBD). This variable is a significant determinant of travel activity. It is calculated as the straight-line distance between the approximate centre of the development and the approximate centre of the nearest central employment area in kilometres.

4.2 Choosing a Scenario

To choose one of the built-in scenarios, or any other custom scenario, simply select one from the appropriate drop-down menu in the Step 1 screen. The scenario displayed in this field is always the active scenario. Select the "Main Menu" button in the upper right of the screen, which will return you to the Main Menu. The scenario's costing, revenue, development, and other characteristics can then be viewed by selecting the appropriate button in the main menu.



Notes to User: When switching scenarios and returning to the Main Menu, the user might experience a delay (typically no more than a minute) as CLIC re-populate and calculate the back-end data. Percentage progress can be viewed at the bottom task bar, as illustrated below.



4.3 Creating a New Scenario

New scenarios are created as modifiable copies of existing user-defined or built-in scenarios. To create a new scenario, navigate to the Step 1 screen and proceed to:

1. Using the drop-down menu, “activate” a scenario by choosing the existing scenario that best defines the characteristics of the development you want to explore. CLIC will automatically load the default values of the existing base scenario into the new scenario being created.
2. In the second field, enter the name for the new scenario.
3. Select the button, “Save New Name” (to do this, you will first need to select an empty cell away from the field in which you entered the scenario name). The new scenario automatically becomes the active scenario.
4. To make modifications to your new scenario, select the “Done” button in the upper right of the screen, which will return you to the Main Menu, and proceed to the appropriate screens.

There is **no limit to the number of new scenarios** that can be created. However, in order to keep the file size manageable, it is recommended not to create more than 15 new scenarios in the same file.

Notes to User: Once the user has customized their first scenario, it can be used as the base from which base the subsequent scenario so that the initial customized values auto populate instead of the built-in scenario values. To do so, make sure the first scenario has been “activated” by selecting it from the from down menu before naming the next scenario.

4.4 Deleting a Scenario

To delete a scenario, navigate to the Step 1 screen and proceed to:

1. Using the drop-down menu, choose the scenario that you want to delete. **Built-in scenarios cannot be deleted.**
2. Select the “Delete Scenario” button and select “Yes” in response to the confirm deletion question. The scenario name and all its associated attributes (characteristics, costing values, revenue values etc.) will be deleted. **Once a scenario is deleted it cannot be retrieved**.

5 SPECIFYING COSTING VARIABLES (STEP 2)

5.1 Default Unit Costs

Infrastructure costs are estimated based on unit costs typically expressed per physical unit of infrastructure (e.g. per metre) or per household. The scenario will populate default values based on the scenario that was active when you created your current scenario (refer to 4.3). These built-in scenario values can be used as a guide, but can be highly variable so should be customized with local inputs for more contextualized results.

The user can modify unit costs as appropriate and **save changes unique to each scenario**.

5.2 Specifying Costing Variables

Step 2, "Specify Costing Variables" allows the user to modify the unit cost assumptions related to Potential Community Services, private costs, and external costs. The user can also modify the interest rate for amortizing capital costs. Details about each specific cost are provided in CLIC using the ☞ symbol. It should be noted that costs typically **exclude the cost of land acquisition**. It is recommended that this cost be included as a User Defined cost, under Step 7, if desired.

After completing this step, select the button at the top right of the screen to go back to the Main Menu and proceed to the next step, review previous steps, or proceed to the results. If you change any costing variables, you can select the button to "Save Changes" to the input or use the "Revert Changes" button at the top right of the screen, to revert to saved values for the current scenario. All costing variables are summarized in the table below.

Category	Cost Type	Variable	Unit
General	Interest Rate for Amortizing Capital Costs		%
Potential Community Services	Roads	Basic Roadworks Capital Cost (by road type)	$/m
		Road O&M Cost	$/m
	Potable Water	Local Distribution Capital Cost (by road type)	$/m
		Regional Distribution Capital Cost	$/m of trunk pipe
		Water Treatment Capital Cost	$/household
		Distribution O&M Cost	$/m
		Water Treatment O&M Cost (by housing type)	$/household
	Sanitary Sewers	Local Collection Capital Cost (by road type)	$/m
		Regional Distribution Capital Cost	$/m of trunk pipe
		Wastewater Treatment Capital Cost	$/household
		Collection O&M Cost	$/m
		Wastewater Treatment O&M Cost	$/household
	Storm Sewer	Local Collection Capital Cost (by road type)	$/m
		Regional Distribution Capital Cost	$/m of trunk pipe
		Collection O&M Cost	$/m
	Local Storm Water Management	Retention Pond Capital Cost	$/gross ha
		Retention Pond O&M Cost	$/gross ha
	Parks & Open Space	Capital Cost	$/household
		O&M Cost	$/household

Category	Cost Type	Variable	Unit
Potential Community Services	Community Facilities (e.g. rinks, library, muni hall)	Capital Cost	$/household
		O&M Cost	$/household
	Schools	Capital Cost	$/student
		O&M Cost	$/student
		School Bus (combined Capital plus O&M Cost)	$/student
	Transit	Capital Cost	$/bus
		O&M Cost	$/vehicle service hour
	Fire Protection	Capital Cost	$/household
		O&M Cost	$/household
	Police Services	Capital Cost	$/household
		O&M Cost	$/household
	Waste Management	Capital Cost (by housing type)	$/household
		O&M Cost (by housing type)	$/household
Private Costs	Private Vehicles	Annual Vehicle Ownership Cost	$/vehicle/annum
		O&M Cost	$/km
	Home Heating	Annual Home Energy Costs (3 dwelling types)	$/household
External Costs	Climate Change and Air Pollution	Average Fuel Efficiency for Passenger Vehicles	L/100 km
		GHG Emissions Factor	g/L fuel
		GHG Emission Cost	$/tonne of CO_2 eq.
		Air Pollutant Emissions Factor (5 variables for common pollutants / emissions)	g/L fuel
		Emission Costs (5 variables for common pollutants / emissions)	$/tonne
	Motor Vehicle Collisions	Fatal Collision Rate	collisions/VKT
		Fatal Cost	$/collision
		Injury Collision Rate	collisions/VKT
		Injury Cost	$/collision
		Property Damage Collision Rate	collisions/VKT
		Property Damage Cost	$/collision

Notes to User: If the user prefers to exclude any category (such as schools, transit, etc.) from the results, enter '0'. Deleting the value will result in an NA error value. In this case it is pertinent to note the exclusions to provide context to interpretation and presentation of the results.

Notes to User: If information is not available for total cost from all parties, the user may choose to only include the cost incurred by the local government. In this case it is pertinent to note the exclusions to provide context to interpretation and presentation of the results. If costs from all parties are included, the percentage portion attributed to other partners can be specified in Step 5 – Cost Allocation.

5.3 General Cost Assumption / Interest Rate

The tool displays all values in current day dollars and **does not account for inflation**. To determine the current capital needed to fund future replacement, users can specify an interest rate for capital amortization. This value is used to determine the capital needed to be invested today to service the projected future replacement cost (in current day dollars). The interest rate for capital construction is typically 0 – 1% above the current long-term residential lending rate.

For example, if it cost 10,000 to build an asset today and it has a replacement period of 20 years, we would need to have $10,000 available in 20 years (no inflation). At an anticipated interest rate of 5% per annum we would need to put $3,769 in the bank today to have the $10,000 in 20 years.

5.4 Capital Household Cost Calculator

The 'capital household cost calculator' is intended to help the user quantify the proportionate household share of the capital cost associated with community-wide assets such as:

- Wastewater Treatment
- Potable Water Treatment
- Parks & Open Space
- Community Facilities
- Fire Protection
- Police Services

The calculator can be accessed from the hyperlink buttons on Step 2. In each case the user will be asked to specify the:

- Replacement / Capital Value of Existing Assets ($) – Capital value or replacement cost of shared assets in the community or catchment area. This value can be derived from the Tangible Capital Assets inventory required for accounting purposes in many communities, or from an Asset Management Register that might exist.
- Existing Households Serviced (hh) – The total number of existing households in the community or catchment area benefitting from the assets / service.
- Capital Value of New / Expansions Triggered ($) – Estimated capital cost for expansions or additional construction triggered by development scenario

Based on the additional households added for the scenario, the tool will calculate and populate a per household cost in Step 2.

CAPITAL HOUSEHOLD COST CALCULATOR

Revert Changes | Save Changes | Return to Costing Variables

Current Scenario: #8 - test

WASTEWATER TREATMENT

Replacement / Capital Value of Existing Assets ($)	$ 0	Capital value or replacement cost of shared assets in the community or catchment area
Existing Households Serviced (hh)	10,000	The total number of existing households in the community or catchment area benefitting from the assets / service
Capital Value of New / Expansions Triggered ($)	$ 0	Capital cost for expansions or additional construction triggered by development scenario
Additional Households from Development (hh)	860	The total number of additional households in the development benefitting from the assets / service
Total Capital Cost ($/household)	$ -	

POTABLE WATER TREATMENT

Replacement / Capital Value of Existing Assets ($)	$ 0	Capital value or replacement cost of assets in the community or catchment area
Existing Households Serviced (hh)	10,000	The total number of existing households in the community or catchment area benefitting from the assets / service
Capital Value of New / Expansions Triggered ($)	$ 0	Capital cost for expansions or additional construction triggered by development scenario
Additional Households from Development (hh)	860	The total number of additional households in the development benefitting from the assets / service
Total Capital Cost ($/household)	$ -	

PARKS & OPEN SPACE

Replacement / Capital Value of Existing Assets ($)	$ 500,000	Capital value or replacement cost of assets in the community or catchment area
Existing Households Serviced (hh)	10,000	The total number of existing households in the community or catchment area benefitting from the assets / service
Capital Value of New / Expansions Triggered ($)	$ 15,000	Capital cost for expansions or additional construction triggered by development scenario
Additional Households from Development (hh)	860	The total number of additional households in the development benefitting from the assets / service
Total Capital Cost ($/household)	$ 47.42	

COMMUNITY FACILITIES

Replacement / Capital Value of Existing Assets ($)	$ 0	Capital value or replacement cost of assets in the community or catchment area
Existing Households Serviced (hh)	10,000	The total number of existing households in the community or catchment area benefitting from the assets / service
Capital Value of New / Expansions Triggered ($)	$ 0	Capital cost for expansions or additional construction triggered by development scenario
Additional Households from Development (hh)	860	The total number of additional households in the development benefitting from the assets / service
Total Capital Cost ($/household)	$ -	

FIRE PROTECTION

Replacement / Capital Value of Existing Assets ($)	$ 580,000	Capital value or replacement cost of assets in the community or catchment area
Existing Households Serviced (hh)	10,000	The total number of existing households in the community or catchment area benefitting from the assets / service
Capital Value of New / Expansions Triggered ($)	$ 40,000	Capital cost for expansions or additional construction triggered by development scenario
Additional Households from Development (hh)	860	The total number of additional households in the development benefitting from the assets / service
Total Capital Cost ($/household)	$ 57.09	

POLICE SERVICE

Replacement / Capital Value of Existing Assets ($)	$ 300,000	Capital value or replacement cost of assets in the community or catchment area
Existing Households Serviced (hh)	10,000	The total number of existing households in the community or catchment area benefitting from the assets / service
Capital Value of New / Expansions Triggered ($)	$ 20,000	Capital cost for expansions or additional construction triggered by development scenario
Additional Households from Development (hh)	860	The total number of additional households in the development benefitting from the assets / service
Total Capital Cost ($/household)	$ 29.47	

5.5 Specifying O&M Cost

It is best practice to separate Operating Cost from Maintenance Cost. Where it is not possible to get separate values, the user can add the combined O&M cost in either category as this will not affect the lifecycle calculation (only the total O&M is used to calculate life cycle cost).

A common challenge is that O&M cost information is not readily available. Annual O&M budgets can be used as a proxy for the cost but in cases that can be skewed as the budget does not necessarily reflect what the true cost of the service is. Alternatively, where detailed O&M costs are unavailable, the user could use 1-3% of the capital value as an estimate of O&M. Take caution to adjust for measure of unit as some capital inputs are per m where some O&M is per household.

Notes to User: When calculating average costs, be sure to divide the total cost incurred by the local government or other operators against only the households serviced for that service. For instance, if the local government is providing waste collection in the southern part of town, but a private operator is servicing the north, the average cost is the cost for each party divided by its serviced customers, not all the households in the community.

5.6 Roads – Capital Costs

The capital cost of roads is a function of length, width and the types of design features included in the right-of-way. As a base assumption, it is assumed that roadways are asphalt paved with curb, gutter and sidewalks varying by type of roadway. Street signs, street lighting and silt fencing are also included in the construction cost. Unit costs for each individual component is on a per m (length) or per m^2 (area) basis. **Utility costs** are not included assuming that the utility companies would carry these costs. Note that six general titles are provided for typical road **types (1-6) that will be consistent for all the scenarios**. However, **road type 7 allows the user to define a typology that are unique to the scenario**.

This section refers to the cost of road infrastructure within the community/development being examined.
The costs are then applied to the road layout specified in Step 4.

	Type 1 Public Laneway 7.5 m R.O.W	Type 2 Two-lane local 15 m R.O.W	Type 3 Two-lane local 18 m R.O.W	Type 4 Two-lane collector 20 m R.O.W	Type 5 Four-lane collector 26 m R.O.W	Type 6 Four-lane Arterial R.O.W	Type 7 User Defined 0 m R.O.W
Basic Roadworks ($/m)	$ 852	$ 1,109	$ 1,327	$ 1,414	$ 1,902	$ 2,095	$ -

Incudes excavation, granular fill, asphalt walks, and basic landscaping

For information on the assumptions for road costs, including quantities and unit costs, click here: **Road Cost Calculator**

ROAD COST CALCULATOR — Revert Changes | Save Changes | Return to Costing Variables

Current Scenario: #1 – Inner Core / High D

ROAD ALLOWANCE ASSUMPTIONS

Note: For Type 1-6, changes to road allowance assumptions are applied consistently to all scenarios. Only Type 7 can vary between scenarios.

	Consistent for ALL Scenarios						Current Scenario
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7
Name	Public Laneway	Two-lane local	Two-lane local	Two-lane collector	Four-lane collector	Four-lane Arterial	User Defined
Category	Local	Local	Local	Collector	Arterial	Arterial	User Defined
	7.5 m R.O.W	15 m R.O.W	18 m R.O.W	20 m R.O.W	26 m R.O.W	33.5 m R.O.W	0 m R.O.W
Right-of-way Width (m)	7.5	15.0	18.0	20.0	26.0	33.5	0.0
Pavement Width (Gutter to Gutter) (m)	6.0	8.5	8.5	8.5	13.0	14.0	0.0
Top Asphalt thickness (m)	0.050	0.050	0.050	0.050	0.050	0.050	0.0
Base Asphalt thickness (m)	0.050	0.050	0.050	0.075	0.075	0.075	0.0
Granular "A" Road Base Thickness (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.0
Granular "B" Road Sub-Base Thickness (m)	0.300	0.300	0.500	0.500	0.500	0.500	0.0
Conc. sidewalk (130mm thick), total width (m)	0.0	1.5	3.0	3.0	3.0	3.0	0.0
Unit Paver sidewalk, total width per ROW (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of Curb/Gutters	2.0	2.0	2.0	2.0	4.0	4.0	0.0
Subdrains - both sides or one?	2	2	2	2	2	2	0.0
Average Stop and Street Sign Spacing (m)	330	330	330	330	330	330	0.0
Streetlight Spacing (m)	30.0	30.0	30.0	30.0	30.0	30.0	0.0
Streetlights - both sides or one?	1	1	1	1	1	1	1.0
Street Tree Spacing on Both Sides (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ROAD COSTS

			Cost per Metre of Roadway ($/m)						
			Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7
	Unit Cost	Unit	Public Laneway	Two-lane local	Two-lane local	Two-lane collector	Four-lane collector	Four-lane Arterial	User Defined
Excavation Allowance in ROW	$ 10	cu.m	$ 52	$ 94	$ 150	$ 171	$ 217	$ 275	$ 0
Top Asphalt (HL3)	$ 220	cu.m	$ 66	$ 94	$ 94	$ 94	$ 143	$ 154	$ 0
Base Asphalt (HL8)	$ 200	cu.m	$ 60	$ 85	$ 85	$ 128	$ 195	$ 210	$ 0
Granular "A"	$ 52	cu.m	$ 47	$ 66	$ 66	$ 66	$ 101	$ 109	$ 0
Granular "B"	$ 45	cu.m	$ 81	$ 115	$ 191	$ 191	$ 293	$ 315	$ 0
Concrete sidewalk	$ 45	sq.m	$ 0	$ 68	$ 135	$ 135	$ 135	$ 135	$ 0
Unit Paver	$ 60	sq.m	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Curb and Gutter	$ 85	m	$ 170	$ 170	$ 170	$ 170	$ 340	$ 340	$ 0
Subdrain	$ 12	m	$ 24	$ 24	$ 24	$ 24	$ 24	$ 24	$ 0
Stop and Street Signs	$ 320	ea	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 0
Streetlights	$ 10,000	ea	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 0
Topsoil & Sod	$ 12	sq.m	$ 18	$ 60	$ 78	$ 102	$ 120	$ 198	$ 0
Street Trees	$ 500	ea	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total			**$ 852**	**$ 1,109**	**$ 1,327**	**$ 1,414**	**$ 1,902**	**$ 2,095**	**$ 0**

Utility capital costs assumed to be carried by private utility companies.

Notes to User: The values in the Road Cost Calculator are constant across all scenarios for Road Types 1-6 and can therefore not be customized for each scenario. If updated and saved, the values overwrite values for all scenarios. Road Type 7 is unique to each scenario and can therefore vary between scenarios.

5.7 Water, Sanitary and Storm – Capital Costs

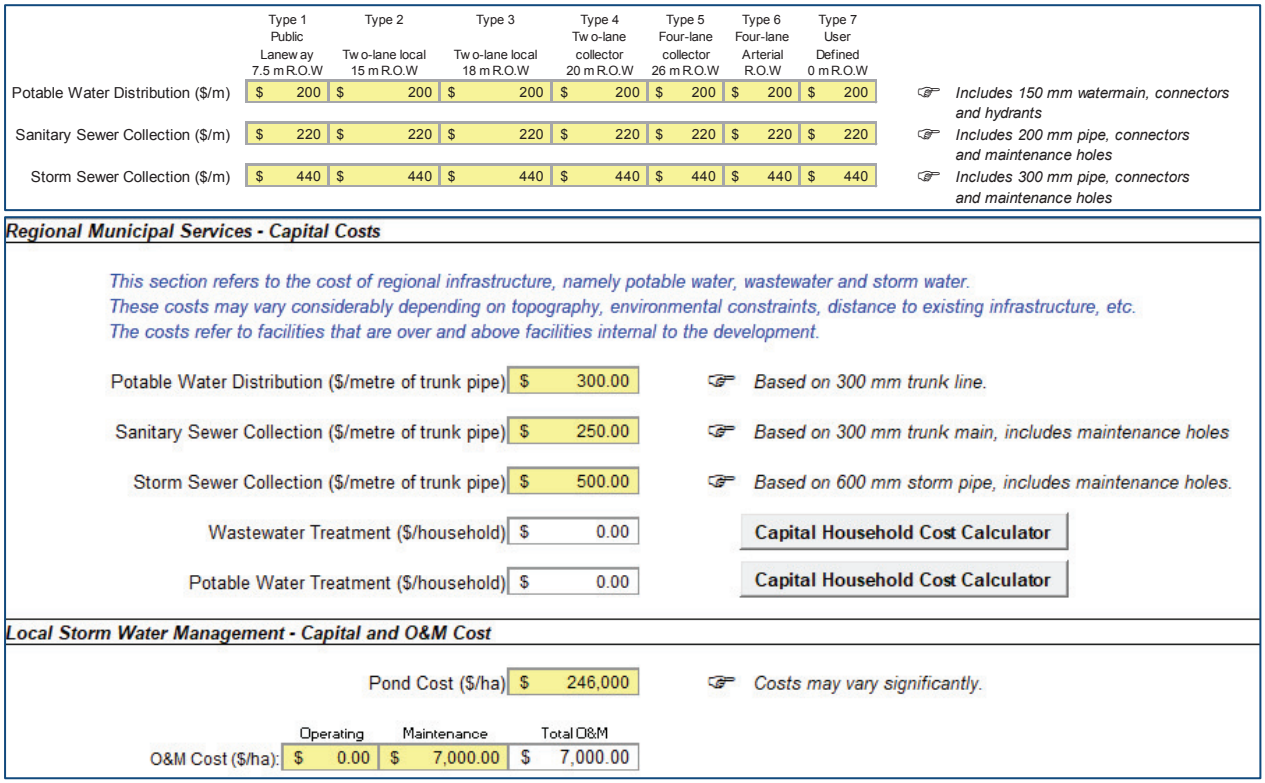
The cost of potable water, sanitary sewer, and storm sewer distribution services within a neighbourhood are almost directly related to the length of internal roads. Therefore, costs are developed by multiplying the linear unit costs of distribution and collection pipes by the length of local roads within the scenario. For 'external roads', there is no assumption made of underlying networks.

Notes to User: For rural or other scenarios where water, sanitary, and/or storm services are not provided, the user would have to set the unit costs for these services to $0. If not, the tool will assume a linear network equal to the road length.

Local water, sanitary, and storm water distribution costs include the cost of both local distribution lines as well as trunk lines **internal** to the development, main lines, service laterals and any other components of the distribution or collection system for the development.

Local distribution cost could be higher for higher density developments — mainly attributed to the increase in pipe diameter and/or the number of parcels and the corresponding increase in service connections.

Capital costs for new / upgrading trunk lines **external** to the development can be specified separately. Unlike local roads, the length of external road does not automatically assume an associated pipe network.



	Type 1 Public Lanew ay 7.5 m R.O.W	Type 2 Tw o-lane local 15 m R.O.W	Type 3 Tw o-lane local 18 m R.O.W	Type 4 Tw o-lane collector 20 m R.O.W	Type 5 Four-lane collector 26 m R.O.W	Type 6 Four-lane Arterial R.O.W	Type 7 User Defined 0 m R.O.W	
Potable Water Distribution ($/m)	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	☞ *Includes 150 mm watermain, connectors and hydrants*
Sanitary Sewer Collection ($/m)	$ 220	$ 220	$ 220	$ 220	$ 220	$ 220	$ 220	☞ *Includes 200 mm pipe, connectors and maintenance holes*
Storm Sewer Collection ($/m)	$ 440	$ 440	$ 440	$ 440	$ 440	$ 440	$ 440	☞ *Includes 300 mm pipe, connectors and maintenance holes*

Regional Municipal Services - Capital Costs

This section refers to the cost of regional infrastructure, namely potable water, wastewater and storm water.
These costs may vary considerably depending on topography, environmental constraints, distance to existing infrastructure, etc.
The costs refer to facilities that are over and above facilities internal to the development.

Potable Water Distribution ($/metre of trunk pipe)	$ 300.00	☞ *Based on 300 mm trunk line.*
Sanitary Sewer Collection ($/metre of trunk pipe)	$ 250.00	☞ *Based on 300 mm trunk main, includes maintenance holes*
Storm Sewer Collection ($/metre of trunk pipe)	$ 500.00	☞ *Based on 600 mm storm pipe, includes maintenance holes.*
Wastewater Treatment ($/household)	$ 0.00	Capital Household Cost Calculator
Potable Water Treatment ($/household)	$ 0.00	Capital Household Cost Calculator

Local Storm Water Management - Capital and O&M Cost

Pond Cost ($/ha)	$ 246,000	☞ *Costs may vary significantly.*

	Operating	Maintenance	Total O&M
O&M Cost ($/ha):	$ 0.00	$ 7,000.00	$ 7,000.00

Potable Water Distribution

Default capital costs for potable water distribution is based on the cost of pipes (150mm), trunks (300mm), and associated infrastructure (valves, hydrants, etc.). Cost associated with non-linear water distribution network, such as pump station upgrades, can be included as a user defined cost in Step 7.

Sanitary Sewer Distribution

The default cost of sanitary sewer distribution is based on the cost of pipes (200 mm), trunks (250 mm), and related catch basins.

Storm Sewer Collection & Treatment Ponds

The default cost of storm water distribution is based on the cost of pipes (300 mm), trunks (500 mm), and related catch basins. Basic capital costs for storm water treatment ponds assume typical surface coverage and surface treatments.

Potable Water Treatment & Wastewater Treatment

The capital costs for potable water treatment and wastewater treatment facilities can be included as a $/household. Refer to the Capital Household Cost Calculator (see section 5.4) for guidance.

5.8 Roads, Water, Sanitary and Storm – O&M Costs

Roads, Water, Sanitary and Storm - O&M Costs

☞ *It is best practice to separate Operatng Costs from Maintenance Cost. Where separate values don't exist, the user can add the combined total in either category as only total combined O&M Cost is used to calculate lifecycle cost.*

Road O&M Costs ($/m)

	Operating	Maintenance	Total O&M
Local	$ 3.00	$ 7.00	$ 10.00
Collector	$ 3.60	$ 8.40	$ 12.00
Arterial	$ 6.00	$ 14.00	$ 20.00

☞ *Road maintenance costs may vary by local climatic conditions and policies for snow clearing.*

Potable Water Treatment ($/household)

	Operating	Maintenance	Total O&M
Single Detached	$ 240.00	$ 60.00	$ 300.00
Semi-detached/Rowhouses	$ 220.00	$ 55.00	$ 275.00
Apartments	$ 200.00	$ 50.00	$ 250.00

☞ *Includes the cost of centralized treatment. Lower costs for higher density neighbourhoods are due to lower lawn watering, etc.*

	Operating	Maintenance	Total O&M
Potable Water Distribution ($/m)	$ 2.00	$ 2.00	$ 4.00

	Operating	Maintenance	Total O&M
Wastewater Treatment ($/household)	$ 200.00	$ 50.00	$ 250.00

☞ *Includes the cost of centralized treatment.*

	Operating	Maintenance	Total O&M
Sanitary Sewer Collection ($/m)	$ 4.20	$ 2.80	$ 7.00

☞ *Include all costs associated main pipe, service laterals and any other components of the distribution or collection system.*

	Operating	Maintenance	Total O&M
Storm Sewer Collection ($/m)	$ 1.00	$ 1.00	$ 2.00

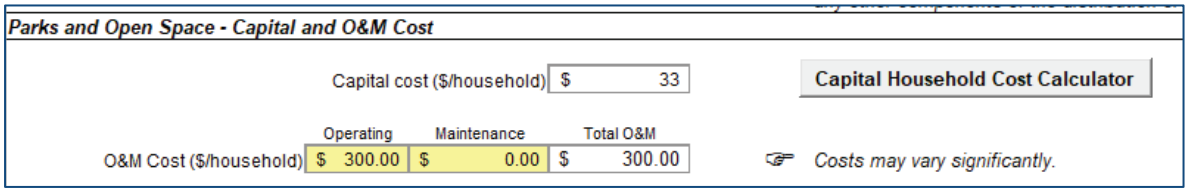
☞ *Include all costs associated main pipe, service laterals and any other components of the distribution or collection system.*

For **road O&M costs**, municipal road budgets can be used to develop average default costs per lane-kilometre. Road maintenance costs can vary and include road maintenance for winter control (snowplowing and road salting). **Potable Water Treatment** value could be reduced slightly for medium- and high- density development to account for differences in lawn irrigation water use, etc. O&M costs for **wastewater treatment** are primarily related to the cost of the treatment and disposal. O&M default costs for **sanitary sewers** are based on average values from representative municipalities. Therefore, they do not reflect differences in O&M needs by type of development. These differences are expected to be small. The O&M cost of **storm sewers** (e.g. cleaning of catch basins) are typically relatively small. It includes all costs associated with maintaining and operating main pipes, service laterals and any other components of the collection system. O&M costs associated with pumping might vary from one community to the next so default values should be adjusted to reflect the local context. O&M cost for **trunk lines** are assumed in the tool to be the same as for local distribution / collection.

Notes to User: Note that municipalities that recover O&M costs from user fees would either reflect the net costs to the local government or show the full cost and identify the revenue under 'User Charges' in Step 3 – Revenue Variables.

5.9 Parks & Open Space – Capital and O&M Costs

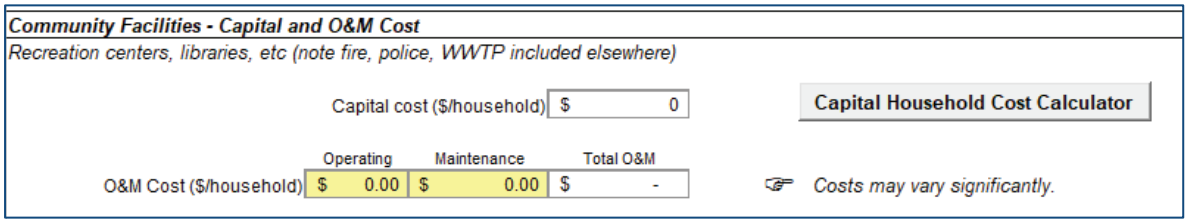
Costs vary widely by local government and therefore only a notional default estimate is provided. Refer to the Capital Household Cost Calculator (see section 5.4) for guidance on calculating capital cost. Municipal O&M budgets can be used to estimate a per household value.



Notes to User: Outdoor recreation facilities such as trails, skate parks, soccer fields can be included under 'Parks & Open Space' or 'Community Facilities' depending on what is easier for data sourcing, as long as double counting is avoided.

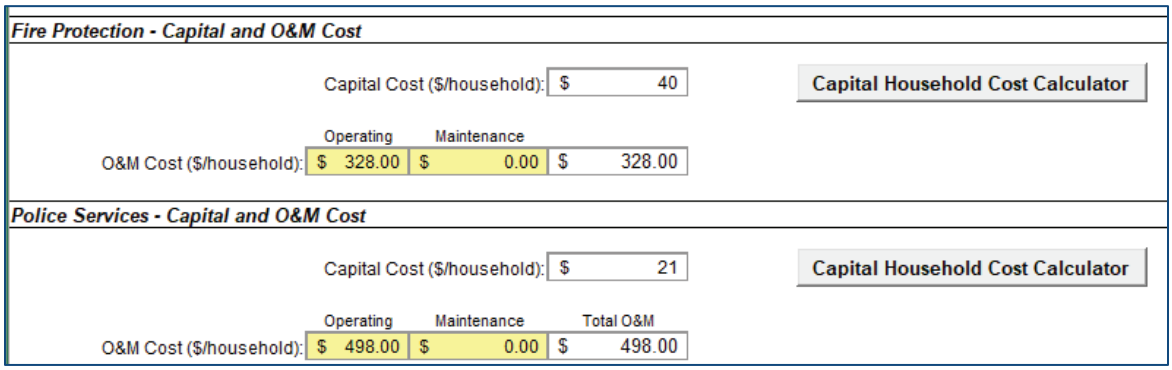
5.10 Community Facilities – Capital and O&M Costs

Community facilities may include community centres, skating rinks, municipal hall, library, etc. Costs vary widely by local government and therefore only a notional default estimate is provided. Refer to the Capital Household Cost Calculator (see section 5.4) for guidance on calculating capital cost. Municipal O&M budgets can be used to estimate a per household value.



5.11 Fire Protection & Police Services – Capital & O&M Cost

The cost of fire services and police services are estimated on a per household basis using average community-wide values obtained from municipal operating and capital budgets. Refer to the Capital Household Cost Calculator (see section 5.4) for guidance on calculating capital cost.



Notes to User: The default values for Fire / Police is based on a city-wide average and does not differentiate levels of service between neighbourhood densities. Where more than one facility exists, the user might choose to vary the costs by scenario based on facility averages per catchment area.

5.12 Waste Management – Capital & O&M Cost

The **capital cost** of waste management might not be known or easily quantified. Many municipalities contract out waste management services to private organizations and limited costing information might be available for landfills. Municipal operating budgets are used to develop **O&M cost** per household for waste management. Inputs are available by housing type to provide flexibility in specifying varying costs for development associated with curbside vs dumpster pickup.

Waste Management - Capital and O&M Cost

Capital Cost

Housing Type	Capital Cost per hh
Single Detached:	$ 0
Semi Detached:	$ 0
Rowhouse/Townhouse/Duplex:	$ 0
Low Rise:	$ 0
High Rise:	$ 0

☞ *Include costs for landfills, recycling, trucks, etc. Cost might vary to allow variances*
i.e. single-family curbside pick-up vs multifamily dumpster pickup

Operations & Maintenance

Housing Type	Operating ($/hh)	Maintenance ($/hh)	($/hh)
Single Detached:	$ 184.00	$ 0.00	$ 184.00
Semi Detached:	$ 184.00	$ 0.00	$ 184.00
Rowhouse/Townhouse/Duplex:	$ 80.00	$ 0.00	$ 80.00
Low Rise:	$ 0.00	$ 0.00	$ -
High Rise:	$ 0.00	$ 0.00	$ -

Notes to User: Where the user chooses to exclude costs associated with multifamily (often contracted separately), it should be noted that the waste management results per household displayed in Step 8 will be averaged over the total housing units (not just the ones serviced).

5.13 Transit – Capital & O&M Cost

Transit - Capital and O&M Cost

Capital Cost ($/bus): $ 500,000

☞ *Transit capital costs assume a bus-based system. Capital costs for other forms of transit (e.g. subway, LRT, commuter rail) vary by urban area.*
Other transit costs may be added as a "user defined cost" Step 7.

	Operating	Maintenance	Total O&M
O&M Cost ($/Vehicle service hour):	$ 90.00	$ 0.00	$ 90.00

In British Columbia, the total cost of providing transit services within a neighbourhood is comprised of O&M costs, which are partially recouped by revenue and partially by government funding, and capital costs, which are completely provided by government funding. Both costs are functions of service levels which are, in turn, functions of neighbourhood type.

The approach adopted for estimating capital costs assumes that the capital cost of providing service to a given development varies solely with the number of buses required to provide that service level. The cost of other supporting infrastructure (e.g. stops and garages) is a system-wide cost that is not considered. Average bus fleet requirements are estimated from the average number of buses required per 1,000 vehicle service hours. The neighbourhood-dependent transit service capital cost is then determined assuming a vehicle service life of 18 years and purchase price of $500,000.

Capital costs for other transit technologies such as LRT or Subway, as well as capital costs for maintenance facilities and other supporting transit infrastructure, are not included in CLIC analysis. The user can choose to add any of these additional costs as a User Defined Cost under Step 7.

Operating costs increase directly with higher service levels, that is, if no service is provided, there is no operating cost. On the other hand, there must be some minimum initial capital investment before any service is provided at all. Because of this, capital costs are less affected by neighbourhood type than are operating costs.

The method for determining the operating cost of providing transit to a given neighbourhood is to multiply the estimated neighbourhood transit service level (represented by Vehicle Service Hours [VSH]) by the net cost to provide that service level, where the net cost is the difference between gross costs and revenues collected. Although gross costs would not vary significantly for a constant level of transit service, net costs may vary significantly by neighbourhood type depending on the load factors for the service (e.g. the number of passengers per bus).

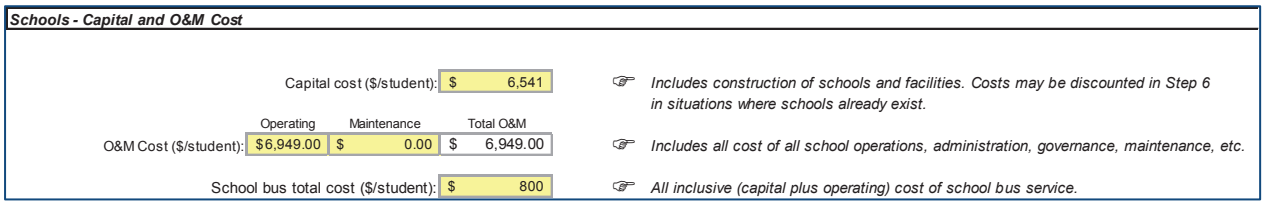
5.14 Schools – Capital & O&M Cost

Capital costs for schools include the construction cost of both elementary and secondary schools. O&M costs are "all-inclusive" and include the costs for maintaining buildings, administration and governance, and school operations. Capital and O&M costs are obtained from school boards and converted to unit costs per student capita (population under 18 years of age).

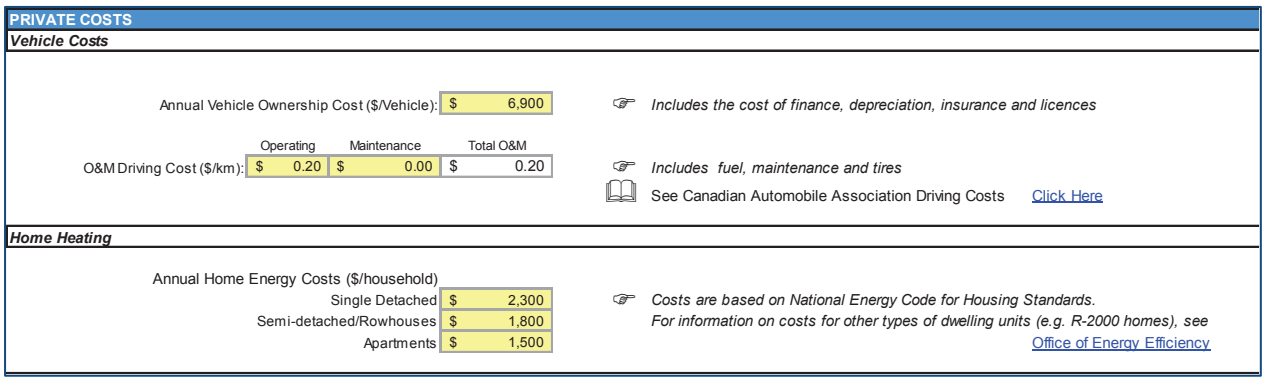
The cost of **school transit** primarily consists of school busing costs and is inclusive of both capital and O&M costs. The cost of bus replacement is therefore not included in the analysis. Costs of schools are fairly constant for different development types and locations, although land costs may be more expensive in inner areas contributing to a higher capital costs per capita. A regression equation for school transit mode shares is used to estimate the percentage of students requiring school busing for a given scenario, a given household density. This estimate would then be increased by 10%, as busing service must be provided to each eligible student daily, even though a certain percentage does not make use of the service due to being absent from school, getting to school by automobile, etc. The resulting equation to estimate student transportation costs is therefore as follows:

School Transit Costs = (Average annual cost per bus transit student) x (percentage of students requiring school bus transit) x (total number of students)

The number of elementary or high school age students in the neighbourhood is automatically calculated as a given percentage of the total population.



5.15 Private Costs



Vehicle Costs

Vehicle costs include both the cost of operating and owning a vehicle. Vehicle O&M costs include the cost of fuel, oil and maintenance. Annual ownership costs are fixed costs like insurance, licence fees, registration fees, taxes, finance costs and depreciation.

Auto ownership and use is estimated based on a variety of development and socio-economic characteristics (e.g. jobs within 5 km, income, etc.) based on methods developed by the Canada Mortgage and Housing Corporation. These values are then converted to annual costs using data from the 2005 Driving Costs report by the Canadian Automobile Association. Both automobile ownership and total kilometres travelled per household are higher on average for suburban developments compared to inner area neighbourhoods due to several factors, including land use patterns and availability of transit.

Home Heating

Home energy consumption is related to heating, air conditioning and hot-water heating. For this tool, data for home heating only is considered. Annual residential heating cost is estimated by building type. The local utility rates are used in calculating the cost of household energy use.

Notes to User: The annual residential heating cost estimate is based on research drawn from the National Energy Code for Housing Standards from the Canadian Commission on Building and Fire Codes (mostly from the early '90s) and should be customized if these results are of importance to the user.

5.16 External Costs

EXTERNAL COSTS

Climate Change and Air Pollution

Average Fuel Efficiency for Passenger Vehicles (L/100 km)	10.98	☞ *This is used to calculate fuel consumption, greenhouse gas emissions and air emissions*
GHG Emissions Factor (grams/L):	2,500	☞ *This is a standard factor based on conventional petroleum fuels*
Cost per tonne GHG ($/tonne of CO_2 equivalents):	$ 25	☞ *Costs per tonne of GHG have a large variance and will depend on emerging carbon trading markets. This is a preliminary working value.*

Air Emissions

CMHC Tool for Evaluating Neighbourhood Sustainability Click Here

	Emissions Factor grams/litre of fuel	Cost Per Tonne
Volatile Organic Compounds (VOCs)	19	$ 1,000
Carbon Monoxide (CO)	200	$ 100
Nitrogen Oxides (NOx)	14	$ 1,000
Sulphur Oxides (SOx)	0.038	$ 500
Particulate Matter less than 10 microns (PM10)	0.233	$ 1,000

☞ *Emissions factors apply to passenger cars only. Other emissions may occur due to transit vehicles and commercial vehicles.*

Transportation Emissions Guidebook
Center for Clean Air Policy http://www.ccap.org/guidebook/

Motor Vehicle Collisions

	VKT	Collision	
Fatal	8.50.E-09	$ 3.59	million
Injury	6.28.E-07	$ 49,340	
Property Damage	1.87.E-06	$ 5,084	

☞ *These values have a high degree of uncertainty*

Climate Change

Greenhouse gas emissions are measured in tonnes of CO_2 equivalent. The primary greenhouse gases include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), of which CO_2 accounts for about 80% of the total impact from transportation. Direct CO_2 emissions can be estimated from transportation activities if the type of fuel used is known since the factor is essentially the same for any type of fuel, regardless of mode.

Estimates of greenhouse gas emissions are developed from the fuel consumption estimates generated from vehicle-km traveled. Emissions factors are available for gasoline fuel are from Natural Resources Canada and are on average, about 2,500 g/L. These emissions factors are applied to fuel consumption estimates, which are in turn based on average fuel consumption ratios (11 L/100km is used). Similar to emissions factors for air contaminants, fuel efficiency depends on the type of travel in question, average speeds and type of vehicle. As it is not feasible to capture all of these variables, average values are adopted. The cost of these emissions is then estimated based on the default estimate of $50 per tonne of GHG emissions.

Air Emissions & Motor Vehicle Collisions

The development of the costs of both motor vehicle collisions and air emissions is factor of the estimated vehicle-km generated by a particular scenario which is in turn a function of neighbourhood type and location. The estimated vehicle-km generated include all vehicle-km generated by persons living in the development, not just the kilometres driven internal to the development.

For **total emission**, an emissions rate is applied per vehicle-km to determine the total emissions by scenario. A value in dollars per tonne is then applied to the emissions estimates. For **vehicle collisions**, a collision rate is applied to vehicle-kilometres of travel (e.g. collisions per 100 million kilometres travelled). The starting point for estimating the costs of motor vehicle collisions is the vehicle-km of travel generated by the neighbourhood scenario. Using data on collision rates per vehicle-km, it is possible to estimate the number of collisions by type: property damage only, injury and fatality. A value is then assigned for each type of collision and an aggregate cost for collisions is calculated. The cost of motor vehicle collisions includes the direct costs of fatal, injury and property damage collisions. These costs implicitly include health care costs.

6 SPECIFYING REVENUE VARIABLES (STEP 3)

Step 3, "Specify Revenue Variables" allows the user to modify the revenue assumptions related to development charges, property taxes and user charges. Details about each specific revenue variable are provided in CLIC using the ☞ symbol.

After completing this step, select the button at the top right of the screen to go back to the Main Menu and proceed to the next step, review previous steps, or proceed to the results. If you change any revenue variables, you can select the button to "Save Changes" to the input or use the "Revert Changes" button, at the top right of the screen, to revert to saved values for the current scenario.

All revenue variables are summarized in the table below.

Category	Revenue Type	Variable	Unit
Development Charges	Single Detached DCC	Single Detached	$/unit
	Semi-detached/ Rowhouses DCC	Semi-Detached	$/unit
		Rowhouse/Townhouse/Duplex	$/unit
	Apartments DCC	Low Rise	$/unit
		High Rise	$/unit
Property Taxes	Average Assessment Value	Single Detached	$/unit
		Semi-Detached	$/unit
		Rowhouse/Townhouse/Duplex	$/unit
		Low Rise	$/unit
		High Rise	$/unit
	Property Tax Rate		rate
	Non-Residential Revenue		$ total
User Charges	User charges not included in property taxes		$/unit
	Transit Fare	Transit Costs Recovered Through Transit Fares	%

6.1 Property Taxes

The mil rate is used to calculate property tax using the following formula:

$$\text{Property Tax Bill} = \frac{\text{Mil Rate} \times \text{Assessed Value}}{1{,}000}$$

Notes to User: Property tax typically has a component that goes as a 'flow-through' to the province, school board, regional district etc. If the cost of these partners has not been accounted for in defining the costing variables in Step 2, their portions of the revenue should be excluded to show only the representative tax revenue staying with the local government. Typically, the 'general tax' portion is used.

6.2 Development Cost Charges

Development Cost Charges (DCC) require an input by housing type and as a $/unit. Some communities calculate DCC as a $/sq. ft., in which case typical unit size assumptions can be used to extrapolate the DCC value based on housing type. Other communities might only differentiate single-family vs multi-family, in which case the multi-family value can be repeated for all Semi-detached, Rowhouse and Apartment categories. If the inputs do not match the user's DCC variables, a calculation can be done separately and the total DCC value added as a User Defined Revenue under Step 7.

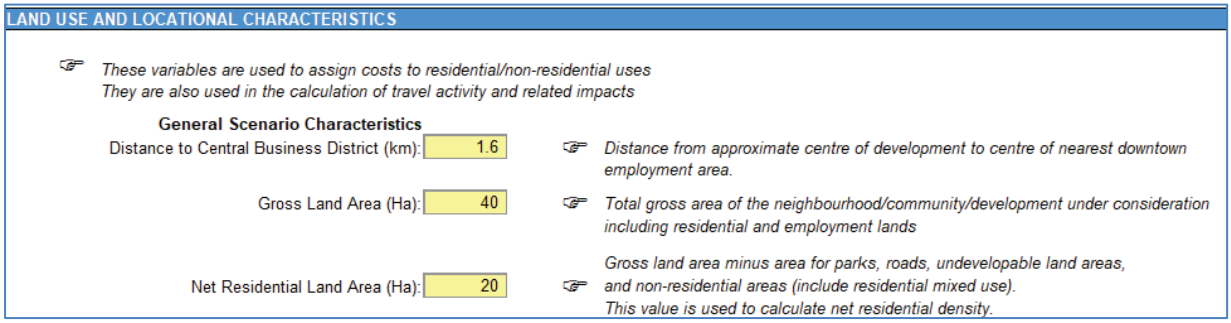
6.3 Non-residential Revenue

Non-residential revenue is inserted as a total, which can be derived from similar tax revenues in the area, based on anticipated type and square footage. This value is used only to calculate the total anticipated revenue (residential and non-residential) to the local government.

7 ENTERING DEVELOPMENT CHARACTERISTICS (STEP 4)

Step 4, "Enter Development Characteristics" allows the user to specify development characteristics, such as land use, demographic assumptions, residential densities and the amount of infrastructure required. When assessing different development types for a given plot of land, unit cost and revenue assumptions will generally remain consistent between scenarios; leaving the development characteristics as the defining element which influences costs and revenues between the scenarios. Thus, it is important to specify these characteristics as accurately as possible. Explanations for each development characteristics category are provided below.

7.1 Land Use & Locational Characteristics



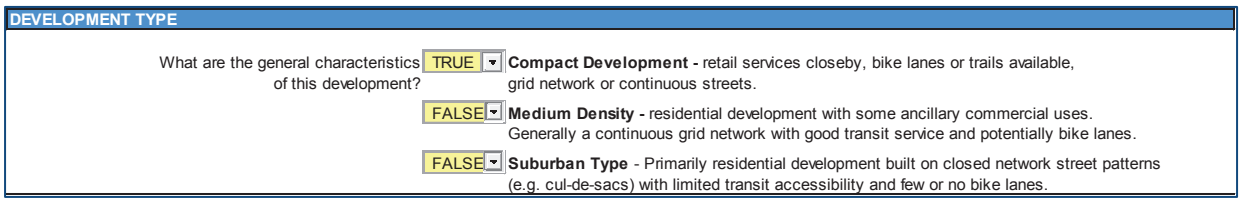
Variables under this category are used in the calculation of travel activity and related costs as well as in the allocation of costs between residential and non-residential uses. These variables are defined, as follows:

- **Distance to Central Business District:** The straight-line distance between the approximate centre of the development and the approximate centre of the nearest central employment area in kilometres. This variable is a significant determinant of travel activity and can be excluded (made '0') if the user is not interested in analysing travel and GHG cost.

- **Gross Land Area:** The total land area (in hectares) contained within the development boundary / perimeter, including any area, such as streams or other sensitive areas that will not be developed.

- **Net Residential Land Area**: Gross land area minus area not developable for residential such as parks, roads, undevelopable land areas, and non-residential areas. This value is used to calculate net residential density.

7.2 Development Type



This category requires the user to characterize the development as one of three types:

- **Compact development** – retail services close by, bike lanes or trails available, grid network or continuous streets.
- **Medium density** – residential development with some ancillary commercial uses. Generally a continuous grid network with good transit service and potentially bike lanes.
- **Suburban** – primarily residential development built on closed network street patterns (e.g. cul-de-sacs) with limited transit accessibility and few or no bike lanes.

Select "True" for the statement that best characterize the development. Only one option can be selected as "True". This input is used by CLIC to assume approximate values for several variables, which play a minor role in the estimation of auto ownership and related vehicle collision and GHG costs. These variables include weekday transit service hours within one-kilometre radius, percent curvilinear road layout and the ratio of bike lanes to road kilometres, among others.

7.3 Development Densities

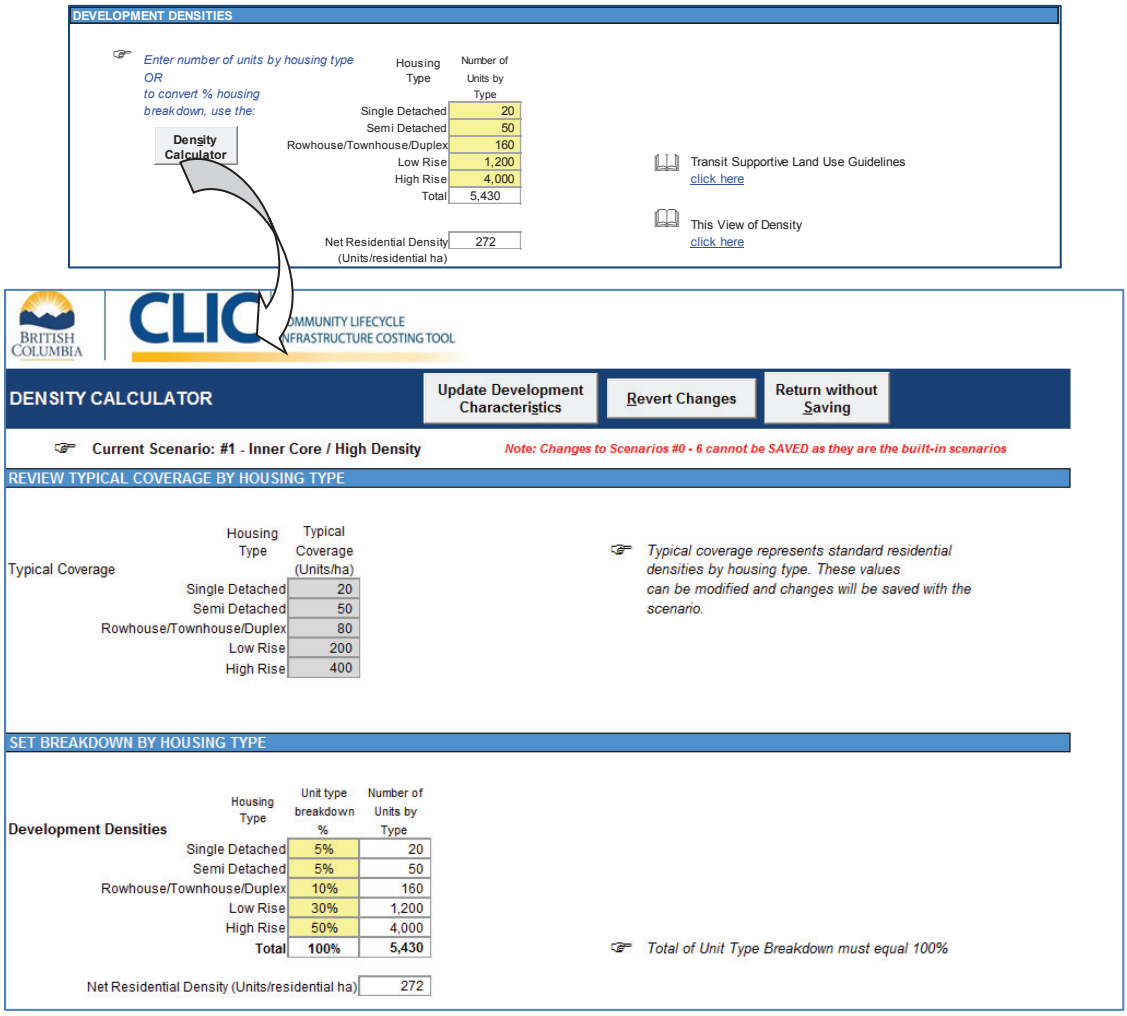
The number of residential units by housing type is required to determine many factors, such as the number of households and per household costs, revenues, population, and auto ownership and use, among others. CLIC considers five dwelling types:

- single detached;
- semi-detached;
- rowhouse/townhouse/ duplex;
- low rise; and
- high-rise.

Each built-in scenario is the same size (i.e. 40 hectares), but has a different breakdown of housing units by type. These values can be modified for new scenarios. Users have the choice of entering:

- the number of housing units by type directly, or
- the percentage of unit type breakdown (i.e. the proportion of residential land dedicated to each dwelling type) through the 'Density Calculator' sub-tool.

A screenshot of the Density Calculator is also shown below. This worksheet provides typical coverage values (units/ha) for each dwelling type as well as default percentages of unit type breakdown. The number of units of each dwelling type is calculated based on the user-entered percentages, the typical coverage values, and the net amount of residential land. Users can also modify the 'Typical Coverage' values, which are saved with each scenario.



Note to User: CLIC consider non-residential land uses at a cursory level only. The tool is therefore mostly applicable to scenarios with significant residential components.

Demographic Assumptions & Jobs

Demographic assumptions are important in calculations regarding auto ownership and use, and school costs. Assumptions include the average household size by dwelling type, the number of adults per household, average household income, and the number of jobs within 5 kilometres of the development. Jobs within 5 kilometres of the development and the distance to the central business district should be calculated from approximately the centre of the development. This can be excluded if transit and emissions are not being analysed.

DEMOGRAPHIC ASSUMPTIONS

	Household Size (person/unit)	Adults (16+) (person/unit)	School age children (person/unit)	Average Household Income ($)
Single Detached	3.2	2.0	1.2	125,000
Semi Detached	2.8	1.8	1.0	90,000
Rowhouse/Townhouse/Duplex	2.4	1.8	0.6	70,000
Low Rise	1.6	1.2	0.4	55,000
High Rise	1.6	1.2	0.4	55,000
Weighted average	1.6	1.2	0.4	56,022

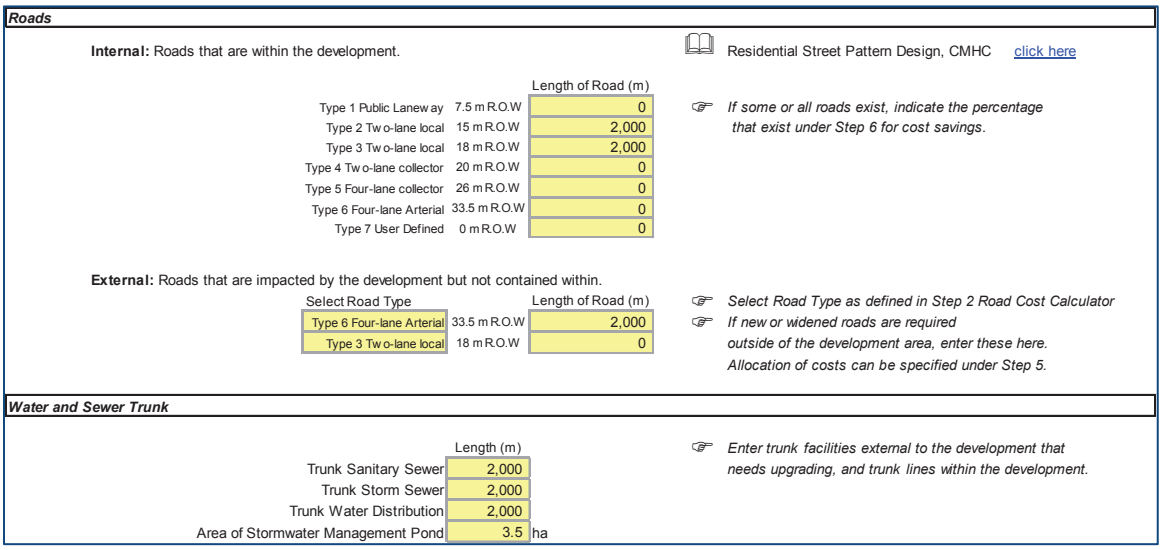
☞ *Enter the typical demographic characteristics by unit type These variables are used to calculate auto ownership and use as well as school costs*

Development population	
Adults	6,658
Children	2,250
Total	8,908

Jobs within 5 Km	200,000

7.4 Potential Community Services

Roads, Water, Sanitary, Storm



Roads

Internal: Roads that are within the development.

Residential Street Pattern Design, CMHC click here

		Length of Road (m)
Type 1 Public Laneway	7.5 m R.O.W	0
Type 2 Two-lane local	15 m R.O.W	2,000
Type 3 Two-lane local	18 m R.O.W	2,000
Type 4 Two-lane collector	20 m R.O.W	0
Type 5 Four-lane collector	26 m R.O.W	0
Type 6 Four-lane Arterial	33.5 m R.O.W	0
Type 7 User Defined	0 m R.O.W	0

If some or all roads exist, indicate the percentage that exist under Step 6 for cost savings.

External: Roads that are impacted by the development but not contained within.

Select Road Type		Length of Road (m)
Type 6 Four-lane Arterial	33.5 m R.O.W	2,000
Type 3 Two-lane local	18 m R.O.W	0

Select Road Type as defined in Step 2 Road Cost Calculator

If new or widened roads are required outside of the development area, enter these here. Allocation of costs can be specified under Step 5.

Water and Sewer Trunk

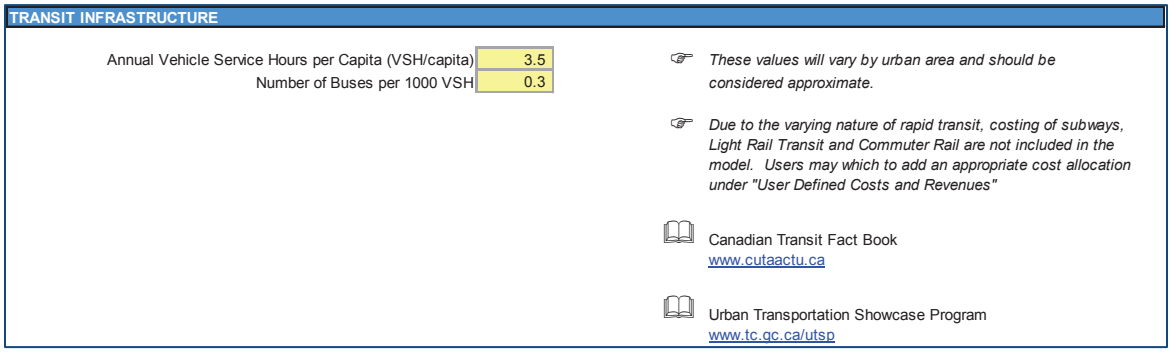
	Length (m)	
Trunk Sanitary Sewer	2,000	
Trunk Storm Sewer	2,000	
Trunk Water Distribution	2,000	
Area of Stormwater Management Pond	3.5	ha

Enter trunk facilities external to the development that needs upgrading, and trunk lines within the development.

The amount of required road, water, wastewater and stormwater infrastructure determines much of the costs of the development. Due to possible differences in allocation of costs, road inputs are divided into **internal and external road requirements** (i.e. those within the development boundary and external impacts outside of the boundary). Internal road lengths can be specified in terms of seven different road types as specified in the Road Cost Calculator (subset of Step 2) ranging from public laneways, to four-lane arterials, to user-specified facilities (i.e. user can create a new road type). Roads external to the development, but requiring investment (such as upgrading, widening) due to the development, can also be identified.

Internal water and sewer infrastructure requirements do not need to be specified as they are assumed to follow the internal road requirements. Water and sewer unit costs by road type are specified in the Costing Variables sheet (Step 2). **Water and sewer infrastructure external** to the development is identified explicitly, including the length of required trunk pipes for water distribution, storm sewers, and sanitary sewers, as well as the size of stormwater management pond required.

Transit Infrastructure



TRANSIT INFRASTRUCTURE

Annual Vehicle Service Hours per Capita (VSH/capita)	3.5
Number of Buses per 1000 VSH	0.3

These values will vary by urban area and should be considered approximate.

Due to the varying nature of rapid transit, costing of subways, Light Rail Transit and Commuter Rail are not included in the model. Users may which to add an appropriate cost allocation under "User Defined Costs and Revenues"

Canadian Transit Fact Book
www.cutaactu.ca

Urban Transportation Showcase Program
www.tc.gc.ca/utsp

Public transit infrastructure is specified in terms of the vehicle service hours per capita and the number of buses required per 1000 vehicle service hours. Vehicle service hours per capita (or revenue service hours per capita) can be estimated from local results from your community. Contact your local transit agency or look to the Canadian Transit Fact Book published by the Canadian Urban Transit Association (http://www.cutaactu.ca/).

8 SPECIFYING ALLOCATION OF COSTS (STEP 5)

A key factor in determining the costs of a development is the question of who pays. Allocation of capital and O&M costs associated with Potential Community Services is specified in Step 5, "Allocation of Costs". The cost allocation input screen is shown below. Users can specify the percentage of cost to be attributed to residential development (vs. non-residential). This percentage is used to calculate the proportion of infrastructure and services costs associated with the residential component, as displayed in the results. For a residential subdivision 100% of cost will be attributed to residential, regardless of green space, roads, etc. On the other hand, a development that has a non-residential portion where for instance 15% of the gross land area is used for retail-only, the assumption can be made that 85% of the costs (associated with the remaining 85% gross land area, as a proxy for cost) are attributed to residential. Costs associated with residential mixed uses can be attributed to residential.

RESIDENTIAL COST ALLOCATION

% Cost Attributed to Residential Development: 100%

☞ *Cost attributed to residential vs non-residential customers. This percentage is used to calculate the proportion of infrastructure and services costs associated with the residential component as displayed in the results. For a residential subdivision 100% of cost will be attributed to residential. Where 20% of the gross area is dedicated to retail-only, the remaining 80% can be allocated to residential.*

Users can also specify how each cost is shared between four different partners: the developer, the local government, the user and "other" category. The user can modify the default values as appropriate but should ensure that the total column for each cost sums to 100%. Note that replacement cost is automatically 100% assigned to the local government.

COST ALLOCATION

	Allocation CAPITAL Cost				Total	Allocation O&M Cost				Total
	Municipal	Developer	User*	Other		Municipal	Developer	User*	Other	
Potential Community Services										
Internal Roads	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
External Roads	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Potable Water Distribution Network (local)	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Potable Water Treatment System	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Water Distribution Network (regional trunks)	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Sanitary Sewer Collection Network (local)	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Sanitary Sewer Treatment System	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Sewer Collection Network (regional trunks)	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Storm Sewer Collection Network (local)	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Storm Water Ponds	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Sewer Collection Network (regional trunks)	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Parks and Open Space	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Community Facilities	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Fire Service	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Police Service	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Waste Management Service	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Bus Transit	100%	0%	0%	0%	100%	100%	0%	0%	0%	100%
Schools	0%	0%	0%	100%	100%	0%	0%	0%	100%	100%
School Transit	Capital cost, if any specified, combined with School Transit O&M					0%	0%	0%	100%	100%

☞ *Enter the percentage of costs born by each.*

☞ *Totals must add to 100%. Cells that appear in red indicate errors.*

☞ ** Cost allocated to Users and not already accounted for as User fees in step 3.*

Allocation REPLACEMENT Cost

☞ *Replacement cost is automatically calculated and assigned 100% to the local government, except for Fire, Police, Waste, Transit, and Schools (which assumes replacement cost at same % allocation as initial capital cost)*

Notes to User: Only assign costs to other parties if the cost of that party was included in your costing variables in Step 2 or Step 7. For instance, if a private operator is collecting a portion of the waste but you did not include the cost of the private operator, then 0% of the cost should be reallocated to the private operator in this step. If you only accounted for municipal costs, 100% of the costs should be allocated to the local government here.

Notes to User: If the local government is paying the capital cost, but collecting revenues from others to offset the cost incurred, the cost allocation should remain 100% municipal and the revenues to offset the cost should be specified under Step 3 or Step 7.

9 ENTERING COST SAVINGS & REPLACEMENT PERIOD (STEP 6)

9.1 Existing Infrastructure

Step 6, enables users to **discount initial capital costs** to account for infrastructure that may already be in place or which can be reduced. Users can enter the proportion of infrastructure that already exists. Final capital costs will be multiplied by the difference between the percentage entered and 100%. Entering 0% means that no cost savings are incurred and 100% of costs are attributed to the development. Entering 90% means that 90% of the infrastructure exist and only 10% of the total cost will be considered as the initial capital cost. Note that this value does not impact replacement cost as it is assumed that 100% of the cost will be incurred once the infrastructure reaches end of life.

When a "Percentage in Place" value is entered, a corresponding "Age of Existing" needs to be specified. The age of the existing infrastructure is used to calculate when the replacement cycle would occur in calculating lifecycle cost. For example, a road might have a 65 year replacement period, but if the road already exist and is currently 10 years old, the road will need replacement in year 55 and not in year 65.

Notes to User: Where an existing old asset, such as a road, has reached its end of life and will be replaced by the developer as part of redeveloping the site, it is recommended that the user enter the road as "new" i.e. 0% existing. If however the user chooses to enter the road as 100% existing, the tool will assume the imminent replacement will be paid for by the local government, as all replacements are assigned to the local government. To offset the cost covered by the developer to redevelop the road, the user would then have to allocate User Defined revenue in Step 7 for the amount.

Notes to User: Where multiple assets are considered, such as community facilities, it is recognized that individual assets will have varying ages. The user can generalize and average the age of assets weighted towards the most expensive assets. Having a precise number is not critical, but a general age if useful to determine the reinvestment timing.

Existing Infrastructure

Roads

☞ *Roads that are within the development.*

	Percentage in Place %	Age of Existing (Years)
Type 1 Public Laneway	0%	0.00
Type 2 Two-lane local	0%	0.00
Type 3 Two-lane local	0%	0.00
Type 4 Two-lane collector	0%	0.00
Type 5 Four-lane collector	0%	0.00
Type 6 Four-lane Arterial	0%	0.00
Type 7 User Defined	0%	0.00

☞ *Users can enter the proportion of infrastructure that already exists and is considered spare capacity. Final costs will be multiplied by the difference between the percentage entered and 100%. Entering 0% means that no cost savings are incurred due to excess infrastructure and all costs are attributed to the development.*

☞ *Areas such as brownfields may have excess capacity to accommodate new growth without the need for additional infrastructure. Certain green infrastructure elements can also reduce the costs of other infrastructure elements (e.g., the use of green roofs can significantly reduce storm sewer requirements).*

☞ *Roads that are impacted by the development but not contained within.*

	Percentage in Place %	Age of Existing (Years)
Type 6 Four-lane Arterial	0%	0.00
Type 3 Two-lane local	0%	0.00

Potable Water Distribution and Treatment

	Percentage in Place %	Age of Existing (Years)
Potable Water Distribution Network (local)	0%	0.00
Potable Water Treatment System	0%	0.00
Potable Water Distribution Network (regional trunks)	0%	0.00

Sanitary Sewer Collection and Treatment

	Percentage in Place %	Age of Existing (Years)
Sanitary Sewer Collection Network (local)	0%	0.00
Sanitary Sewer Treatment System	0%	0.00
Sanitary Sewer Collection Network (regional trunks)	0%	0.00

Storm Sewer Collection

	Percentage in Place %	Age of Existing (Years)
Storm Sewer Collection Network (local)	0%	0.00
Storm Water Ponds	0%	0.00
Storm Sewer Collection Network (regional trunks)	0%	0.00

Other

	Percentage in Place %	Age of Existing (Years)
Parks and Open Space	0%	0.00
Community Facilities	0%	0.00
Fire Services	0%	0.00
Police Services	0%	0.00
Transit Services	0%	0.00
Waste Management	0%	0.00
School Construction	0%	0.00

9.2 Replacement Periods / Useful Life

Infrastructure ages and requires replacement once the asset has reached the end of its life. The typical lifespan (years from new to replacement) of various assets is estimated and can be updated by the user. CLIC assumes complete asset renewal, and not varying replacement periods for different parts of the asset (e.g. the top asphalt layer of a road having a shorter replacement period vs the base layer etc.). This is a simplification for analysis of overall lifecycle costs for different options and therefore appropriate for this Tool.

The replacement cost percentage is required to calculate the total lifecycle investment. It represents the percentage of the original cost that would be required to replace the infrastructure. Note the is **not an escalation for inflation,** but rather increased cost due to the circumstances in the future. For example, replacing an asset that was originally installed in a greenfield site, that now has a lot of other services around it, will by comparison be more expensive to replace in today's dollars, for example, the replacement cost may be 120% of the original cost. Whereas other assets that perhaps needed a lot of one-off preparation work for the original install might be comparatively cheaper to replace. Typically, the default value would be that the replacement cost percentage is 100% (i.e. the replacement work will be the same level of effort as the original installation).

Infrastructure Replacement

Roads

Required to calculate the total investment needed during the life cycle. The replacement cost % represents the percentage of the original cost that would be required to replace the infrastructure (in today's dollar value).

Internal: Roads that are within the development.

	Years for Replacement	Replacement Cost %
Type 1 Public Laneway	30	100%
Type 2 Two-lane local	30	100%
Type 3 Two-lane local	30	100%
Type 4 Two-lane collector	30	100%
Type 5 Four-lane collector	30	100%
Type 6 Four-lane Arterial	30	100%
Type 7 User Defined	30	100%

External: Roads that are impacted by the development but not contained within.

	Years for Replacement	Replacement Cost %
Type 6 Four-lane Arterial	30	100%
Type 3 Two-lane local	30	100%

Other

	Years for Replacement	Replacement Cost %
Potable Water Distribution Network	75	100%
Potable Water Treatment System	45	100%
Sanitary Sewer Collection Network	75	100%
Sanitary Sewer Treatment System	45	100%
Storm Sewer Collection Network	75	100%
Storm Water Ponds	75	100%
Waste Management	25	100%
School Construction and Operation	50	100%
Parks and Open Space	20	100%
Community Facilities	50	100%
Transit Services	15	100%
Fire Services	25	100%
Police Services	25	100%

11 ADDING USER-DEFINED COSTS & REVENUES (STEP 7)

CLIC includes many of the most common types of costs associated with a development. However, there may be other costs and revenues that users may wish to include that has not already been accounted for in other steps. The user can calculate and enter these costs and revenues, and are advised to use the User Comments section to make notes on what inputs and assumptions were used in calculating the totals. O&M and revenues should be entered as an annual equivalent amortized over the lifecycle (i.e. 100 years).

USER DEFINED COSTS

☞ *This Tool includes the most common types of costs associated with a development. However, there may be other costs that users may wish to include such as:*
- *land costs*
- *site remediation costs due to pre-existing environmental contamination*
- *district energy systems*
- *contribution to health care facilities*
- *public art or urban design enhancements*
- *noise remediation*
- *demolition costs*

Enter the total value of miscellaneous initial capital costs and/or annual operating costs that are to be carried forward to the final results summary.

Use the Comment section below to document the various inputs considered in deriving at this total value.

COSTS	Initial Capital Costs	Annual O&M Costs
Total User Defined Costs	$ 0	$ 0
Years for Replacement	0	

USER DEFINED REVENUES

☞ *As with other costs, users may want to include other sources of revenue to be added to the results summary. This could include, for example:*
- *Green Infrastructure Funds*
- *Brownfield redevelopment funds*
- *Other funding sources*
- *Sale of lands or other resources*
- *Revenues from district energy production or other green ventures*

Values should be entered as an annual equivalent.

Use the Comment section below to document the various inputs considered in deriving at this total value.

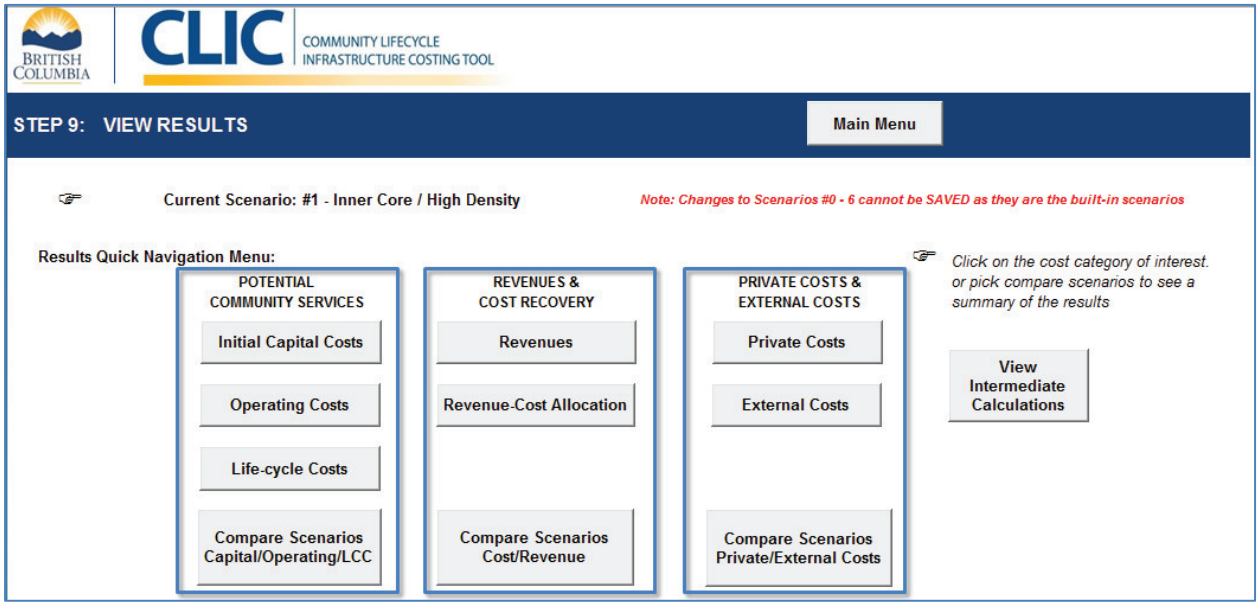
REVENUES	Annual Revenues
Total User Defined Revenues	$ 0

Notes to User: All costs and revenues specified in this section will be 100% allocated to the local government, so exclude costs carried by other parties. Where more than one capital cost is added, the user should determine an approximate weighted average for the 'replacement period' input.

12 VIEWING RESULTS (STEP 8)

Step 8, "View Results" allows users to view and print summaries of costs and revenues, and compare results from different scenarios. As shown in the screenshot of the Results Navigation Window, below, users can be directed to result summaries and scenario comparisons under three categories: "Potential Community Services", "Revenues and Cost Recovery", and "Private Costs and External Costs". As mentioned earlier, CLIC is geared towards estimating planning-level costs and revenues associated with the residential component of a development, and the accuracy of estimated results will depend on the amount of customization performed. It should be noted that results typically **exclude the cost of land acquisition**, unless this was specifically added in the analysis.

Directions for viewing the data and performing scenario comparisons are provided in the sections below.



The user also has the option to "**View Intermediate Calculations**". These are the "raw" back-end data calculations for producing the Results.

12.1 Potential Community Services Costs

CLIC generates tables and graphs summarizing initial capital costs, annual O&M costs and lifecycle costs. **Lifecycle costs** are expressed on an annual basis and calculated as initial capital costs, annual O&M costs and replacement costs amortized over the 100-year time-horizon. For assets that get replaced multiple times in the 100-year time horizon, the replacement value would be calculated at every repeating year interval. For example, an asset with a 30-year replacement would be considered to have replaced two times in the 100-year timeframe. Sample screenshots of these summaries are shown below.

Summary tables subdivide costs into:

- **Complete Development Costs** associated with the entire development (residential and non-residential).
- **Residential portion** of costs refer to the infrastructure and service costs associated with the residential portion of the development and are calculated as total costs multiplied by the Percent Cost Allocated to Residential, specified in Step 5. The residential portion costs are displayed in four different units to enable flexibility: total,

per household, per person, per gross ha. For each cost summary, charts provide a visual breakdown of costs. Note that due to the relative magnitude of school costs, these costs are not included in the graphs.

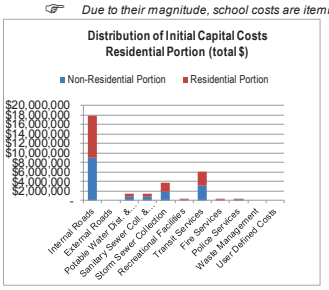
- **Non-residential portion** of costs which is the difference between the Complete Development Cost minus the Residential Portion.

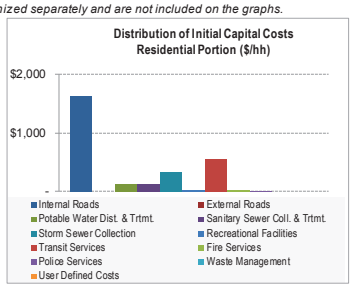
User defined costs (from Step 7) are shown as a separate line item. A "**Return to Results Menu**" button below each of these charts allows the user to easily return to the Results Navigation Window and then view other results.

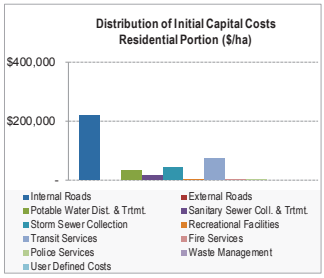
INITIAL CAPITAL COSTS

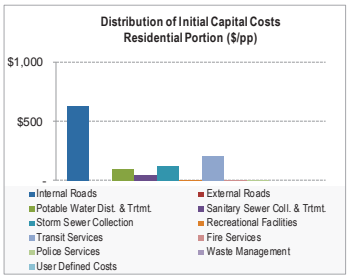
POTENTIAL COMMUNITY SERVICES		Complete Development total $	Non-Resid. Portion total $	Residential Portion total $	%	$/hh	$/ha	$/pp
Internal Roads		$17,826,958	$8,913,479	$8,913,479	$1	$1,642	$222,837	$631
External Roads		-	-	-	-	-	-	-
Potable Water Dist. & Trtmt.		$1,400,000	$700,000	$700,000	$0	$129	$35,000	$99
Sanitary Sewer Coll. & Trtmt.		$1,380,000	$690,000	$690,000	$0	$127	$17,250	$49
Storm Sewer Collection		$3,621,000	$1,810,500	$1,810,500	$0	$333	$45,263	$128
Recreational Facilities		$249,780	$124,890	$124,890	$0	$23	$3,122	$9
Transit Services		$5,986,575	$2,993,288	$2,993,288	$0	$551	$74,832	$212
Fire Services		$309,510	$154,755	$154,755	$0	$29	$3,869	$11
Police Services		$162,900	$81,450	$81,450	$0	$15	$2,036	$6
Waste Management		-	-	-	-	-	-	-
USER DEF.	r Defined Costs	-	-	-	-	-	-	-
SCHOOL	School O&M	$17,758,815	$8,879,408	$8,879,408		$1,635	$221,985	$629
COSTS	School Transit	-	-	-		-	-	-
Total Costs (excl. schools)		**$30,936,723**	**$15,468,362**	**$15,468,362**	**$1**	**$2,849**	**$404,209**	**$1,145**
Total Costs		**$48,695,538**	**$24,347,769**	**$24,347,769**		**$4,484**	**$626,194**	**$1,774**

Due to their magnitude, school costs are itemized separately and are not included on the graphs.





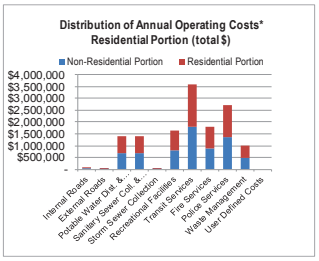


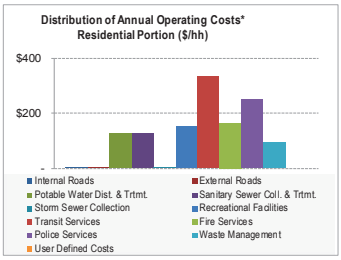


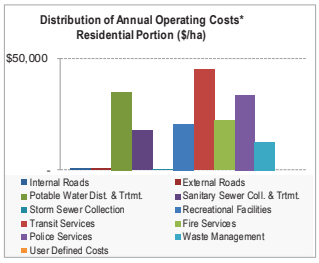
ANNUAL O&M COSTS

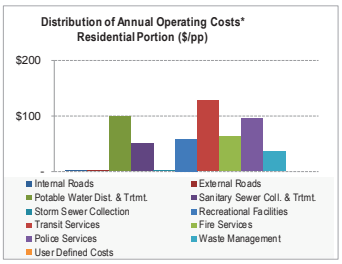
POTENTIAL COMMUNITY SERVICES	Complete Development total $	Non-Resid. Portion total $	Residential Portion total $	%	$/hh	$/ha	$/pp
Internal Roads	$48,000	$24,000	$24,000	$0	$4	$600	$2
External Roads	$20,000	$10,000	$10,000	$0	$2	$500	$1
Potable Water Dist. & Trtmt.	$1,387,750	$693,875	$693,875	$0	$128	$34,694	$98
Sanitary Sewer Coll. & Trtmt.	$1,399,500	$699,750	$699,750	$0	$129	$17,494	$50
Storm Sewer Collection	$12,000	$6,000	$6,000	$0	$1	$150	$0
Recreational Facilities	$1,629,000	$814,500	$814,500	$0	$150	$20,363	$58
Transit Services	$3,591,945	$1,795,973	$1,795,973	$0	$331	$44,899	$127
Fire Services	$1,781,040	$890,520	$890,520	$0	$164	$22,263	$63
Police Services	$2,704,140	$1,352,070	$1,352,070	$0	$249	$33,802	$96
Waste Management	$999,120	$499,560	$499,560	$0	$92	$12,489	$35
USER DEF. er Defined Costs	-	-	-	-	-	-	-
SCHOOLS School O&M	$18,866,535	$9,433,268	$9,433,268		$1,737	$235,832	$668
SCHOOLS School Transit	$2,172,000	$1,086,000	$1,086,000		$200	$27,150	$77
Total Costs (excl. schools)	**$13,572,495**	**$6,786,248**	**$6,786,248**	**$1**	**$1,250**	**$187,253**	**$531**
Total Costs	**$34,611,030**	**$17,305,515**	**$17,305,515**		**$3,187**	**$450,235**	**$1,276**

☞ *Due to their magnitude, school costs are itemized separately and are not included on the graphs.*





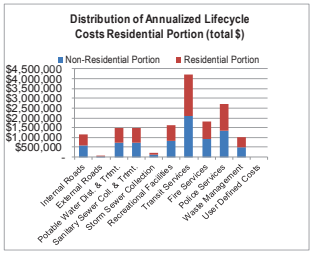


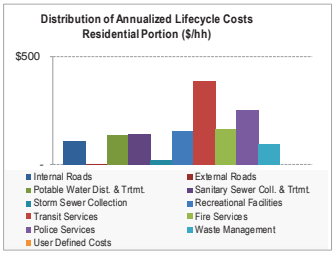


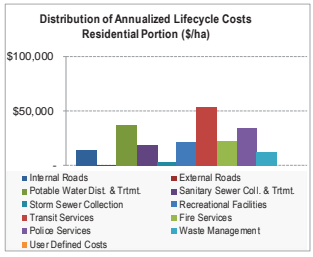
ANNUALIZED LIFECYCLE COSTS

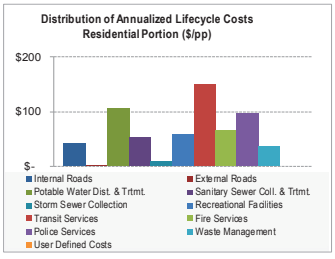
POTENTIAL COMMUNITY SERVICES	Total Development total $	Non-Resid. Portion total $	Residential Portion total $	%	$/hh	$/ha	$/pp
Internal Roads	$1,145,081	$572,540	$572,540	7%	$105	$14,314	$ 41
External Roads	$20,000	$10,000	$10,000	0%	$2	$500	$ 1
Potable Water Dist. & Trtmt.	$1,476,572	$738,286	$738,286	9%	$136	$36,914	$ 105
Sanitary Sewer Coll. & Trtmt.	$1,483,595	$741,798	$741,798	9%	$137	$18,545	$ 53
Storm Sewer Collection	$232,658	$116,329	$116,329	1%	$21	$2,908	$ 8
Recreational Facilities	$1,648,539	$824,270	$824,270	10%	$152	$20,607	$ 58
Transit Services	$4,206,898	$2,103,449	$2,103,449	27%	$387	$52,586	$ 149
Fire Services	$1,805,252	$902,626	$902,626	11%	$166	$22,566	$ 64
Police Services	$2,720,873	$1,360,437	$1,360,437	17%	$251	$34,011	$ 96
Waste Management	$999,120	$499,560	$499,560	6%	$92	$12,489	$ 35
USER DEF. er Defined Costs	-	-	-	0%	-	-	$ -
SCHOOLS School O&M	$19,967,610	$9,983,805	$9,983,805		$1,839	$249,595	$ 707
SCHOOLS School Transit	$2,172,000	$1,086,000	$1,086,000		$200	$27,150	$ 77
Total Costs (excl. schools)	**$15,738,589**	**$7,869,295**	**$7,869,295**	**100%**	**$1,449**	**$215,440**	**$610**
Total Costs	**$37,878,199**	**$18,939,100**	**$18,939,100**		**$3,488**	**$492,185**	**$1,394**

☞ *Based on 100 year analysis period. Includes initial capital, annual O&M, and replacement costs.*









12.2 Municipal Revenues

A breakdown of the municipal residential revenues is shown, which included residential property tax, user fees, development charges, and other revenues specified in Step 7. These revenues are annualized.

REVENUES

	Total Residential ($)	Residential Revenues per household ($)	Total Non-Residential ($)
Annual Property Taxes	$18,919,980	$3,484	N/A
Annual User Fees	$3,424,973	$631	N/A
Total Initial Development Charges	$27,750,000	$5,110	N/A
Annual User Defined Revenues	$ -	$ -	$ -
Total Annualized Value of Residential Revenues*	**$24,014,874**	**$4,423**	**N/A**

- *Revenue collected from residents such as waste collection charges, transit fares, water fees, etc.*
- *Revenue collected from the developer through DCCs*
- *Also includes home heating savings from Green Infrastructure Alternatives*

** Based on 100 year analysis period. Includes annual property taxes, initial development charges, user charges and user defined revenues*

12.3 Private & External Costs

CLIC summarizes private costs associated with personal transportation and home heating, two major household costs that depend on development form. Displayed private costs include annual driving costs (i.e. vehicle ownership and operation), transit fares and home heating. External costs associated with vehicle use are also estimated including motor vehicle collisions, air pollution and climate change. Sources for default unit costs are noted in CLIC, but it is emphasized that the valuation of external costs is highly varied and results should be viewed as approximate.

PRIVATE COSTS

ANNUAL COSTS

	Total Development	Household Costs
	$	$
Driving Costs	$37,063,332	$6,826
Transit Fares	$1,795,973	$331
Home Heating Costs	$8,224,000	$1,515

- *Transportation costs and home heating costs are two major household costs that depend on development form.*
- *The cost of operating and owning a vehicle.*
- *Home energy consumption is related to heating, air conditioning and hot-water heating.*

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EXTERNAL COSTS OF AUTOMOBILE USE

ANNUAL COSTS

	Total Development	Household Costs
	$	$
Motor Vehicle Collisions	$1,923,947	$354
Air Pollution	$278,159	$51
Climate Change	$326,465	$60

- *Valuation of external costs is highly varied and results should be viewed as approximate.*
- *The cost of motor vehicle collisions includes the direct costs of fatal, injury and property damage collisions. These costs implicitly include the costs of health care.*
- *Climate change is based on model assumptions around the Vehicle km Travelled. GHGs are calculated at $25/tonne - a standard cost for offsets, but does not necessarily account for the total external costs associated with Climate Change impacts such as rebuilding dykes, emergency response costs, etc.*

12.4 Comparing Scenarios

Under the heading, “Cost Comparison of Potential Community Services – Residential Portion”, CLIC allows the user to compare up to three scenarios. Both user-defined and built-in scenarios can be compared with the active scenario. Use the drop-down menus to select the appropriate scenario for Scenario 2 and Scenario 3 as shown in the sample screenshot below.

Comparing Potential Community Service Costs

Users can see the cost comparisons for initial capital, annual O&M and annual lifecycle costs.

COST COMPARISON FOR POTENTIAL COMMUNITY SERVICES - RESIDENTIAL PORTION

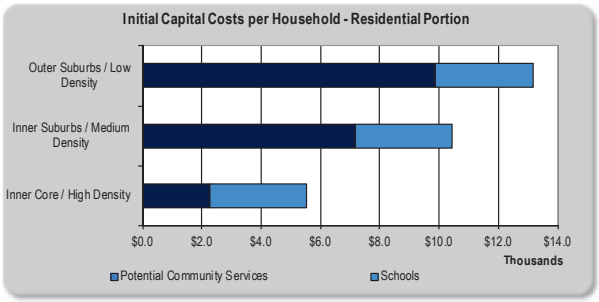
Scenarios for Comparison (Select scenarios)

Scenario 2: Inner Suburbs / Medium Density

Scenario 3: Outer Suburbs / Low Density

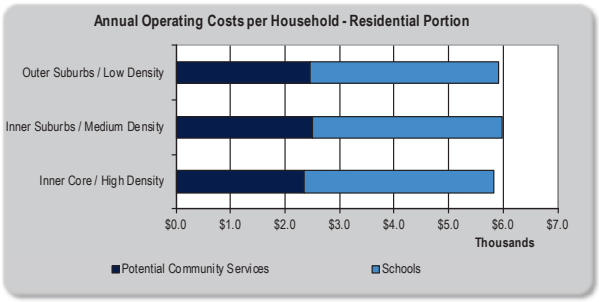
INITIAL CAPITAL COSTS PER HOUSEHOLD

Initial Capital Costs (hh)	Inner Core / High Density	Inner Suburbs / Medium	Outer Suburbs / Low Density
Potential Community Services	$2,254	$7,184	$9,889
Schools	$3,271	$3,271	$3,271
User Defined Costs	-	-	-
Total Costs	**$5,524**	**$10,455**	**$13,159**



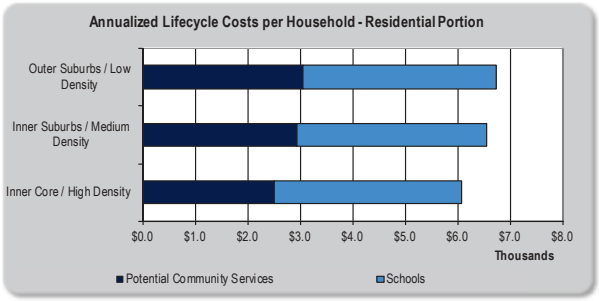
ANNUAL O&M COSTS PER HOUSEHOLD

Annual O&M Costs (hh)	Inner Core / High Density	Inner Suburbs / Medium	Outer Suburbs / Low Density
Potential Community Services	$2,361	$2,515	$2,450
Schools	$3,475	$3,475	$3,475
User Defined Costs	-	-	-
Total Costs	**$5,835**	**$5,989**	**$5,925**



ANNUAL LIFECYCLE COSTS PER HOUSEHOLD

Lifecycle Costs (hh)	Inner Core / High Density	Inner Suburbs / Medium	Outer Suburbs / Low Density
Potential Community Services	$2,506	$2,949	$3,068
Schools	$3,576	$3,616	$3,677
User Defined Costs	-	-	-
Total Costs	**$6,082**	**$6,565**	**$6,745**



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Comparing Municipal Cost and Revenue

Under the category of "Municipal Cost and Revenue", CLIC generates tables summarizing revenues and comparing them to costs associated with the local government. Costs allocated to other partners under Step 5 has been removed from these figures to only show the costs incurred by the local government. Values are expressed as annual lifecycle costs and revenues, and are broken down by residential vs. non-residential portions of the development.

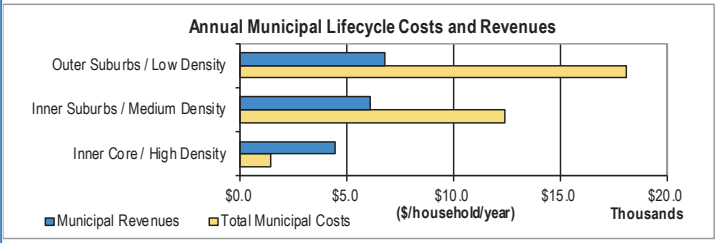
COMPARISON OF MUNICIPAL COSTS AND REVENUES

☞ *Caution should be observed in comparing municipal costs against municipal revenues as municipal revenues are intended to cover a wide range of services. Note Schools are not included in these costs.*

ANNUAL MUNICIPAL LIFECYCLE COSTS AND REVENUES

Lifecycle Costs and Revenues (hh)	Inner Core / High Density	Inner Suburbs / Medium Density	Outer Suburbs / Low Density
Municipal Portion of Residential Costs (hh)	$1,449	$12,384	$18,097
Municipal Portion of Non-Residential Costs (hh)	$1,449	$1,819	$2,242
Complete Municipal Costs (hh)	**$2,898**	**$14,203**	**$20,339**
Municipal Portion of Residential Revenues (hh)	$4,423	$6,050	$6,768
Municipal Portion of Non-Residential Revenues (hh)	-	-	-
Complete Municipal Revenues (hh)	**$4,423**	**$6,050**	**$6,768**
Net Revenue (Residential Only) (hh)	$2,973	($6,333)	($11,330)
Net Revenue (Non-Residential Only) (hh)	($1,449)	($1,819)	($2,242)
Net Revenue (Complete Development) (hh)	**$1,524**	**($8,152)**	**($13,571)**

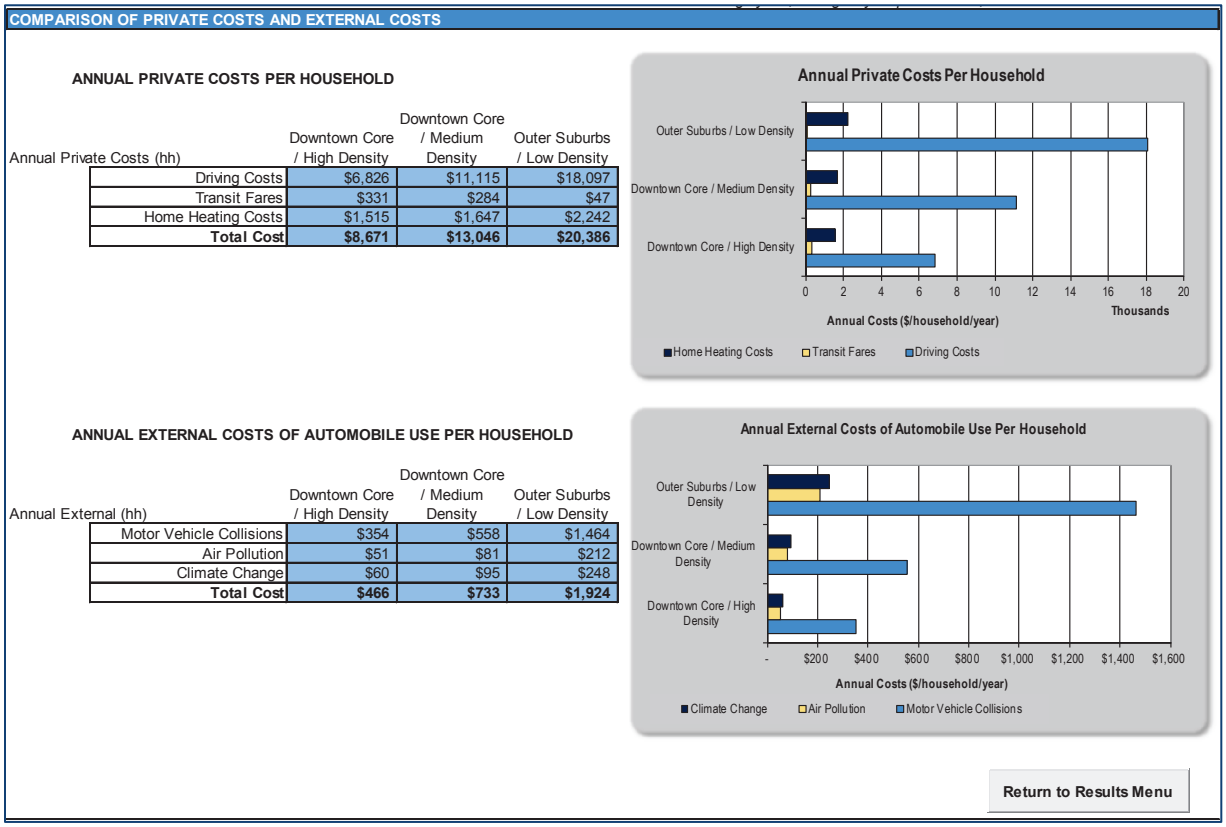
[1]Total Municipal Costs = municipal service and infrastructure costs from residential component of community
[2]Municipal Revenues = municipal revenue related to residential component of community, including taxes, development charges, and user charges



Notes to User: Caution should be observed in comparing municipal costs against municipal revenues, as municipal revenues are intended to cover a wide range of services. Similarly, due to varied approaches used by municipalities for providing credits for development charges, it is not recommended that development charges be compared directly with developer costs.

Comparing Private Costs and External Costs

Under the title “Comparison of Private Costs and External Costs”, CLIC allows the user to compare private and external costs among up to three scenarios. These values are expressed as annual costs per household. An example of this comparison is shown in the screenshot below.



COMPARISON OF PRIVATE COSTS AND EXTERNAL COSTS

ANNUAL PRIVATE COSTS PER HOUSEHOLD

Annual Private Costs (hh)	Downtown Core / High Density	Downtown Core / Medium Density	Outer Suburbs / Low Density
Driving Costs	$6,826	$11,115	$18,097
Transit Fares	$331	$284	$47
Home Heating Costs	$1,515	$1,647	$2,242
Total Cost	**$8,671**	**$13,046**	**$20,386**

ANNUAL EXTERNAL COSTS OF AUTOMOBILE USE PER HOUSEHOLD

Annual External (hh)	Downtown Core / High Density	Downtown Core / Medium Density	Outer Suburbs / Low Density
Motor Vehicle Collisions	$354	$558	$1,464
Air Pollution	$51	$81	$212
Climate Change	$60	$95	$248
Total Cost	**$466**	**$733**	**$1,924**

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13 VIEWING USER COMMENTS (STEP 9)

At the end of most Steps, the user has the option of adding notes / comments and a number of input fields provided. This is intended to help with interpretation at a later stage about sources of input values, assumptions made, inclusions and exclusions, etc. These comments are unique to the current scenario.

Upon completion, the user can view and print all the combined comments in Step 9.

14 PRINTING

To print results, comments, or any other Step; select (File>>Print>>OK). Printing settings (i.e. Print Area settings) are already pre-set.