Clair-Maltby

Transform. Connect. Community.

Energy and Other Utilities Study – Background and Technical Work

June 16, 2021

City of Guelph

Making a Difference

Energy & Other Utilities Study – Final Phase Report

Contract Name: Master Environmental Servicing Plan and Secondary Plan Study for Clair-Maltby
Project Location: City of Guelph
Wood Project Number: TPB168050

Prepared for:

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04 August 2020

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1.0 Study Background

The Clair-Maltby area in the City of Guelph (the City), located in the City's southeast quadrant, has a land base of approximately 415 hectares bordered by Clair Road, Victoria Road, and Maltby Road to the north, east, and south respectively. This land parcel is the last unplanned greenfield site in the City.

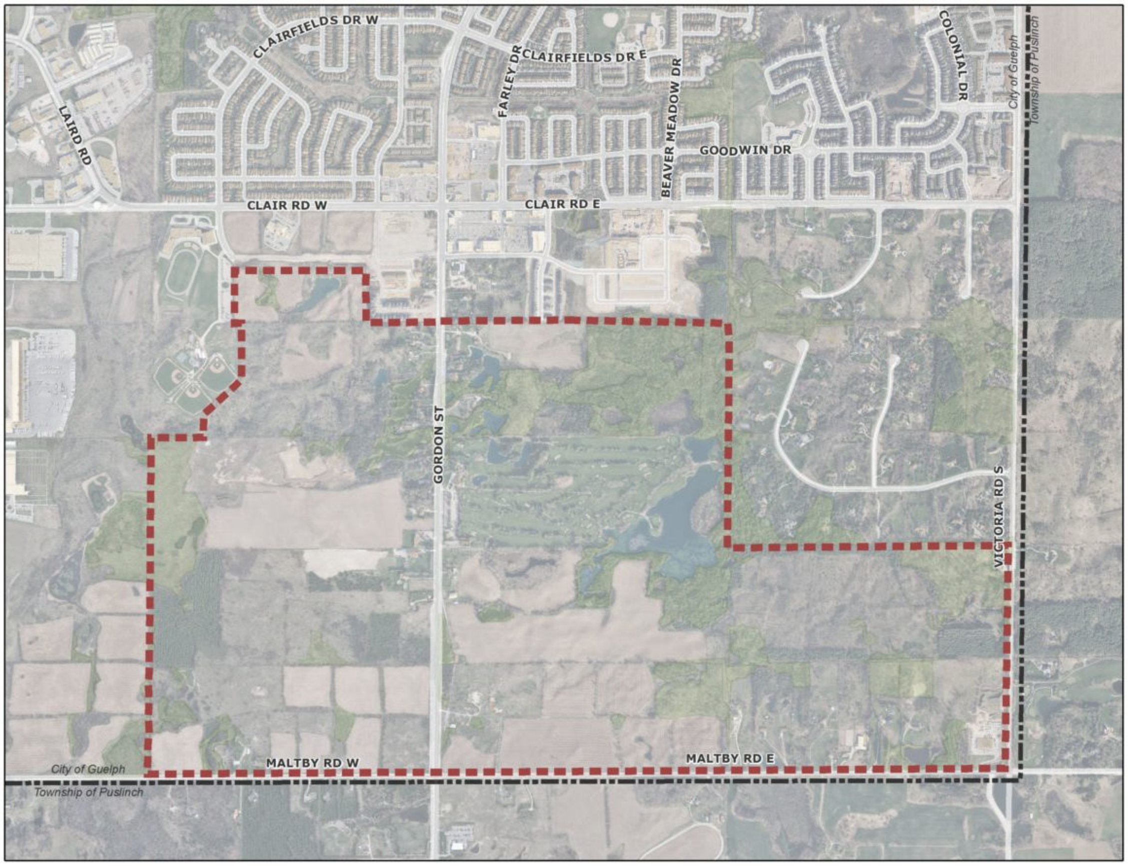


Figure 1-1: 2012 Orthophoto Clair-Maltby Secondary Planning Area (Image Source: City of Guelph)

In 2016, the City commissioned a Master Environmental Servicing Plan (MESP) and Secondary Plan Study for the Clair-Maltby Secondary Plan Area (SPA) as per the Terms of Reference (TOR). The TOR also defined a Primary Study Area (PSA) which constitutes the SPA plus lands within 500 m of the SPA boundary (Figure 1-2). The Secondary Plan, intended to establish a preferred land use plan for the Clair-Maltby site, will inform a number of the new community's attributes such as the land use mix, built form densities, and urban design.

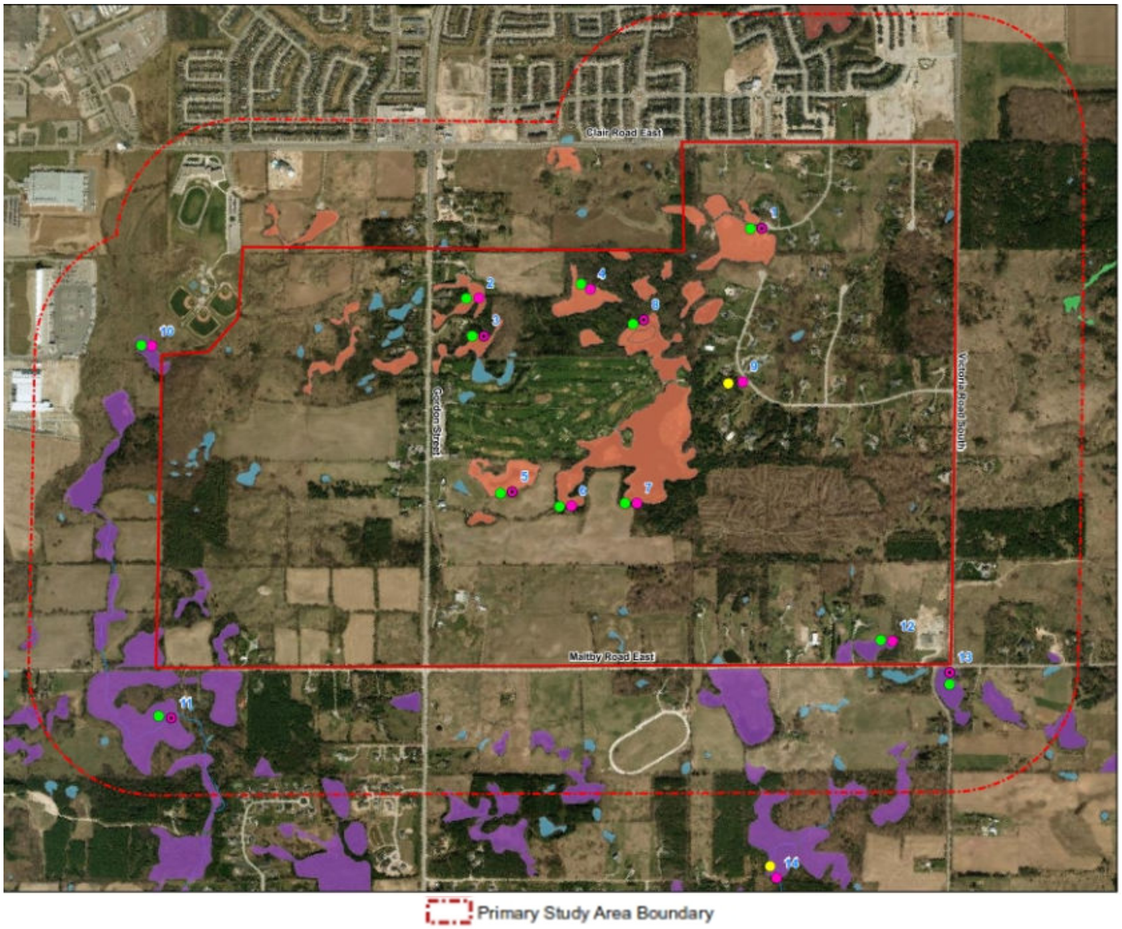


Figure 1-2: Clair-Maltby Primary Study Area Boundary

The MESP and Secondary Plan Study are comprised of different study components, one of which is the Energy & Other Utilities study (henceforth referred to in this report as the 'EOU study'). In 2017, Wood completed a preliminary assessment (Phase 1) under the EOU study; the Phase 1 report covered the following elements:

- A summary of policies, plans, and programs relevant to energy
- An analysis of the City's energy and water use trends
- Technical work plan for the final assessment of the EOU study

This report constitutes the technical findings from the final assessment in the context of the energy and water demand of the new community's built environment and associated infrastructure. The following are addressed in this report:

- Updates[1] to policies, plans, and programs relevant to energy
- Energy and water use estimated baseline for the recommended Clair-Maltby Community Structure[2] (henceforth referred to in this report as the 'Clair-Maltby Community')

[1] Since time of the Phase 1 report submission
[2] In May 2019, the City released an updated preferred community structure for the Clair-Maltby Secondary Plan which was accepted by City Council.

- Potential energy and water savings for higher efficiency scenarios, versus a baseline scenario, for the Clair-Maltby Community
- Potential measures that can assist with achieving the higher efficiency scenarios

2.0 Update to Policies, Plans, and Programs

Since release of the Phase 1 report in June 2017, there have been policy changes in the area of energy, both at the provincial and federal levels. There has also been some transformation to certain government programs, as well, the preparation of additional community studies by the City relevant to the EOU study. This section discusses the pertinent updates in the realm of policies, studies, and programs.

2.1 Greenhouse Gas Pollution Pricing Act

Under the Greenhouse Gas Pollution Pricing Act (GGPPA) passed by the Canadian government in June 2018, the federal government has implemented a federal carbon pollution pricing system [1]. The carbon pricing system is applicable in provinces and territories with no carbon pricing mechanism in place or with a pricing mechanism that falls short of the established federal criteria. In general, the carbon pricing mechanism under the GGPPA entails the following:

- A fuel charge applicable to the use of fossil fuels such as gasoline, diesel, and natural gas, and typically paid for by the fuel producers/distributors with end-users being passed on these charges at their point of purchase (fuel charge impact is 4.42 cents per liter of gasoline and 3.91 cents per cubic meter of natural gas in 2019; note this fuel charge will increase over time) [2]
- An output-based (i.e., emissions per unit output) pricing system applicable to emission-intensive industrial facilities

Under the proposed plan, proceeds from the federal price on carbon pollution will be revenue- neutral and distributed to the respective jurisdiction of origin. In Ontario, beneficiaries of these proceeds will include:

- Individuals/families through the Climate Action Incentive Payment
- The MUSH[3] sector, small and medium-sized enterprises, not-for-profit organizations, and Indigenous communities
- Greenhouse gas (GHG) reduction initiatives

The provincial government in Ontario currently has a legal action[4] underway challenging the GGPPA [3]. In the interim, the Ontario government has released its Greenhouse Gas Emissions Environmental Performance Standard (EPS Regulation; O. Reg. 241/19) which sets GHG limits for emission-intensive covered facilities effective July 2019. Based on the current status of the province's legal challenge to the GGPPA, as of this report, the federal output-based pricing system remains in effect in Ontario and the compliance aspect of the EPS Regulation is not in force in the province.

2.2 The Cap and Trade Cancellation Act

Ontario's Climate Change Mitigation and Low-carbon Economy Act which came into effect in July 2016 had established an emission trading program (cap-and-trade program) in the province. The proceeds from the cap-and-trade program were intended to be invested into GHG reduction initiatives/programs.

[3] Acronym for municipalities, universities, school boards and hospitals
[4] Ontario Court of Appeal has held the GGPPA as constitutional; Ontario government intends to appeal to the Supreme Court with hearing expected to commence in March 2020 (Source: https://www.osler.com/en/resources/regulations/2019/ontario-court-of-appeal-upholds-constitutionality-of-federal-carbon-pricing-regime, https://www.theglobeandmail.com/opinion/article-the-solomons-choice-that-could-render-ottawas-carbon-pricing/

The Cap and Trade Cancellation Act passed in 2018 repealed the Climate Change Mitigation and Low-carbon Economy Act winding down the cap-and-trade program (several of GHG reduction programs such as the GreenON program were cancelled as a result), but has provisions that require the Ontario government to establish GHG reduction targets and to prepare a climate change plan along with progress reports with respect to the plan [4].

2.3 Cancellation of the Electric and Hydrogen Incentive Program

In 2018, the Ontario government cancelled the Electric and Hydrogen Incentive Program (EHVIP). The EHVIP had offered incentives ranging from $5,000 to $14,000 for purchase of new eligible fully electric and plug-in hybrid vehicles. Presently, there are no rebate programs offered by the provincial government for purchase of electric or plug-in-hybrid vehicles.

2.4 Federal Incentives for Purchase of Zero-Emission Vehicles

Effective May 1, 2019, the federal government offers point of sale incentive for customers who purchase or lease eligible zero-emission vehicles (ZEVs). There are two levels of incentive [5]:

- An incentive of $5,000 for battery-electric, hydrogen fuel cell, and longer-range plug-in hybrid vehicles
- An incentive of $2,500 for shorter range plug-in hybrid electric vehicles

The federal government has also set new ZEVs sales target for Canada of '10 percent of new light-duty vehicle sales by 2025; 30 percent by 2030; and 100 percent by 2040' [5].

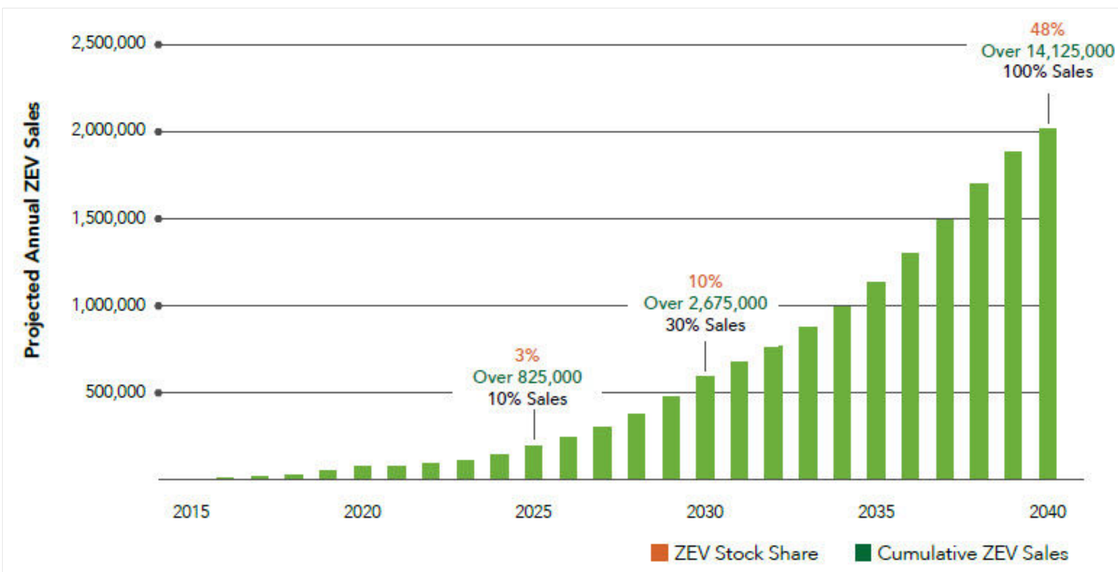


Figure 2-1: Projected Annual ZEV Sales in Canada (Image Source: [5])

2.5 Used Electric Vehicle Incentive Program

Plug'n Drive, a non-profit organization, in collaboration with Clean Air Partnership, has launched the Used EV Incentive program offering $1,000 as rebate to purchasers of used fully electric and plug-in hybrid electric cars with a re-sale sticker price below $50,000 [6].

2.6 Cancellation of Save on Energy Programs

In 2019, the Ontario government cancelled many electricity conservation programs which were delivered by local utilities including the following new construction related province-wide programs:

- Residential New Construction[5]
- High Performance New Construction[6]

2.7 Green Energy Repeal Act, 2018

In 2018, with passing Bill 34, Green Energy Repeal Act, the Ontario government repealed the Green Energy Act (GEA) passed in 2009 citing its contribution to rising electricity rates in the province [7]. The GEA had, through the Feed-in-Tariff (FIT) program, established a basis for a guaranteed pricing structure for renewable energy projects. Applications are no longer accepted under the FIT program. The Green Energy Repeal Act has also increased (through changes to the Planning Act and Environmental Protection Act) the power of local governments to not accept renewable energy project applications [7].

2.8 Made-in-Ontario Environment Plan

Under the provisions of the Cap and Trade Cancellation Act, the Ontario government released its Made-in-Ontario Environment Plan (henceforth referred to as OEP in this report) in November 2018 [8]. The OEP, required to be reviewed on a four-year basis, lists priorities and actions that will guide the province's GHG reduction and climate change activities. Figure 2-2 and Figure 2-3 are excerpts from the OEP; the former figure depicts the provincial government's forecast GHG reduction trend over the 2016 to 2030 horizon towards meeting the province's 2030 GHG target and expected to be achieved through implementing the policies and actions in the OEP, while the latter figure lists specific action item categories and depicts their estimated potential in contributing to the province's GHG reduction goal.

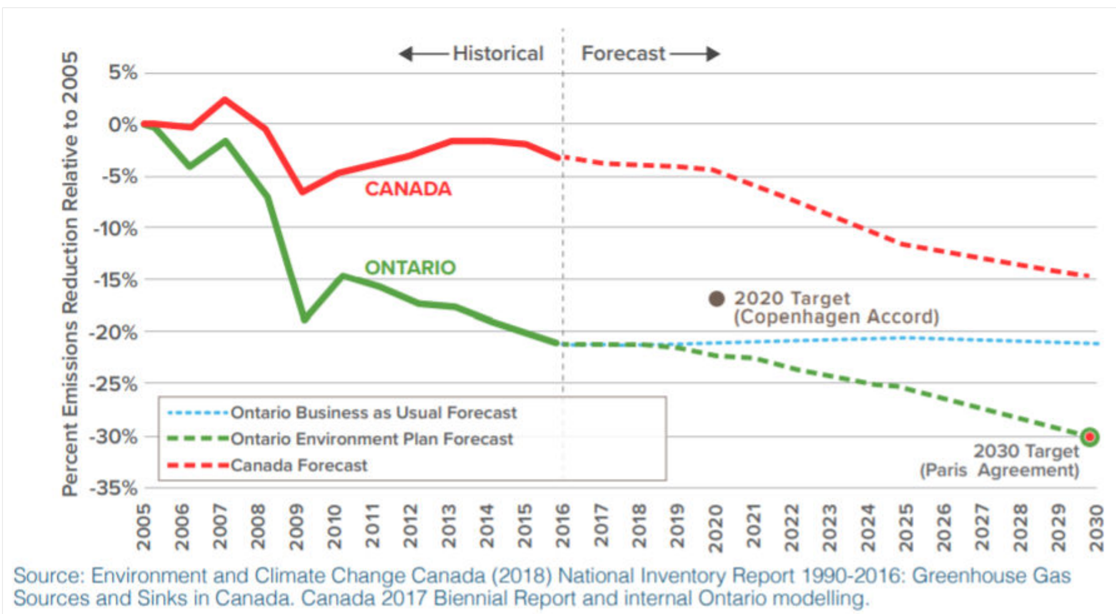


Figure 2-2: Forecast GHG Reduction Trend in ON – 2016 to 2030 Horizon (Image Source: [8])

[5] Incentives for incorporating energy efficiency into new home construction, or extensive home renovation projects, in ON
[6] Incentives for design assistance for new construction projects that, from an electrical energy performance perspective, exceed the Ontario Building Code

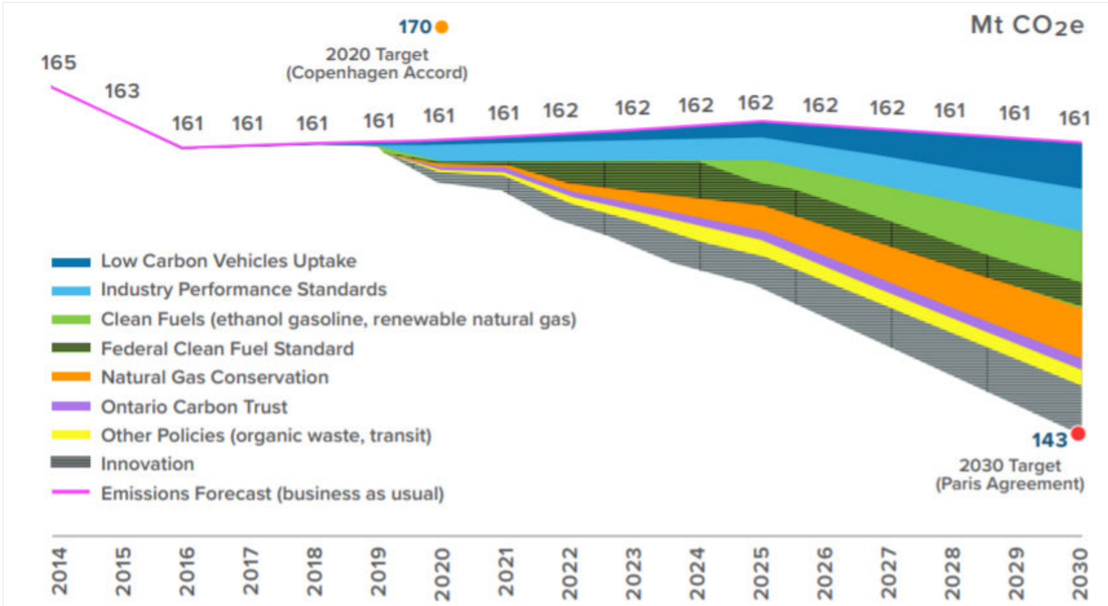


Figure 2-3: Action Item Categories – Contribution to ON's GHG Reduction Goal (Image Source: [8])

Select action item categories from Figure 2-3 relevant to the EOU study, and their expected impact on resource use and GHG emissions for the Clair-Maltby Community are summarized in Table 2-1. Figure 2-4, excerpted from the OEP, depicts the estimated contribution (in terms of % reduction) of the various action item categories to the different sectors contributing to the province's GHG footprint. As observed in Figure 2-4, specific to the built environment segment[7], the province has identified the Natural Gas Conservation and Ontario Carbon Trust action item categories as expected to contribute significantly to the built environment's GHG reduction mandate.

Table 2-1 Select Action Item Categories and Impact on Clair-Maltby Community Resource Use

Action item category	Description	Positive impacts
Low Carbon Vehicles Uptake	Uptake of electric vehicles (EVs)	Will reduce carbon-intensive fossil fuel use
Clean Fuels/ Federal Clean Fuel Standard	Ethanol content in gasoline, renewable natural gas (RNG), low carbon fuel (reduce carbon intensity in fuel), and Federal standards (redesign of emission testing and standards and driving uptake of low-carbon fuels)	Will reduce carbon pollution from transportation fuels
Natural Gas Conservation	Expansion of utility incentive programs	Will increase uptake of energy conservation/efficiency measures through financial assistance

[7]Note while this will include both existing and new building construction, the former is not applicable to the Clair-Maltby Community

Action item category	Description	Positive impacts
Innovation	Advances in technology such as energy storage or fuel switching	Will support implementation of alternative/clean energy sources
Ontario Carbon Trust	Emission reduction fund to leverage and unlock private investment in commercially viable clean technologies	Will accelerate deployment of low-carbon solutions

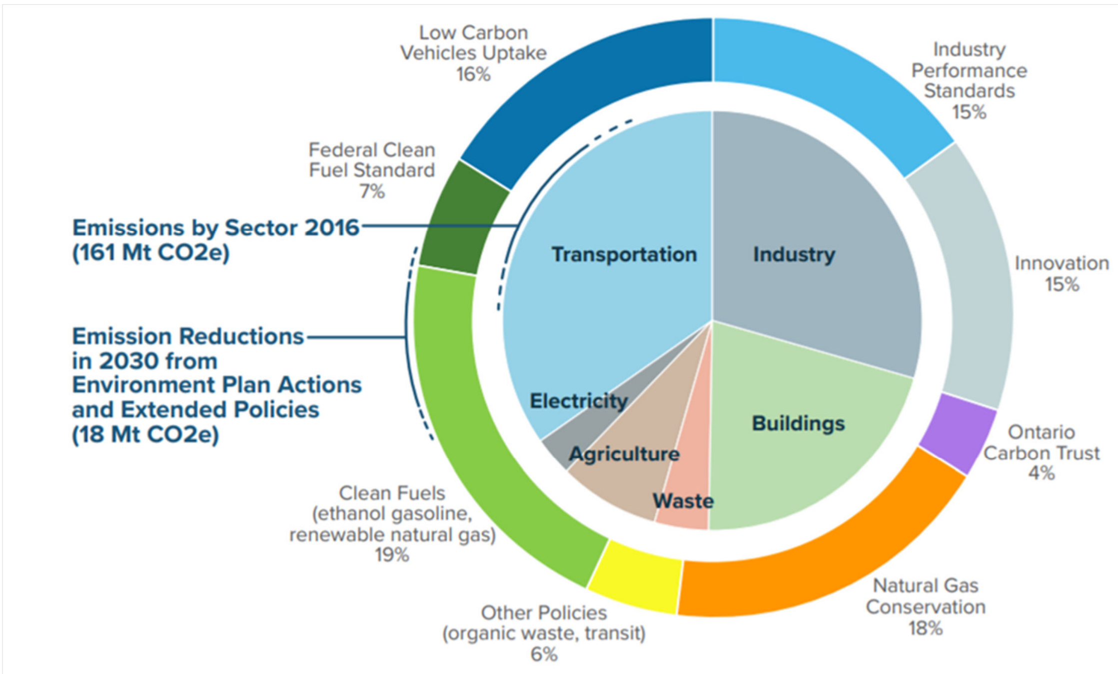


Figure 2-4: Inner Pie Sector-wise Breakdown of Ontario's 2016 GHG Emissions, Outer Pie – Contribution Breakdown by Action Category to Ontario's GHG Reduction (Image Source: [8])

From reviewing the OEP, the following initiatives and actions which are among the list of areas the province has elected to focus, are considered most relevant to the Clair-Maltby Community:

- Supporting adoption of energy efficiency measures in buildings including through reviewing the Building Code
- Ensuring equipment and appliance provincial energy efficiency standards continue to be among the top in North America
- Encouraging use of heat pumps for space heating and water heating application
- Working with Ontario Real Estate for voluntary display of home energy rating on listings
- Encouraging deployment of community-based systems such as district energy
- Requiring gas utilities to implement a voluntary renewable natural gas option for consumers
- Supporting the integration of smart grid technologies and distributed resources (e.g. energy storage)
- Working with local governments to support transition to a low-carbon future

2.9 Community Energy Plan Update - 2018

The City released a Community Energy Plan (CEP) in 2007, the first in Canada. Two key targets were established in the CEP, one to reduce the City's energy use by 50%, and the second to reduce the City's GHG emissions by 60% (per capita basis), both as 2031 targets, and over the year 2006 as the base year [9]. In 2010, the CEP was renamed the Community Energy Initiative (CEI) to represent a transition to implementation aspects [10]. A CEI update was presented to City Council in May 2018 with Council accepting all the recommendations made in the CEI update. Under the CEI update, twenty potential actions to reduce energy use and achieve GHG reduction were short-listed and priority ranked by the City. These short-listed actions are listed below in their order of priority:

- Retrofit homes pre-1980
- Retrofit industrial, commercial, and institutional (ICI) buildings
- Stricter codes on new build
  - Supporting advocacy efforts for more stringent provisions related to energy efficiency and on-site renewable energy in the Ontario Building Code (OBC)
  - Considering adoption of more stringent Green Development Standards specific to the jurisdiction of Guelph
- Photovoltaic (PV) net metering
  - Supporting advocacy efforts for net metering options such as Virtual Net Metering (VNM), 3rd Party Ownership (3PO), and Multiple Entity Virtual Net Metering (MEVNM), which are all currently being considered by the Ontario government
- Electrify transit
- Heat pumps
- Retrofit homes 1980-2017
- Large Photovoltaic
- Active transportation
- Energy storage
- Electrify fleets (including the municipal fleet)
- Expand transit
- District energy
- Solar hot water
- Wind energy
- Renewable natural gas
- Electrify personal vehicles
- Ride share programs
- Car free zones
- Autonomous vehicles

Also, as an outcome of the CEI update, the City established a new target of **becoming a net zero carbon community by 2050.** Under the ambit of the CEI update, various study components were completed, one of which was the Metrics and Analysis component. The Metric and Analysis component[8] comprised of two phases, as per following:

Phase 1 – Development of a baseline inventory for 2016 along with a base case projection to 2050 depicting the City's energy use and GHG emissions accounting for population and employment growth projections and assuming no implementation of new policies, actions, or strategies other than those planned or underway to reduce energy use and GHG emissions [11]

Phase 2 - Modeling of twenty-five specific actions[9] using a simulation tool and establishing their GHG reduction potential towards identifying a coherent low carbon pathway to meet the City's net zero carbon target [12]

The twenty-five specific actions selected for analysis under the Metrics and Analysis Phase 2 study scope were informed by the CEI update process and preliminary list of actions, and the Metrics and Analysis Phase 1 findings. Table 2-2 and Table 2-3 summarize key information/data, relevant to the EOU study, extracted from the Phase 1 and Phase 2 reports respectively. Six of the twenty-five specific actions (henceforth referred to in this report as 'select low carbon pathway measures') are short-listed in Table 2-3 along with their corresponding estimated GHG reduction contribution[10]. These six actions are considered relevant to the Clair-Maltby Community.

[8] Sustainability Solutions Group (SSG) led the Metrics and Analysis study component; charts inserted in Table 2-2 and Table 2-3 are excerpted from SSG's reports

[9] Quoting from [12], action is defined as an intervention supported by policy or other mechanisms that can be led by the City or its partners to reduce GHG emissions

[10] GHG reduction potential is based on the modelling results from work under the Metrics and Analysis Phase 2 component

Table 2-2 Metric Analysis component – Key Information from Phase 1 Report (Source: [11])

Item description	Year 2016 (Baseline)	Year 2050 Projection - Comments
Population (people)	148,172	-
Employment (jobs)	77,674	-
Households	55,901	-
Total energy consumption (GJ)	25.09 million	-
Total local energy production[11] (GJ)	986,000	-
Total emissions (Mt CO_2e)	1.16	-
Commercial sector energy consumption (GJ)	7,543,600	Over the projected horizon, while improved building code and equipment standards, and reduced heating degree days will reduce energy consumption, population growth and housing stock growth will increase energy use.
Residential sector energy consumption (GJ)	5,404,300	
Transportation sector energy consumption (GJ)	5,473,400	Over the projected horizon, while improvement in vehicle fuel efficiency standards will reduce energy use (assumed to flatline after 2035), increase in uptake of electric vehicles will increase electricity consumption, and increase in vehicle kilometers traveled will increase energy consumption
Building sector energy consumption (GJ)	18.7 million	-
Commercial sector emissions (kt CO_2e)	275,300	-
Residential sector emissions (kt CO_2e)	208,400	-
Transportation sector emissions (kt CO_2e)	374,200	-
Per capita energy (GJ/person)	169	-
Per household residential energy use (GJ/household)	97	-

[11] Includes district energy generation, solar PV generation, and landfill biogas energy production

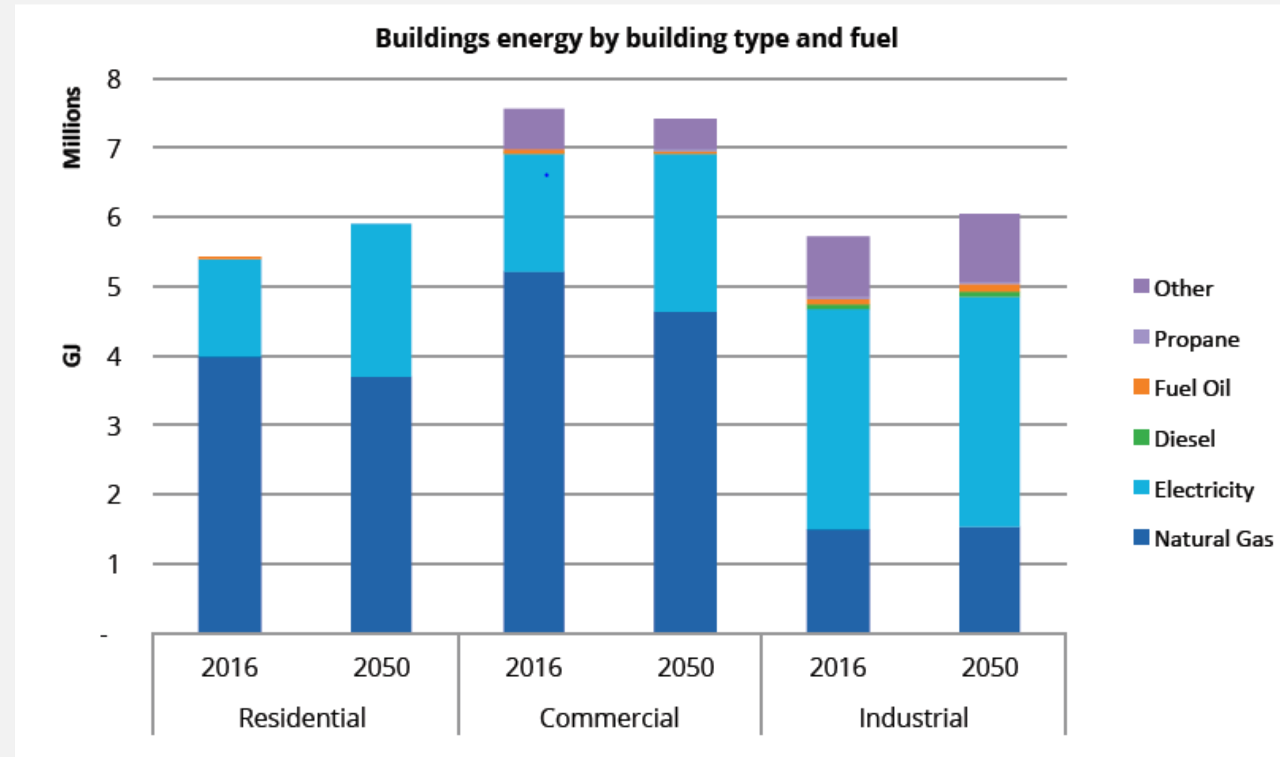
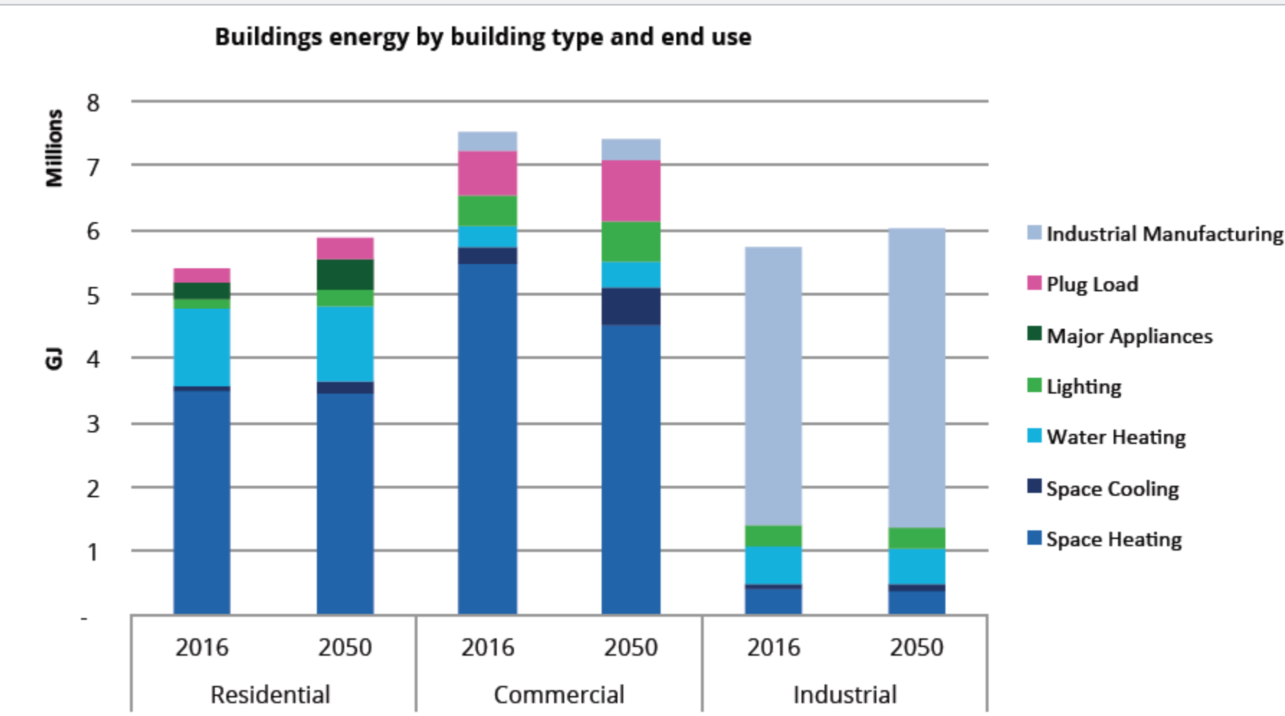
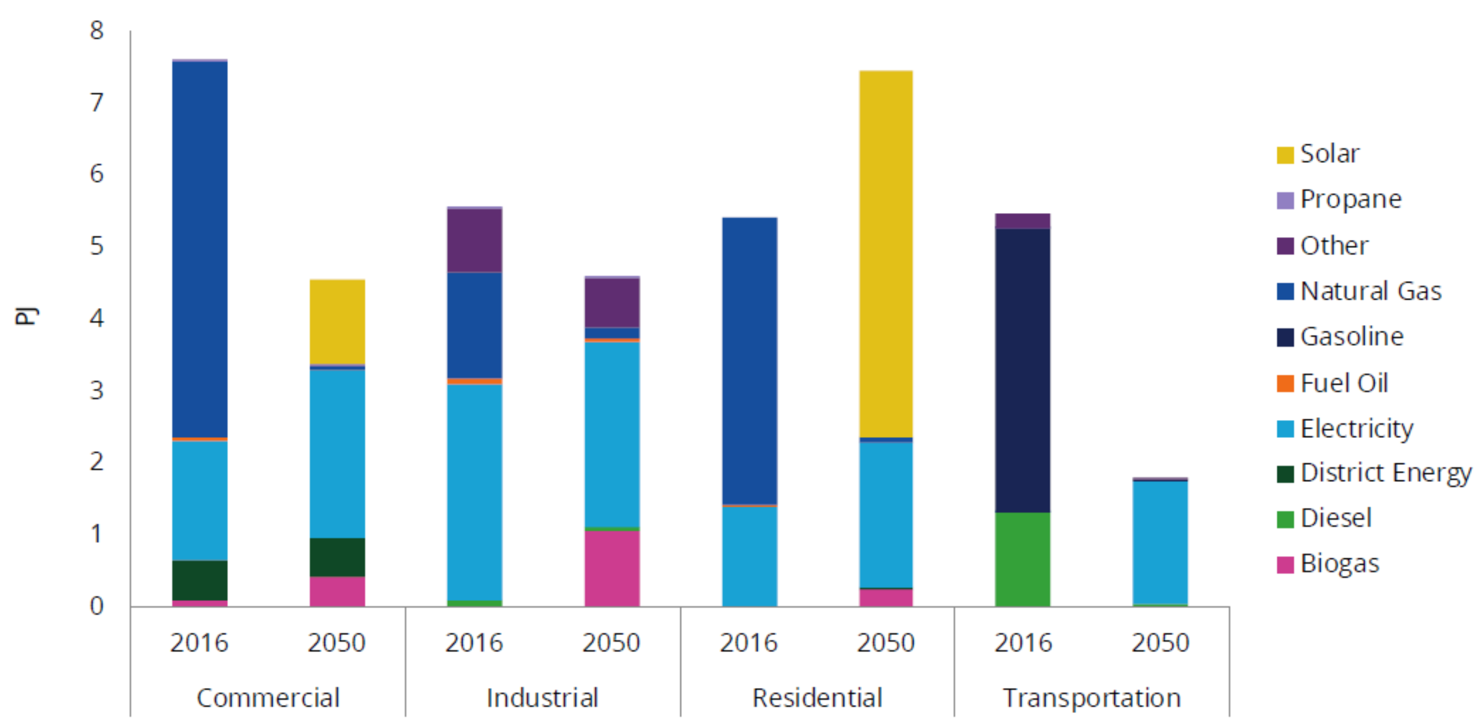
Item description	Year 2016 (Baseline)	Year 2050 Projection - Comments
Buildings energy by building type & fuel		
Buildings energy by building type & end use		

Table 2-3 Metric Analysis component – Key Information from Phase 2 Report (Source: [12])

Segment	Action	Year 2050 (Projected GHG reduction in kt CO_2e)	Comments
Future buildings	1) Incrementally increase the number of new net-zero energy homes to 100% by 2030.	36	Collectively, these six specific actions are estimated to contribute to a 52% reduction in GHG emissions versus the 2016 baseline GHG emissions.
	2) Incrementally increase the number of non-residential buildings which achieve Passive House levels of performance to 100% by 2030	41	
Energy systems	3) Air source heat pumps are added to 50% of residential buildings and 30% of commercial buildings by 2050 Ground source heat pumps are added to 20% of residential and 40% of commercial buildings by 2050	274	
	4) Solar PV systems are installed on 80% of all buildings by 2050.	3	
	5) Heat pumps for hot water installations are scaled up to 80% of residential buildings by 2050, and 50% of commercial buildings by 2050	34	
Transportation	6) 100% of new passenger vehicles are electric by 2030	190	
Total emissions (kt CO_2e)	All twenty-five specific actions implemented by 2050	940	Combined, the twenty-five specific actions are estimated can reduce GHG emissions from 1,104 kt CO_2e to 93 kt CO_2e; this reduction is expected to be driven by electrification and phasing out of fossil fuel use in the City.
	2050 versus 2016		
Energy mix and energy consumption			

3.0 Clair-Maltby Community Business-As-Usual Baseline Energy and Water Consumption Scenario versus Higher Efficiency Scenarios

As outlined earlier, in May 2019, the City released an updated preferred community structure for the Clair-Maltby Secondary Plan (Figure 3-1) which was accepted by City Council. Table 3-1 summarizes the land use budget[12], including units per hectare and people per unit targets, for the preferred community structure which formed the basis of a consumption scenarios analysis (energy and water consumption related) conducted by Wood for the Clair-Maltby Community.

The energy consumption scenarios analysis comprised of establishing a business-as-usual (BAU) baseline scenario and two higher efficiency scenarios (termed Higher Energy Efficiency Scenario – I & Higher Energy Efficiency Scenario – II respectively). More specifically, the energy consumption scenarios analysis consisted of:

- Assigning a baseline energy use intensity[13] (EUI expressed in gigajoules per square meter or in short, GJ/m^2) value to applicable land use types (that is, types hosting a built environment) and multiplying these assigned EUI values with the calculated total gross floor area (GFA) expected to be associated with the built environment in the respective land use types;
- Generating a BAU baseline energy map;
- Assigning higher efficiency EUI values[14]corresponding to the two higher efficiency energy scenarios; and
- Generating energy maps corresponding to the two higher energy efficiency scenarios.

The water consumption scenarios analysis, focused on the residential sector in the Clair-Maltby Community, and comprised of establishing a BAU baseline water consumption scenario and two higher efficiency scenarios (termed Higher Water Efficiency Scenario – I & Higher Water Efficiency Scenario – II respectively). More specifically, the water consumption scenarios analysis comprised of:

- Assigning a baseline water use intensity value (expressed in the unit liter per capita per day or in short, lpcd) to the residential land uses and multiplying these intensity values by the target number of units and the target number of people per unit values as stated in Table 3-1;
- Generating a total water consumption value specific to the residential sector in the Clair-Maltby Community;
- Assigning higher water efficiency intensity values to the two higher efficiency water use scenarios; and
- Generating a total water consumption value corresponding to the two higher water efficiency scenarios respectively.

Table 3-2 and Table 3-3 present the results of the scenarios analysis including the assumptions and values applied, and the compliance pathways expected to contribute to the higher efficiency scenarios. Table 3-4 and Table 3-5 that follow, list potential measures that can assist with achieving the respective higher efficiency scenarios. Figure 3-2, Figure 3-3, and Figure 3-4 depict energy use visualization maps[15] generated for the BAU, Higher Energy Efficiency Scenario – I, and Higher Energy Efficiency Scenario – II scenarios respectively in the context of the preferred community structure.

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[12] Provided by the City
[13] Sourced from Reference [14]
[14] Sourced from Reference [14]
[15] The energy maps were generated based on the updated zipped geodatabase file shared by the City in August 2019

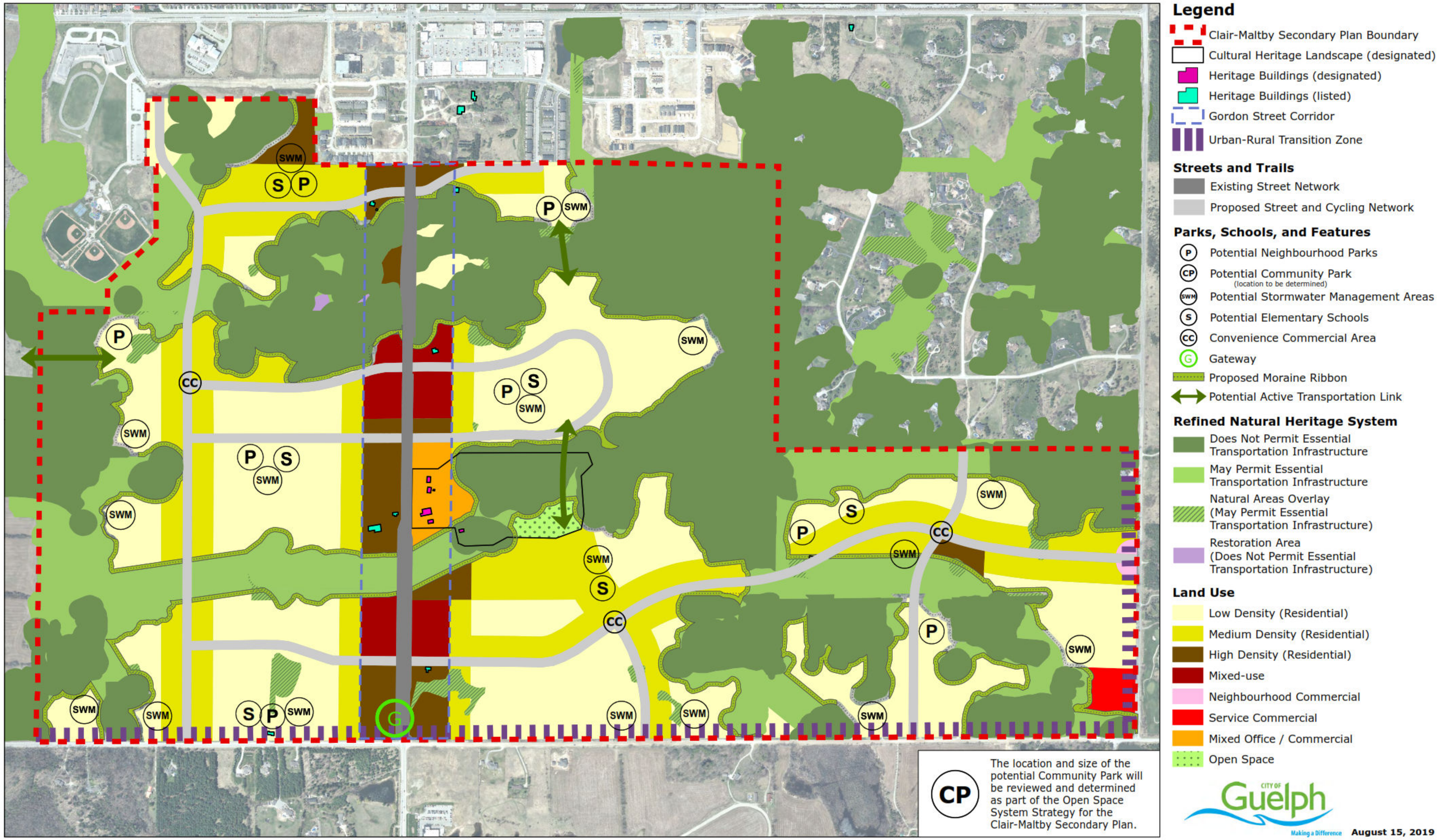

Figure 3-1: Clair-Maltby Preferred Community Structure Map

Table 3-1 Land-use Budget for Preferred Community Structure

Land use	Gross Area (ha)	Net Area (ha)	Target number of units	Target number of people per unit	Target number of people per land use category	Gross floor area assigned to a unit[16] (m^2)	Assumptions for scenarios analysis
Low Density Residential	90.54	63.31	2,051	3	6,153	153.3	Low density residential comprising of a mix of detached housing and townhouses
Medium Density Residential	46.35	35.70	2,440	2	4,880	70	Archetype building - Multi-unit residential building with each building accommodating 56 units; 68 units per hectare as target number of units per hectare
High Density Residential	14.14	12.00	2,099	2	4,198	100	175 units per hectare as target number of units per hectare
Mixed Use	8.05	6.80	-	-		-	Mix of commercial and residential use
Neighborhood Commercial	0.40	0.36	-	-		-	Building to parcel footprint ratio of 0.24 assigned based on observed average building density in the south end area of the City
Service Commercial	1.88	1.34	-	-		-	Building to parcel footprint ratio of 0.24 assigned based on based on observed average building density in the south end area of the City
Office Commercial	3.88	3.06	-	-		-	Building to parcel footprint ratio of 0.24 assigned based on observed average building density in the south end area of the City
School	11.35	11.05	-	-		-	Building to parcel footprint ratio of 0.3 assigned based on observed average building density in the south end area of the City

Note(s)

1. The Gross Area represents the total gross area of the respective land use while the Net Area is the gross area of the respective land use minus the hard and soft servicing.

[16] Assigned based on typical gross floor area (GFA) of housing units in the City's south end

Table 3-2 Energy Use Scenario Analysis (BAU & Higher Efficiency Scenarios)

	Residential			Non-Residential or Mixed					Total consumption (GJ)
	Low Density Residential	*Medium Density Residential*	*High Density Residential*	*Mixed*	*Neighborhood Commercial*	*Service Commercial*	*Office Commercial*	*School*	-
EUI (GJ/m²) BAU Scenario	0.45	0.71	0.68	-	0.68	0.68	0.68	0.75	-
EUI (GJ/m²) Higher Energy Efficiency Scenario - I	0.36	0.59	0.61	-	0.61	0.61	0.61	0.68	-
EUI (GJ/m²) Higher Energy Efficiency Scenario - II	0.23	0.47	0.49	-	0.43	0.43	0.43	0.61	-
GJ/ha BAU Scenario	2,235	3,390	11,956	2,515	1,640	1,640	1,640	2,250	-
GJ/ha Higher Energy Efficiency Scenario - I	1,784	2,825	10,698	2,264	1,468	1,468	1,468	2,025	-
GJ/ha Higher Energy Efficiency Scenario - II	1,115	2,226	8,495	2,037	1,036	1,036	1,036	1,823	-
Total GJ BAU Scenario	141,498	121,023	143,472	17,102	590	2,198	5,018	24,863	455,764
Total GJ Higher Energy Efficiency Scenario - I	112,945	100,853	128,376	15,392	528	1,967	4,492	22,376	386,929
Total GJ Higher Energy Efficiency Scenario - II	70,591	79,468	101,940	13,853	373	1,388	3,170	20,139	290,921
Basis of BAU Scenario	Ontario Building Code (OBC) - 2017	Ontario Building Code (OBC) - 2017	Ontario Building Code (OBC) - 2017	Assumed as mean of Medium Density Residential GJ/ha & Commercial GJ/ha BAU values	Ontario Building Code (OBC) - 2017	Ontario Building Code (OBC) - 2017	Ontario Building Code (OBC) - 2017	Ontario Building Code (OBC) - 2017	-
Basis of Higher Energy Efficiency Scenario - I	Energy Star® for New Homes Standard *(20% reduction versus BAU)*	4-6 Story MURB Toronto Green Standard (TGS) Version 3, Tier 1	High-rise MURB TGS Version 3, Tier 1	Assumed as 10% reduction versus BAU	Retail Building TGS Version 3, Tier 1	Retail Building TGS Version 3, Tier 1	Office Building TGS Version 3, Tier 1	Assumed as 10% reduction versus BAU	-
Basis of Higher Energy Efficiency Scenario - II	R-2000 *(50% reduction versus BAU)*	4-6 Story MURB TGS Version 3, Tier 2	High-rise MURB TGS Version 3, Tier 2	Assumed as 10% reduction versus Scenario I	Retail Building TGS Version 3, Tier 2	Retail Building TGS Version 3, Tier 2	Office Building TGS Version 3, Tier 2	Assumed as 10% reduction versus Scenario I	-

Table 3-3 Water Consumption Scenario Analysis (BAU & Higher Efficiency Scenarios)

	Land use[17]			
	Low Density Residential	*Medium Density Residential*	*High Density Residential*	
Lpcd BAU Baseline Water Efficiency Scenario	180	180	180	
Lpcd Higher Water Efficiency Scenario - I	153	153	153	
Lpcd Higher Water Efficiency Scenario - II	112	112	112	
				Total
BAU Baseline Water Efficiency Scenario (million liters/annum)	404	321	276	1001
Higher Water Efficiency Scenario – I (million liters/annum)	344	273	234	851
Higher Water Efficiency Scenario – II (million liters/annum)	252	-[18]	-	

Note(s)

2. References [15] and [16], informed assignment of the Lpcd metric for the three scenarios

[17] Mixed use land use excluded from the water consumption scenario analysis
[18] Higher water efficiency scenario II not modelled for medium density residential & high density residential assuming no uptake of rainwater harvesting opportunities

Table 3-4 Measures to assist with Higher Energy Efficiency Scenarios

Scenario	Measures list[19]
Low Density Residential Higher Energy Efficiency Scenario - I	Design to meet Energy Star® for New Homes Standard [17] Key improvement measures per standard versus the BAU scenario are - • Higher prescribed levels of insulation levels for the building envelope • Energy Star® rated fenestration and lower limit of window to wall ratio • Energy Star® certified appliances • More energy efficient space conditioning (heating and cooling) systems • Airtightness targets for whole house air leakage (2.5 to 3 ACH @ 50 Pascals)
Low Density Residential Higher Energy Efficiency Scenario - II	Design to meet R-2000 Standard [18] Key improvement measure per standard versus the Energy Efficiency Scenario – I is - • Higher air-tightness requirements (1.5 ACH @ 50 Pascals)
Medium Density Residential Higher Energy Efficiency Scenario - I	Meet TGS Version 3 Tier 1 for Low-Rise MURB Potential measures list (improvement versus BAU) to meet the TGS target include - • Triple glazing • Higher air-tightness requirements • Reduced building corridor pressurization (applicable where corridor pressurization ventilation strategy is adopted) • More efficient mechanical ventilation heat recovery • Reduced domestic hot water load
Medium Density Residential Higher Energy Efficiency Scenario - II	Meet TGS Version 3 Tier 2 for Low-Rise MURB Potential measures list (improvement versus Scenario – I) to meet the TGS target include - • High performance triple glazing • Higher air-tightness requirements • Higher efficiency mechanical ventilation heat recovery • Fuel switch measures (e.g. use of heat pumps) • Reduced domestic hot water load
High Density Residential Higher Energy Efficiency Scenario - I	Meet TGS Version 3 Tier 1 for High-Rise MURB Potential measures list (improvement versus BAU) to meet the TGS target include - • Triple glazing • Higher air-tightness requirements • Reduced corridor pressurization (applicable where corridor pressurization ventilation strategy is adopted) • More efficient mechanical ventilation heat recovery • Reduced domestic hot water load

[19] Measures list referenced from [14], [17], and [18]

Scenario	Measures list[19]
High Density Residential Higher Energy Efficiency Scenario - II	Meet TGS Version 3 Tier 2 for High-Rise MURB Potential measures list (improvement versus Scenario – I) to meet the TGS target include - • High performance triple glazing • Higher air-tightness requirements • Higher efficiency mechanical ventilation heat recovery • Fuel switch measures • Reduced domestic hot water load
Commercial Higher Energy Efficiency Scenario - I	Meet TGS Version 3 Tier 1 for Retail Buildings Potential measures list (improvement versus Scenario – I) to meet the TGS target include - • Mechanical ventilation heat recovery • Demand control ventilation
Commercial Higher Energy Efficiency Scenario - II	Meet TGS Version 3 Tier 2 for Retail Buildings Potential measures list (improvement versus Scenario – I) to meet the TGS target include - • High performance triple glazing • Higher air-tightness requirements • Dedicated outdoor air system with heat recovery
Office Higher Energy Efficiency Scenario - I	Meet TGS Version 3 Tier 1 for Office Buildings Potential measures list (improvement versus Scenario – I) to meet the TGS target include - • High performance building envelope • <50% window-to-wall ratio • High performance ventilation and cooling systems
Office Higher Energy Efficiency Scenario - II	Meet TGS Version 3 Tier 2 for Office Buildings Potential measures list (improvement versus Scenario – I) to meet the TGS target include - • High performance triple glazing • Higher air-tightness requirements • Dedicated outdoor air system with heat recovery and terminal heating and cooling

Table 3-5 Measures to assist with Higher Water Efficiency Scenarios

Scenario	Measures list[20]
Low Density Residential BAU to Higher Water Efficiency Scenario - I	The City's Blue Built Home certification – Bronze level [20] Measure options include: • Energy Star® certified appliances • WaterSense® labeled flow/flush fixtures • Greywater reuse • Rainwater harvesting system • Sub-metering
Low Density Residential BAU to Higher Water Efficiency Scenario - II	The City's Blue Built Home certification – Silver level [20] Measure options include: • Energy Star® certified appliances • WaterSense® labeled flow/flush fixtures • Greywater reuse • Rainwater harvesting system • Sub-metering
Medium Density Residential BAU to Higher Water Efficiency Scenario - I	Measure options include: • Energy Star® certified appliances • WaterSense® labeled flow/flush fixtures • Sub-metering
High Density Residential BAU to Higher Water Efficiency Scenario - I	Measure options include: • Energy Star® certified appliances • WaterSense® labeled flow/flush fixtures • Sub-metering

[20] Measures list referenced from [15], [16], [19], [20]

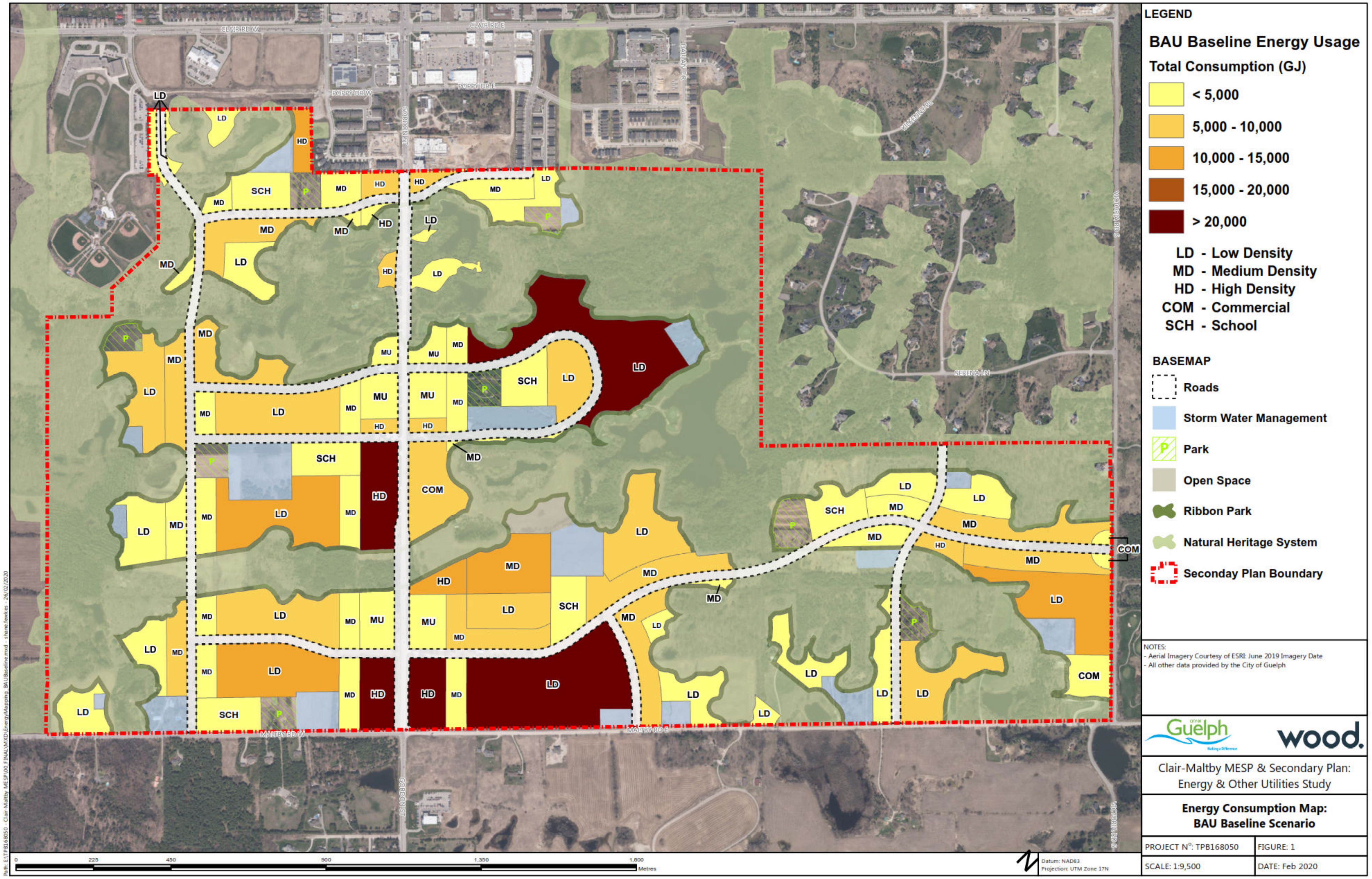

Figure 3-2: BAU Baseline Scenario Energy Map

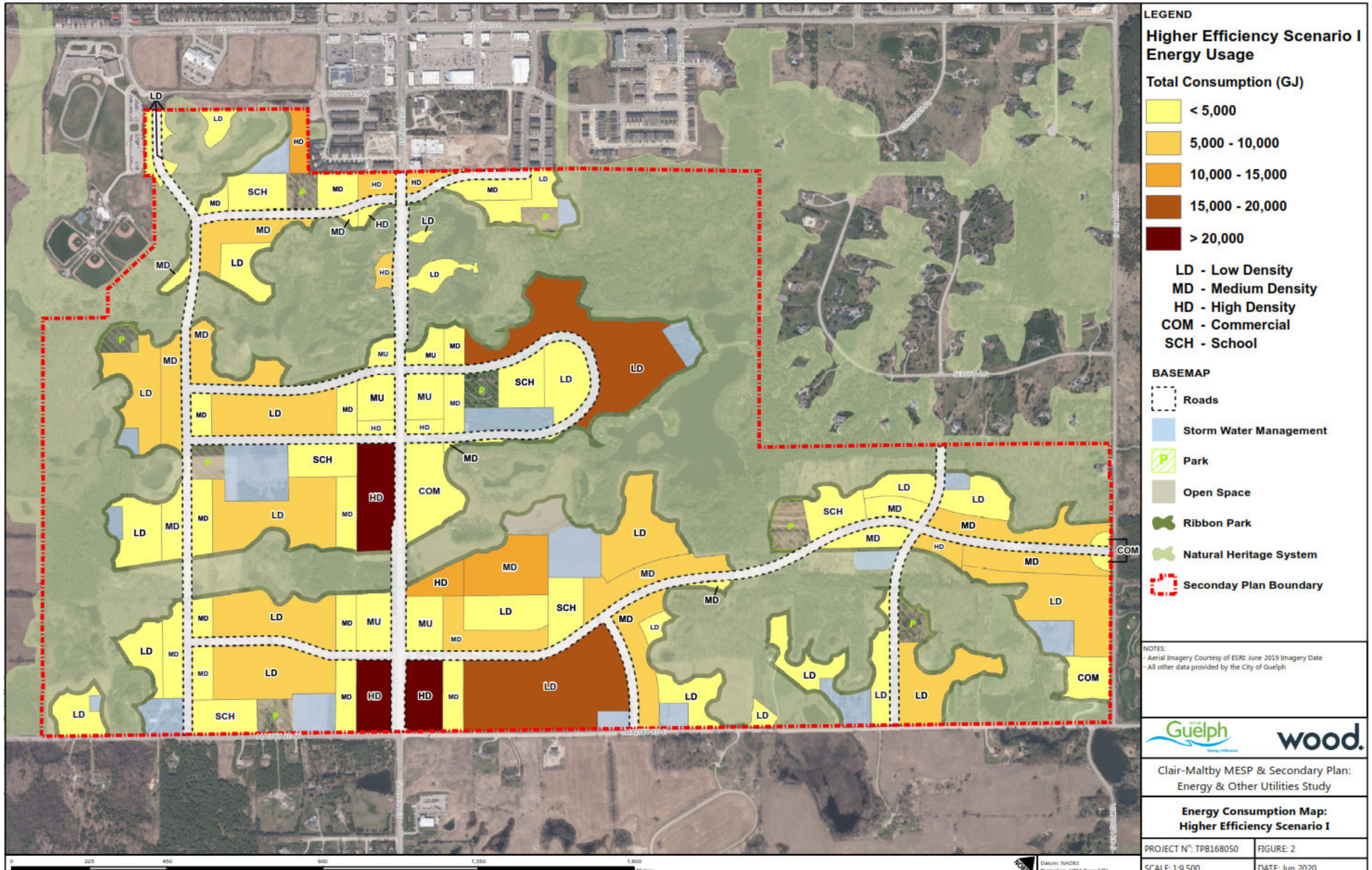

Figure 3-3: Higher Energy Efficiency Scenario - I Energy Map

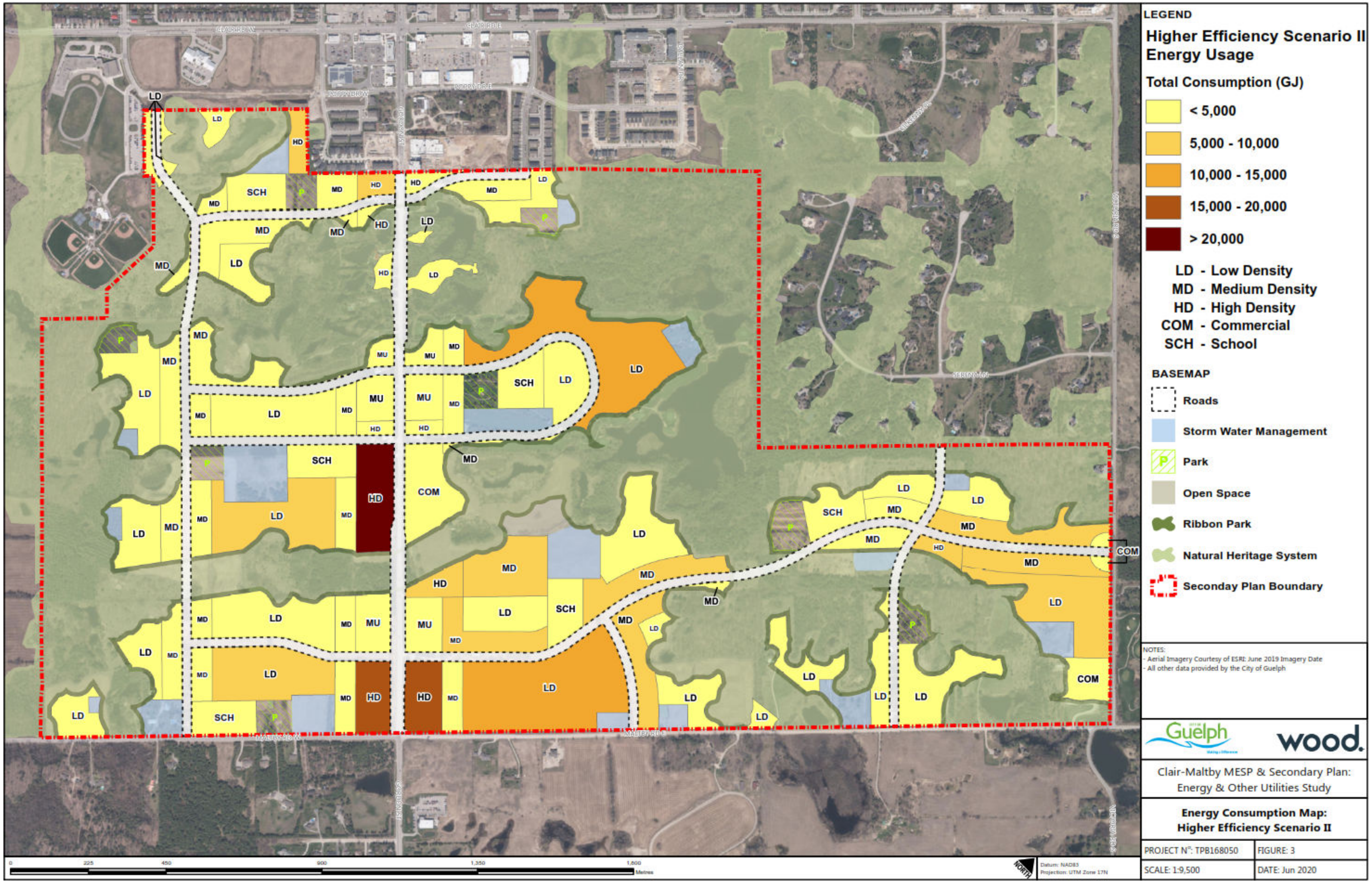

Figure 3-4: Higher Energy Efficiency Scenario - II Energy Map

4.0 Clair-Maltby Community - Infrastructure Servicing

The Water/Wastewater servicing study component of the MESP and Secondary Plan Study [13] recommends an elevated tank to provide the necessary water storage to meet peak demand, emergency, and fire storage requirements for the Clair-Maltby Community. Besides permitting a relatively constant pumping rate and maintaining a relatively constant system pressure, an elevated storage system, as opposed to an in-ground system[21], will permit access to any available storage without any pumping requirement as the flow from the storage tank is gravity-assisted. An in-ground storage system will not function in the event of a power outage unless adequate standby power is available, nor will it function if both lead and back-up delivery pumps fail. Besides operational simplicity, an elevated tank storage system could also permit an arrangement where the tank is drained over the day as a result of downstream demand and filled in during the night when electricity rates are typically lower[22].

Assuming a power consumption per total volume of water produced of 0.4 kWh/m^3, this suggests a potential savings of approximately 60,000 kWh/annum between the Higher Water Efficiency Scenario – I versus the BAU scenario specifically related to water distribution energy use for the Clair-Maltby Community.

5.0 Clair-Maltby Community – Impact of Select Low-Carbon Pathway Measures

This section discusses four (4) of the short-listed measures in Table 2-3, namely, air-source heat pumps[23] (ASHPs), air-source heat pump water heaters (ASHPWHs), roof-mounted solar photovoltaic (PV) systems, and electric vehicles (EVs), with potential to contribute to a lower GHG footprint for the Clair-Maltby Community.

5.1 Air-Source Heat Pumps

Space heating accounts for a significant portion (generally ~60%) of residential energy use in Ontario. ASHPs can be utilized for space heating applications in buildings. ASHPs operate by drawing heat from the ambient air through a refrigerant-to-air heat exchanger and transferring the heat to conditioned spaces within a building. The efficiency of ASHPs, denoted by the term coefficient of performance (COP[24]), drops with decreases in outside temperature[25] seasonally ranging in value from two to four [21]. However, this COP still implies two to four times more thermal energy output than the energy input to an ASHP unit. For comparison, an electric resistance heater has a COP of one and the most efficient natural gas fired heating systems have a thermal efficiency <100%. ASHPs can therefore offer a significant energy performance advantages, plus, in the context of Ontario's low carbon electricity system, ASHPs can significantly assist with decarbonization efforts through electrification of space heating. In the cooling season, under reversible operation, ASHPs can remove heat from the conditioned building spaces to be expelled into the outdoor environment. Past studies suggest a potential of at least 20% GHG savings with implementing a full-electric[26] ASHP in place of a conventional residential space heating system [22].

[21] The Clair-Maltby SPA falls under the 'Zone 3 pressure zone' for water distribution. At the Clair-Maltby SPA, the ground is not high enough for an underground reservoir to be constructed to meet the elevation requirements of Zone 3, thereby meaning water would have to be pumped to the reservoir and then repumped from the reservoir to the hydraulic grade line for distribution to end-users.

[22] The lower rate opportunity will offer significant cost reduction only if the water associated with Clair-Maltby has time-of-use pricing as its service rate structure.

[23] There are various heat pump technology types; only air-sourced systems are discussed here.

[24] Ratio of energy output (delivered as useful heat) to energy input (in the form of electricity or from fossil fuels)

[25] As outside temperature drops, it becomes more difficult to achieve heat extraction.

[26] Another type of ASHP is the hybrid type

5.2 Air-Source Heat Pump Water Heaters

Domestic hot water heating generally accounts for ~15% of residential energy use in Ontario. Hot water end uses in a residential household (Figure 5-1) typically include flow fixtures (showers, faucets), and appliances (washing machine, dishwasher). Similar to ASHPs, ASHPWHs utilize electricity to transfer heat from air to water thereby generating hot water supply [22]. In the process, heat is also removed from the interior space which can be advantageous in summer but less beneficial in winter[27].

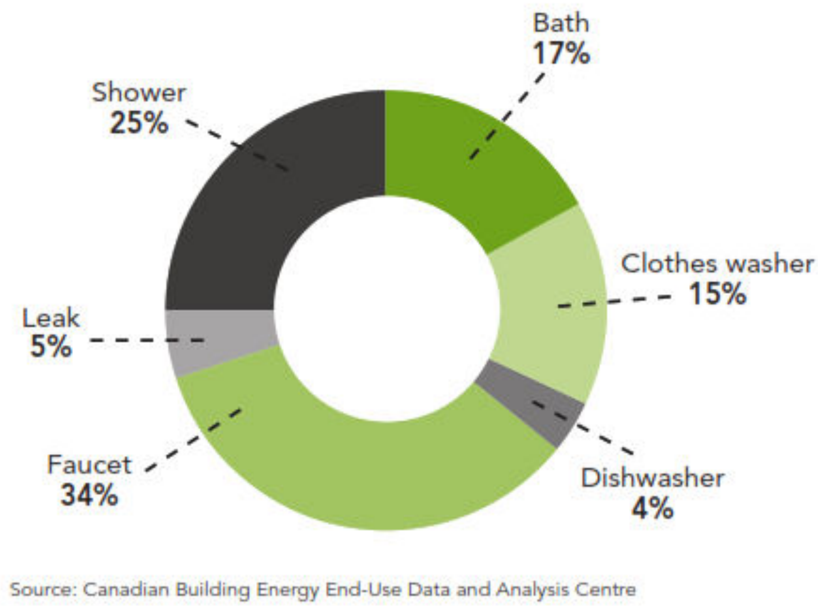

Figure 5-1: Household Hot Water End Uses (Image Source: [23])

Assuming a scenario where residential households in the Clair-Maltby Community implement an ASHPWH for hot water needs, past studies indicate a 15% GHG emission reduction potential relative to a base case scenario of natural gas water heating[28].

5.3 Roof-Mounted Solar PV

Solar power is produced by generating electricity from solar energy, a renewable clean source of energy and the most abundant energy source on earth. The conversion of sunlight into electricity can be achieved using PV systems. Assuming a scenario where roof-mounted PV systems are installed on every low-density residential building in the Clair-Maltby Community[29], the power generated by PV panels[30] on the roof is estimated to offset approximately 2.2 million kWh of electricity (7,920 GJ) from the grid.

5.4 Electric Vehicles

It is estimated that personal and light transportation within the City contributes to 30% of the City's energy use [25]. According to the CEP, the use of private cars accounts for a significant component of the City's energy use and trips using auto mode constitute the majority of commuter trips in the City.

[27] Options to address this include installing the ASHPWH in unconditioned spaces or switching operating mode so that the unit operates as an electrical resistance heater over the heating season [22].

[28] Also assumes natural gas for space heating and conventional air-conditioning for cooling in the base case scenario

[29] Assumes the houses can support a PV system installation

[30] Assumes (1) a generation potential of 900kWh/kW/annum based on reported generation data from the City's owned solar PV installations shared by the City, (2) available rooftop area as 0.5*0.3 of total rooftop area [24], and (3) 1.2kW per 10m^2 array area as generation capacity per area

Passenger vehicle fuel type being predominately gasoline entails a high GHG footprint. EVs are partially (e.g. plug-in hybrid electric vehicles) or fully powered (e.g. battery electric vehicles) by electricity offering a decarbonization pathway, as a result of the province's relatively clean grid supply.

The following considerations and assumptions formed the basis of a comparative assessment by Wood between a light vehicle use base case scenario, assuming no uptake of EVs by residents of the Clair-Maltby Community[31] , versus a low carbon scenario assuming uptake of EVs:

- Base case scenario aspects
  - Light vehicles per household – 1 (based on survey data reporting 1.45 light vehicles per household in Ontario [26])
  - Light vehicle category split between sedans and light trucks – 30% sedans and 70% light trucks (based on country sales profile in 2018 [27])
  - Average distance traveled by light vehicles per annum - 16,000 kilometers (based on survey data for Ontario [26])
  - Fuel type, consumption, and tail pipe emission rates based on combined rating data reported for representative vehicle models in each category as follows -
    - Gasoline fuel
    - 9 L/100 km fuel mileage & 230 grams CO_2/km emission rate for light trucks (averaged based on ratings reported for pick-up trucks, vans, and SUVs) [28]
    - 7 L/100 km fuel mileage & 165 grams CO_2/km emission rate for sedans [28]
- Low carbon scenario aspects – same as the base case scenario expect for the following changes -
  - Fuel type, consumption, and tail pipe emission rates based on combined rating data reported for representative vehicle models in each category as follows:
    - Gasoline fuel for all light trucks, and 90% of sedans, with the balance 10% of sedans as EVs
    - EV type is battery electric vehicles
    - 1.9 L_e/100 km or 16.9 kWh/100 km for EVs (sedans)
- Emission factors applied
  - 2.523 kg CO_2e/L for gasoline
  - 0.029 kg CO_2e/kWh for electricity

The results of the comparative assessment are presented in Table 5-1. A 10% uptake of electric vehicles in the sedan vehicle category can result in an estimated 2.4% GHG emission reduction versus the assumed base case scenario with no EVs.

[31] Note EVs currently make up ~2% of total passenger vehicle sales in the province (https://globalnews.ca/news/6298949/electric-vehicle-sales-down-ontario/)

Table 5-1 Comparative Assessment of Light Vehicle Use Base Case Scenario vs. Low Carbon Scenario

	Base case scenario	Low carbon scenario	% reduction
Fuel consumption (L)	8,856,960	8,635,536	2.5
Fuel consumption related GHG emissions (t CO_2e)	22,346	21,787	2.5
Electricity use (kWh)	0	535,392	-
Electricity use related GHG emissions (t CO_2e)	0	16	-
Total GHG emissions (t CO_2e)	22,346	21,803	2.4

Note(s)

3. Assume 10% uptake level of EVs in the low carbon scenario
4. Assume 6,590 household units

6.0 Clair-Maltby Community – Heating Density

District energy systems (DES) use a central energy plant to distribute thermal energy (heating and/or cooling) to multiple buildings from the centralized plant location through a network of underground piping. There are various factors that can influence the viability of a DES and some of these include:

- Development density
- Thermal loads, heat density, and presence of a steady base load
- Presence of anchor clients
- Linear heat density
- Economics
  - Cost of the central plant
  - Cost of energy generation (depends on energy source)
  - Cost of the distribution network and energy transfer stations
- Compatibility of building mechanical systems with DES
- Drivers for implementation (for e.g. CO_2 reduction potential)

Heat load density is only one among the various factors to determine DES viability. Figure 6-1 depicts, within each land use zone boundary, an estimate of the cumulative space heating demand expected from future buildings under the Higher Energy Efficiency Scenario–II setting. Assuming a heat density threshold of 140 MJ/m^2 [32] as the basis of a preliminary scan, only the high-density residential land use zones depicted in Figure 6-1 offer a higher heat density. However, as stated earlier, heat density is only one indicator; as well, a still lower threshold may be favorable for a DES. A feasibility study will assist with establishing the viability of a DES for the Clair-Maltby Community.

[32] This threshold was applied in a previous study for the City [12].

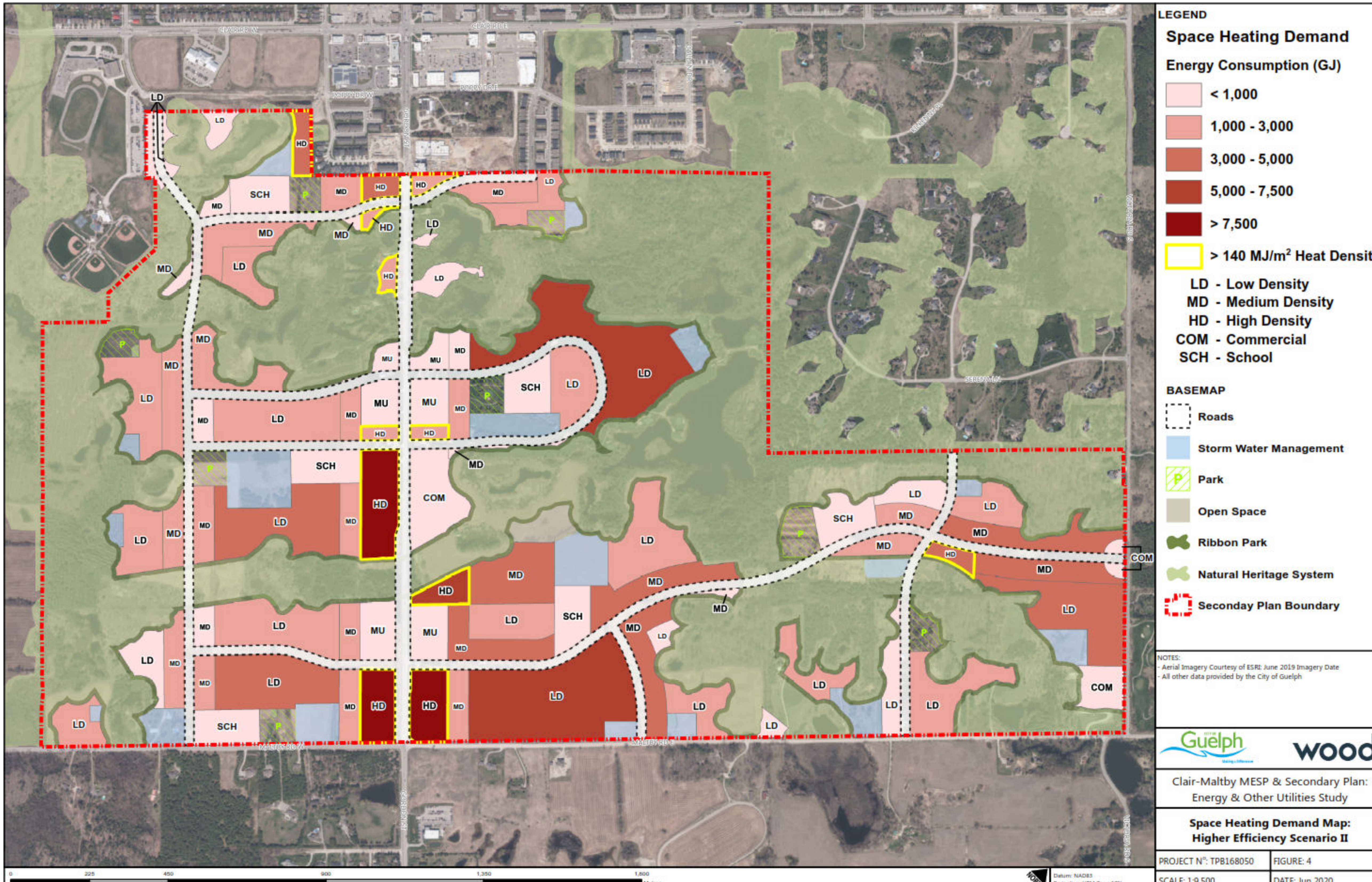

Figure 6-1: Space Heating Demand Map for Higher Energy Efficiency Scenario- II

7.0 Conclusions

Table 7-1 presents a summary of the estimated energy use and related carbon footprints associated with the Clair-Maltby BAU and higher efficiency scenarios modeled for the built environment and transportation categories.

Table 7-1 Summary of Energy and Carbon Footprints - BAU & Higher Efficiency Scenarios

Built Environment		
	Energy Use (GJ)	GHG Emissions (kt CO_2e)
BAU Scenario	455,764	18.15
Higher Energy Efficiency Scenario – I	386,929	15.39
Higher Energy Efficiency Scenario - II	290,921	11.55
Transportation		
	GHG Emissions (kt CO_2e)	
BAU Scenario	22.35	
Low Carbon Scenario	21.80	

Note(s)

5. Emission factors applied are 0.000029 tonnes $C0_2e$ for electricity and 0.001888 tonnes $C0_2e$ for natural gas.
6. An energy use dispersion of 75% natural gas & 25% electricity, and 65% natural gas & 35% electricity, is assumed for residential and non-residential buildings respectively.

The OEP mentions various initiatives and actions the province has elected to focus on and some of these are relevant to the development of the Clair-Maltby Community and also align with priority actions identified under the CEI update to reduce community energy use and achieve GHG reduction. The Clair-Maltby Community's carbon footprint holds high relevance considering the City's mandate of becoming a net zero carbon community by 2050. As cited in the CEI update report, sustainable development practices adopted for buildings in the new community will have direct implications on the City's 2050 net zero carbon goal. A combination of demand side and supply side measures will both be key towards achieving a low carbon and water use footprint for the new community.

Measures that offer GHG and water use reduction potential include adoption of passive design strategies, high performance building thermal enclosures, energy efficient equipment, water efficient flow and flush fixtures, energy recovery, and fuel switch opportunities. Encouraging builders to develop the site beyond minimum energy efficiency requirements through incentives, development bonuses, or mandates can also play a very important role towards developing a feasible pathway to reach net zero carbon. Considering the low carbon grid supply in the province today, any effort to reduce the new community's GHG footprint must address fossil fuel use (natural gas, gasoline) as a priority. Natural gas remains the primary source of residential heating fuel in the City both for space heating and hot water heating applications. Capital and operating cost considerations aside, and an increased demand on the grid during the heating season, electrification of space heating and domestic hot water heating offer a substantial decarbonization pathway.

Adoption of ZEVs present an opportunity to reduce the new community's carbon footprint if the federal government's target uptake level (100 percent of light-duty vehicles by 2040) is achieved. This will entail current restraints such as price premium, vehicle range limitations, and access to charging infrastructure not presenting as barriers to achieving the desired market penetration.

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Memo

To: Stacey Laughlin, MCIP, RPP

From: Ayman Nicola, M.Sc., P.Eng.

cc:

Date: 11 May 2021

Re: **Environmental Sustainability Measures Guidance for Clair-Maltby Developers/Builders – Technical Memorandum, City of Guelph**

1.0 Introduction

This technical memorandum prepared by Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood), presents a reporting framework for future Clair-Maltby developers/builders to demonstrate the environmental sustainability measures to be incorporated into their development project, as part of the City's development approvals process, at the building and neighborhood scale.

This guidance framework for development in Clair-Maltby is based on the principles of:

- Enabling sustainable site and building design;
- Reducing the community's energy and water use footprint; and
- Supporting the City of Guelph Community Net Zero Carbon target.

2.0 Energy and Climate Change Mitigation Guidance Framework

Table 1 presents the categories, demonstration aspects to consider[1], and submittal requirements as guidance to developers/builders for environmentally sustainable site design in Clair-Maltby.

Table 1: Categories and Demonstration Aspects

Category	Description	Demonstration Examples & Required Submittals
Green Building Rating / Certification Systems and Green Building Standards[2]	New building construction targeting rating system certification, meeting labelling program requirements, or	Examples of building construction industry recognized rating systems and building standards include - • ENERGY STAR® • R-2000

[1] Demonstration aspects, per the example measures listed in the table, are not intended to be an exhaustive set. The developer/builder is encouraged to evaluate and list additional potentially applicable sustainability measures for the respective categories.

[2] The most recent version of the respective rating system or building standard shall be used.

Category	Description	Demonstration Examples & Required Submittals
	adopting requirements in advanced energy standards that exceed code	• Passive House • EnerGuide • Canadian Home Builder's Association (CHBA) Net Zero Home Labelling Program • Zero Carbon Building (ZCB) Standard • LEED® • BOMA BEST • BUILT GREEN® • ANSI/ASHRAE/USGBC/IES Standard 189 Submittal – Indicate intent to pursue compliance with any building sector recognized rating system, labelling program, and/or advanced energy standards.
Building Energy Modelling	Use of energy modelling to simulate building energy performance	Submittal – Demonstrate energy performance through submission of an energy model(s)[3] for new construction (applicable to residential and commercial types only) ensuring the following: • At a minimum, model compliance with the most recent version of the Ontario Building Code (OBC), applicable reference energy codes in OBC, and building code energy requirements • Submission of modelling files in electronic format with modelling conducted using 8,760-hour whole building computer simulation software tested with the most recent ASHRAE 140 Standard (Acceptable energy modelling software includes EnergyPlus or its derivations, eQUEST, IES Virtual Environment, Carrier Hourly Analysis Program (HAP), or Trane Trace 700) • Submission of engineering calculations used to support the modelling where applicable • Where the proposed building design is planned to exceed the energy performance of an equivalent code compliant building, submission of modelling files for both the OBC compliant reference building and the proposed building design to demonstrate energy savings Submit a summary energy modelling report, with the energy modelling report to include, but not limited to:

[3] A model and report for each new individual building is expected. However, for Part 9 buildings, similar dwelling units can be grouped to be represented by a single energy model; for e.g., energy modelling one single detached housing to represent the energy performance of similar detached housings within a low density residential sub-division.

Category	Description	Demonstration Examples & Required Submittals

		• Review, verification and signature by a qualified professional (licensed architect, BEMP, or P.Eng.)
		• Modelling process details (including software used and software version), inputs[4], and assumptions applied
		• Weather station used
		• GHG emission factors used
		• Modelled floor area
		• Proposed building energy performance
		    ○ Total energy use and total energy use intensity
		    ○ Thermal energy demand intensity
		    ○ GHG intensity
		    ○ Summer and winter peak electrical demand
		    ○ Building level renewable energy generation capacity (e.g. solar PV, solar thermal). Renewable energy credits or offsets are not to be included.
		    ○ Where applicable, proposed building energy performance compared to the equivalent OBC compliant reference building
		• Key energy measures adopted in the proposed building design towards achieving improved energy performance

Green Product Certification	Use of products that hold product certification attesting to green credentials related to attributes such as energy use, water use, recycled content, or disclosure of life cycle impact	Examples of green product certifications include: • Energy Star® • WaterSense • Green Seal <u>Submittal</u> – Indicate if use of building construction materials or building systems that hold green certification is planned
Outdoor Water Use	Adoption of measures to reduce outdoor water use	Examples of these measures include: • Mitigation of water leakage • Improved irrigation system efficiency • Greywater reuse • Selection of well-suited vegetation/Xeriscaping

[4] Inputs are expected to reflect the design intent for the respective building(s) being modelled and expected to include information on intended building characteristics and configuration, orientation, envelope, fenestration, plant level and system level mechanical/electrical equipment, zoning, schedules, internal gains, infiltration, ventilation rates, and any model workarounds if applicable.

Category	Description	Demonstration Examples & Required Submittals
		• Low Impact Development (LID) best management practices (e.g. rainwater harvesting, bioretention, permeable pavements) Submittal – List planned measures to reduce outdoor water use
Neighborhood-Scale Energy System	Implementation of neighborhood energy systems such as a micro-grid or district energy system (fueled by low-carbon or renewable energy sources)	Examples of these measures include – • Micro-grid • Centralized battery storage • District energy system (fueled by low-carbon or renewable energy sources) Submittal – Indicate if a neighborhood-scale energy system is planned
Passive Design Strategies	Design strategies to minimize built environment energy load	Examples of these measures include – • Lot organization and building orientation (informed by aspects such as sun path, wind data, etc.) • Building aspect ratio • Passive heating and cooling strategies • Daylighting Submittal – List planned passive design strategies to reduce site energy load
Microclimate Enhancement	Design strategies to mitigate negative effects on the microclimate (e.g. heat island effect)	Examples of these measures include – • Provision of shading over areas such as paved surfaces or roofs with architectural (e.g. solar carport) or vegetated structures (e.g. trees) • Use of paving materials with a higher solar reflectance (SR) value • Use of cool roofs • Use of vegetation covered hardscapes (e.g. green roofs) Submittal – List planned site design strategies to mitigate negative effects on the site's microclimate
Waste Management	Design of site waste management elements to encourage practices such as recycling or composting to improve waste diversion rates	Submittal – List planned site design elements to encourage waste management best practices
Green Transportation	Adoption of measures to encourage uptake of green transportation choices	Examples of these measures include –

Category	Description	Demonstration Examples & Required Submittals
		• Eased connectivity from site buildings to active transportation enabling infrastructure such as bicycle lanes and pedestrian networks • Availability of sheltered bike share stations near site buildings • Dedicated parking spaces for carpool parking • Access to electric vehicle charging stations • Access to public transit Submittal – List planned measures to encourage uptake of green transport modes
Smart Infrastructure	Embedding digital technology to the built environment and urban infrastructure such as use of sensors for real-time data acquisition or enabling access to high-speed communication infrastructure	Submittal – List planned smart infrastructure related installations

3.0 Closing Discussions

The guidance framework table presents direction, specific to carbon footprint reduction from sustainable site and built environment design, to inform development of an Implementation Strategy by the City for Clair-Maltby. The various demonstration facets proposed for consideration by future Clair-Maltby developers/builders aligns with the vision and guiding principles set in the Clair-Maltby Secondary Plan and can contribute towards the City's Net Zero Carbon goal.