



PORT COLBORNE

PARTNERS FOR CLIMATE PROTECTION MILESTONE 3: CORPORATE CLIMATE ACTION PLAN

CITY OF PORT COLBORNE

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1 Introduction

1.1 Partners for Climate Protection

The Partners for Climate Protection (PCP) is a program that provides a Framework for municipalities to set goals and take actions towards reducing corporate and community GHG emissions. This partnership is deployed by the Green Municipal Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. There are five milestones associated with the PCP Framework, which are as follows.

- **Milestone 1:** Create a baseline emissions inventory.
- **Milestone 2:** Set emissions reductions targets.
- **Milestone 3:** Develop a corporate climate action plan.
- **Milestone 4:** Implement the corporate climate action plan.
- **Milestone 5:** Monitor and report results.

WalterFedy has been engaged by the City of Port Colborne to complete Milestones 1 through 3. Community emissions are not considered in this report, as the agreed upon scope was limited to corporate emissions. The contents of this report focus on Milestone 3. Milestone 1 and Milestone 2 material have been included in previous reports.

1.1.1 Milestone 3

Milestone 3 consists of a corporate climate action plan to meet emissions targets. The City of Port Colborne has chosen to investigate multiple pathways, laid out in the GHG Reduction Pathways section. Greenhouse gas (GHG) inventories consider emissions from the following sectors:

- Buildings and Facilities
- Fleet Vehicles
- Streetlights and Traffic Signals
- Water and Waste Water
- Corporate Solid Waste

1.2 GHG Emissions Methodology

This section outlines the factors and assumptions used to estimate GHG emissions from the fuel consumption and waste data from the City of Port Colborne.

1.2.1 Emission Coefficients

To estimate the emissions associated with each sector, Table 1 outlines the emission coefficients used for the following fuel sources.

Table 1: GHG emission factors

Utility	Unit	GHG factor
Electricity	[tCO ₂ e/kWh]	0.000055
Natural gas	[tCO ₂ e/m ³]	0.001921
Gasoline - Equipment	[tCO ₂ e/L]	0.002514
Gasoline - Light Vehicles	[tCO ₂ e/L]	0.002384
Gasoline - Light Trucks	[tCO ₂ e/L]	0.002389
Gasoline - Heavy Vehicles	[tCO ₂ e/L]	0.002347
Propane - Equipment	[tCO ₂ e/L]	0.001557
Ethanol 10 - Equipment	[tCO ₂ e/L]	0.001510
Ethanol 10 - Light Vehicles	[tCO ₂ e/L]	0.001510
Ethanol 10 - Heavy Vehicles	[tCO ₂ e/L]	0.001510
Diesel - Equipment	[tCO ₂ e/L]	0.002709
Diesel - Light Vehicles	[tCO ₂ e/L]	0.002741
Diesel - Light Trucks	[tCO ₂ e/L]	0.002741
Diesel - Heavy Vehicles	[tCO ₂ e/L]	0.002714

Notes on emission coefficients

- All fuel emission factors are obtained from the National Inventory Report: Greenhouse Gas Sources and Sinks in Canada.
- The emission coefficient for electricity aligns with the Ontario electrical grid GHG intensity for the base-line year (Table A13-7 in the National Inventory Report: Greenhouse Gas Sources and Sinks in Canada). Grid emissions factors up to 2023 were obtained from the National Inventory Report, and from 2024 to 2050 were obtained from the Environment and Climate Change Canada Data Catalogue (Electricity Grid Intensities), as per the plot below.

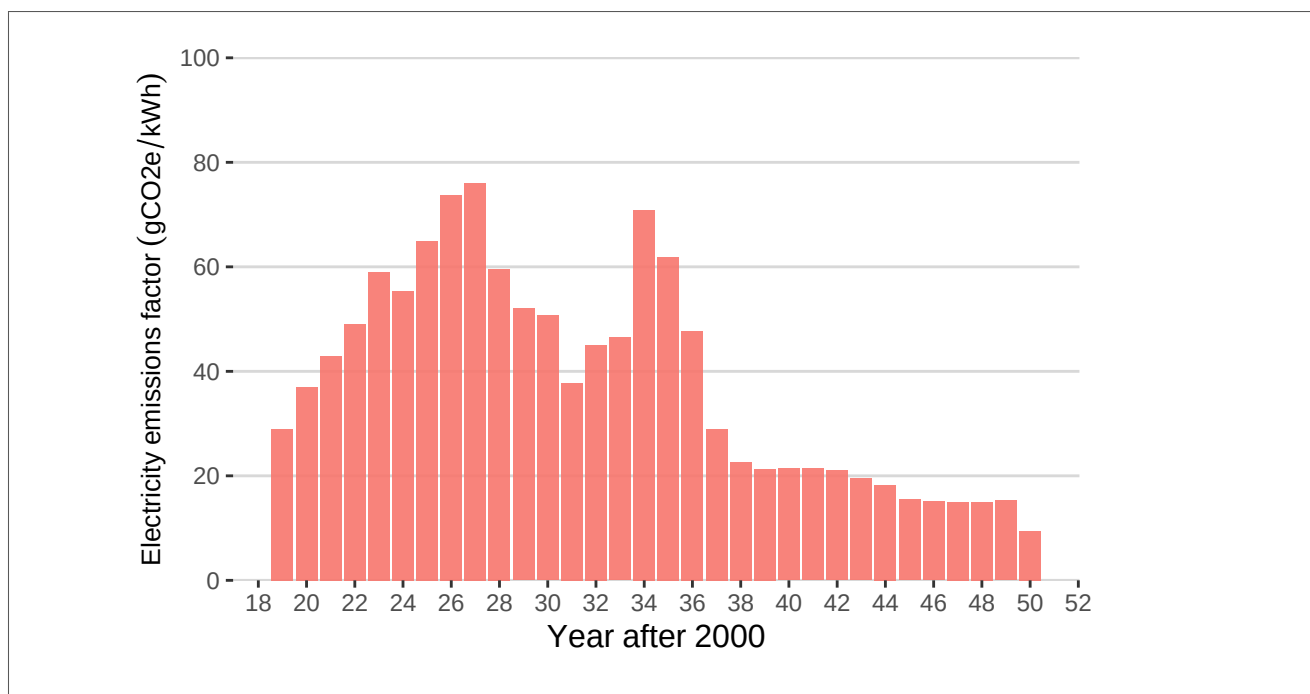


Figure 1: Electricity emission coefficient projections

- To align with the level of detail in fleet vehicle reporting, average values were taken to approximate the emissions of various vehicle types, including Tier 1, 2, and 3, etc.
- CO₂ equivalent factors for mobile combustion sources are determined by considering the emission factors of CH₄ and N₂O and their associated Global Warming Potentials (GWP) from the National Inventory Report.

Solid waste emissions

GHG emissions from corporate solid waste were calculated via the "PCP Protocol Method C: Landfills with no LFG System", "Option 1: Methane Commitment Model", "Approach 2: Emissions from Corporate Solid Waste Generation". It should be noted that all waste is collected by Niagara Region, and landfill sites are not maintained by the City of Port Colborne. The above approach for estimating waste emissions was chosen as landfill gas (LFG) data is only available for waste sites as a whole, which includes emissions that are beyond the scope of the City of Port Colborne. LFG collection data from Niagara Region is used to estimate factors such as methane correction factor, oxidation factor, and fraction of methane emissions recovered. Those values, in addition to other key waste assumptions, are displayed in Table 2.

Table 2: Solid waste factors

Description	Unit	Value
Methane correction factor	[dcml]	1.00
Oxidation factor	[dcml]	0.10
Methane recovery factor	[dcml]	0.49

Methane recovery factor is obtained from the 2024 Humberstone Landfill Gas Annual Report.

1.2.2 Summary of Data Sources

A vast amount of municipal data was collected and analyzed to create the GHG inventory. Table 3 provides a summary of data sources for all of the information used in this report as well as key assumptions regarding the data collected.

Table 3: Data sources

Sector	Item	Source
Buildings and Facilities	Electricity consumption	City of Port Colborne, utility bills from Canadian Niagara Power Inc.
Buildings and Facilities	Natural gas consumption	City of Port Colborne, utility bills from Enbridge Gas Inc.
Fleet Vehicles	Gasoline consumption	City of Port Colborne, various departments
Fleet Vehicles	Diesel consumption	City of Port Colborne, various departments
Water and Waste Water	Electricity consumption	City of Port Colborne, utility bills from Canadian Niagara Power Inc.
Streetlights and Traffic Lights	Electricity consumption	City of Port Colborne, utility bills from Canadian Niagara Power Inc.
Solid Waste	Annual waste	Garbage bin size and frequency of pickup provided by the City. Total weight collection provided for 2024; it is assumed that there is little deviation of corporate solid waste year over year, and it is reasonable to assume this same value for the baseline.

1.2.3 Description of Assumptions

Several key assumptions were made to complete the GHG emission inventory, in instances where data was incomplete or limited. These assumptions are as follows.

1. **Landfill gas collection:** It is understood that all waste from the City of Port Colborne is directed to Humberstone Landfill Site, and that landfill gas is collected at this site and flared in order to convert the high GWP methane gas collected into CO₂. The 2024 Humberstone Landfill Gas Annual Report states the flare was in operation for 50.5% of the year and operated at a conversion efficiency of 98%. It is assumed that these operation conditions can be applied to the baseline year. Furthermore, it is assumed that all landfill gas not flared at the site is released as methane gas. All flared gases are omitted from the inventory, as the

CO₂ produced is considered to be of biogenic origin according to the PCP Protocol. Only escaped methane gases will be considered in the GHG inventory.

2. **Mobile combustion emission coefficients:** The National Inventory Report provides emission coefficients for various engine types (Tier 1, Tier 2, Tier 3, etc.). CH₄ and N₂O factors vary for these engines. In order to approximate these factors, as detailed engine information was not available, an average of all listed engine types was taken to estimate a singular emission factor per vehicle type. As CO₂ accounts the majority of combustion emissions, fleet emissions are estimated with a high level of confidence and any variations in CH₄ and N₂O not captured by this assumption are expected to have a negligible impact on the overall emissions factor.

1.3 Measures and Pathways Methodology

This section outlines the factors and assumptions used to estimate the utility savings for the measures. It also outlines assumptions made while compiling the pathways.

1.3.1 Measures Calculations

Each asset considered in this plan has an assumed end use breakdown (fraction of energy used for heating, cooling, etc.) based on the known end use breakdown of similar facilities. For each measure, the relevant end use changes are modelled (for instance, for heat pump measures, the relevant heating end use is switched from natural gas to electric heating, and the efficiency is improved). Measure costs are estimated based on the floor area or utility use of the facility, or number of assets for fleet departments. Note that estimated measure costs include anticipated material, design, and construction costs, as well as contingencies. GHG emissions are calculated using the GHG emissions methodology detailed above, considering the new projected utility use.

1.3.2 Pathway Calculations

For pathways, the measures are assumed to take place over the course of a given timeline, taking into account interactive effects between measures. Changes in the anticipated GHG emission coefficients and utility costs over the years are taken into account during these projections.

In addition, various financial calculations are performed, as per the following methodology:

- **Business as usual costs:** Business as usual costs for certain measures are estimated for a better basis of comparison between the pathways. For certain measures, such as fleet decarbonization measures or heat pump measures, it is assumed that if the measure is not implemented, the equipment will instead have to be replaced using a like-for-like replacement. In these cases, the cost of replacement is assumed to be half as much as what is estimated for the measure cost.
- **Inflation:** For cost metrics other than the net present value (NPV), it is assumed that costs increase over time due to inflation. Inflation is assumed to be an average of a 2.2% increase each year.
- **Net present value:** The net present value is the sum of the project costs and utility costs, including inflation, discounted to the present assuming a discount rate of 5%.
- **Incentives and effective project cost:** Incentive costs are estimated based on the criteria for known incentives. Note that incentives are calculated according to prices in today's dollars, as it is unknown how incentives may change with time. In the case that incentives have a maximum amount spread over the portfolio, this is not reflected in the individual project incentives, but is accounted for as relevant projects are implemented over the course of each pathway. The effective project cost metric is the project cost minus the incentive cost, to reflect the expected capital that the municipality will need to obtain to implement the project.
- **Total cost:** The total cost, which is only shown as a cumulative value (considering the sum of total costs from the baseline year to 2050), is the sum of the project costs and utility costs over the study period.

2 Description of Stakeholder Engagement

2.1 Stakeholder Engagement Overview

The Corporate Climate Action Plan is intended to outline feasible and actionable steps toward achieving Net Zero corporate greenhouse gas (GHG) emissions. As the measures proposed to reach this target affect a wide range of municipal departments and operational practices, several key stakeholders within the City of Port Colborne were engaged throughout the Plan's development. Stakeholder engagement included a Corporate Climate Action Plan Workshop, held virtually on December 9, 2025, with participation from multiple municipal departments and divisions, including Public Works, Facilities and Fleet, Environmental Services, and the Office of the CAO. The workshop featured open discussions that provided participants with an opportunity to understand the objectives of the Plan and to offer feedback on proposed measures, particularly those with implications for departmental operations and budgeting. In addition, draft Plan materials were circulated to municipal staff and members of the Environmental Advisory Committee for review, comment, and endorsement. Input received through these engagement activities was considered and incorporated, as appropriate, into the final Corporate Climate Action Plan.

3 Description of Approach to EDI and Reconciliation

3.1 EDI and Reconciliation Overview

The City of Port Colborne is home to a diverse community with a wide range of backgrounds, identities, and lived experiences. To ensure equity and inclusivity across municipal operations, the municipality is committed to embedding principles of equity, diversity, inclusion (EDI), and Reconciliation into the implementation of the Corporate Climate Action Plan. Planning and decision-making processes will consider the needs of all residents, ensuring that public spaces and services are accessible regardless of socioeconomic status, age, ability, ethnicity, gender identity, or cultural background, consistent with best practices in sustainable infrastructure. Public buildings will continue to serve as inclusive gathering places for the entire community. As public infrastructure is expanded or modified, the City of Port Colborne will engage in ongoing consultation to ensure meaningfully informed development and implementation. Through the Corporate Climate Action Plan, the municipality aims to create equitable opportunities for community engagement while enhancing the well-being, accessibility, and resilience of public infrastructure and spaces for all residents.

4 Recommended Measures

4.1 Measure Overview

There are multiple measures which can be taken to reduce GHG emissions. A high-level overview of potential measures is provided in Table 4.

Table 4: High level measure descriptions

Sector	Measure name	Description	Department responsible
Buildings and Facilities	Conduct energy audit	Conduct energy audits on the buildings to identify opportunities to reduce energy use and determine the best avenues to proceed with the general measures outlined in this report. This measure is not expected to directly impact the facility's energy use.	Public Works
Buildings and Facilities	Electrification measures	Replace gas-fired equipment, such as dehumidifiers, with electric equipment. Electric equipment is often more efficient than gas-fired equipment, depending on the scenario. In addition, electricity from the Ontario grid has a lower GHG impact than natural gas, and switching from gas-fired to electric equipment will often significantly decrease the GHG emissions from that equipment.	Public Works
Buildings and Facilities	HVAC to heat pump	General measure to represent replacing the heating system (DHW, boiler, HVAC, pool heat, etc.) with heat pumps. In these measures, air-source heat pumps are considered unless stated otherwise, but each building can be surveyed to check whether a geothermal heat pump would be a suitable alternative. As with the general electrification measures, if the original equipment is gas-fired, the switch to electric equipment can reduce GHG emissions. Additionally, heat pumps are a high efficiency alternative to most existing heating systems, as air-source heat pumps typically have an average COP of around 3 (corresponding to 300% efficiency), and geothermal heat pumps often have an average COP above 3.5. Note that it is assumed that an electric backup is installed for heat pumps when needed. To account for electric backup, which is 100% efficient, the average heat pump effective COP is assumed to be 2.5. As these technologies continue to develop, the efficiencies that can be achieved continue to increase.	Public Works

Table 4: High level measure descriptions (*continued*)

Sector	Measure name	Description	Department responsible
Buildings and Facilities	HVAC system optimization	General measure to represent various HVAC upgrades to reduce the heating load. This measure represents a budget to be put aside to optimize the HVAC system, and could include recommissioning measures or HVAC controls upgrades. The most effective controls upgrades will vary depending on the facility, but could include items such as setpoint temperature setbacks, BAS system optimization (if applicable), HVAC system scheduling, and demand control ventilation. This measure does not account for installation of new control infrastructure and if there is no BAS would represent optimizing the existing controls. Note that as limited information is available for these facilities, there may not be opportunities for the projected savings, and it is recommended that the energy audits be undertaken and use the results to identify opportunities for HVAC system optimization.	Public Works
Buildings and Facilities	Lighting upgrade	General measure to represent upgrading building lighting to reduce the energy consumed by light fixtures. This could include lighting retrofits to LED or upgrading the lighting controls in a building. Depending on which lighting controls are feasible in a facility, this could include daylighting, occupancy sensors, or other opportunities to save on lighting energy.	Public Works
Buildings and Facilities	Solar PV	Implement solar PV arrays to generate renewable energy, to reduce GHG emissions by reducing electricity consumption. Note that solar PV systems were sized based on the gross floor area and may not be suitable in all locations; a feasibility study is recommended to determine whether solar PV would be suitable at each location.	Public Works
Buildings and Facilities	Install low GWP refrigerant equipment	To reduce the emissions associated with refrigeration, the City can replace existing equipment with low global warming potential (GWP) refrigerant equipment. Note that this measure is assigned to a single recreation facility based on the report setup, but is recommended to be implemented in any facilities with refrigerant equipment.	Public Works
Buildings and Facilities	Implement a local green standard	Implement a standard with minimum green requirements to ensure that new facilities are built to be sufficiently energy-efficient and low-carbon. This could include items such as minimum standards for the HVAC equipment efficiency, envelope insulation, lighting power, or the facility's thermal energy demand intensity. Note that this measure is not included in any of the pathways as it does not impact any existing assets, although it would be expected to cost \$50,000 to \$100,000 to account for consulting fees and the time required to implement this standard.	Public Works
CAO Office	Purchase carbon offsets	Purchase carbon offsets to offset any GHG emissions that cannot be reduced with other measures.	CAO Office

Table 4: High level measure descriptions (*continued*)

Sector	Measure name	Description	Department responsible
Corporate Waste	Conduct waste audit	Conduct waste audits on the sources of waste to better understand the largest contributors to waste and the waste composition. This can help municipalities to develop more effective plans to reduce their waste GHG emissions.	Public Works
Corporate Waste	Waste mitigation	Take steps to reduce the City's waste. This could include improved education and waste separation programs to divert recycling and composting where appropriate. This could also include steps such as investing in a circular economy and starting initiatives to reduce the use of single-use items, which add to the waste stream. Finally, this could involve an improvement to the landfill gas capturing system at the applicable waste disposal sites. It is noted that these sites are typically managed by Niagara Region and not the City. It should be noted that this measure does not consider the privatization of curbside recycling pickup. Emissions from recycling are not included in the scope of this study and therefore not included in the waste mitigation measure.	Public Works
Fleet Vehicles	Fleet optimization	General measure to represent measures to optimize fleet fuel usage, which could include steps such as preventative maintenance, anti-idling campaigns, carpooling when possible, and optimizing routes using GPS.	Public Works
Fleet Vehicles	Fleet equipment decarbonization	Replace fleet vehicles with electric equivalents. Note that this measure is not performed for heavy vehicles.	Public Works
Fleet Vehicles	Heavy vehicle decarbonization	Replace fleet heavy vehicles with electric equivalents. Note that hydrogen vehicles should also be considered, but electric vehicles were used for the utility use analysis and costing purposes in this report as hydrogen vehicles are not as readily available.	Public Works

Potential incentives to support the implementation of these measures are described in Table 5. Note that incentives are calculated based on the present value of measure project costs. Also note that in cases where there is a maximum amount awarded for the portfolio as a whole, this is not reflected in the incentive savings in the individual measures table; however, this is accounted for during the pathway analysis.

Table 5: Potential incentive opportunities

Funding Organization	Funding Opportunity Name	Summary	Description	Max Award
Green Municipal Fund (GMF)	Study: GHG reduction pathway feasibility	Assess the feasibility to support near-term and long-term projects that reduce energy and GHGs, extend asset life and reduce cost of ownership for local recreational and cultural facilities. Determine the best approach to achieving near net zero buildings with a study grant.	Integrate energy and GHG reductions into longer-term management plans for local recreational and cultural facilities. Studies will include feasibility work to support near-term and long-term capital projects while mapping out a course to extend asset life and reduce cost of ownership (i.e., the total capital, operating and maintenance costs over the building's remaining useful life). This grant enables the identification of measures to be addressed in a GHG reduction pathway retrofit capital project. Studies will consider the unique objectives and constraints of the building owner (e.g., building condition, capital budgets, equipment renewal cycles, etc.), and provide a detailed exploration of multiple optimization scenarios.	Single building: Grant for a maximum of \$65,000 to cover up to 80% of eligible costs. Portfolio of buildings: Grant for a maximum of \$200,000 to cover up to 80% of eligible costs (cost per building cannot exceed \$65,000).
Green Municipal Fund (GMF)	Capital project: GHG reduction pathway retrofit	Retrofit a local recreational or cultural facility, or group of facilities, using an outcomes-oriented approach to achieving near-net zero carbon buildings over time. Finance your upgrade with capital project funding.	Make significant reductions in energy-use and GHG emissions by retrofitting community buildings over time. This funding enables the implementation of longer-term, multi-measure retrofit capital projects that contribute to a GHG reduction pathway. Note that if the GHG reduction pathway feasibility study has not been completed, a similar FCM grant (Capital project: GHG impact retrofit) can be used instead, provided the project will reduce facility emissions by at least 30%.	Maximum of \$10 million per project. Up to 25% as a grant and the remainder as a loan. Combined loan and grant for up to 80% of eligible project costs.

Table 5: Potential incentive opportunities (*continued*)

Funding Organization	Funding Opportunity Name	Summary	Description	Max Award
Green Municipal Fund (GMF)	Study: Municipal fleet electrification	Reduce fuel costs and fleet GHG emissions.	GMF funds feasibility studies to support the electrification of municipal and/or transit fleets - the transition to zero-emission vehicles (ZEVs) that have the potential to produce no tailpipe emissions, including battery-electric, plug-in hybrid electric and hydrogen fuel cell vehicles.	Grant: Up to 50% of eligible costs to a maximum of \$200,000.
Green Municipal Fund (GMF)	Capital project: Municipal fleet electrification	Reduce fuel costs and fleet GHG emissions.	GMF funds capital projects to support the electrification of municipal and/or transit fleets - the transition to zero-emission vehicles (ZEVs) that have the potential to produce no tailpipe emissions, including battery-electric, plug-in hybrid electric and hydrogen fuel cell vehicles.	Combined grant and loan for up to 80% of eligible costs, with a maximum of \$10M. Grant for up to 15% of loan amount.
Enbridge	Standard custom retrofit incentives	Reduce natural gas use and GHG emissions.	Enbridge has incentives for retrofit projects to reduce natural gas use.	Awards \$0.25 per m3 of natural gas saved, up to 50% of project upgrade costs, with a maximum of \$100,000 per project.
Save On Energy	Custom Stream	Reduce electricity use and demand.	Save On Energy has incentives for retrofit projects to reduce electricity use.	Awards \$0.2 per kWh of electricity saved, up to 50% of project upgrade costs. Note that this incentive would also be capped at 1,800 \$/kW of electricity demand reduction; however, this is outside of the scope of this study.

4.2 Measure Details

The recommended high-level measures, along with a generalized cost estimate and the anticipated energy savings, are presented in Table 6. Note that measures for assets with the highest GHG contributions are listed individually (these assets grouped together contribute to roughly 30% of the corporate GHG emissions). Otherwise, the assets are grouped together for the measure entry.

Table 6: Recommended measures and energy savings

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Vale Health and Wellness Centre	Conduct energy audit	58,177	0	58,177	0	0	0	0	0	0	0
	DHW to heat pump	120,000	2,925	117,075	20	-2,492	-39,529	11,701	0	0	0
	Equipment electrification	500,000	100,000	400,000	14	-9,090	-83,228	9,855	0	0	0
	HVAC system optimization	100,000	4,008	95,992	35	15,500	80,944	16,030	0	0	0
	HVAC to heat pump	4,920,633	984,127	3,936,506	278	-34,138	-541,577	160,318	0	0	0
	Ice resurfacer conversion	175,000	0	175,000	0	-125	-1,145	136	0	0	0
	Install low GWP refrigerant equipment	0	0	0	0	0	0	0	0	0	0
	Lighting upgrade	872,658	22,569	850,089	0	14,981	112,843	-3,144	0	0	0
	Pool heat to heat pump	1,000,000	200,000	800,000	63	-7,798	-123,709	36,620	0	0	0
	Solar PV	1,280,000	256,000	1,024,000	20	51,018	364,416	0	0	0	0
Various Facilities	Conduct energy audit	496,273	200,000	296,273	0	0	0	0	0	0	0
	Demolish building	0	0	0	4	553	266	1,983	0	0	0
	DHW to heat pump	115,000	1,171	113,829	8	-997	-15,823	4,684	0	0	0
	HVAC system optimization	277,836	1,299	276,537	14	11,134	69,879	5,196	0	0	0
	HVAC to heat pump	2,049,414	409,883	1,639,531	90	-11,065	-175,538	51,963	0	0	0

Table 6: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m3/yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
	Lighting upgrade	1,517,698	19,377	1,498,321	0	12,862	96,885	-2,699	0	0	0
	Solar PV	1,460,000	292,000	1,168,000	23	58,193	415,662	0	0	0	0
Sugarloaf Marina Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
	Waste mitigation	8,340	0	8,340	68	0	0	0	0	0	0
Vale Health and Wellness Centre Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
	Waste mitigation	8,340	0	8,340	64	0	0	0	0	0	0
Various Waste Assets	Conduct waste audit	41,700	0	41,700	0	0	0	0	0	0	0
	Waste mitigation	83,400	0	83,400	134	0	0	0	0	0	0
Parks Fleet	Fleet equipment decarbonization	12,600,000	0	12,600,000	60	29,129	-66,693	0	18,758	0	6,886
	Fleet optimization	2,780	0	2,780	5	2,828	0	0	1,379	0	506
	Heavy vehicle decarbonization	26,000,000	0	26,000,000	88	42,837	-98,079	0	27,586	0	10,126
Transportation Fleet	Fleet equipment decarbonization	12,120,000	0	12,120,000	45	19,479	-55,682	0	3,316	0	14,867
	Fleet optimization	2,780	0	2,780	10	5,454	0	0	663	0	2,973
	Heavy vehicle decarbonization	25,500,000	0	25,500,000	181	77,914	-222,726	0	13,263	0	59,468
Various Fleet Assets	Fleet equipment decarbonization	14,880,000	0	14,880,000	101	46,257	-117,370	0	20,246	0	21,547
	Fleet optimization	44,480	0	44,480	8	4,619	0	0	1,378	0	1,702
	Heavy vehicle decarbonization	34,000,000	1,500,000	32,500,000	137	61,354	-161,578	0	21,941	0	34,043

Measures which target the Vale Health and Wellness Centre are among some of the most important measures to reduce the City of Port Colborne's GHG emissions, particularly the HVAC to heat pump and pool heat to heat pump measures. Other significant measures are the equipment and heavy vehicle decarbonization measures for fleet assets, particularly for the Parks Fleet and Transportation Fleet. Finally, waste mitigation measures for the Sugarloaf Marina and Vale Health and Wellness Centre are also anticipated to have a large impact on reducing the City of Port Colborne's emissions.

5 GHG Reduction Pathways

5.1 Pathway Overview

Multiple potential pathways are considered in this report to align with various GHG reduction targets. These pathways are outlined below.

Table 7: GHG reduction pathways

Pathway name	Description
Business as Planned	To understand the impact of not implementing any measures, but allowing assets to continue operating at existing energy/GHG performance levels (like-for-like replacement).
Most Aggressive	To understand the impact of implementing GHG-reducing measures while aiming to attain 18% reduction by 2028, 50% reduction by 2035, and net-zero by 2040, with carbon offsets as necessary.
Most Aligned	To understand the impact of implementing GHG-reducing measures while aiming to attain 18% reduction by 2028, 40% reduction by 2035, and net-zero by 2050, with carbon offsets as necessary. These targets are intended to be aligned with the goals currently in place at the regional and federal levels.
Most Achievable	To understand the impact of implementing GHG-reducing measures while aiming to attain 40% reduction by 2035 and 80% reduction by 2050, using carbon offsets to achieve net-zero.

The recommended measure implementation plan for each of these pathways is outlined in the following subsections.

5.2 Business as Planned

The objective of the Business as Planned pathway is to understand the impact of not implementing any measures throughout the study period, allowing assets to operate at existing conditions with like-for-like replacements.

Note that GHG emissions are projected to increase over the study period due to population growth, according to the assumptions listed in Milestone 1.

The Business as Planned pathway assumes that no energy conservation measures are implemented to understand the City of Port Colborne's expected utility use and GHG emissions if no planned changes are undertaken.

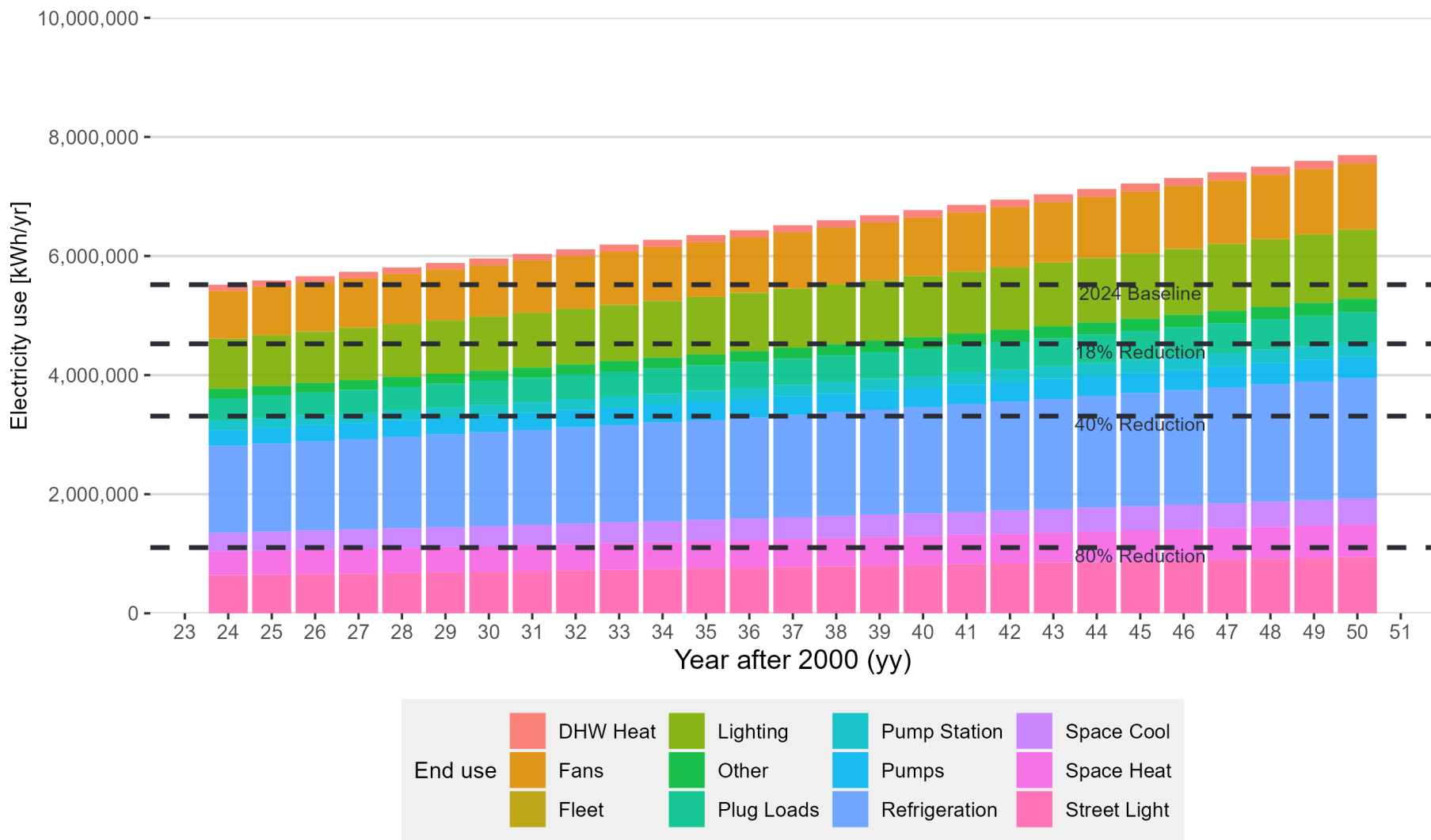


Figure 2: Projected electricity use in the Business as Planned pathway.

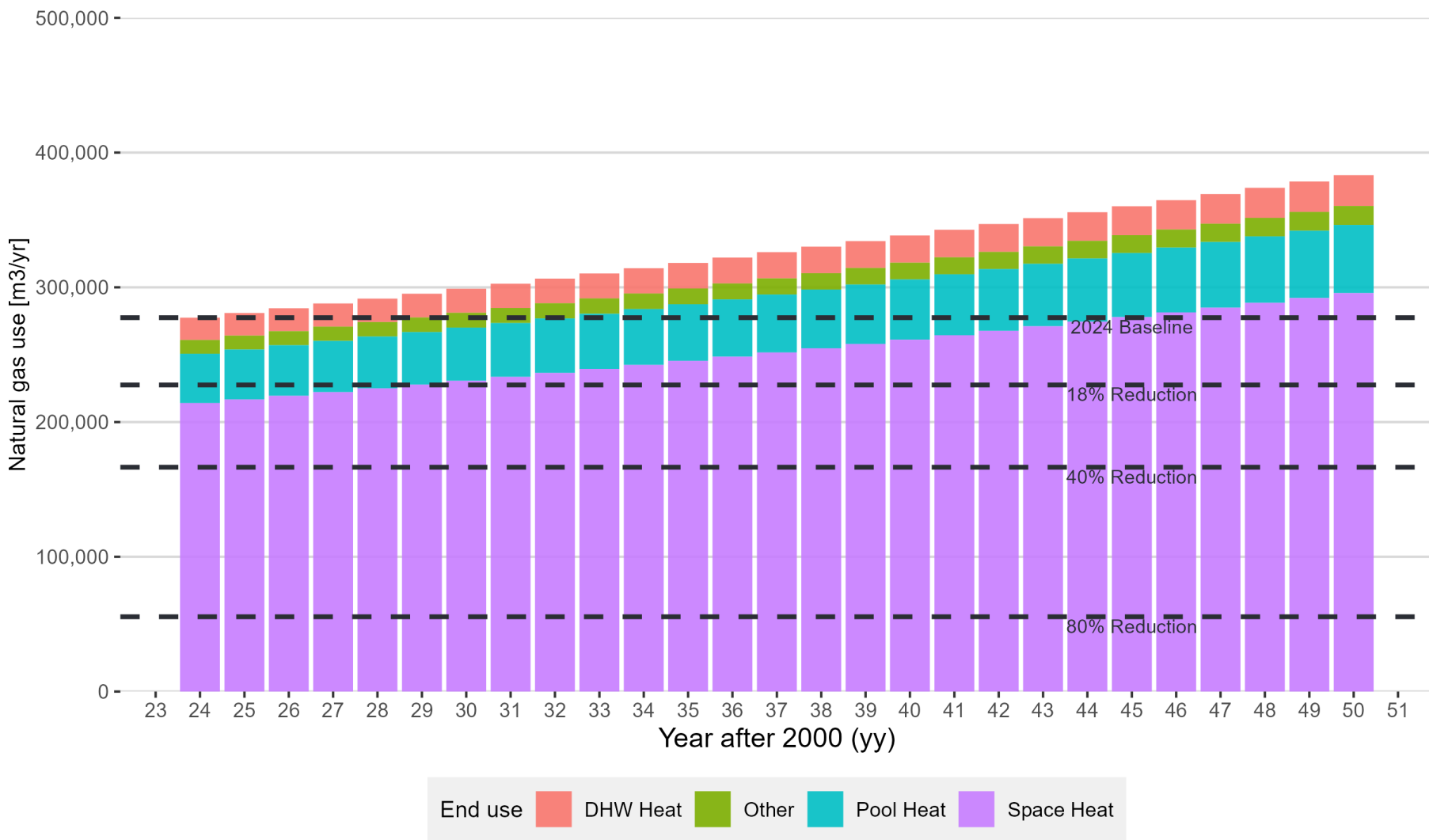


Figure 3: Projected natural gas use in the Business as Planned pathway.

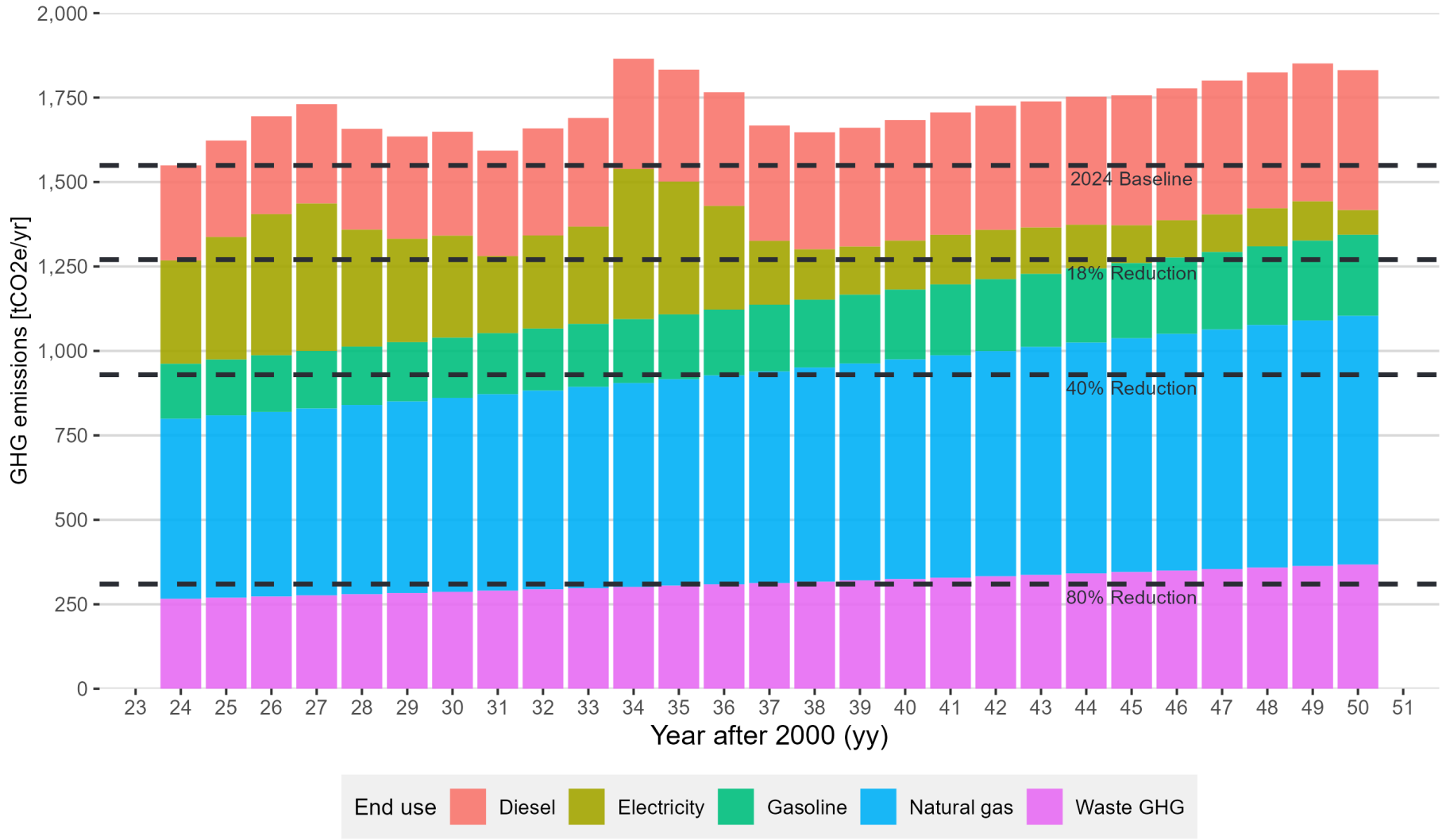


Figure 4: Projected GHG emissions in the Business as Planned pathway.

For the Business as Planned pathway, it is assumed that no measures are performed. In this case, due to the anticipated population growth outlined in Milestone 1, it is anticipated that utility use will gradually increase with time. This is anticipated to increase the GHG emissions as time goes on, even as the grid emissions factor for electricity is projected to decrease.

5.3 Most Aggressive

The objective of the Most Aggressive pathway is to understand the impact of implementing GHG-reducing measures while aiming to attain 18% reduction by 2028, 50% reduction by 2035, and net-zero by 2040. These targets are intended to achieve net zero emissions at a slightly faster pace than the scientific imperative established by the IPCC for emissions to drop by 45% below 2010 levels by 2030 and net-zero by 2050 in order to limit warming to 1.5°C. In addition, the goal of net zero by 2040 is chosen to align with more aggressive targets that have been established by other Canadian municipalities, such as the City of Toronto. This also aligns with the emissions goal in the City of Port Colborne's strategic plan.

Note that GHG emissions are projected to increase over the study period due to population growth, according to the assumptions listed in Milestone 1.

The recommended measure implementation plan for this pathway is presented in the following table, and the projected electricity use, natural gas use, and GHG emissions are presented in the following plots. Note that measures for assets with the highest GHG contributions are listed individually (these assets grouped together contribute to roughly 30% of the corporate GHG emissions). Otherwise, the assets are grouped together for the measure entry.

Table 8: Recommended measures and timeline for Most Aggressive pathway

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Vale Health and Wellness Centre	Conduct energy audit	60,765	0	5	0	-	-
	Vale Health and Wellness Centre	Ice resurfacers conversion	182,785	0	15	3	927,517	61,834
	Various Facilities	Conduct energy audit	318,349	0	5	0	-	-
	Various Facilities	HVAC to heat pump	99,485	5	15	72	20,852	1,390
	Various Facilities	Lighting upgrade	1,151,935	0	10	1	9,691,617	969,162
	Sugarloaf Marina Waste	Conduct waste audit	4,355	0	5	0	-	-
	Vale Health and Wellness Centre Waste	Conduct waste audit	4,355	0	5	0	-	-
	Various Waste Assets	Conduct waste audit	43,555	0	5	0	-	-
	Various Fleet Assets	Fleet optimization	14,518	2	10	20	7,410	741
2027	Vale Health and Wellness Centre	HVAC system optimization	102,739	35	15	529	2,912	194
	Various Facilities	HVAC system optimization	295,281	14	15	208	21,316	1,421
	Various Facilities	Lighting upgrade	188,650	0	10	0	4,579,427	457,943
	Parks Fleet	Fleet optimization	2,968	5	10	47	632	63

Table 8: Recommended measures and timeline for Most Aggressive pathway (continued)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Measure life (years)	Lifetime GHG reduction (tCO2e)	Project cost per GHG reduction (\$/tCO2e/yr)	Project cost per lifetime GHG reduction (\$/tCO2e)
2028	Transportation Fleet	Fleet optimization	2,968	10	10	97	307	31
	Various Fleet Assets	Fleet equipment decarbonization	768,573	8	5	42	90,580	18,116
	Various Fleet Assets	Fleet optimization	32,643	6	10	60	5,449	545
	Vale Health and Wellness Centre	HVAC to heat pump	4,384,022	278	15	4,170	15,772	1,051
	Vale Health and Wellness Centre	Lighting upgrade	929,455	0	10	2	4,382,227	438,223
	Various Facilities	Demolish building	0	4	-	-	0	-
	Various Facilities	DHW to heat pump	43,267	3	15	39	16,816	1,121
	Various Facilities	Lighting upgrade	66,671	0	10	0	3,445,606	344,561
	Various Fleet Assets	Fleet equipment decarbonization	2,225,532	49	5	247	44,976	8,995
	Various Facilities	DHW to heat pump	27,549	2	15	34	12,238	816
	Various Facilities	HVAC to heat pump	97,876	4	15	65	22,592	1,506
2029	Various Facilities	Lighting upgrade	176,856	0	10	0	65,517,831	6,551,783
	Various Fleet Assets	Fleet equipment decarbonization	3,077,256	6	5	31	490,625	98,125
	Various Facilities	DHW to heat pump	45,363	2	15	23	30,231	2,015
	Various Facilities	Solar PV	225,474	4	15	57	59,565	3,971
	Parks Fleet	Fleet equipment decarbonization	14,357,404	60	5	301	238,750	47,750
2030	Transportation Fleet	Fleet equipment decarbonization	13,810,455	45	5	226	305,663	61,133
	Various Fleet Assets	Fleet equipment decarbonization	136,737	5	5	26	25,983	5,197
	Vale Health and Wellness Centre	DHW to heat pump	136,820	20	15	304	6,744	450

Table 8: Recommended measures and timeline for Most Aggressive pathway (continued)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Measure life (years)	Lifetime GHG reduction (tCO2e)	Project cost per GHG reduction (\$/tCO2e/yr)	Project cost per lifetime GHG reduction (\$/tCO2e)
	Various Facilities	DHW to heat pump	11,386	2	15	27	6,337	422
	Various Facilities	Solar PV	578,727	9	15	142	61,154	4,077
	Various Fleet Assets	Fleet equipment decarbonization	10,760,396	31	5	157	343,094	68,619
2032	Vale Health and Wellness Centre	Pool heat to heat pump	990,165	63	15	952	15,595	1,040
	Various Facilities	Solar PV	297,049	5	15	71	62,778	4,185
	Various Fleet Assets	Heavy vehicle decarbonization	1,070,165	2	10	20	544,515	54,451
2033	Vale Health and Wellness Centre	Solar PV	1,300,926	20	15	303	64,439	4,296
	Various Facilities	HVAC to heat pump	527,164	21	15	315	25,095	1,673
	Various Facilities	Solar PV	325,232	5	15	76	64,439	4,296
	Various Fleet Assets	Heavy vehicle decarbonization	2,192,697	28	10	277	79,269	7,927
2034	Various Facilities	HVAC to heat pump	776,210	30	15	452	25,756	1,717
	Various Fleet Assets	Heavy vehicle decarbonization	6,738,650	50	10	501	134,520	13,452
2035	Vale Health and Wellness Centre	Install low GWP refrigerant equipment	0	0	-	-	-	-
	Various Facilities	HVAC to heat pump	468,297	25	15	372	18,873	1,258
	Parks Fleet	Heavy vehicle decarbonization	33,031,873	388	10	884	373,516	37,352
	Transportation Fleet	Heavy vehicle decarbonization	32,396,645	181	10	1,807	179,257	17,926
	Various Fleet Assets	Heavy vehicle decarbonization	7,202,740	11	10	108	664,741	66,474
2037	Vale Health and Wellness Centre	Equipment electrification	563,486	14	18	258	39,349	2,186
2038	Various Facilities	HVAC to heat pump	143,762	5	15	76	28,548	1,903
	Various Fleet Assets	Heavy vehicle decarbonization	8,136,990	0	10	0	-	-

Table 8: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Measure life (years)	Lifetime GHG reduction (tCO2e)	Project cost per GHG reduction (\$/tCO2e/yr)	Project cost per lifetime GHG reduction (\$/tCO2e)
2039	Various Fleet Assets	Heavy vehicle decarbonization	18,018,009	46	10	461	390,661	39,066
2040	Sugarloaf Marina Waste	Waste mitigation	11,814	68	20	1,365	173	9
	Vale Health and Wellness Centre Waste	Waste mitigation	11,814	64	20	1,285	184	9
	Various Waste Assets	Waste mitigation	118,135	134	20	2,673	884	44

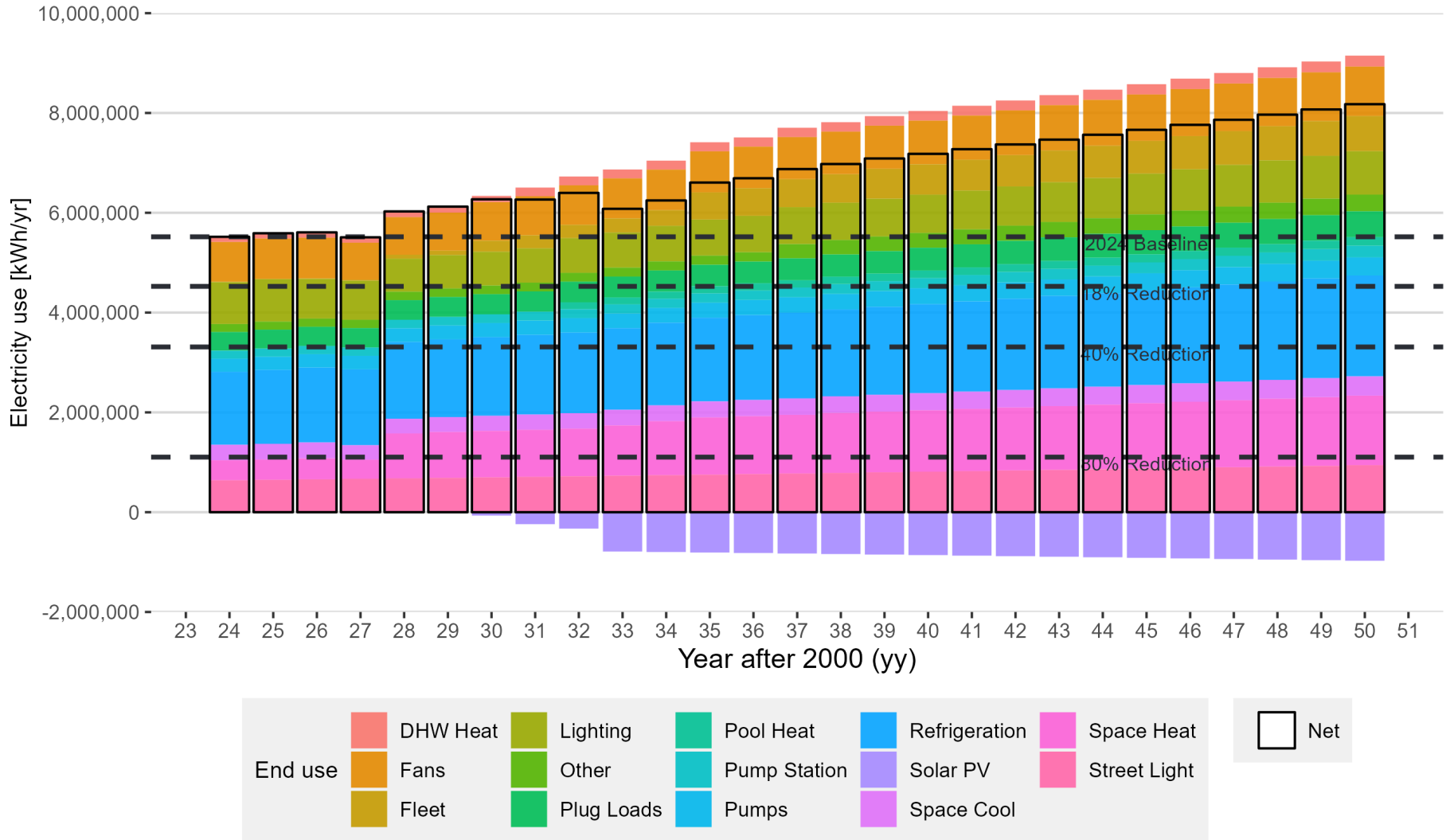


Figure 5: Projected electricity use in the Most Aggressive pathway.

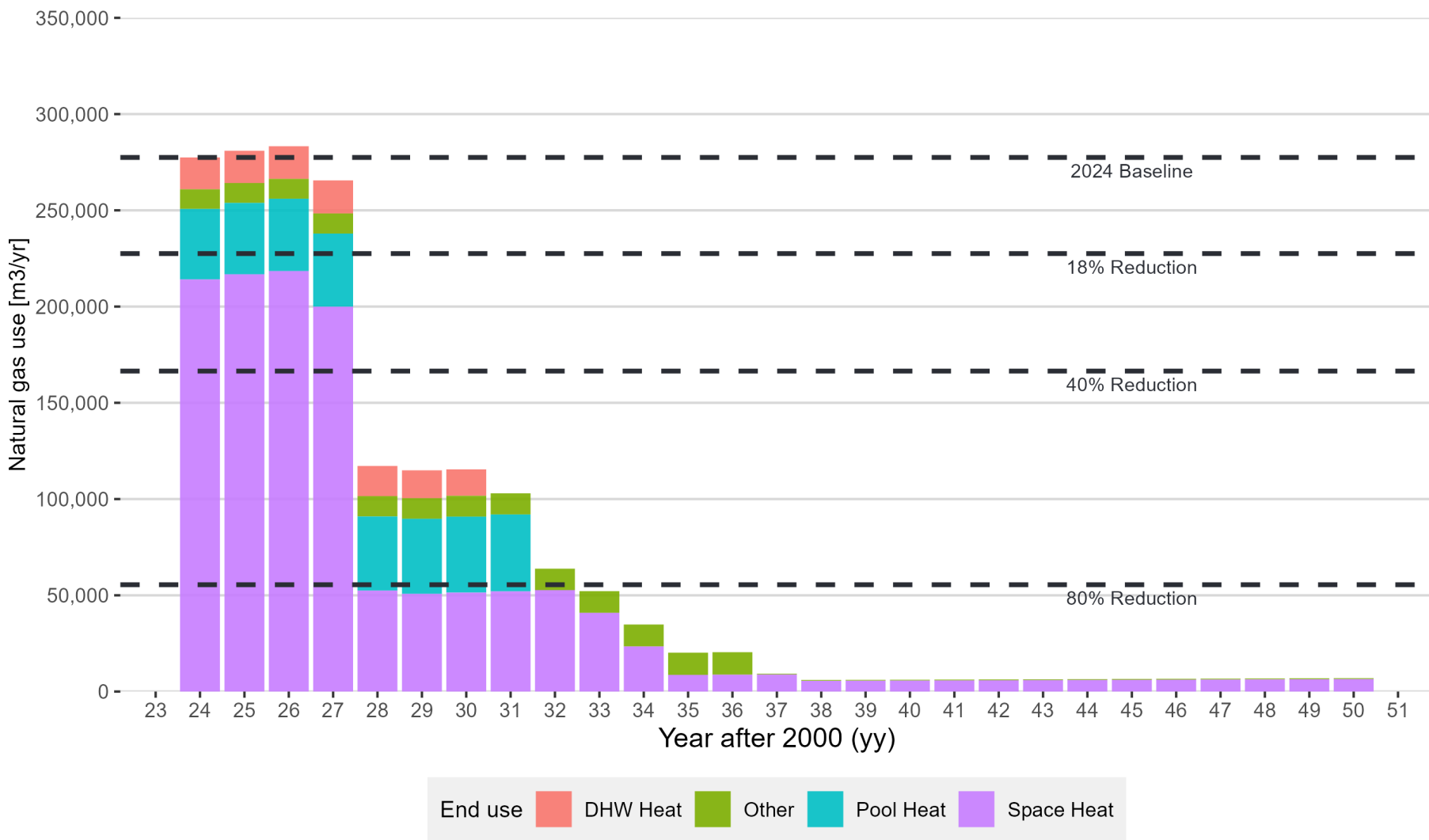


Figure 6: Projected natural gas use in the Most Aggressive pathway.

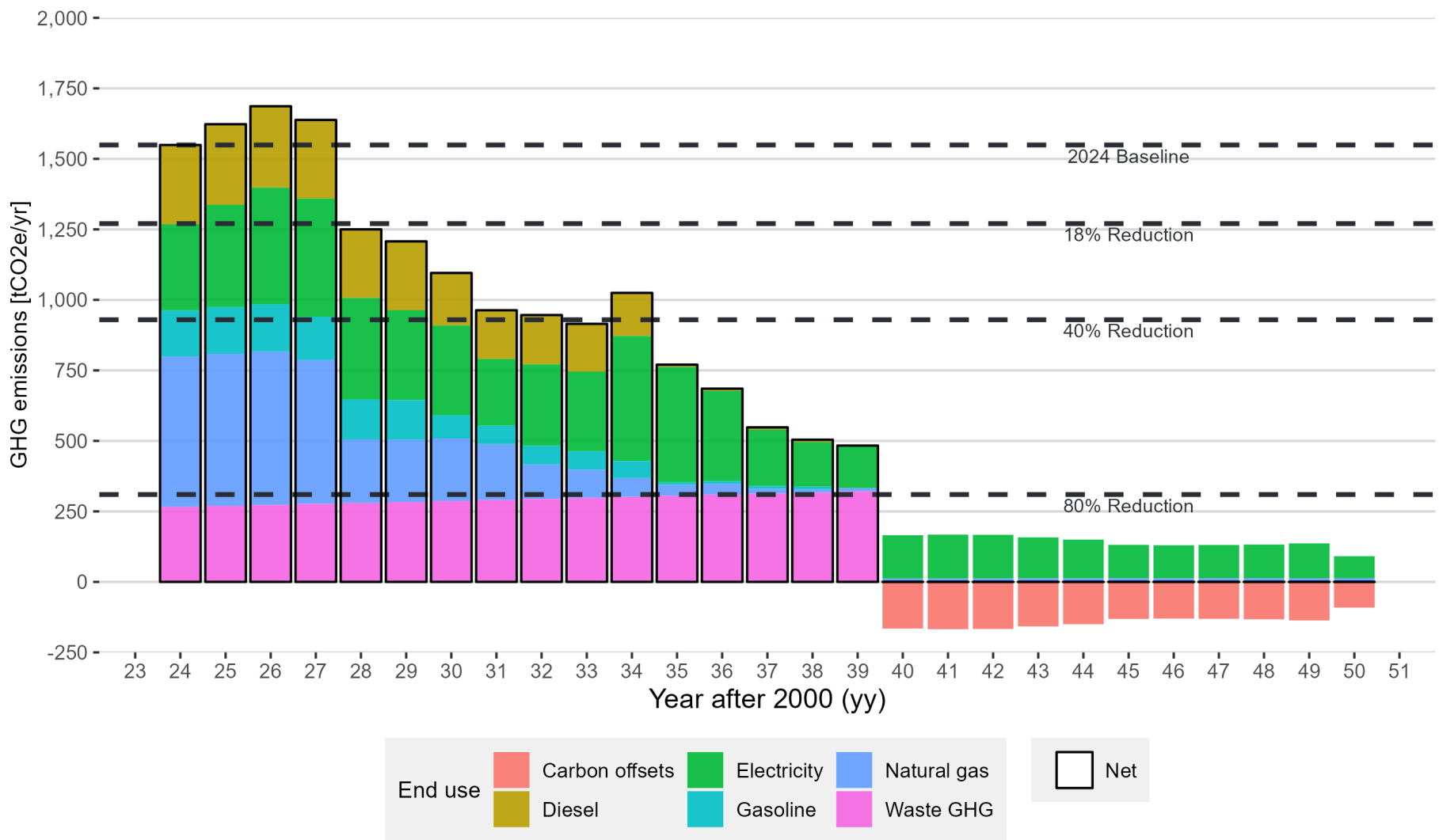


Figure 7: Projected GHG emissions in the Most Aggressive pathway.

To achieve the targets in the Most Aggressive pathway, many measures for the facilities must be undertaken in a relatively short timeframe. The lighting upgrade, fleet optimization, and some fuel switching measures (such as DHW or HVAC to heat pump measures and fleet equipment decarbonization) should be completed by 2028 to attain the 18% reduction target. By 2035, to achieve the target of 50% reduction, most of the fossil fuels (natural gas and fleet fuels) should be replaced with electricity and renewable energy. Waste is assumed to be mitigated by 2040 due to the recommendations described in the waste mitigation measure description, and any remaining GHG emissions due to non-renewable electricity are assumed to be offset with carbon offsets after 2040.

The largest reductions in GHG emissions correspond to the years when there are noticeable drops in natural gas, gasoline, or diesel. This is particularly visible from 2027 to 2028, when the Vale Health and Wellness Centre HVAC to heat pump measure is performed, substantially reducing the City of Port Colborne's natural gas use in 2028.

5.4 Most Aligned

The objective of the Most Aligned pathway is to understand the impact of implementing GHG-reducing measures while aiming to attain 18% reduction by 2028, 40% reduction by 2035, and net-zero by 2050. These targets are intended to align with Niagara Region's goal of nearly 18% GHG reduction by 2028, the Canadian federal targets of 45-50% reduction from 2005 levels to 2035 and net zero by 2050.

Note that GHG emissions are projected to increase over the study period due to population growth, according to the assumptions listed in Milestone 1.

The recommended measure implementation plan for this pathway is presented in the following table, and the projected electricity use, natural gas use, and GHG emissions are presented in the following plots. Note that measures for assets with the highest GHG contributions are listed individually (these assets grouped together contribute to roughly 30% of the corporate GHG emissions). Otherwise, the assets are grouped together for the measure entry.

Table 9: Recommended measures and timeline for Most Aligned pathway

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Vale Health and Wellness Centre	Conduct energy audit	60,765	0	5	0	-	-
	Vale Health and Wellness Centre	Ice resurfacers conversion	182,785	0	15	3	927,517	61,834
	Various Facilities	Conduct energy audit	318,349	0	5	0	-	-
	Various Facilities	HVAC to heat pump	99,485	5	15	72	20,852	1,390
	Various Facilities	Lighting upgrade	1,151,935	0	10	1	9,691,617	969,162
	Sugarloaf Marina Waste	Conduct waste audit	4,355	0	5	0	-	-
	Vale Health and Wellness Centre Waste	Conduct waste audit	4,355	0	5	0	-	-
	Various Waste Assets	Conduct waste audit	43,555	0	5	0	-	-
	Various Fleet Assets	Fleet optimization	14,518	2	10	20	7,410	741
2027	Vale Health and Wellness Centre	HVAC system optimization	102,739	35	15	529	2,912	194
	Various Facilities	HVAC system optimization	295,281	14	15	208	21,316	1,421
	Various Facilities	Lighting upgrade	188,650	0	10	0	4,579,427	457,943
	Parks Fleet	Fleet optimization	2,968	5	10	47	632	63
	Transportation Fleet	Fleet optimization	2,968	10	10	97	307	31

Table 9: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2028	Various Fleet Assets	Fleet equipment decarbonization	768,573	8	5	42	90,580	18,116
	Various Fleet Assets	Fleet optimization	32,643	6	10	60	5,449	545
	Vale Health and Wellness Centre	HVAC to heat pump	4,384,022	278	15	4,170	15,772	1,051
	Vale Health and Wellness Centre	Lighting upgrade	929,455	0	10	2	4,382,227	438,223
	Various Facilities	Demolish building	0	4	-	-	0	-
	Various Facilities	DHW to heat pump	43,267	3	15	39	16,816	1,121
	Various Facilities	Lighting upgrade	66,671	0	10	0	3,445,606	344,561
2029	Various Fleet Assets	Fleet equipment decarbonization	2,225,532	49	5	247	44,976	8,995
	Various Facilities	DHW to heat pump	27,549	2	15	34	12,238	816
	Various Facilities	HVAC to heat pump	97,876	4	15	65	22,592	1,506
	Various Facilities	Lighting upgrade	176,856	0	10	0	65,517,831	6,551,783
2030	Various Fleet Assets	Fleet equipment decarbonization	3,077,256	6	5	31	490,625	98,125
	Various Facilities	DHW to heat pump	45,363	2	15	23	30,231	2,015
	Various Facilities	Solar PV	225,474	4	15	57	59,565	3,971
	Parks Fleet	Fleet equipment decarbonization	14,357,404	460	5	301	238,750	47,750
	Transportation Fleet	Fleet equipment decarbonization	13,810,455	45	5	226	305,663	61,133
	Various Fleet Assets	Fleet equipment decarbonization	136,737	5	5	26	25,983	5,197
2031	Vale Health and Wellness Centre	DHW to heat pump	136,820	20	15	304	6,744	450
	Various Facilities	DHW to heat pump	11,386	2	15	27	6,337	422

Table 9: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
	Various Facilities	Solar PV	578,727	9	15	142	61,154	4,077
	Various Fleet Assets	Fleet equipment decarbonization	10,760,396	31	5	157	343,094	68,619
2032	Vale Health and Wellness Centre	Pool heat to heat pump	990,165	63	15	952	15,595	1,040
	Various Facilities	Solar PV	297,049	5	15	71	62,778	4,185
	Various Fleet Assets	Heavy vehicle decarbonization	1,070,165	2	10	20	544,515	54,451
2033	Vale Health and Wellness Centre	Solar PV	1,300,926	20	15	303	64,439	4,296
	Various Facilities	HVAC to heat pump	527,164	21	15	315	25,095	1,673
	Various Facilities	Solar PV	325,232	5	15	76	64,439	4,296
	Various Fleet Assets	Heavy vehicle decarbonization	2,192,697	28	10	277	79,269	7,927
2034	Various Facilities	HVAC to heat pump	776,210	30	15	452	25,756	1,717
	Various Fleet Assets	Heavy vehicle decarbonization	6,738,650	50	10	501	134,520	13,452
2035	Vale Health and Wellness Centre	Install low GWP refrigerant equipment	0	0	-	-	-	-
	Various Facilities	HVAC to heat pump	468,297	25	15	372	18,873	1,258
	Various Fleet Assets	Heavy vehicle decarbonization	5,932,283	11	10	108	547,491	54,749
2037	Various Fleet Assets	Heavy vehicle decarbonization	1,326,972	0	10	0	-	-
2038	Parks Fleet	Heavy vehicle decarbonization	35,260,291	88	10	884	398,714	39,871
2039	Transportation Fleet	Heavy vehicle decarbonization	35,343,017	181	10	1,807	195,559	19,556
2042	Vale Health and Wellness Centre	Equipment electrification	639,752	14	18	258	44,674	2,482
2043	Various Fleet Assets	Heavy vehicle decarbonization	9,072,318	0	10	0	-	-
2044	Various Facilities	HVAC to heat pump	167,282	5	15	76	33,218	2,215

Table 9: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Measure life (years)	Lifetime GHG reduction (tCO2e)	Project cost per GHG reduction (\$/tCO2e/yr)	Project cost per lifetime GHG reduction (\$/tCO2e)
2045	Various Fleet Assets	Heavy vehicle decarbonization	10,265,549	12	10	122	839,863	83,986
2046	Various Fleet Assets	Heavy vehicle decarbonization	10,491,391	134	10	339	309,490	30,949
2050	Sugarloaf Marina Waste	Waste mitigation	14,686	68	20	1,365	215	11
	Vale Health and Wellness Centre Waste	Waste mitigation	14,686	64	20	1,285	229	11
	Various Waste Assets	Waste mitigation	146,855	134	20	2,673	1,099	55

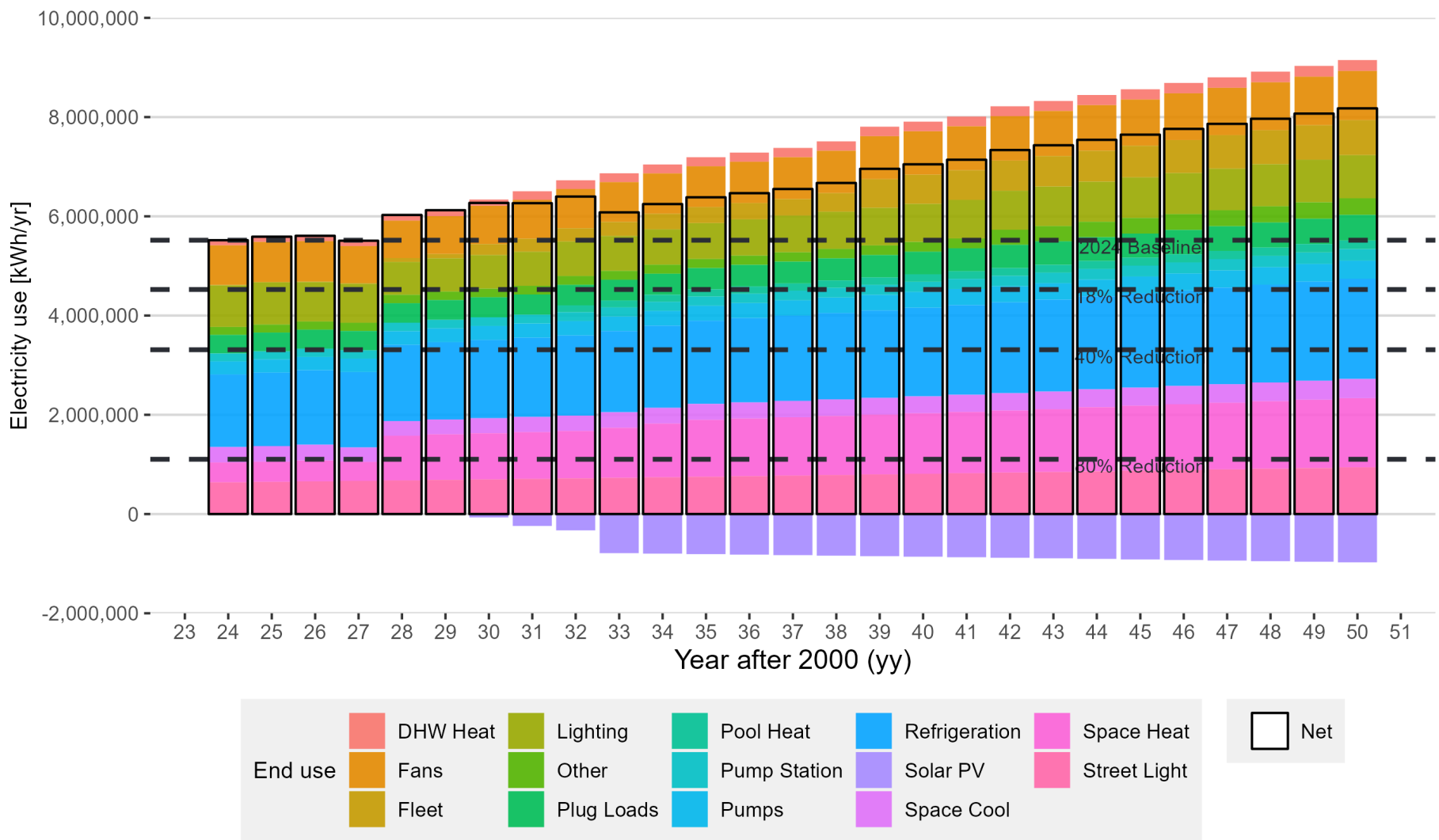


Figure 8: Projected electricity use in the Most Aligned pathway.

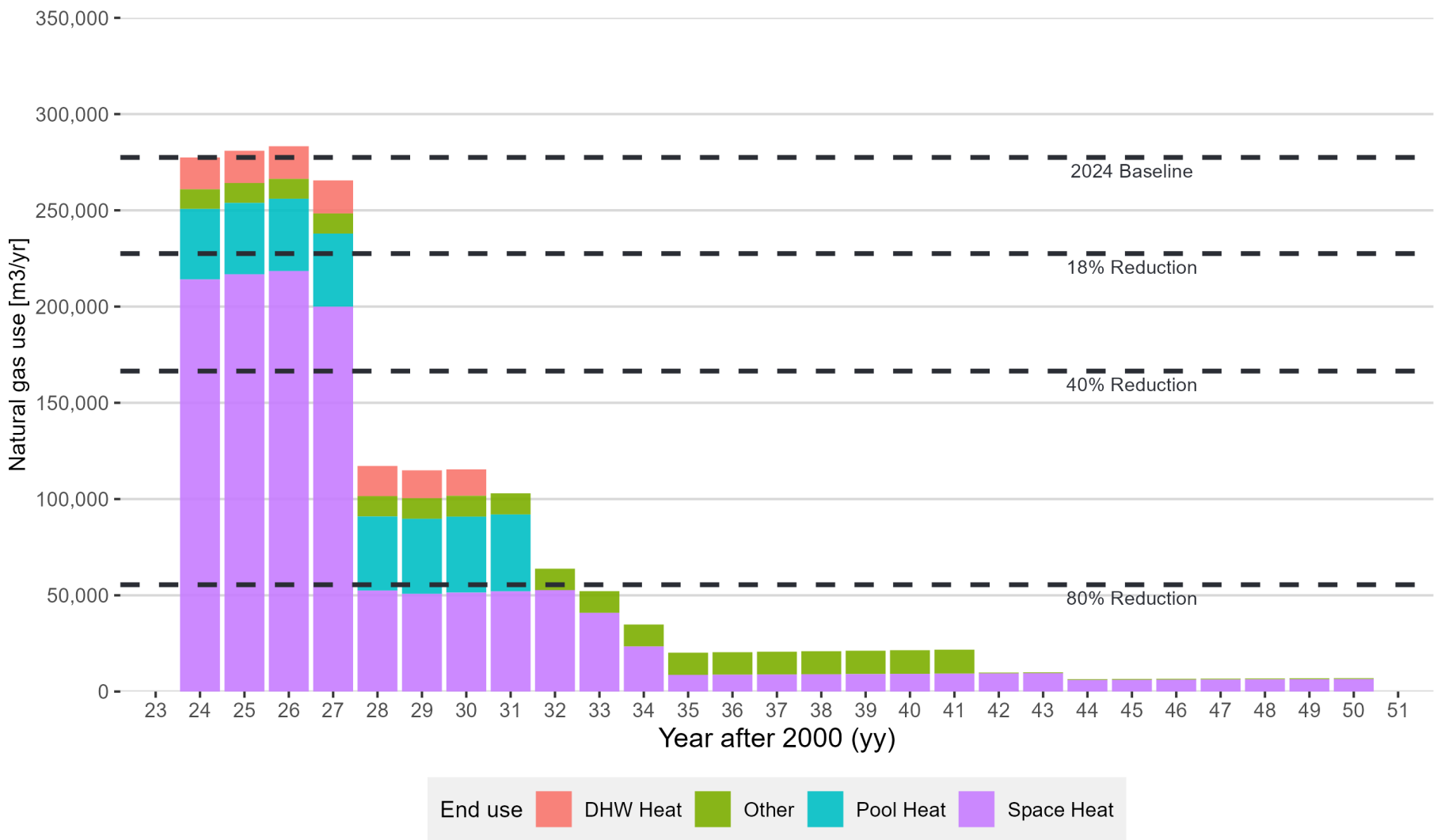


Figure 9: Projected natural gas use in the Most Aligned pathway.

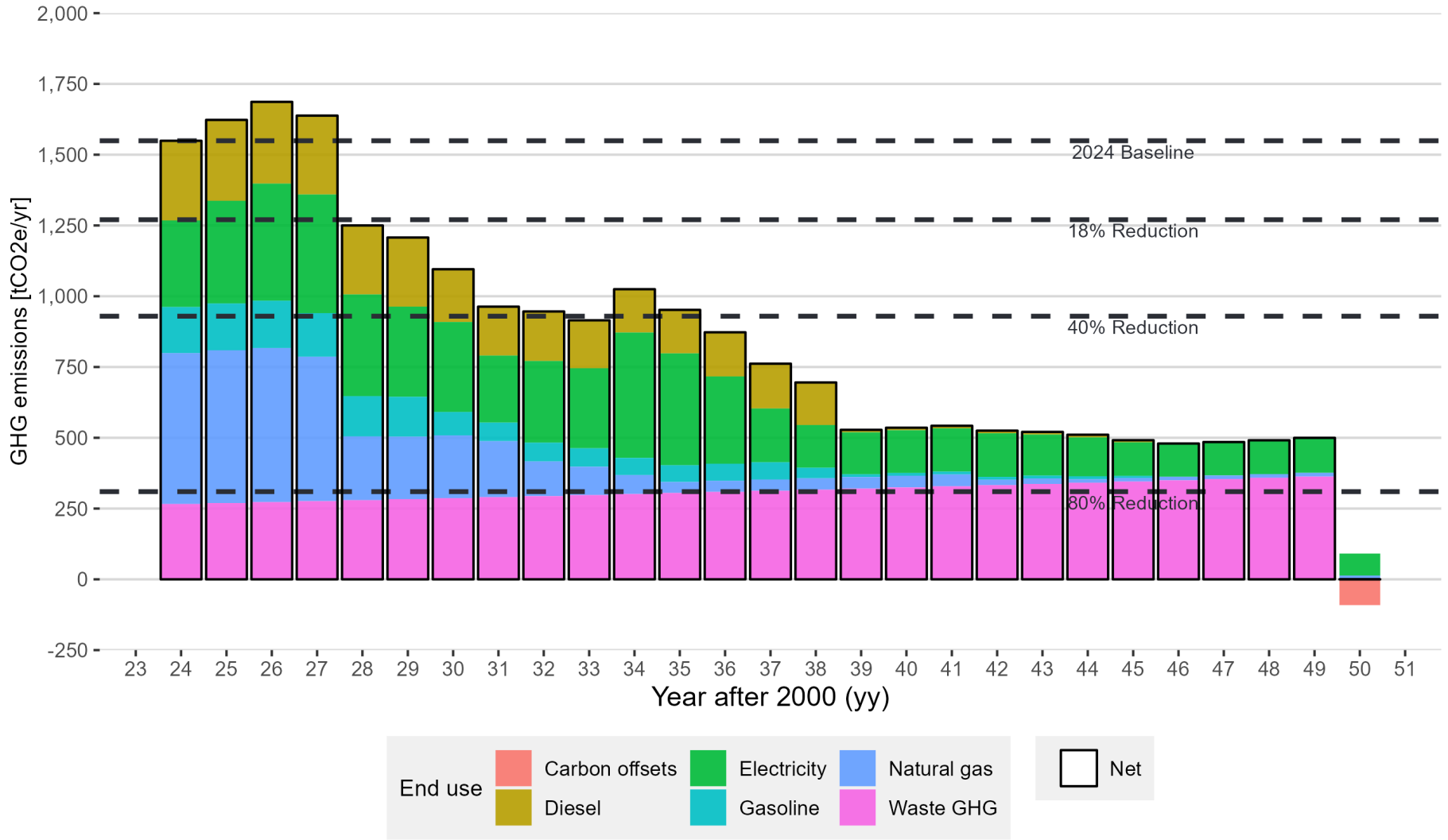


Figure 10: Projected GHG emissions in the Most Aligned pathway.

To achieve the targets in the Most Aligned pathway, a similarly quick measure implementation timeline to the Most Aggressive pathway must be undertaken in the first few years to meet the 2028 reduction target. The lighting upgrade, fleet optimization, and some fuel switching measures (such as DHW or HVAC to heat pump measures and fleet equipment decarbonization) should be completed by 2028 to attain the 18% reduction target. By 2035, to achieve the target of 40% reduction, many of the fossil fuels (natural gas and fleet fuels) should be replaced with electricity and renewable energy. Waste is assumed to be mitigated by 2050 due to the recommendations described in the waste mitigation measure description, and any remaining GHG emissions due to non-renewable electricity are assumed to be offset with carbon offsets after 2050.

The largest reductions in GHG emissions correspond to the years when there are noticeable drops in natural gas, gasoline, or diesel. This is particularly visible from 2027 to 2028, when the Vale Health and Wellness Centre HVAC to heat pump measure is performed, substantially reducing the City of Port Colborne's natural gas use in 2028. It is also visible from 2049 to 2050, when the effects of the waste mitigation measure are assumed to be accounted for.

5.5 Most Achievable

The objective of the Most Achievable pathway is to understand the impact of implementing GHG-reducing measures while aiming to attain 40% reduction by 2035 and 80% reduction by 2050, using carbon offsets to achieve net-zero. This scenario intends to achieve similar outcomes to the Most Aligned scenario, however, it considers targets that place less emphasis on immediate GHG reductions and allows for greater use of carbon offsets to avoid high capital cost measures.

Note that GHG emissions are projected to increase over the study period due to population growth, according to the assumptions listed in Milestone 1.

The recommended measure implementation plan for this pathway is presented in the following table, and the projected electricity use, natural gas use, and GHG emissions are presented in the following plots. Note that measures for assets with the highest GHG contributions are listed individually (these assets grouped together contribute to roughly 30% of the corporate GHG emissions). Otherwise, the assets are grouped together for the measure entry.

Table 10: Recommended measures and timeline for Most Achievable pathway

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Vale Health and Wellness Centre	Conduct energy audit	60,765	0	5	0	-	-
	Vale Health and Wellness Centre	Ice resurfacers conversion	182,785	0	15	3	927,517	61,834
	Various Facilities	Conduct energy audit	318,349	0	5	0	-	-
	Various Facilities	HVAC to heat pump	99,485	5	15	72	20,852	1,390
	Various Facilities	Lighting upgrade	130,396	0	10	0	6,068,410	606,841
	Sugarloaf Marina Waste	Conduct waste audit	4,355	0	5	0	-	-
	Vale Health and Wellness Centre Waste	Conduct waste audit	4,355	0	5	0	-	-
	Various Waste Assets	Conduct waste audit	43,555	0	5	0	-	-
2027	Various Facilities	Lighting upgrade	1,232,891	0	10	1	8,897,478	889,748
	Various Fleet Assets	Fleet optimization	14,838	2	10	20	7,573	757
2028	Vale Health and Wellness Centre	HVAC system optimization	105,087	35	15	529	2,979	199
	Vale Health and Wellness Centre	Lighting upgrade	929,455	0	10	2	4,382,227	438,223
	Various Facilities	Demolish building	0	4	-	-	0	-

Table 10: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
	Various Facilities	DHW to heat pump	10,855	0	15	6	28,814	1,921
	Various Facilities	HVAC system optimization	301,667	14	15	208	21,778	1,452
	Various Facilities	Lighting upgrade	66,671	0	10	0	3,445,606	344,561
	Parks Fleet	Fleet optimization	3,033	5	10	47	646	65
	Transportation Fleet	Fleet optimization	3,033	10	10	97	314	31
	Various Fleet Assets	Fleet equipment decarbonization	785,482	8	5	42	92,573	18,515
	Various Fleet Assets	Fleet optimization	33,361	6	10	60	5,568	557
2029	Vale Health and Wellness Centre	HVAC to heat pump	4,502,122	278	15	4,170	16,197	1,080
	Various Facilities	DHW to heat pump	33,132	2	15	33	15,086	1,006
	Various Facilities	HVAC system optimization	142	0	15	0	300,909	20,061
	Various Facilities	HVAC to heat pump	97,876	4	15	65	22,592	1,506
	Various Facilities	Lighting upgrade	176,856	0	10	0	65,517,831	6,551,783
	Various Fleet Assets	Fleet equipment decarbonization	2,006,906	23	5	117	85,915	17,183
2030	Various Facilities	DHW to heat pump	28,162	2	15	34	12,511	834
	Various Fleet Assets	Fleet equipment decarbonization	3,418,430	32	5	162	105,521	21,104
2031	Various Facilities	DHW to heat pump	46,365	2	15	23	30,899	2,060
	Various Facilities	Solar PV	231,491	4	15	57	61,154	4,077
	Parks Fleet	Fleet equipment decarbonization	14,673,267	60	5	301	244,002	48,800
	Transportation Fleet	Fleet equipment decarbonization	14,114,285	45	5	226	312,388	62,478
	Various Fleet Assets	Fleet equipment decarbonization	139,745	5	5	26	26,554	5,311

Table 10: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2032	Vale Health and Wellness Centre	DHW to heat pump	139,894	20	15	304	6,895	460
	Various Facilities	DHW to heat pump	11,643	2	15	27	6,479	432
	Various Facilities	Solar PV	594,099	9	15	142	62,778	4,185
	Various Fleet Assets	Fleet equipment decarbonization	10,997,124	31	5	157	350,642	70,128
2033	Vale Health and Wellness Centre	Pool heat to heat pump	1,016,349	63	15	952	16,007	1,067
	Various Facilities	Solar PV	304,905	5	15	71	64,439	4,296
2034	Vale Health and Wellness Centre	Solar PV	1,335,179	20	15	303	66,135	4,409
	Various Facilities	HVAC to heat pump	541,044	21	15	315	25,756	1,717
	Various Facilities	Solar PV	333,795	5	15	76	66,135	4,409
2035	Vale Health and Wellness Centre	Install low GWP refrigerant equipment	0	0	-	-	-	-
	Various Facilities	HVAC to heat pump	1,264,858	55	15	824	23,018	1,535
2042	Vale Health and Wellness Centre	Equipment electrification	639,752	14	18	258	44,674	2,482
2044	Various Facilities	HVAC to heat pump	167,282	5	15	76	33,218	2,215
2050	Sugarloaf Marina Waste	Waste mitigation	14,686	68	20	1,365	215	11
	Vale Health and Wellness Centre Waste	Waste mitigation	14,686	64	20	1,285	229	11
	Various Waste Assets	Waste mitigation	146,855	134	20	2,673	1,099	55

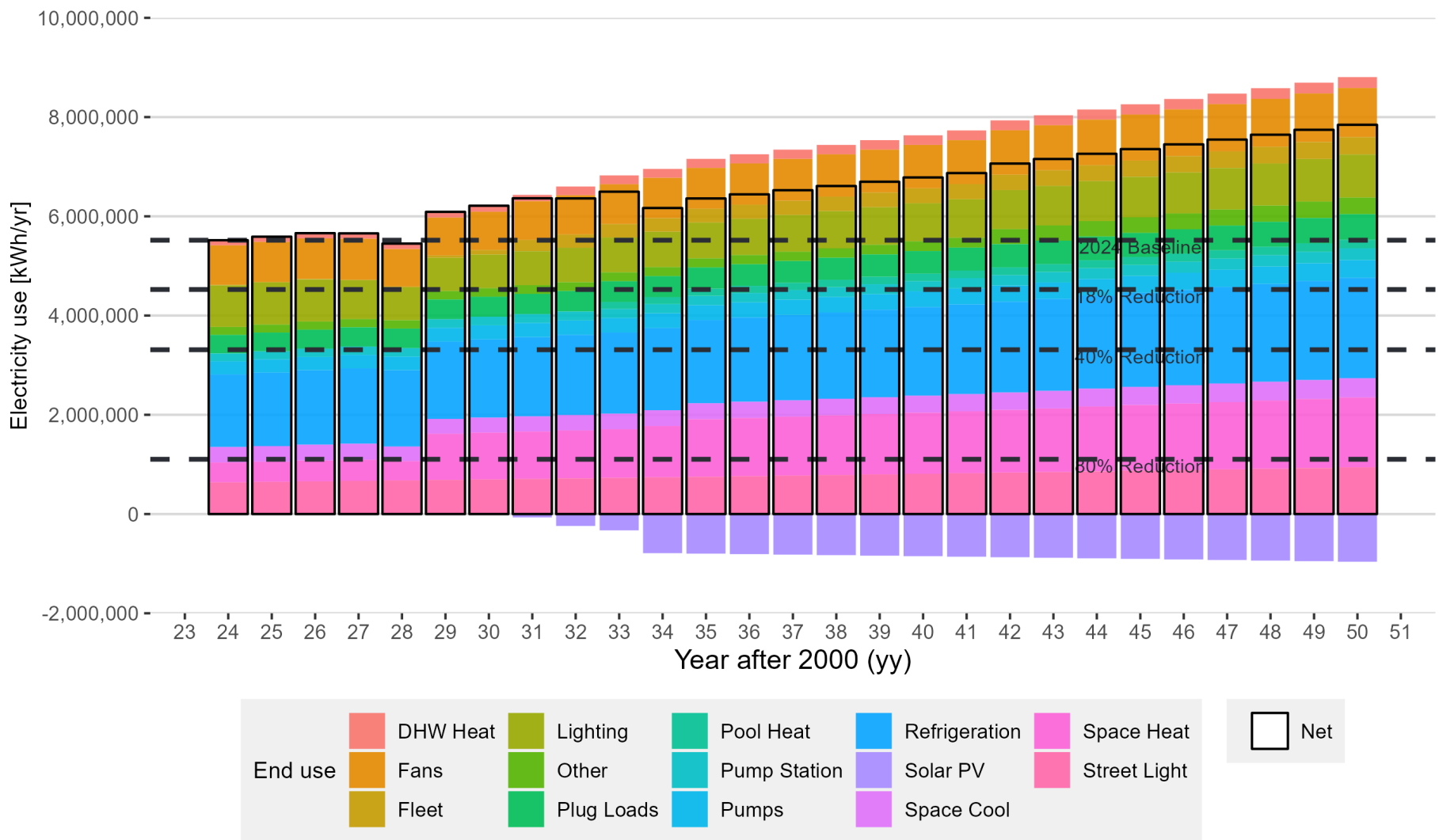


Figure 11: Projected electricity use in the Most Achievable pathway.

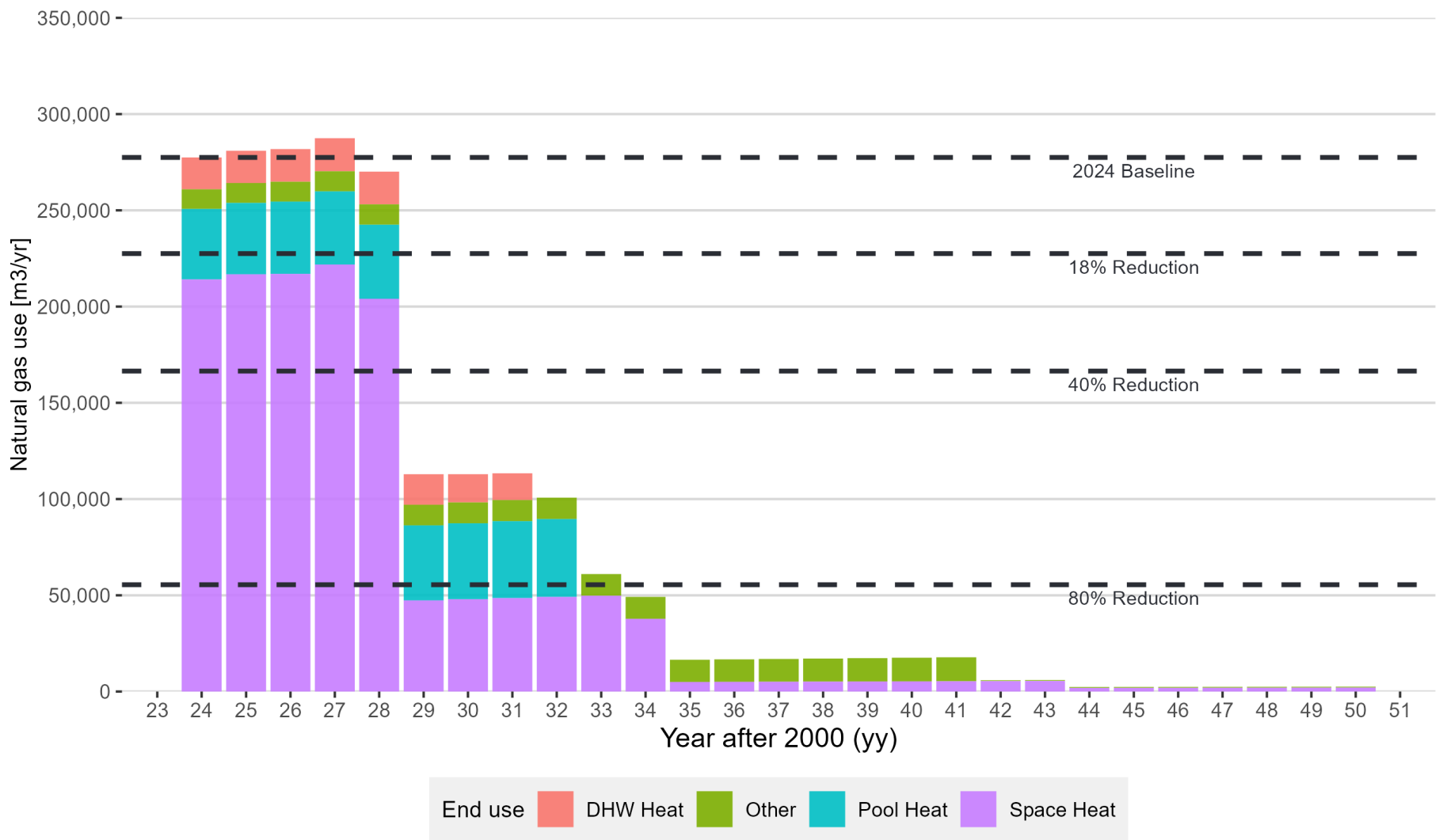


Figure 12: Projected natural gas use in the Most Achievable pathway.

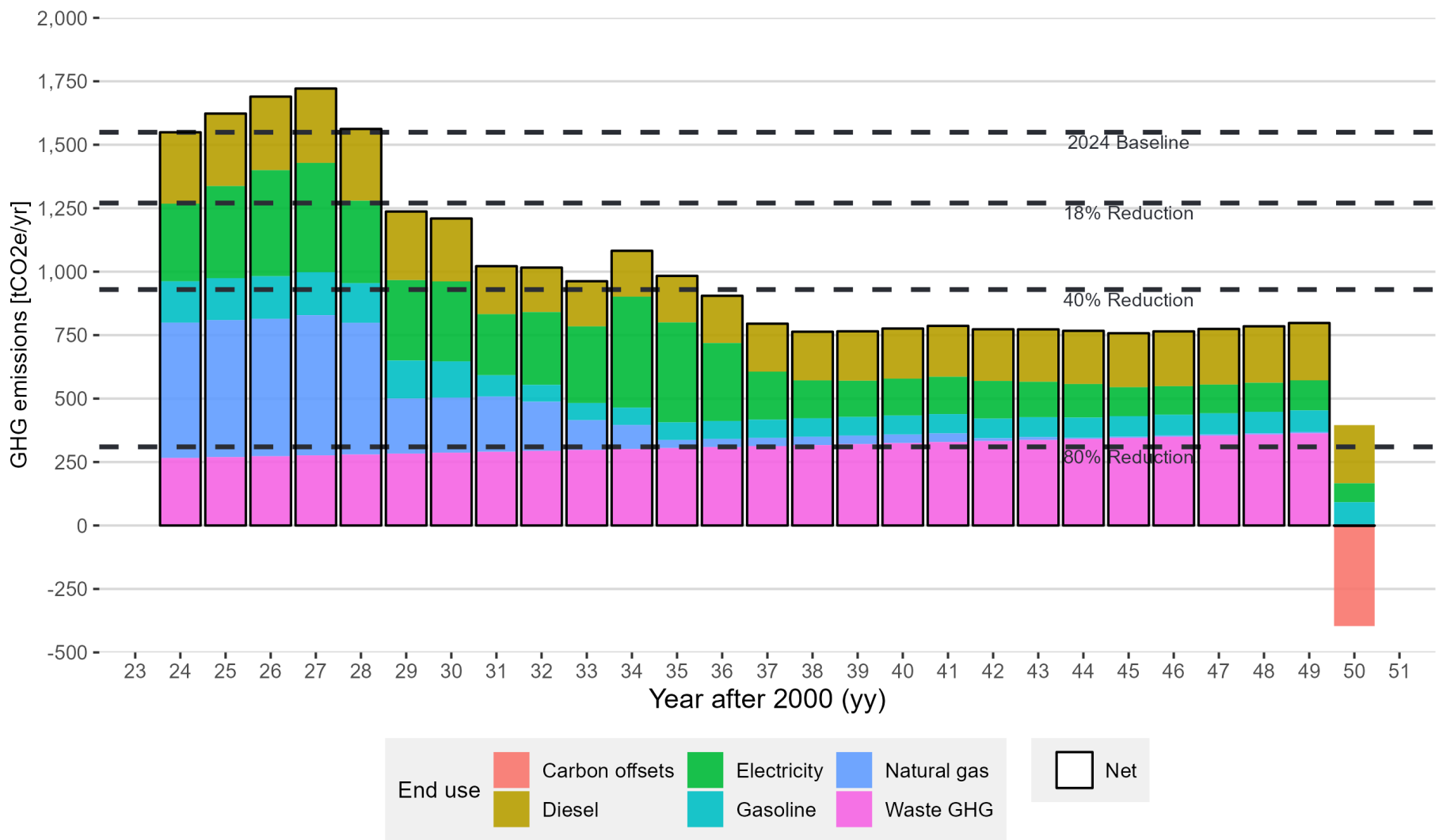


Figure 13: Projected GHG emissions in the Most Achievable pathway.

The Most Achievable pathway is meant to have the most gradual measure implementation timeline to achieve GHG reduction targets in a more manageable way, but the measures must still be implemented fairly quickly to achieve a 40% reduction by 2035. To accomplish this, the lighting upgrade, fleet optimization, and some fuel switching measures (such as DHW or HVAC to heat pump measures and fleet equipment decarbonization) should be completed by 2035. This requires that a good portion of the City of Port Colborne's assets (HVAC or fleet) be electrified to reduce GHG emissions. Waste is assumed to be mitigated by 2050 due to the recommendations described in the waste mitigation measure description, and any remaining GHG emissions due to non-renewable electricity are assumed to be offset with carbon offsets after 2050. For this pathway, it is assumed that heavy vehicle decarbonization is not completed to reduce costs while still substantially reducing the City of Port Colborne's GHG emissions. This doesn't quite meet the target of reducing emissions by 80% before carbon offsets, but approaches the target while focusing on the most cost effective and practical measures.

The largest reductions in GHG emissions correspond to the years when there are noticeable drops in natural gas, gasoline, or diesel. This is particularly visible from 2027 to 2028, when the Vale Health and Wellness Centre HVAC to heat pump measure is performed, substantially reducing the City of Port Colborne's natural gas use in 2028. It is also visible from 2049 to 2050, when the effects of the waste mitigation measure are assumed to be accounted for.

5.6 Overall Pathway Results

The pathway results are compared in the following table. Note that "final" refers to the parameter value in the final year of the study (2050), while cumulative refers to the total value of that parameter summed up over the course of the study period (from the baseline year until 2050). Also note that for the financial parameters, the estimated inflation is factored in.

Table 11: Pathway results comparison

Parameter	Unit	Business as Planned	Most Aggressive	Most Aligned	Most Achievable
Electricity utility use final (2050)	[kWh/yr]	7,700,000	8,180,000	8,180,000	7,840,000
Natural gas utility use final (2050)	[m3/yr]	383,000	6,950	6,950	2,520
Gasoline utility use final (2050)	[L/yr]	101,000	0	0	36,500
Diesel utility use final (2050)	[L/yr]	153,000	0	0	84,400
Waste disposal GHG emissions final (2050)	[tCO2e/yr]	368	0	0	0
Carbon offsets utility use final (2050)	[tCO2e/yr]	0	91	91	396
GHG emissions final (2050)	[tCO2e/yr]	1,830	0	0	0
Utility cost final (2050)	[\$/yr]	2,860,000	2,110,000	2,110,000	2,380,000
Electricity utility use cumulative	[kWh]	177,000,000	184,000,000	183,000,000	179,000,000
Natural gas utility use cumulative	[m3]	8,850,000	1,840,000	1,920,000	2,100,000
Gasoline utility use cumulative	[L]	2,260,000	550,000	655,000	1,110,000
Diesel utility use cumulative	[L]	3,420,000	925,000	1,160,000	2,200,000
Waste disposal GHG emissions cumulative	[tCO2e]	8,490	4,680	8,120	8,120
Carbon offsets utility use cumulative	[tCO2e]	0	1,560	91	396
GHG emissions cumulative	[tCO2e]	46,400	16,900	22,800	26,700
Project cost cumulative	[\$]	87,300,000	173,000,000	182,000,000	123,000,000
Incentives cumulative	[\$]	0	2,820,000	2,820,000	2,460,000
Effective project cost cumulative	[\$]	87,300,000	170,000,000	179,000,000	121,000,000
Utility cost cumulative	[\$]	50,900,000	40,200,000	40,500,000	43,300,000
Total cost cumulative	[\$]	138,000,000	210,000,000	219,000,000	164,000,000
Net present value cumulative	[\$]	75,200,000	129,000,000	123,000,000	95,000,000

All pathways, other than the Business as Planned pathway, are net-zero by 2050 due to the implementation of carbon offsets. The Most achievable has the highest amount of carbon offsets, as it does not consider every measure to reduce costs.

Implementing the measures in the pathways is anticipated to decrease the consumption of most utilities, but increase the electricity consumption due to the electrification measures being performed. This results in substantially lower GHG emissions even before carbon offsets are implemented. Note that the cumulative offsets are highest in the Most Aggressive scenario due to the accelerated timeline.

The utility costs in the pathways are lower than the anticipated Business as Planned utility costs, due to the increased efficiency of the equipment in the measures. However, project costs are much higher in the pathways when compared to the estimated replacement costs in the Business as Planned pathway.

The project costs in the Most Achievable pathway are lower than the other pathways, with relatively similar utility costs, suggesting that the Most Achievable pathway is likely to be the most feasible approach for reducing GHG emissions while maintaining manageable capital costs.

5.7 Recommendation

The Most Achievable pathway is able to significantly reduce the City of Port Colborne's GHG emissions with considerably lower costs than the Most Aggressive and Most Aligned pathways. As such, this is the recommended pathway to undertake to reduce corporate GHG emissions.

6 References

6.1 Emission Coefficients References

The reference links for emissions coefficients are provided below.

National Inventory Report: Greenhouse Gas Sources and Sinks in Canada:

- <https://publications.gc.ca/site/eng/9.506002/publication.html>

Environment and Climate Change Canada Data Catalogue (Electricity Grid Intensities):

- <https://data-donnees.az.ec.gc.ca/data/substances/monitor/canada-s-greenhouse-gas-emissions-projections/Current-Projections-Actuelles/Energie-Energie/AM%20Scenario%20AMS/Grid-O%26G-Intensities-Intensites-Reseau-Delectricite-P%26G?lang=en>

6.2 GHG Targets and Net Zero References

Canadian Federal Target 2035:

- <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/2035-emissions-reduction-target.html>

Canadian Net Zero Target:

- <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050.html>

PCP Milestone 2 and IPCC Targets:

- https://cdn.prod.website-files.com/6022ab403a6b2126c03ebf95/6203d4ae7774df41b9623bc0_pcp-milestone-2-instruction-manual-english.pdf

City of Toronto - Transform to Net Zero Strategy:

- <https://www.toronto.ca/legdocs/mmis/2021/ie/bgrd/backgroundfile-173758.pdf>

A Additional Pathway Details

A.1 Recommended ECMs

The full list of recommended measures is presented below.

Table 12: Recommended measures and energy savings

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
00 Sugarloaf St, Splashpad	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
00 Sugarloaf St, Splashpad	Lighting upgrade	9,653	28	9,625	0	18	139	-4	0	0	0
00 Sugarloaf St, Splashpad	Purchasing carbon offsets	0	0	0	0	-4	0	0	0	0	0
000 Weaver Rd, Sec Camera	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
000 Weaver Rd, Sec Camera	Lighting upgrade	1,428	8	1,420	0	5	41	-1	0	0	0
000 Weaver Rd, Sec Camera	Purchasing carbon offsets	0	0	0	0	-1	0	0	0	0	0
1 Marina Rd (fuel docks)	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
1 Marina Rd (fuel docks)	HVAC system optimization	6,414	0	6,414	0	73	520	0	0	0	0
1 Marina Rd (fuel docks)	Lighting upgrade	32,068	68	32,000	0	45	340	-9	0	0	0
1 Marina Rd (fuel docks)	Purchasing carbon offsets	0	0	0	0	-12	0	0	0	0	0
11 King St (Metal Shed)	Purchasing carbon offsets	0	0	0	0	0	0	0	0	0	0
11 King St (Storage Bldg) 14 King St	Purchasing carbon offsets	0	0	0	0	0	0	0	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
145 Mellanby Ave, Lock 8 Viewing Stand	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
145 Mellanby Ave, Lock 8 Viewing Stand	Lighting upgrade	33,279	131	33,148	0	87	653	-18	0	0	0
145 Mellanby Ave, Lock 8 Viewing Stand	Purchasing carbon offsets	0	0	0	0	-13	0	0	0	0	0
2 John St. Lockview	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
2 John St. Lockview	Purchasing carbon offsets	0	0	0	0	-0	0	0	0	0	0
227 Catharine St, Market Square	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
227 Catharine St, Market Square	Lighting upgrade	1,262	4	1,258	0	2	18	-1	0	0	0
227 Catharine St, Market Square	Purchasing carbon offsets	0	0	0	0	-0	0	0	0	0	0
280 King Street (Barn)	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
280 King Street (Barn)	Lighting upgrade	23,462	68	23,394	0	45	338	-9	0	0	0
280 King Street (Barn)	Purchasing carbon offsets	0	0	0	0	-9	0	0	0	0	0
287 West Side Rd, Flow Meter	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
287 West Side Rd, Flow Meter	Lighting upgrade	1,783	10	1,773	0	7	51	-1	0	0	0
287 West Side Rd, Flow Meter	Purchasing carbon offsets	0	0	0	0	-1	0	0	0	0	0
296 Fielden Ave, Business Roselawn Centre	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
296 Fielden Ave, Business Roselawn Centre	DHW to heat pump	10,000	54	9,946	0	-46	-734	217	0	0	0
296 Fielden Ave, Business Roselawn Centre	HVAC system optimization	31,776	62	31,714	1	150	607	250	0	0	0
296 Fielden Ave, Business Roselawn Centre	HVAC to heat pump	106,974	21,395	85,579	4	-532	-8,441	2,499	0	0	0
296 Fielden Ave, Business Roselawn Centre	Lighting upgrade	158,880	287	158,593	0	191	1,436	-40	0	0	0
296 Fielden Ave, Business Roselawn Centre	Purchasing carbon offsets	0	0	0	6	-184	0	0	0	0	0
296 Fielden Ave, Business Roselawn Centre	Solar PV	60,000	12,000	48,000	1	2,391	17,082	0	0	0	0
296 Fielden Ave, Heritage Roselawn Centre	Conduct energy audit	25,475	20,380	5,095	0	0	0	0	0	0	0
296 Fielden Ave, Heritage Roselawn Centre	DHW to heat pump	15,000	295	14,705	2	-251	-3,989	1,181	0	0	0
296 Fielden Ave, Heritage Roselawn Centre	HVAC system optimization	76,426	339	76,087	3	810	3,263	1,358	0	0	0
296 Fielden Ave, Heritage Roselawn Centre	HVAC to heat pump	581,426	116,285	465,141	24	-2,892	-45,879	13,581	0	0	0
296 Fielden Ave, Heritage Roselawn Centre	Lighting upgrade	382,130	1,543	380,587	0	1,024	7,716	-215	0	0	0

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
296 Fielden Ave, Heritage Roselawn Centre	Purchasing carbon offsets	0	0	0	33	-999	0	0	0	0	0
296 Fielden Ave, Heritage Roselawn Centre	Solar PV	280,000	56,000	224,000	4	11,160	79,716	0	0	0	0
3 Marina St (Air Conditioning)	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
3 Marina St (Air Conditioning)	HVAC system optimization	7,265	0	7,265	0	117	838	0	0	0	0
3 Marina St (Air Conditioning)	Purchasing carbon offsets	0	0	0	0	-14	0	0	0	0	0
3 Marina St, Sugarloaf Marina docks	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
3 Marina St, Sugarloaf Marina docks	DHW to heat pump	10,000	259	9,741	2	-221	-3,501	1,036	0	0	0
3 Marina St, Sugarloaf Marina docks	HVAC system optimization	6,000	250	5,750	2	950	4,927	1,001	0	0	0
3 Marina St, Sugarloaf Marina docks	HVAC to heat pump	253,538	50,708	202,830	17	-2,133	-33,831	10,015	0	0	0
3 Marina St, Sugarloaf Marina docks	Lighting upgrade	30,000	1,812	28,188	0	1,202	9,058	-252	0	0	0
3 Marina St, Sugarloaf Marina docks	Purchasing carbon offsets	0	0	0	27	-823	0	0	0	0	0
3 Marina St, Sugarloaf Marina docks	Solar PV	320,000	64,000	256,000	5	12,755	91,104	0	0	0	0
550 Elizabeth St, Ball Field	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
550 Elizabeth St, Ball Field	HVAC system optimization	2,848	0	2,848	0	30	214	0	0	0	0
550 Elizabeth St, Ball Field	Lighting upgrade	14,241	35	14,206	0	23	173	-5	0	0	0
550 Elizabeth St, Ball Field	Purchasing carbon offsets	0	0	0	0	-5	0	0	0	0	0
550 Elizabeth St, Charg Stn	Purchasing carbon offsets	0	0	0	1	-15	0	0	0	0	0
61 Princess Street (Garage)	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
61 Princess Street (Garage)	Lighting upgrade	982	3	979	0	2	14	-0	0	0	0
61 Princess Street (Garage)	Purchasing carbon offsets	0	0	0	0	-0	0	0	0	0	0
78 Lakeshore Rd W, Heat Trace	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
78 Lakeshore Rd W, Heat Trace	Purchasing carbon offsets	0	0	0	0	0	0	0	0	0	0
Arabellas Tea Room	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
Arabellas Tea Room	DHW to heat pump	10,000	29	9,971	0	-25	-396	117	0	0	0
Arabellas Tea Room	HVAC system optimization	1,793	34	1,759	0	58	166	135	0	0	0
Arabellas Tea Room	HVAC to heat pump	57,780	11,556	46,224	2	-287	-4,559	1,350	0	0	0
Arabellas Tea Room	Lighting upgrade	8,964	79	8,885	0	52	394	-11	0	0	0
Arabellas Tea Room	Purchasing carbon offsets	0	0	0	3	-92	0	0	0	0	0
Athletic Field Washrooms	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Athletic Field Washrooms	Lighting upgrade	10,800	65	10,735	0	43	324	-9	0	0	0
Athletic Field Washrooms	Purchasing carbon offsets	0	0	0	0	-9	0	0	0	0	0
Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Lighting upgrade	11,400	55	11,345	0	37	276	-8	0	0	0
Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Purchasing carbon offsets	0	0	0	0	-7	0	0	0	0	0
Centennial Park Washrooms	Conduct energy audit	12,000	9,600	2,400	0	0	0	0	0	0	0
Centennial Park Washrooms	Lighting upgrade	3,132	58	3,074	0	39	291	-8	0	0	0
Centennial Park Washrooms	Purchasing carbon offsets	0	0	0	0	-8	0	0	0	0	0
City Hall	Conduct energy audit	12,056	6,820	5,236	0	0	0	0	0	0	0
City Hall	HVAC system optimization	36,167	0	36,167	1	3,095	22,106	0	0	0	0
City Hall	Lighting upgrade	180,834	4,383	176,451	0	2,910	21,917	-611	0	0	0
City Hall	Purchasing carbon offsets	0	0	0	21	-635	0	0	0	0	0
City Hall	Solar PV	240,000	48,000	192,000	4	9,566	68,328	0	0	0	0
Clarence St Crosswalk	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Clarence St Crosswalk	Lighting upgrade	2,977	17	2,960	0	11	86	-2	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Clarence St Crosswalk	Purchasing carbon offsets	0	0	0	0	-1	0	0	0	0	0
Clarence St, Seaway Lite Seaway Park	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Clarence St, Seaway Lite Seaway Park	Lighting upgrade	17,679	51	17,628	0	34	255	-7	0	0	0
Clarence St, Seaway Lite Seaway Park	Purchasing carbon offsets	0	0	0	0	-7	0	0	0	0	0
E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Lighting upgrade	2,571	7	2,564	0	5	37	-1	0	0	0
E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Purchasing carbon offsets	0	0	0	0	-1	0	0	0	0	0
Eagle Marsh Drain Outlet Structure	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Eagle Marsh Drain Outlet Structure	Lighting upgrade	30,601	88	30,513	0	59	441	-12	0	0	0
Eagle Marsh Drain Outlet Structure	Purchasing carbon offsets	0	0	0	0	-12	0	0	0	0	0
Fielden Washrooms	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Fielden Washrooms	Lighting upgrade	2,436	12	2,424	0	8	62	-2	0	0	0
Fielden Washrooms	Purchasing carbon offsets	0	0	0	0	-2	0	0	0	0	0
Fire and Emergency Services	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Fire and Emergency Services	HVAC system optimization	21,446	0	21,446	0	1,202	8,583	0	0	0	0
Fire and Emergency Services	Lighting upgrade	107,232	1,965	105,267	0	1,305	9,826	-274	0	0	0
Fire and Emergency Services	Purchasing carbon offsets	0	0	0	9	-280	0	0	0	0	0
Fire and Emergency Services	Solar PV	160,000	32,000	128,000	3	6,377	45,552	0	0	0	0
Harbour Master	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Harbour Master	HVAC system optimization	420	0	420	0	54	387	0	0	0	0
Harbour Master	Lighting upgrade	2,100	77	2,023	0	51	384	-11	0	0	0
Harbour Master	Purchasing carbon offsets	0	0	0	0	-11	0	0	0	0	0
HH Knoll Park	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
HH Knoll Park	HVAC system optimization	7,421	0	7,421	0	99	704	0	0	0	0
HH Knoll Park	Lighting upgrade	37,106	156	36,950	0	103	779	-22	0	0	0
HH Knoll Park	Purchasing carbon offsets	0	0	0	1	-27	0	0	0	0	0

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m3/yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Humberstone Hall Visitors Centre	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Humberstone Hall Visitors Centre	DHW to heat pump	10,000	59	9,941	0	-50	-799	237	0	0	0
Humberstone Hall Visitors Centre	HVAC system optimization	2,100	68	2,032	1	89	133	272	0	0	0
Humberstone Hall Visitors Centre	HVAC to heat pump	116,466	23,293	93,173	5	-579	-9,190	2,720	0	0	0
Humberstone Hall Visitors Centre	Lighting upgrade	10,500	63	10,437	0	42	315	-9	0	0	0
Humberstone Hall Visitors Centre	Purchasing carbon offsets	0	0	0	6	-177	0	0	0	0	0
Library	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Library	DHW to heat pump	10,000	259	9,741	2	-220	-3,496	1,035	0	0	0
Library	HVAC system optimization	14,448	298	14,150	2	765	3,257	1,190	0	0	0
Library	HVAC to heat pump	509,546	101,909	407,637	21	-2,534	-40,207	11,902	0	0	0
Library	Lighting upgrade	72,240	1,724	70,516	0	1,145	8,621	-240	0	0	0
Library	Purchasing carbon offsets	0	0	0	30	-906	0	0	0	0	0
Library	Solar PV	80,000	16,000	64,000	1	3,189	22,776	0	0	0	0
Lions Field Park Canteen and Kitchen	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Lions Field Park Canteen and Kitchen	DHW to heat pump	10,000	5	9,995	0	-4	-63	19	0	0	0
Lions Field Park Canteen and Kitchen	HVAC system optimization	1,680	5	1,675	0	36	215	21	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Lions Field Park Canteen and Kitchen	HVAC to heat pump	9,138	1,828	7,310	0	-45	-721	213	0	0	0
Lions Field Park Canteen and Kitchen	Lighting upgrade	8,400	230	8,170	0	153	1,150	-32	0	0	0
Lions Field Park Canteen and Kitchen	Purchasing carbon offsets	0	0	0	1	-39	0	0	0	0	0
Lock 8 Washrooms	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Lock 8 Washrooms	HVAC system optimization	614	0	614	0	83	591	0	0	0	0
Lock 8 Washrooms	Lighting upgrade	3,072	131	2,941	0	87	653	-18	0	0	0
Lock 8 Washrooms	Purchasing carbon offsets	0	0	0	1	-22	0	0	0	0	0
Market Square	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Market Square	HVAC system optimization	1,865	0	1,865	0	17	125	0	0	0	0
Market Square	Lighting upgrade	9,323	25	9,298	0	16	124	-3	0	0	0
Market Square	Purchasing carbon offsets	0	0	0	0	-4	0	0	0	0	0
Museum LR Wilson Archives	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Museum LR Wilson Archives	DHW to heat pump	10,000	53	9,947	0	-45	-720	213	0	0	0
Museum LR Wilson Archives	HVAC system optimization	2,970	61	2,909	0	132	491	245	0	0	0
Museum LR Wilson Archives	HVAC to heat pump	104,926	20,985	83,941	4	-522	-8,279	2,451	0	0	0

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m3/yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Museum LR Wilson Archives	Lighting upgrade	14,850	232	14,618	0	154	1,161	-32	0	0	0
Museum LR Wilson Archives	Purchasing carbon offsets	0	0	0	6	-176	0	0	0	0	0
Museum Sharpe HRC	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Museum Sharpe HRC	DHW to heat pump	10,000	34	9,966	0	-29	-463	137	0	0	0
Museum Sharpe HRC	HVAC system optimization	4,320	39	4,281	0	66	182	158	0	0	0
Museum Sharpe HRC	HVAC to heat pump	67,470	13,494	53,976	3	-336	-5,324	1,576	0	0	0
Museum Sharpe HRC	Lighting upgrade	21,600	86	21,514	0	57	431	-12	0	0	0
Museum Sharpe HRC	Purchasing carbon offsets	0	0	0	4	-107	0	0	0	0	0
Museum Williams House	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Museum Williams House	DHW to heat pump	10,000	60	9,940	0	-51	-808	239	0	0	0
Museum Williams House	HVAC system optimization	2,650	69	2,581	1	126	390	275	0	0	0
Museum Williams House	HVAC to heat pump	117,806	23,561	94,245	5	-586	-9,296	2,752	0	0	0
Museum Williams House	Lighting upgrade	13,248	185	13,063	0	123	924	-26	0	0	0
Museum Williams House	Purchasing carbon offsets	0	0	0	6	-190	0	0	0	0	0
Nickle Beach Washrooms	Purchasing carbon offsets	0	0	0	0	0	0	0	0	0	0
Pleasant Beach Rd security camera	Purchasing carbon offsets	0	0	0	0	0	0	0	0	0	0

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Public Works (Engineering and Operations Centre)	Conduct energy audit	14,742	0	14,742	0	0	0	0	0	0	0
Public Works (Engineering and Operations Centre)	HVAC system optimization	44,226	0	44,226	1	2,527	18,050	0	0	0	0
Public Works (Engineering and Operations Centre)	Lighting upgrade	221,130	3,579	217,551	0	2,376	17,896	-499	0	0	0
Public Works (Engineering and Operations Centre)	Purchasing carbon offsets	0	0	0	17	-518	0	0	0	0	0
Public Works (Engineering and Operations Centre)	Solar PV	320,000	64,000	256,000	5	12,755	91,104	0	0	0	0
Scouts Hall	Demolish building	0	0	0	4	553	266	1,983	0	0	0
Sugarloaf Marina Marlon Building	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Sugarloaf Marina Marlon Building	DHW to heat pump	10,000	63	9,937	0	-54	-853	253	0	0	0
Sugarloaf Marina Marlon Building	HVAC system optimization	4,860	73	4,787	1	652	4,121	290	0	0	0
Sugarloaf Marina Marlon Building	HVAC to heat pump	124,344	24,869	99,475	5	-618	-9,812	2,904	0	0	0
Sugarloaf Marina Marlon Building	Lighting upgrade	24,300	1,949	22,351	0	1,294	9,746	-272	0	0	0
Sugarloaf Marina Marlon Building	Purchasing carbon offsets	0	0	0	12	-368	0	0	0	0	0
Tennis Courts	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Tennis Courts	Lighting upgrade	11,400	161	11,239	0	107	806	-22	0	0	0
Tennis Courts	Purchasing carbon offsets	0	0	0	1	-21	0	0	0	0	0
Vale Health and Wellness Centre	Conduct energy audit	58,177	0	58,177	0	0	0	0	0	0	0
Vale Health and Wellness Centre	DHW to heat pump	120,000	2,925	117,075	20	-2,492	-39,529	11,701	0	0	0
Vale Health and Wellness Centre	Equipment electrification	500,000	100,000	400,000	14	-9,090	-83,228	9,855	0	0	0
Vale Health and Wellness Centre	HVAC system optimization	100,000	4,008	95,992	35	15,500	80,944	16,030	0	0	0
Vale Health and Wellness Centre	HVAC to heat pump	4,920,633	984,127	3,936,506	278	-34,138	-541,577	160,318	0	0	0
Vale Health and Wellness Centre	Ice resurfacers conversion	175,000	0	175,000	0	-125	-1,145	136	0	0	0
Vale Health and Wellness Centre	Install low GWP refrigerant equipment	0	0	0	0	0	0	0	0	0	0
Vale Health and Wellness Centre	Lighting upgrade	872,658	22,569	850,089	0	14,981	112,843	-3,144	0	0	0
Vale Health and Wellness Centre	Pool heat to heat pump	1,000,000	200,000	800,000	63	-7,798	-123,709	36,620	0	0	0
Vale Health and Wellness Centre	Purchasing carbon offsets	0	0	0	601	-18,060	0	0	0	0	0
Vale Health and Wellness Centre	Solar PV	1,280,000	256,000	1,024,000	20	51,018	364,416	0	0	0	0
Wignell Drain Outlet Structure	Conduct energy audit	12,000	0	12,000	0	0	0	0	0	0	0
Wignell Drain Outlet Structure	HVAC system optimization	127	0	127	0	1	8	0	0	0	0
Wignell Drain Outlet Structure	Lighting upgrade	635	2	633	0	1	8	-0	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Wignell Drain Outlet Structure	Purchasing carbon offsets	0	0	0	0	-0	0	0	0	0	0
Archives Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Archives Waste	Purchasing carbon offsets	0	0	0	1	-44	0	0	0	0	0
Archives Waste	Waste mitigation	8,340	0	8,340	1	0	0	0	0	0	0
City Hall Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
City Hall Waste	Purchasing carbon offsets	0	0	0	15	-442	0	0	0	0	0
City Hall Waste	Waste mitigation	8,340	0	8,340	15	0	0	0	0	0	0
Fire Hall Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Fire Hall Waste	Purchasing carbon offsets	0	0	0	4	-133	0	0	0	0	0
Fire Hall Waste	Waste mitigation	8,340	0	8,340	4	0	0	0	0	0	0
Library Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Library Waste	Purchasing carbon offsets	0	0	0	3	-88	0	0	0	0	0
Library Waste	Waste mitigation	8,340	0	8,340	3	0	0	0	0	0	0
Museum Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Museum Waste	Purchasing carbon offsets	0	0	0	1	-44	0	0	0	0	0
Museum Waste	Waste mitigation	8,340	0	8,340	1	0	0	0	0	0	0
Nickel Beach Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Nickel Beach Waste	Purchasing carbon offsets	0	0	0	14	-422	0	0	0	0	0

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Nickel Beach Waste	Waste mitigation	8,340	0	8,340	14	0	0	0	0	0	0
Operations Centre Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Operations Centre Waste	Purchasing carbon offsets	0	0	0	32	-965	0	0	0	0	0
Operations Centre Waste	Waste mitigation	8,340	0	8,340	32	0	0	0	0	0	0
Park Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Park Waste	Purchasing carbon offsets	0	0	0	61	-1,823	0	0	0	0	0
Park Waste	Waste mitigation	8,340	0	8,340	61	0	0	0	0	0	0
Roselawn Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Roselawn Waste	Purchasing carbon offsets	0	0	0	0	-11	0	0	0	0	0
Roselawn Waste	Waste mitigation	8,340	0	8,340	0	0	0	0	0	0	0
Sugarloaf Marina Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Sugarloaf Marina Waste	Purchasing carbon offsets	0	0	0	68	-2,051	0	0	0	0	0
Sugarloaf Marina Waste	Waste mitigation	8,340	0	8,340	68	0	0	0	0	0	0
Tea Room Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0
Tea Room Waste	Purchasing carbon offsets	0	0	0	1	-44	0	0	0	0	0
Tea Room Waste	Waste mitigation	8,340	0	8,340	1	0	0	0	0	0	0
Vale Health and Wellness Centre Waste	Conduct waste audit	4,170	0	4,170	0	0	0	0	0	0	0

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Vale Health and Wellness Centre Waste	Purchasing carbon offsets	0	0	0	64	-1,931	0	0	0	0	0
Vale Health and Wellness Centre Waste	Waste mitigation	8,340	0	8,340	64	0	0	0	0	0	0
Building Dept Fleet	Fleet equipment decarbonization	360,000	0	360,000	2	1,288	-2,620	0	1,103	0	0
Building Dept Fleet	Fleet optimization	2,780	0	2,780	0	83	0	0	55	0	0
Building Dept Fleet	Purchasing carbon offsets	0	0	0	3	-79	0	0	0	0	0
By-Law Dept Fleet	Fleet equipment decarbonization	240,000	0	240,000	5	2,414	-4,911	0	2,068	0	0
By-Law Dept Fleet	Fleet optimization	2,780	0	2,780	0	155	0	0	103	0	0
By-Law Dept Fleet	Purchasing carbon offsets	0	0	0	5	-148	0	0	0	0	0
Canal Days Fleet	Fleet equipment decarbonization	120,000	0	120,000	1	591	-1,599	0	176	0	367
Canal Days Fleet	Fleet optimization	2,780	0	2,780	0	60	0	0	13	0	27
Canal Days Fleet	Heavy vehicle decarbonization	500,000	60,000	440,000	2	869	-2,352	0	259	0	540
Canal Days Fleet	Purchasing carbon offsets	0	0	0	2	-63	0	0	0	0	0
Comm & Ecdev Fleet	Fleet equipment decarbonization	120,000	0	120,000	0	0	0	0	0	0	0
Comm & Ecdev Fleet	Fleet optimization	2,780	0	2,780	0	0	0	0	0	0	0
Comm & Ecdev Fleet	Heavy vehicle decarbonization	500,000	60,000	440,000	0	0	0	0	0	0	0
Comm & Ecdev Fleet	Purchasing carbon offsets	0	0	0	0	0	0	0	0	0	0

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m3/yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Drains Fleet	Fleet equipment decarbonization	720,000	0	720,000	19	8,129	-22,940	0	1,630	0	5,930
Drains Fleet	Fleet optimization	2,780	0	2,780	1	834	0	0	120	0	436
Drains Fleet	Heavy vehicle decarbonization	1,500,000	180,000	1,320,000	28	11,954	-33,736	0	2,397	0	8,721
Drains Fleet	Purchasing carbon offsets	0	0	0	30	-887	0	0	0	0	0
Engineering Fleet	Fleet equipment decarbonization	360,000	0	360,000	0	0	0	0	0	0	0
Engineering Fleet	Fleet optimization	2,780	0	2,780	0	0	0	0	0	0	0
Engineering Fleet	Heavy vehicle decarbonization	500,000	60,000	440,000	0	0	0	0	0	0	0
Engineering Fleet	Purchasing carbon offsets	0	0	0	0	0	0	0	0	0	0
Facility Maint Fleet	Fleet equipment decarbonization	600,000	0	600,000	5	2,318	-4,754	0	1,952	0	36
Facility Maint Fleet	Fleet optimization	2,780	0	2,780	0	219	0	0	144	0	3
Facility Maint Fleet	Heavy vehicle decarbonization	1,000,000	120,000	880,000	7	3,408	-6,991	0	2,871	0	53
Facility Maint Fleet	Purchasing carbon offsets	0	0	0	7	-213	0	0	0	0	0
Fire Fleet	Fleet equipment decarbonization	120,000	0	120,000	25	10,571	-30,472	0	1,587	0	8,304
Fire Fleet	Fleet optimization	2,780	0	2,780	2	1,301	0	0	139	0	728
Fire Fleet	Heavy vehicle decarbonization	5,000,000	600,000	4,400,000	43	18,545	-53,460	0	2,785	0	14,568
Fire Fleet	Purchasing carbon offsets	0	0	0	46	-1,393	0	0	0	0	0
Fleet Fleet	Fleet equipment decarbonization	120,000	0	120,000	1	710	-1,444	0	608	0	0
Fleet Fleet	Fleet optimization	2,780	0	2,780	0	65	0	0	43	0	0

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m3/yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Fleet Fleet	Heavy vehicle decarbonization	500,000	60,000	440,000	2	1,014	-2,063	0	868	0	0
Fleet Fleet	Purchasing carbon offsets	0	0	0	2	-63	0	0	0	0	0
Marina Fleet	Fleet equipment decarbonization	2,160,000	0	2,160,000	6	2,792	-6,922	0	1,356	0	1,151
Marina Fleet	Fleet optimization	2,780	0	2,780	0	276	0	0	100	0	85
Marina Fleet	Heavy vehicle decarbonization	4,500,000	360,000	4,140,000	9	4,105	-10,179	0	1,995	0	1,692
Marina Fleet	Purchasing carbon offsets	0	0	0	9	-283	0	0	0	0	0
Museum Fleet	Fleet equipment decarbonization	120,000	0	120,000	0	128	-261	0	110	0	0
Museum Fleet	Fleet optimization	2,780	0	2,780	0	8	0	0	5	0	0
Museum Fleet	Purchasing carbon offsets	0	0	0	0	-8	0	0	0	0	0
Nickel Beach Fleet	Fleet equipment decarbonization	480,000	0	480,000	0	0	0	0	0	0	0
Nickel Beach Fleet	Fleet optimization	2,780	0	2,780	0	0	0	0	0	0	0
Nickel Beach Fleet	Heavy vehicle decarbonization	1,000,000	0	1,000,000	0	0	0	0	0	0	0
Nickel Beach Fleet	Purchasing carbon offsets	0	0	0	0	0	0	0	0	0	0
Parks Fleet	Fleet equipment decarbonization	12,600,000	0	12,600,000	60	29,129	-66,693	0	18,758	0	6,886
Parks Fleet	Fleet optimization	2,780	0	2,780	5	2,828	0	0	1,379	0	506
Parks Fleet	Heavy vehicle decarbonization	26,000,000	0	26,000,000	88	42,837	-98,079	0	27,586	0	10,126
Parks Fleet	Purchasing carbon offsets	0	0	0	94	-2,821	0	0	0	0	0

Table 12: Recommended measures and energy savings (*continued*)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Project Management Fleet	Fleet equipment decarbonization	120,000	0	120,000	5	2,725	-5,544	0	2,334	0	0
Project Management Fleet	Fleet optimization	2,780	0	2,780	0	175	0	0	117	0	0
Project Management Fleet	Purchasing carbon offsets	0	0	0	6	-167	0	0	0	0	0
Transportation Fleet	Fleet equipment decarbonization	12,120,000	0	12,120,000	45	19,479	-55,682	0	3,316	0	14,867
Transportation Fleet	Fleet optimization	2,780	0	2,780	10	5,454	0	0	663	0	2,973
Transportation Fleet	Heavy vehicle decarbonization	25,500,000	0	25,500,000	181	77,914	-222,726	0	13,263	0	59,468
Transportation Fleet	Purchasing carbon offsets	0	0	0	193	-5,802	0	0	0	0	0
Utilities Fleet	Fleet equipment decarbonization	2,880,000	0	2,880,000	0	0	0	0	0	0	0
Utilities Fleet	Fleet optimization	2,780	0	2,780	0	0	0	0	0	0	0
Utilities Fleet	Heavy vehicle decarbonization	6,000,000	0	6,000,000	0	0	0	0	0	0	0
Utilities Fleet	Purchasing carbon offsets	0	0	0	0	0	0	0	0	0	0
WasteWater Fleet	Fleet equipment decarbonization	3,120,000	0	3,120,000	8	3,927	-9,378	0	2,208	0	1,286
WasteWater Fleet	Fleet optimization	2,780	0	2,780	1	385	0	0	162	0	95
WasteWater Fleet	Heavy vehicle decarbonization	6,500,000	0	6,500,000	12	5,776	-13,792	0	3,247	0	1,891
WasteWater Fleet	Purchasing carbon offsets	0	0	0	13	-390	0	0	0	0	0
Water Fleet	Fleet equipment decarbonization	3,240,000	0	3,240,000	23	10,664	-26,525	0	5,113	0	4,473

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m ³ /yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Water Fleet	Fleet optimization	2,780	0	2,780	2	1,057	0	0	376	0	329
Water Fleet	Heavy vehicle decarbonization	6,500,000	0	6,500,000	34	15,683	-39,007	0	7,519	0	6,577
Water Fleet	Purchasing carbon offsets	0	0	0	36	-1,084	0	0	0	0	0
000Clarence St, Traf Light Elm St	Purchasing carbon offsets	0	0	0	0	-8	0	0	0	0	0
160 Sugarloaf St, Lighting 200A Service-Cenotaph, etc	Purchasing carbon offsets	0	0	0	0	-3	0	0	0	0	0
160 Sugarloaf St, Park Light	Purchasing carbon offsets	0	0	0	0	-1	0	0	0	0	0
183 Main St West Lights	Purchasing carbon offsets	0	0	0	0	-7	0	0	0	0	0
212 West, No. 5 Panel Promenade lights	Purchasing carbon offsets	0	0	0	0	-5	0	0	0	0	0
3 Marina St (Marina Lighting) master	Purchasing carbon offsets	0	0	0	2	-73	0	0	0	0	0
Church&Main St. W Light Pedestal	Purchasing carbon offsets	0	0	0	1	-25	0	0	0	0	0
Light House and Sign	Purchasing carbon offsets	0	0	0	0	-4	0	0	0	0	0
Main St West Lights	Purchasing carbon offsets	0	0	0	1	-16	0	0	0	0	0
Near 48 Main St. W Light Pedestal	Purchasing carbon offsets	0	0	0	0	-7	0	0	0	0	0
Street Lights - General	Purchasing carbon offsets	0	0	0	30	-894	0	0	0	0	0
Traffic Lights-King St	Purchasing carbon offsets	0	0	0	0	-6	0	0	0	0	0

Table 12: Recommended measures and energy savings (continued)

Facility / Asset	Measure	Estimated project cost (\$)	Incentives (\$)	Effective project cost (\$)	Reduction in GHG emissions (tCO2e/yr)	Reduction in utility cost (\$/yr)	Reduction in electricity use (kWh/yr)	Reduction in natural gas use (m3/yr)	Reduction in gasoline use (L/yr)	Reduction in ethanol 10 use (L/yr)	Reduction in diesel use (L/yr)
Traffic Lights-Steele and Clarence	Purchasing carbon offsets	0	0	0	0	-6	0	0	0	0	0
550 Elizabeth St, Pump Stn 66 Elizabeth St	Purchasing carbon offsets	0	0	0	0	-11	0	0	0	0	0
69 Lake Rd, Pump House Nickel Beach	Purchasing carbon offsets	0	0	0	0	-6	0	0	0	0	0
69 Lake Rd, Trl Pumps Nickel Beach	Purchasing carbon offsets	0	0	0	0	-7	0	0	0	0	0
Bulk Water Station 2	Purchasing carbon offsets	0	0	0	0	-5	0	0	0	0	0
Johnson St Pumping Station	Purchasing carbon offsets	0	0	0	1	-43	0	0	0	0	0
Scholl Field Pump	Purchasing carbon offsets	0	0	0	7	-206	0	0	0	0	0
*											

A.2 Most Aggressive Pathway ECMs

The full list of recommended measures for the Most Aggressive pathway is presented below.

Table 13: Recommended measures and timeline for Most Aggressive pathway

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	00 Sugarloaf St, Splashpad	Conduct energy audit	2,934	0	5	0	-	-
2026	00 Sugarloaf St, Splashpad	Lighting upgrade	10,055	0	10	0	38,419,555	3,841,956
2026	000 Weaver Rd, Sec Camera	Conduct energy audit	2,934	0	5	0	-	-
2026	000 Weaver Rd, Sec Camera	Lighting upgrade	1,483	0	10	0	19,160,294	1,916,029
2026	1 Marina Rd (fuel docks)	Conduct energy audit	2,934	0	5	0	-	-
2026	1 Marina Rd (fuel docks)	Lighting upgrade	33,426	0	10	0	52,272,649	5,227,265
2026	145 Mellanby Ave, Lock 8 Viewing Stand	Conduct energy audit	2,934	0	5	0	-	-
2026	145 Mellanby Ave, Lock 8 Viewing Stand	Lighting upgrade	34,629	0	10	0	28,222,465	2,822,247
2026	2 John St. Lockview	Conduct energy audit	2,934	0	5	0	-	-
2026	227 Catharine St, Market Square	Conduct energy audit	2,934	0	5	0	-	-
2026	227 Catharine St, Market Square	Lighting upgrade	1,314	0	10	0	38,412,661	3,841,266
2026	280 King Street (Barn)	Conduct energy audit	2,934	0	5	0	-	-
2026	280 King Street (Barn)	Lighting upgrade	24,438	0	10	0	38,420,174	3,842,017
2026	287 West Side Rd, Flow Meter	Conduct energy audit	2,934	0	5	0	-	-
2026	287 West Side Rd, Flow Meter	Lighting upgrade	1,852	0	10	0	19,154,270	1,915,427
2026	296 Fielden Ave, Business Roselawn Centre	Conduct energy audit	2,934	0	5	0	-	-
2026	296 Fielden Ave, Heritage Roselawn Centre	Conduct energy audit	6,228	0	5	0	-	-

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	296 Fielden Ave, Heritage Roselawn Centre	Lighting upgrade	397,585	0	10	0	27,412,811	2,741,281
2026	3 Marina St (Air Conditioning)	Conduct energy audit	2,934	0	5	0	-	-
2026	3 Marina St, Sugarloaf Marina docks	Conduct energy audit	2,934	0	5	0	-	-
2026	550 Elizabeth St, Ball Field	Conduct energy audit	2,934	0	5	0	-	-
2026	550 Elizabeth St, Ball Field	Lighting upgrade	14,840	0	10	0	45,757,571	4,575,757
2026	61 Princess Street (Garage)	Conduct energy audit	2,934	0	5	0	-	-
2026	61 Princess Street (Garage)	Lighting upgrade	1,023	0	10	0	38,433,484	3,843,348
2026	78 Lakeshore Rd W, Heat Trace	Conduct energy audit	2,934	0	5	0	-	-
2026	Arabellas Tea Room	Conduct energy audit	2,934	0	5	0	-	-
2026	Arabellas Tea Room	Lighting upgrade	9,284	0	10	0	12,545,210	1,254,521
2026	Athletic Field Washrooms	Conduct energy audit	2,934	0	5	0	-	-
2026	Athletic Field Washrooms	Lighting upgrade	11,216	0	10	0	18,419,060	1,841,906
2026	Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Conduct energy audit	2,934	0	5	0	-	-
2026	Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Lighting upgrade	11,852	0	10	0	22,857,045	2,285,705
2026	Centennial Park Washrooms	Conduct energy audit	2,934	0	5	0	-	-
2026	Centennial Park Washrooms	Lighting upgrade	3,213	0	10	0	5,878,078	587,808
2026	City Hall	Conduct energy audit	5,772	0	5	0	-	-
2026	Clarence St Crosswalk	Conduct energy audit	12,534	0	5	0	-	-
2026	Clarence St Crosswalk	Lighting upgrade	3,092	0	10	0	19,156,327	1,915,633

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Clarence St, Seaway Lite Seaway Park	Conduct energy audit	12,534	0	5	0	-	-
2026	Clarence St, Seaway Lite Seaway Park	Lighting upgrade	18,414	0	10	0	38,420,835	3,842,084
2026	E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Conduct energy audit	12,534	0	5	0	-	-
2026	E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Lighting upgrade	2,678	0	10	0	38,426,923	3,842,692
2026	Eagle Marsh Drain Outlet Strucuture	Conduct energy audit	12,534	0	5	0	-	-
2026	Eagle Marsh Drain Outlet Strucuture	Lighting upgrade	31,874	0	10	0	38,421,092	3,842,109
2026	Fielden Washrooms	Conduct energy audit	12,534	0	5	0	-	-
2026	Fielden Washrooms	Lighting upgrade	2,532	0	10	0	21,652,982	2,165,298
2026	Fire and Emergency Services	Conduct energy audit	12,534	0	5	0	-	-
2026	Fire and Emergency Services	Lighting upgrade	110,037	0	10	0	5,957,745	595,774
2026	Harbour Master	Conduct energy audit	12,534	0	5	0	-	-
2026	Harbour Master	Lighting upgrade	2,117	0	10	0	2,932,073	293,207
2026	HH Knoll Park	Conduct energy audit	12,534	0	5	0	-	-
2026	HH Knoll Park	Lighting upgrade	38,601	0	10	0	26,372,115	2,637,212
2026	Humberstone Hall Visitors Centre	Conduct energy audit	12,534	0	5	0	-	-
2026	Humberstone Hall Visitors Centre	Lighting upgrade	10,904	0	10	0	18,413,493	1,841,349
2026	Library	Conduct energy audit	12,534	0	5	0	-	-

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Library	Lighting upgrade	73,729	0	10	0	4,550,087	455,009
2026	Lions Field Park Canteen and Kitchen	Conduct energy audit	12,534	0	5	0	-	-
2026	Lions Field Park Canteen and Kitchen	Lighting upgrade	8,544	0	10	0	3,953,168	395,317
2026	Lock 8 Washrooms	Conduct energy audit	12,534	0	5	0	-	-
2026	Lock 8 Washrooms	Lighting upgrade	3,078	0	10	0	2,507,322	250,732
2026	Market Square	Conduct energy audit	12,534	0	5	0	-	-
2026	Market Square	Lighting upgrade	9,713	0	10	0	41,771,454	4,177,145
2026	Museum LR Wilson Archives	Conduct energy audit	12,534	0	5	0	-	-
2026	Museum LR Wilson Archives	Lighting upgrade	15,278	0	10	0	7,001,734	700,173
2026	Museum Sharpe HRC	Conduct energy audit	12,534	0	5	0	-	-
2026	Museum Williams House	Conduct energy audit	12,534	0	5	0	-	-
2026	Museum Williams House	HVAC to heat pump	99,485	5	15	72	20,852	1,390
2026	Museum Williams House	Lighting upgrade	13,653	0	10	0	7,865,024	786,502
2026	Public Works (Engineering and Operations Centre)	Conduct energy audit	15,398	0	5	0	-	-
2026	Public Works (Engineering and Operations Centre)	Lighting upgrade	227,388	0	10	0	6,760,122	676,012
2026	Sugarloaf Marina Marlon Building	Conduct energy audit	12,534	0	5	0	-	-
2026	Sugarloaf Marina Marlon Building	Lighting upgrade	23,432	0	10	0	1,279,182	127,918
2026	Tennis Courts	Conduct energy audit	12,534	0	5	0	-	-
2026	Vale Health and Wellness Centre	Conduct energy audit	60,765	0	5	0	-	-

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Vale Health and Wellness Centre	Ice resurfer conversion	182,785	0	15	3	927,517	61,834
2026	Wignell Drain Outlet Structure	Conduct energy audit	12,534	0	5	0	-	-
2026	Wignell Drain Outlet Structure	Lighting upgrade	662	0	10	0	41,795,040	4,179,504
2026	Archives Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	City Hall Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Fire Hall Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Library Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Museum Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Nickel Beach Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Operations Centre Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Park Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Roselawn Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Sugarloaf Marina Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Tea Room Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Vale Health and Wellness Centre Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Building Dept Fleet	Fleet optimization	2,904	0	10	1	22,065	2,207
2026	By-Law Dept Fleet	Fleet optimization	2,904	0	10	2	11,772	1,177
2026	Canal Days Fleet	Fleet optimization	2,904	0	10	1	27,714	2,771
2026	Comm & Ecdev Fleet	Fleet optimization	2,904	0	10	0	-	-
2026	Drains Fleet	Fleet optimization	2,904	1	10	15	1,967	197
2027	1 Marina Rd (fuel docks)	HVAC system optimization	6,847	0	15	0	237,739	15,849

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2027	296 Fielden Ave, Business Roselawn Centre	HVAC system optimization	33,857	1	15	8	65,921	4,395
2027	296 Fielden Ave, Heritage Roselawn Centre	HVAC system optimization	81,242	3	15	42	29,125	1,942
2027	3 Marina St (Air Conditioning)	HVAC system optimization	7,755	0	15	1	166,986	11,132
2027	3 Marina St, Sugarloaf Marina docks	HVAC system optimization	6,154	2	15	33	2,802	187
2027	550 Elizabeth St, Ball Field	HVAC system optimization	3,040	0	15	0	256,893	17,126
2027	Arabellas Tea Room	HVAC system optimization	1,880	0	15	4	7,004	467
2027	City Hall	HVAC system optimization	38,607	1	15	18	31,524	2,102
2027	City Hall	Lighting upgrade	188,650	0	10	0	4,579,427	457,943
2027	Fire and Emergency Services	HVAC system optimization	22,893	0	15	7	48,146	3,210
2027	Harbour Master	HVAC system optimization	448	0	15	0	20,891	1,393
2027	HH Knoll Park	HVAC system optimization	7,922	0	15	1	202,994	13,533
2027	Humberstone Hall Visitors Centre	HVAC system optimization	2,174	1	15	8	4,102	273
2027	Library	HVAC system optimization	15,125	2	15	37	6,132	409
2027	Lions Field Park Canteen and Kitchen	HVAC system optimization	1,788	0	15	1	33,807	2,254
2027	Lock 8 Washrooms	HVAC system optimization	655	0	15	0	20,025	1,335
2027	Market Square	HVAC system optimization	1,991	0	15	0	287,993	19,200
2027	Museum LR Wilson Archives	HVAC system optimization	3,109	0	15	7	6,244	416
2027	Museum Sharpe HRC	HVAC system optimization	4,572	0	15	5	14,616	974
2027	Museum Williams House	HVAC system optimization	2,760	1	15	8	5,016	334

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2027	Public Works (Engineering and Operations Centre)	HVAC system optimization	47,210	1	15	15	47,211	3,147
2027	Sugarloaf Marina Marlon Building	HVAC system optimization	5,115	1	15	12	6,506	434
2027	Vale Health and Wellness Centre	HVAC system optimization	102,739	35	15	529	2,912	194
2027	Wignell Drain Outlet Structure	HVAC system optimization	136	0	15	0	288,093	19,206
2027	Building Dept Fleet	Fleet equipment decarbonization	384,287	2	5	12	154,516	30,903
2027	By-Law Dept Fleet	Fleet equipment decarbonization	256,191	5	5	23	54,959	10,992
2027	Canal Days Fleet	Fleet equipment decarbonization	128,096	1	5	7	95,848	19,170
2027	Engineering Fleet	Fleet optimization	2,968	0	10	0	-	-
2027	Facility Maint Fleet	Fleet optimization	2,968	0	10	4	8,387	839
2027	Fire Fleet	Fleet optimization	2,968	2	10	23	1,280	128
2027	Fleet Fleet	Fleet optimization	2,968	0	10	1	28,392	2,839
2027	Marina Fleet	Fleet optimization	2,968	0	10	5	6,299	630
2027	Museum Fleet	Fleet optimization	2,968	0	10	0	226,161	22,616
2027	Nickel Beach Fleet	Fleet optimization	2,968	0	10	0	-	-
2027	Parks Fleet	Fleet optimization	2,968	5	10	47	632	63
2027	Project Management Fleet	Fleet optimization	2,968	0	10	3	10,657	1,066
2027	Transportation Fleet	Fleet optimization	2,968	10	10	97	307	31
2027	Utilities Fleet	Fleet optimization	2,968	0	10	0	-	-
2027	WasteWater Fleet	Fleet optimization	2,968	1	10	6	4,571	457

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2027	Water Fleet	Fleet optimization	2,968	2	10	18	1,646	165
2028	296 Fielden Ave, Business Roselawn Centre	DHW to heat pump	10,855	0	15	6	28,814	1,921
2028	3 Marina St, Sugarloaf Marina docks	Lighting upgrade	30,917	0	10	0	1,816,029	181,603
2028	Library	DHW to heat pump	10,651	2	15	27	5,935	396
2028	Lions Field Park Canteen and Kitchen	DHW to heat pump	10,905	0	15	0	338,867	22,591
2028	Museum LR Wilson Archives	DHW to heat pump	10,856	0	15	6	29,379	1,959
2028	Museum Sharpe HRC	Lighting upgrade	23,478	0	10	0	28,994,973	2,899,497
2028	Scouts Hall	Demolish building	0	4	-	-	0	-
2028	Tennis Courts	Lighting upgrade	12,276	0	10	0	8,101,014	810,101
2028	Vale Health and Wellness Centre	HVAC to heat pump	4,384,022	278	15	4,170	15,772	1,051
2028	Vale Health and Wellness Centre	Lighting upgrade	929,455	0	10	2	4,382,227	438,223
2028	Comm & Ecdev Fleet	Fleet equipment decarbonization	130,914	0	5	0	-	-
2028	Drains Fleet	Fleet equipment decarbonization	785,482	19	5	94	41,759	8,352
2028	Engineering Fleet	Fleet equipment decarbonization	392,741	0	5	0	-	-
2028	Facility Maint Fleet	Fleet equipment decarbonization	654,568	5	5	23	143,885	28,777
2028	Fire Fleet	Fleet equipment decarbonization	130,914	25	5	124	5,292	1,058
2028	Fleet Fleet	Fleet equipment decarbonization	130,914	1	5	7	94,627	18,925

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2029	296 Fielden Ave, Business Roselawn Centre	HVAC to heat pump	97,876	4	15	65	22,592	1,506
2029	296 Fielden Ave, Business Roselawn Centre	Lighting upgrade	176,856	0	10	0	65,517,831	6,551,783
2029	296 Fielden Ave, Heritage Roselawn Centre	DHW to heat pump	16,429	2	15	31	8,023	535
2029	Arabellas Tea Room	DHW to heat pump	11,120	0	15	3	54,649	3,643
2029	Marina Fleet	Fleet equipment decarbonization	2,408,287	6	5	30	399,773	79,955
2029	Museum Fleet	Fleet equipment decarbonization	133,794	0	5	1	539,531	107,906
2029	Nickel Beach Fleet	Fleet equipment decarbonization	535,175	0	5	0	-	-
2030	Fire and Emergency Services	Solar PV	150,316	3	15	38	59,565	3,971
2030	Humberstone Hall Visitors Centre	DHW to heat pump	11,336	0	15	6	27,637	1,842
2030	Library	Solar PV	75,158	1	15	19	59,565	3,971
2030	Museum Sharpe HRC	DHW to heat pump	11,361	0	15	4	47,812	3,187
2030	Museum Williams House	DHW to heat pump	11,335	0	15	6	27,321	1,821
2030	Sugarloaf Marina Marlon Building	DHW to heat pump	11,332	0	15	7	25,877	1,725
2030	Parks Fleet	Fleet equipment decarbonization	14,357,404	60	5	301	238,750	47,750
2030	Project Management Fleet	Fleet equipment decarbonization	136,737	5	5	26	25,983	5,197
2030	Transportation Fleet	Fleet equipment decarbonization	13,810,455	45	5	226	305,663	61,133

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2031	296 Fielden Ave, Heritage Roselawn Centre	Solar PV	270,073	4	15	66	61,154	4,077
2031	3 Marina St, Sugarloaf Marina docks	DHW to heat pump	11,386	2	15	27	6,337	422
2031	3 Marina St, Sugarloaf Marina docks	Solar PV	308,654	5	15	76	61,154	4,077
2031	Vale Health and Wellness Centre	DHW to heat pump	136,820	20	15	304	6,744	450
2031	Utilities Fleet	Fleet equipment decarbonization	3,353,890	0	5	0	-	-
2031	WasteWater Fleet	Fleet equipment decarbonization	3,633,380	8	5	42	437,148	87,430
2031	Water Fleet	Fleet equipment decarbonization	3,773,126	23	5	115	163,684	32,737
2032	296 Fielden Ave, Business Roselawn Centre	Solar PV	59,410	1	15	14	62,778	4,185
2032	City Hall	Solar PV	237,640	4	15	57	62,778	4,185
2032	Vale Health and Wellness Centre	Pool heat to heat pump	990,165	63	15	952	15,595	1,040
2032	Canal Days Fleet	Heavy vehicle decarbonization	535,082	2	10	20	272,257	27,226
2032	Comm & Ecdev Fleet	Heavy vehicle decarbonization	535,082	0	10	0	-	-
2033	Library	HVAC to heat pump	517,876	21	15	310	25,095	1,673
2033	Lions Field Park Canteen and Kitchen	HVAC to heat pump	9,287	0	15	6	25,096	1,673
2033	Public Works (Engineering and Operations Centre)	Solar PV	325,232	5	15	76	64,439	4,296
2033	Vale Health and Wellness Centre	Solar PV	1,300,926	20	15	303	64,439	4,296
2033	Drains Fleet	Heavy vehicle decarbonization	1,644,523	28	10	277	59,451	5,945

Table 13: Recommended measures and timeline for Most Aggressive pathway (continued)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2033	Engineering Fleet	Heavy vehicle decarbonization	548,174	0	10	0	-	-
2034	296 Fielden Ave, Heritage Roselawn Centre	HVAC to heat pump	606,490	24	15	353	25,756	1,717
2034	Arabellas Tea Room	HVAC to heat pump	60,271	2	15	35	25,756	1,717
2034	Museum LR Wilson Archives	HVAC to heat pump	109,449	4	15	64	25,756	1,717
2034	Facility Maint Fleet	Heavy vehicle decarbonization	1,123,108	7	10	67	167,877	16,788
2034	Fire Fleet	Heavy vehicle decarbonization	5,615,541	43	10	434	129,379	12,938
2035	3 Marina St, Sugarloaf Marina docks	HVAC to heat pump	271,401	17	15	260	15,630	1,042
2035	Humberstone Hall Visitors Centre	HVAC to heat pump	124,672	5	15	71	26,431	1,762
2035	Museum Sharpe HRC	HVAC to heat pump	72,224	3	15	41	26,432	1,762
2035	Vale Health and Wellness Centre	Install low GWP refrigerant equipment	0	0	-	-	-	-
2035	Fleet Fleet	Heavy vehicle decarbonization	575,228	2	10	20	291,052	29,105
2035	Marina Fleet	Heavy vehicle decarbonization	5,357,055	9	10	89	604,700	60,470
2035	Nickel Beach Fleet	Heavy vehicle decarbonization	1,270,457	0	10	0	-	-
2035	Parks Fleet	Heavy vehicle decarbonization	33,031,873	88	10	884	373,516	37,352
2035	Transportation Fleet	Heavy vehicle decarbonization	32,396,645	181	10	1,807	179,257	17,926
2037	Vale Health and Wellness Centre	Equipment electrification	563,486	14	18	258	39,349	2,186
2038	Sugarloaf Marina Marlon Building	HVAC to heat pump	143,762	5	15	76	28,548	1,903
2038	Utilities Fleet	Heavy vehicle decarbonization	8,136,990	0	10	0	-	-
2039	WasteWater Fleet	Heavy vehicle decarbonization	9,009,004	12	10	122	737,061	73,706
2039	Water Fleet	Heavy vehicle decarbonization	9,009,004	34	10	339	265,761	26,576

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2040	00 Sugarloaf St, Splashpad	Purchasing carbon offsets	0	0	-	-	0	-
2040	000 Weaver Rd, Sec Camera	Purchasing carbon offsets	0	0	-	-	0	-
2040	1 Marina Rd (fuel docks)	Purchasing carbon offsets	0	0	-	-	0	-
2040	11 King St (Metal Shed)	Purchasing carbon offsets	0	0	-	-	-	-
2040	11 King St (Storage Bldg) 14 King St	Purchasing carbon offsets	0	0	-	-	-	-
2040	145 Mellanby Ave, Lock 8 Viewing Stand	Purchasing carbon offsets	0	0	-	-	0	-
2040	2 John St. Lockview	Purchasing carbon offsets	0	0	-	-	0	-
2040	227 Catharine St, Market Square	Purchasing carbon offsets	0	0	-	-	0	-
2040	280 King Street (Barn)	Purchasing carbon offsets	0	0	-	-	0	-
2040	287 West Side Rd, Flow Meter	Purchasing carbon offsets	0	0	-	-	0	-
2040	296 Fielden Ave, Business Roselawn Centre	Purchasing carbon offsets	0	6	-	-	0	-
2040	296 Fielden Ave, Heritage Roselawn Centre	Purchasing carbon offsets	0	33	-	-	0	-
2040	3 Marina St (Air Conditioning)	Purchasing carbon offsets	0	0	-	-	0	-
2040	3 Marina St, Sugarloaf Marina docks	Purchasing carbon offsets	0	27	-	-	0	-
2040	550 Elizabeth St, Ball Field	Purchasing carbon offsets	0	0	-	-	0	-
2040	550 Elizabeth St, Charg Stn	Purchasing carbon offsets	0	1	-	-	0	-
2040	61 Princess Street (Garage)	Purchasing carbon offsets	0	0	-	-	0	-
2040	78 Lakeshore Rd W, Heat Trace	Purchasing carbon offsets	0	0	-	-	-	-
2040	Arabellas Tea Room	Purchasing carbon offsets	0	3	-	-	0	-

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2040	Athletic Field Washrooms	Purchasing carbon offsets	0	0	-	-	0	-
2040	Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Purchasing carbon offsets	0	0	-	-	0	-
2040	Centennial Park Washrooms	Purchasing carbon offsets	0	0	-	-	0	-
2040	City Hall	Purchasing carbon offsets	0	21	-	-	0	-
2040	Clarence St Crosswalk	Purchasing carbon offsets	0	0	-	-	0	-
2040	Clarence St, Seaway Lite Seaway Park	Purchasing carbon offsets	0	0	-	-	0	-
2040	E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Purchasing carbon offsets	0	0	-	-	0	-
2040	Eagle Marsh Drain Outlet Structure	Purchasing carbon offsets	0	0	-	-	0	-
2040	Fielden Washrooms	Purchasing carbon offsets	0	0	-	-	0	-
2040	Fire and Emergency Services	Purchasing carbon offsets	0	9	-	-	0	-
2040	Harbour Master	Purchasing carbon offsets	0	0	-	-	0	-
2040	HH Knoll Park	Purchasing carbon offsets	0	1	-	-	0	-
2040	Humberstone Hall Visitors Centre	Purchasing carbon offsets	0	6	-	-	0	-
2040	Library	Purchasing carbon offsets	0	30	-	-	0	-
2040	Lions Field Park Canteen and Kitchen	Purchasing carbon offsets	0	1	-	-	0	-
2040	Lock 8 Washrooms	Purchasing carbon offsets	0	1	-	-	0	-
2040	Market Square	Purchasing carbon offsets	0	0	-	-	0	-
2040	Museum LR Wilson Archives	Purchasing carbon offsets	0	6	-	-	0	-
2040	Museum Sharpe HRC	Purchasing carbon offsets	0	4	-	-	0	-

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2040	Museum Williams House	Purchasing carbon offsets	0	6	-	-	0	-
2040	Nickle Beach Washrooms	Purchasing carbon offsets	0	0	-	-	-	-
2040	Pleasant Beach Rd security camera	Purchasing carbon offsets	0	0	-	-	-	-
2040	Public Works (Engineering and Operations Centre)	Purchasing carbon offsets	0	17	-	-	0	-
2040	Sugarloaf Marina Marlon Building	Purchasing carbon offsets	0	12	-	-	0	-
2040	Tennis Courts	Purchasing carbon offsets	0	1	-	-	0	-
2040	Vale Health and Wellness Centre	Purchasing carbon offsets	0	601	-	-	0	-
2040	Wignell Drain Outlet Structure	Purchasing carbon offsets	0	0	-	-	0	-
2040	Archives Waste	Purchasing carbon offsets	0	1	-	-	0	-
2040	Archives Waste	Waste mitigation	11,814	1	20	29	8,038	402
2040	City Hall Waste	Purchasing carbon offsets	0	15	-	-	0	-
2040	City Hall Waste	Waste mitigation	11,814	15	20	294	804	40
2040	Fire Hall Waste	Purchasing carbon offsets	0	4	-	-	0	-
2040	Fire Hall Waste	Waste mitigation	11,814	4	20	88	2,679	134
2040	Library Waste	Purchasing carbon offsets	0	3	-	-	0	-
2040	Library Waste	Waste mitigation	11,814	3	20	59	4,019	201
2040	Museum Waste	Purchasing carbon offsets	0	1	-	-	0	-
2040	Museum Waste	Waste mitigation	11,814	1	20	29	8,038	402
2040	Nickle Beach Waste	Purchasing carbon offsets	0	14	-	-	0	-
2040	Nickle Beach Waste	Waste mitigation	11,814	14	20	281	841	42

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2040	Operations Centre Waste	Purchasing carbon offsets	0	32	-	-	0	-
2040	Operations Centre Waste	Waste mitigation	11,814	32	20	642	368	18
2040	Park Waste	Purchasing carbon offsets	0	61	-	-	0	-
2040	Park Waste	Waste mitigation	11,814	61	20	1,213	195	10
2040	Roselawn Waste	Purchasing carbon offsets	0	0	-	-	0	-
2040	Roselawn Waste	Waste mitigation	11,814	0	20	7	32,154	1,608
2040	Sugarloaf Marina Waste	Purchasing carbon offsets	0	68	-	-	0	-
2040	Sugarloaf Marina Waste	Waste mitigation	11,814	68	20	1,365	173	9
2040	Tea Room Waste	Purchasing carbon offsets	0	1	-	-	0	-
2040	Tea Room Waste	Waste mitigation	11,814	1	20	29	8,038	402
2040	Vale Health and Wellness Centre Waste	Purchasing carbon offsets	0	64	-	-	0	-
2040	Vale Health and Wellness Centre Waste	Waste mitigation	11,814	64	20	1,285	184	9
2040	Building Dept Fleet	Purchasing carbon offsets	0	3	-	-	0	-
2040	By-Law Dept Fleet	Purchasing carbon offsets	0	5	-	-	0	-
2040	Canal Days Fleet	Purchasing carbon offsets	0	2	-	-	0	-
2040	Comm & Ecdev Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2040	Drains Fleet	Purchasing carbon offsets	0	30	-	-	0	-
2040	Engineering Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2040	Facility Maint Fleet	Purchasing carbon offsets	0	7	-	-	0	-
2040	Fire Fleet	Purchasing carbon offsets	0	46	-	-	0	-
2040	Fleet Fleet	Purchasing carbon offsets	0	2	-	-	0	-
2040	Marina Fleet	Purchasing carbon offsets	0	9	-	-	0	-

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2040	Museum Fleet	Purchasing carbon offsets	0	0	-	-	0	-
2040	Nickel Beach Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2040	Parks Fleet	Purchasing carbon offsets	0	94	-	-	0	-
2040	Project Management Fleet	Purchasing carbon offsets	0	6	-	-	0	-
2040	Transportation Fleet	Purchasing carbon offsets	0	193	-	-	0	-
2040	Utilities Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2040	WasteWater Fleet	Purchasing carbon offsets	0	13	-	-	0	-
2040	Water Fleet	Purchasing carbon offsets	0	36	-	-	0	-
2040	000Clarence St, Traf Light Elm St	Purchasing carbon offsets	0	0	-	-	0	-
2040	160 Sugarloaf St, Lighting 200A Service-Cenotaph, etc	Purchasing carbon offsets	0	0	-	-	0	-
2040	160 Sugarloaf St, Park Light	Purchasing carbon offsets	0	0	-	-	0	-
2040	183 Main St West Lights	Purchasing carbon offsets	0	0	-	-	0	-
2040	212 West, No. 5 Panel Promenade lights	Purchasing carbon offsets	0	0	-	-	0	-
2040	3 Marina St (Marina Lighting) master	Purchasing carbon offsets	0	2	-	-	0	-
2040	Church&Main St. W Light Pedestal	Purchasing carbon offsets	0	1	-	-	0	-
2040	Light House and Sign	Purchasing carbon offsets	0	0	-	-	0	-
2040	Main St West Lights	Purchasing carbon offsets	0	1	-	-	0	-
2040	Near 48 Main St. W Light Pedestal	Purchasing carbon offsets	0	0	-	-	0	-
2040	Street Lights - General	Purchasing carbon offsets	0	30	-	-	0	-
2040	Traffic Lights-King St	Purchasing carbon offsets	0	0	-	-	0	-

Table 13: Recommended measures and timeline for Most Aggressive pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2040	Traffic Lights-Steele and Clarence	Purchasing carbon offsets	0	0	-	-	0	-
2040	550 Elizabeth St, Pump Stn 66 Elizabeth St	Purchasing carbon offsets	0	0	-	-	0	-
2040	69 Lake Rd, Pump House Nickel Beach	Purchasing carbon offsets	0	0	-	-	0	-
2040	69 Lake Rd, Trl Pumps Nickel Beach	Purchasing carbon offsets	0	0	-	-	0	-
2040	Bulk Water Station 2	Purchasing carbon offsets	0	0	-	-	0	-
2040	Johnson St Pumping Station	Purchasing carbon offsets	0	1	-	-	0	-
2040	Scholl Field Pump	Purchasing carbon offsets	0	7	-	-	0	-
*								

A.3 Most Aligned Pathway ECMs

The full list of recommended measures for the Most Aligned pathway is presented below.

Table 14: Recommended measures and timeline for Most Aligned pathway

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	00 Sugarloaf St, Splashpad	Conduct energy audit	2,934	0	5	0	-	-
2026	00 Sugarloaf St, Splashpad	Lighting upgrade	10,055	0	10	0	38,419,555	3,841,956
2026	000 Weaver Rd, Sec Camera	Conduct energy audit	2,934	0	5	0	-	-
2026	000 Weaver Rd, Sec Camera	Lighting upgrade	1,483	0	10	0	19,160,294	1,916,029
2026	1 Marina Rd (fuel docks)	Conduct energy audit	2,934	0	5	0	-	-
2026	1 Marina Rd (fuel docks)	Lighting upgrade	33,426	0	10	0	52,272,649	5,227,265
2026	145 Mellanby Ave, Lock 8 Viewing Stand	Conduct energy audit	2,934	0	5	0	-	-

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	145 Mellanby Ave, Lock 8 Viewing Stand	Lighting upgrade	34,629	0	10	0	28,222,465	2,822,247
2026	2 John St. Lockview	Conduct energy audit	2,934	0	5	0	-	-
2026	227 Catharine St, Market Square	Conduct energy audit	2,934	0	5	0	-	-
2026	227 Catharine St, Market Square	Lighting upgrade	1,314	0	10	0	38,412,661	3,841,266
2026	280 King Street (Barn)	Conduct energy audit	2,934	0	5	0	-	-
2026	280 King Street (Barn)	Lighting upgrade	24,438	0	10	0	38,420,174	3,842,017
2026	287 West Side Rd, Flow Meter	Conduct energy audit	2,934	0	5	0	-	-
2026	287 West Side Rd, Flow Meter	Lighting upgrade	1,852	0	10	0	19,154,270	1,915,427
2026	296 Fielden Ave, Business Roselawn Centre	Conduct energy audit	2,934	0	5	0	-	-
2026	296 Fielden Ave, Heritage Roselawn Centre	Conduct energy audit	6,228	0	5	0	-	-
2026	296 Fielden Ave, Heritage Roselawn Centre	Lighting upgrade	397,585	0	10	0	27,412,811	2,741,281
2026	3 Marina St (Air Conditioning)	Conduct energy audit	2,934	0	5	0	-	-
2026	3 Marina St, Sugarloaf Marina docks	Conduct energy audit	2,934	0	5	0	-	-
2026	550 Elizabeth St, Ball Field	Conduct energy audit	2,934	0	5	0	-	-
2026	550 Elizabeth St, Ball Field	Lighting upgrade	14,840	0	10	0	45,757,571	4,575,757
2026	61 Princess Street (Garage)	Conduct energy audit	2,934	0	5	0	-	-
2026	61 Princess Street (Garage)	Lighting upgrade	1,023	0	10	0	38,433,484	3,843,348
2026	78 Lakeshore Rd W, Heat Trace	Conduct energy audit	2,934	0	5	0	-	-

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Arabellas Tea Room	Conduct energy audit	2,934	0	5	0	-	-
2026	Arabellas Tea Room	Lighting upgrade	9,284	0	10	0	12,545,210	1,254,521
2026	Athletic Field Washrooms	Conduct energy audit	2,934	0	5	0	-	-
2026	Athletic Field Washrooms	Lighting upgrade	11,216	0	10	0	18,419,060	1,841,906
2026	Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Conduct energy audit	2,934	0	5	0	-	-
2026	Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Lighting upgrade	11,852	0	10	0	22,857,045	2,285,705
2026	Centennial Park Washrooms	Conduct energy audit	2,934	0	5	0	-	-
2026	Centennial Park Washrooms	Lighting upgrade	3,213	0	10	0	5,878,078	587,808
2026	City Hall	Conduct energy audit	5,772	0	5	0	-	-
2026	Clarence St Crosswalk	Conduct energy audit	12,534	0	5	0	-	-
2026	Clarence St Crosswalk	Lighting upgrade	3,092	0	10	0	19,156,327	1,915,633
2026	Clarence St, Seaway Lite Seaway Park	Conduct energy audit	12,534	0	5	0	-	-
2026	Clarence St, Seaway Lite Seaway Park	Lighting upgrade	18,414	0	10	0	38,420,835	3,842,084
2026	E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Conduct energy audit	12,534	0	5	0	-	-
2026	E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Lighting upgrade	2,678	0	10	0	38,426,923	3,842,692
2026	Eagle Marsh Drain Outlet Structure	Conduct energy audit	12,534	0	5	0	-	-
2026	Eagle Marsh Drain Outlet Structure	Lighting upgrade	31,874	0	10	0	38,421,092	3,842,109

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Fielden Washrooms	Conduct energy audit	12,534	0	5	0	-	-
2026	Fielden Washrooms	Lighting upgrade	2,532	0	10	0	21,652,982	2,165,298
2026	Fire and Emergency Services	Conduct energy audit	12,534	0	5	0	-	-
2026	Fire and Emergency Services	Lighting upgrade	110,037	0	10	0	5,957,745	595,774
2026	Harbour Master	Conduct energy audit	12,534	0	5	0	-	-
2026	Harbour Master	Lighting upgrade	2,117	0	10	0	2,932,073	293,207
2026	HH Knoll Park	Conduct energy audit	12,534	0	5	0	-	-
2026	HH Knoll Park	Lighting upgrade	38,601	0	10	0	26,372,115	2,637,212
2026	Humberstone Hall Visitors Centre	Conduct energy audit	12,534	0	5	0	-	-
2026	Humberstone Hall Visitors Centre	Lighting upgrade	10,904	0	10	0	18,413,493	1,841,349
2026	Library	Conduct energy audit	12,534	0	5	0	-	-
2026	Library	Lighting upgrade	73,729	0	10	0	4,550,087	455,009
2026	Lions Field Park Canteen and Kitchen	Conduct energy audit	12,534	0	5	0	-	-
2026	Lions Field Park Canteen and Kitchen	Lighting upgrade	8,544	0	10	0	3,953,168	395,317
2026	Lock 8 Washrooms	Conduct energy audit	12,534	0	5	0	-	-
2026	Lock 8 Washrooms	Lighting upgrade	3,078	0	10	0	2,507,322	250,732
2026	Market Square	Conduct energy audit	12,534	0	5	0	-	-
2026	Market Square	Lighting upgrade	9,713	0	10	0	41,771,454	4,177,145
2026	Museum LR Wilson Archives	Conduct energy audit	12,534	0	5	0	-	-
2026	Museum LR Wilson Archives	Lighting upgrade	15,278	0	10	0	7,001,734	700,173

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Museum Sharpe HRC	Conduct energy audit	12,534	0	5	0	-	-
2026	Museum Williams House	Conduct energy audit	12,534	0	5	0	-	-
2026	Museum Williams House	HVAC to heat pump	99,485	5	15	72	20,852	1,390
2026	Museum Williams House	Lighting upgrade	13,653	0	10	0	7,865,024	786,502
2026	Public Works (Engineering and Operations Centre)	Conduct energy audit	15,398	0	5	0	-	-
2026	Public Works (Engineering and Operations Centre)	Lighting upgrade	227,388	0	10	0	6,760,122	676,012
2026	Sugarloaf Marina Marlon Building	Conduct energy audit	12,534	0	5	0	-	-
2026	Sugarloaf Marina Marlon Building	Lighting upgrade	23,432	0	10	0	1,279,182	127,918
2026	Tennis Courts	Conduct energy audit	12,534	0	5	0	-	-
2026	Vale Health and Wellness Centre	Conduct energy audit	60,765	0	5	0	-	-
2026	Vale Health and Wellness Centre	Ice resurfacer conversion	182,785	0	15	3	927,517	61,834
2026	Wignell Drain Outlet Structure	Conduct energy audit	12,534	0	5	0	-	-
2026	Wignell Drain Outlet Structure	Lighting upgrade	662	0	10	0	41,795,040	4,179,504
2026	Archives Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	City Hall Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Fire Hall Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Library Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Museum Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Nickel Beach Waste	Conduct waste audit	4,355	0	5	0	-	-

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Operations Centre Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Park Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Roselawn Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Sugarloaf Marina Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Tea Room Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Vale Health and Wellness Centre Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Building Dept Fleet	Fleet optimization	2,904	0	10	1	22,065	2,207
2026	By-Law Dept Fleet	Fleet optimization	2,904	0	10	2	11,772	1,177
2026	Canal Days Fleet	Fleet optimization	2,904	0	10	1	27,714	2,771
2026	Comm & Ecdev Fleet	Fleet optimization	2,904	0	10	0	-	-
2026	Drains Fleet	Fleet optimization	2,904	1	10	15	1,967	197
2027	1 Marina Rd (fuel docks)	HVAC system optimization	6,847	0	15	0	237,739	15,849
2027	296 Fielden Ave, Business Roselawn Centre	HVAC system optimization	33,857	1	15	8	65,921	4,395
2027	296 Fielden Ave, Heritage Roselawn Centre	HVAC system optimization	81,242	3	15	42	29,125	1,942
2027	3 Marina St (Air Conditioning)	HVAC system optimization	7,755	0	15	1	166,986	11,132
2027	3 Marina St, Sugarloaf Marina docks	HVAC system optimization	6,154	2	15	33	2,802	187
2027	550 Elizabeth St, Ball Field	HVAC system optimization	3,040	0	15	0	256,893	17,126
2027	Arabellas Tea Room	HVAC system optimization	1,880	0	15	4	7,004	467
2027	City Hall	HVAC system optimization	38,607	1	15	18	31,524	2,102
2027	City Hall	Lighting upgrade	188,650	0	10	0	4,579,427	457,943

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2027	Fire and Emergency Services	HVAC system optimization	22,893	0	15	7	48,146	3,210
2027	Harbour Master	HVAC system optimization	448	0	15	0	20,891	1,393
2027	HH Knoll Park	HVAC system optimization	7,922	0	15	1	202,994	13,533
2027	Humberstone Hall Visitors Centre	HVAC system optimization	2,174	1	15	8	4,102	273
2027	Library	HVAC system optimization	15,125	2	15	37	6,132	409
2027	Lions Field Park Canteen and Kitchen	HVAC system optimization	1,788	0	15	1	33,807	2,254
2027	Lock 8 Washrooms	HVAC system optimization	655	0	15	0	20,025	1,335
2027	Market Square	HVAC system optimization	1,991	0	15	0	287,993	19,200
2027	Museum LR Wilson Archives	HVAC system optimization	3,109	0	15	7	6,244	416
2027	Museum Sharpe HRC	HVAC system optimization	4,572	0	15	5	14,616	974
2027	Museum Williams House	HVAC system optimization	2,760	1	15	8	5,016	334
2027	Public Works (Engineering and Operations Centre)	HVAC system optimization	47,210	1	15	15	47,211	3,147
2027	Sugarloaf Marina Marlon Building	HVAC system optimization	5,115	1	15	12	6,506	434
2027	Vale Health and Wellness Centre	HVAC system optimization	102,739	35	15	529	2,912	194
2027	Wignell Drain Outlet Structure	HVAC system optimization	136	0	15	0	288,093	19,206
2027	Building Dept Fleet	Fleet equipment decarbonization	384,287	2	5	12	154,516	30,903
2027	By-Law Dept Fleet	Fleet equipment decarbonization	256,191	5	5	23	54,959	10,992
2027	Canal Days Fleet	Fleet equipment decarbonization	128,096	1	5	7	95,848	19,170

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2027	Engineering Fleet	Fleet optimization	2,968	0	10	0	-	-
2027	Facility Maint Fleet	Fleet optimization	2,968	0	10	4	8,387	839
2027	Fire Fleet	Fleet optimization	2,968	2	10	23	1,280	128
2027	Fleet Fleet	Fleet optimization	2,968	0	10	1	28,392	2,839
2027	Marina Fleet	Fleet optimization	2,968	0	10	5	6,299	630
2027	Museum Fleet	Fleet optimization	2,968	0	10	0	226,161	22,616
2027	Nickel Beach Fleet	Fleet optimization	2,968	0	10	0	-	-
2027	Parks Fleet	Fleet optimization	2,968	5	10	47	632	63
2027	Project Management Fleet	Fleet optimization	2,968	0	10	3	10,657	1,066
2027	Transportation Fleet	Fleet optimization	2,968	10	10	97	307	31
2027	Utilities Fleet	Fleet optimization	2,968	0	10	0	-	-
2027	WasteWater Fleet	Fleet optimization	2,968	1	10	6	4,571	457
2027	Water Fleet	Fleet optimization	2,968	2	10	18	1,646	165
2028	296 Fielden Ave, Business Roselawn Centre	DHW to heat pump	10,855	0	15	6	28,814	1,921
2028	3 Marina St, Sugarloaf Marina docks	Lighting upgrade	30,917	0	10	0	1,816,029	181,603
2028	Library	DHW to heat pump	10,651	2	15	27	5,935	396
2028	Lions Field Park Canteen and Kitchen	DHW to heat pump	10,905	0	15	0	338,867	22,591
2028	Museum LR Wilson Archives	DHW to heat pump	10,856	0	15	6	29,379	1,959
2028	Museum Sharpe HRC	Lighting upgrade	23,478	0	10	0	28,994,973	2,899,497
2028	Scouts Hall	Demolish building	0	4	-	-	0	-
2028	Tennis Courts	Lighting upgrade	12,276	0	10	0	8,101,014	810,101

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2028	Vale Health and Wellness Centre	HVAC to heat pump	4,384,022	278	15	4,170	15,772	1,051
2028	Vale Health and Wellness Centre	Lighting upgrade	929,455	0	10	2	4,382,227	438,223
2028	Comm & Ecdev Fleet	Fleet equipment decarbonization	130,914	0	5	0	-	-
2028	Drains Fleet	Fleet equipment decarbonization	785,482	19	5	94	41,759	8,352
2028	Engineering Fleet	Fleet equipment decarbonization	392,741	0	5	0	-	-
2028	Facility Maint Fleet	Fleet equipment decarbonization	654,568	5	5	23	143,885	28,777
2028	Fire Fleet	Fleet equipment decarbonization	130,914	25	5	124	5,292	1,058
2028	Fleet Fleet	Fleet equipment decarbonization	130,914	1	5	7	94,627	18,925
2029	296 Fielden Ave, Business Roselawn Centre	HVAC to heat pump	97,876	4	15	65	22,592	1,506
2029	296 Fielden Ave, Business Roselawn Centre	Lighting upgrade	176,856	0	10	0	65,517,831	6,551,783
2029	296 Fielden Ave, Heritage Roselawn Centre	DHW to heat pump	16,429	2	15	31	8,023	535
2029	Arabellas Tea Room	DHW to heat pump	11,120	0	15	3	54,649	3,643
2029	Marina Fleet	Fleet equipment decarbonization	2,408,287	6	5	30	399,773	79,955
2029	Museum Fleet	Fleet equipment decarbonization	133,794	0	5	1	539,531	107,906
2029	Nickel Beach Fleet	Fleet equipment decarbonization	535,175	0	5	0	-	-
2030	Fire and Emergency Services	Solar PV	150,316	3	15	38	59,565	3,971

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2030	Humberstone Hall Visitors Centre	DHW to heat pump	11,336	0	15	6	27,637	1,842
2030	Library	Solar PV	75,158	1	15	19	59,565	3,971
2030	Museum Sharpe HRC	DHW to heat pump	11,361	0	15	4	47,812	3,187
2030	Museum Williams House	DHW to heat pump	11,335	0	15	6	27,321	1,821
2030	Sugarloaf Marina Marlon Building	DHW to heat pump	11,332	0	15	7	25,877	1,725
2030	Parks Fleet	Fleet equipment decarbonization	14,357,40460		5	301	238,750	47,750
2030	Project Management Fleet	Fleet equipment decarbonization	136,737	5	5	26	25,983	5,197
2030	Transportation Fleet	Fleet equipment decarbonization	13,810,45545		5	226	305,663	61,133
2031	296 Fielden Ave, Heritage Roselawn Centre	Solar PV	270,073	4	15	66	61,154	4,077
2031	3 Marina St, Sugarloaf Marina docks	DHW to heat pump	11,386	2	15	27	6,337	422
2031	3 Marina St, Sugarloaf Marina docks	Solar PV	308,654	5	15	76	61,154	4,077
2031	Vale Health and Wellness Centre	DHW to heat pump	136,820	20	15	304	6,744	450
2031	Utilities Fleet	Fleet equipment decarbonization	3,353,890	0	5	0	-	-
2031	WasteWater Fleet	Fleet equipment decarbonization	3,633,380	8	5	42	437,148	87,430
2031	Water Fleet	Fleet equipment decarbonization	3,773,126	23	5	115	163,684	32,737
2032	296 Fielden Ave, Business Roselawn Centre	Solar PV	59,410	1	15	14	62,778	4,185
2032	City Hall	Solar PV	237,640	4	15	57	62,778	4,185

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2032	Vale Health and Wellness Centre	Pool heat to heat pump	990,165	63	15	952	15,595	1,040
2032	Canal Days Fleet	Heavy vehicle decarbonization	535,082	2	10	20	272,257	27,226
2032	Comm & Ecdev Fleet	Heavy vehicle decarbonization	535,082	0	10	0	-	-
2033	Library	HVAC to heat pump	517,876	21	15	310	25,095	1,673
2033	Lions Field Park Canteen and Kitchen	HVAC to heat pump	9,287	0	15	6	25,096	1,673
2033	Public Works (Engineering and Operations Centre)	Solar PV	325,232	5	15	76	64,439	4,296
2033	Vale Health and Wellness Centre	Solar PV	1,300,926	20	15	303	64,439	4,296
2033	Drains Fleet	Heavy vehicle decarbonization	1,644,523	28	10	277	59,451	5,945
2033	Engineering Fleet	Heavy vehicle decarbonization	548,174	0	10	0	-	-
2034	296 Fielden Ave, Heritage Roselawn Centre	HVAC to heat pump	606,490	24	15	353	25,756	1,717
2034	Arabellas Tea Room	HVAC to heat pump	60,271	2	15	35	25,756	1,717
2034	Museum LR Wilson Archives	HVAC to heat pump	109,449	4	15	64	25,756	1,717
2034	Facility Maint Fleet	Heavy vehicle decarbonization	1,123,108	7	10	67	167,877	16,788
2034	Fire Fleet	Heavy vehicle decarbonization	5,615,541	43	10	434	129,379	12,938
2035	3 Marina St, Sugarloaf Marina docks	HVAC to heat pump	271,401	17	15	260	15,630	1,042
2035	Humberstone Hall Visitors Centre	HVAC to heat pump	124,672	5	15	71	26,431	1,762
2035	Museum Sharpe HRC	HVAC to heat pump	72,224	3	15	41	26,432	1,762
2035	Vale Health and Wellness Centre	Install low GWP refrigerant equipment	0	0	-	-	-	-
2035	Fleet Fleet	Heavy vehicle decarbonization	575,228	2	10	20	291,052	29,105

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2035	Marina Fleet	Heavy vehicle decarbonization	5,357,055	9	10	89	604,700	60,470
2037	Nickel Beach Fleet	Heavy vehicle decarbonization	1,326,972	0	10	0	-	-
2038	Parks Fleet	Heavy vehicle decarbonization	35,260,291	884	10	884	398,714	39,871
2039	Transportation Fleet	Heavy vehicle decarbonization	35,343,017	1,807	10	1,807	195,559	19,556
2042	Vale Health and Wellness Centre	Equipment electrification	639,752	14	18	258	44,674	2,482
2043	Utilities Fleet	Heavy vehicle decarbonization	9,072,318	0	10	0	-	-
2044	Sugarloaf Marina Marlon Building	HVAC to heat pump	167,282	5	15	76	33,218	2,215
2045	WasteWater Fleet	Heavy vehicle decarbonization	10,265,549	12	10	122	839,863	83,986
2046	Water Fleet	Heavy vehicle decarbonization	10,491,391	34	10	339	309,490	30,949
2050	00 Sugarloaf St, Splashpad	Purchasing carbon offsets	0	0	-	-	0	-
2050	000 Weaver Rd, Sec Camera	Purchasing carbon offsets	0	0	-	-	0	-
2050	1 Marina Rd (fuel docks)	Purchasing carbon offsets	0	0	-	-	0	-
2050	11 King St (Metal Shed)	Purchasing carbon offsets	0	0	-	-	-	-
2050	11 King St (Storage Bldg) 14 King St	Purchasing carbon offsets	0	0	-	-	-	-
2050	145 Mellanby Ave, Lock 8 Viewing Stand	Purchasing carbon offsets	0	0	-	-	0	-
2050	2 John St. Lockview	Purchasing carbon offsets	0	0	-	-	0	-
2050	227 Catharine St, Market Square	Purchasing carbon offsets	0	0	-	-	0	-
2050	280 King Street (Barn)	Purchasing carbon offsets	0	0	-	-	0	-
2050	287 West Side Rd, Flow Meter	Purchasing carbon offsets	0	0	-	-	0	-
2050	296 Fielden Ave, Business Roselawn Centre	Purchasing carbon offsets	0	6	-	-	0	-

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	296 Fielden Ave, Heritage Roselawn Centre	Purchasing carbon offsets	0	33	-	-	0	-
2050	3 Marina St (Air Conditioning)	Purchasing carbon offsets	0	0	-	-	0	-
2050	3 Marina St, Sugarloaf Marina docks	Purchasing carbon offsets	0	27	-	-	0	-
2050	550 Elizabeth St, Ball Field	Purchasing carbon offsets	0	0	-	-	0	-
2050	550 Elizabeth St, Charg Stn	Purchasing carbon offsets	0	1	-	-	0	-
2050	61 Princess Street (Garage)	Purchasing carbon offsets	0	0	-	-	0	-
2050	78 Lakeshore Rd W, Heat Trace	Purchasing carbon offsets	0	0	-	-	-	-
2050	Arabellas Tea Room	Purchasing carbon offsets	0	3	-	-	0	-
2050	Athletic Field Washrooms	Purchasing carbon offsets	0	0	-	-	0	-
2050	Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Purchasing carbon offsets	0	0	-	-	0	-
2050	Centennial Park Washrooms	Purchasing carbon offsets	0	0	-	-	0	-
2050	City Hall	Purchasing carbon offsets	0	21	-	-	0	-
2050	Clarence St Crosswalk	Purchasing carbon offsets	0	0	-	-	0	-
2050	Clarence St, Seaway Lite Seaway Park	Purchasing carbon offsets	0	0	-	-	0	-
2050	E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Purchasing carbon offsets	0	0	-	-	0	-
2050	Eagle Marsh Drain Outlet Strucuture	Purchasing carbon offsets	0	0	-	-	0	-
2050	Fielden Washrooms	Purchasing carbon offsets	0	0	-	-	0	-
2050	Fire and Emergency Services	Purchasing carbon offsets	0	9	-	-	0	-

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	Harbour Master	Purchasing carbon offsets	0	0	-	-	0	-
2050	HH Knoll Park	Purchasing carbon offsets	0	1	-	-	0	-
2050	Humberstone Hall Visitors Centre	Purchasing carbon offsets	0	6	-	-	0	-
2050	Library	Purchasing carbon offsets	0	30	-	-	0	-
2050	Lions Field Park Canteen and Kitchen	Purchasing carbon offsets	0	1	-	-	0	-
2050	Lock 8 Washrooms	Purchasing carbon offsets	0	1	-	-	0	-
2050	Market Square	Purchasing carbon offsets	0	0	-	-	0	-
2050	Museum LR Wilson Archives	Purchasing carbon offsets	0	6	-	-	0	-
2050	Museum Sharpe HRC	Purchasing carbon offsets	0	4	-	-	0	-
2050	Museum Williams House	Purchasing carbon offsets	0	6	-	-	0	-
2050	Nickle Beach Washrooms	Purchasing carbon offsets	0	0	-	-	-	-
2050	Pleasant Beach Rd security camera	Purchasing carbon offsets	0	0	-	-	-	-
2050	Public Works (Engineering and Operations Centre)	Purchasing carbon offsets	0	17	-	-	0	-
2050	Sugarloaf Marina Marlon Building	Purchasing carbon offsets	0	12	-	-	0	-
2050	Tennis Courts	Purchasing carbon offsets	0	1	-	-	0	-
2050	Vale Health and Wellness Centre	Purchasing carbon offsets	0	601	-	-	0	-
2050	Wignell Drain Outlet Structure	Purchasing carbon offsets	0	0	-	-	0	-
2050	Archives Waste	Purchasing carbon offsets	0	1	-	-	0	-
2050	Archives Waste	Waste mitigation	14,686	1	20	29	9,993	500
2050	City Hall Waste	Purchasing carbon offsets	0	15	-	-	0	-

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	City Hall Waste	Waste mitigation	14,686	15	20	294	999	50
2050	Fire Hall Waste	Purchasing carbon offsets	0	4	-	-	0	-
2050	Fire Hall Waste	Waste mitigation	14,686	4	20	88	3,331	167
2050	Library Waste	Purchasing carbon offsets	0	3	-	-	0	-
2050	Library Waste	Waste mitigation	14,686	3	20	59	4,996	250
2050	Museum Waste	Purchasing carbon offsets	0	1	-	-	0	-
2050	Museum Waste	Waste mitigation	14,686	1	20	29	9,993	500
2050	Nickel Beach Waste	Purchasing carbon offsets	0	14	-	-	0	-
2050	Nickel Beach Waste	Waste mitigation	14,686	14	20	281	1,045	52
2050	Operations Centre Waste	Purchasing carbon offsets	0	32	-	-	0	-
2050	Operations Centre Waste	Waste mitigation	14,686	32	20	642	457	23
2050	Park Waste	Purchasing carbon offsets	0	61	-	-	0	-
2050	Park Waste	Waste mitigation	14,686	61	20	1,213	242	12
2050	Roselawn Waste	Purchasing carbon offsets	0	0	-	-	0	-
2050	Roselawn Waste	Waste mitigation	14,686	0	20	7	39,970	1,999
2050	Sugarloaf Marina Waste	Purchasing carbon offsets	0	68	-	-	0	-
2050	Sugarloaf Marina Waste	Waste mitigation	14,686	68	20	1,365	215	11
2050	Tea Room Waste	Purchasing carbon offsets	0	1	-	-	0	-
2050	Tea Room Waste	Waste mitigation	14,686	1	20	29	9,993	500
2050	Vale Health and Wellness Centre Waste	Purchasing carbon offsets	0	64	-	-	0	-
2050	Vale Health and Wellness Centre Waste	Waste mitigation	14,686	64	20	1,285	229	11
2050	Building Dept Fleet	Purchasing carbon offsets	0	3	-	-	0	-

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	By-Law Dept Fleet	Purchasing carbon offsets	0	5	-	-	0	-
2050	Canal Days Fleet	Purchasing carbon offsets	0	2	-	-	0	-
2050	Comm & Ecdev Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2050	Drains Fleet	Purchasing carbon offsets	0	30	-	-	0	-
2050	Engineering Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2050	Facility Maint Fleet	Purchasing carbon offsets	0	7	-	-	0	-
2050	Fire Fleet	Purchasing carbon offsets	0	46	-	-	0	-
2050	Fleet Fleet	Purchasing carbon offsets	0	2	-	-	0	-
2050	Marina Fleet	Purchasing carbon offsets	0	9	-	-	0	-
2050	Museum Fleet	Purchasing carbon offsets	0	0	-	-	0	-
2050	Nickel Beach Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2050	Parks Fleet	Purchasing carbon offsets	0	94	-	-	0	-
2050	Project Management Fleet	Purchasing carbon offsets	0	6	-	-	0	-
2050	Transportation Fleet	Purchasing carbon offsets	0	193	-	-	0	-
2050	Utilities Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2050	WasteWater Fleet	Purchasing carbon offsets	0	13	-	-	0	-
2050	Water Fleet	Purchasing carbon offsets	0	36	-	-	0	-
2050	000Clarence St, Traf Light Elm St	Purchasing carbon offsets	0	0	-	-	0	-
2050	160 Sugarloaf St, Lighting 200A Service-Cenotaph, etc	Purchasing carbon offsets	0	0	-	-	0	-
2050	160 Sugarloaf St, Park Light	Purchasing carbon offsets	0	0	-	-	0	-
2050	183 Main St West Lights	Purchasing carbon offsets	0	0	-	-	0	-

Table 14: Recommended measures and timeline for Most Aligned pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	212 West, No. 5 Panel Promenade lights	Purchasing carbon offsets	0	0	-	-	0	-
2050	3 Marina St (Marina Lighting) master	Purchasing carbon offsets	0	2	-	-	0	-
2050	Church&Main St. W Light Pedestal	Purchasing carbon offsets	0	1	-	-	0	-
2050	Light House and Sign	Purchasing carbon offsets	0	0	-	-	0	-
2050	Main St West Lights	Purchasing carbon offsets	0	1	-	-	0	-
2050	Near 48 Main St. W Light Pedestal	Purchasing carbon offsets	0	0	-	-	0	-
2050	Street Lights - General	Purchasing carbon offsets	0	30	-	-	0	-
2050	Traffic Lights-King St	Purchasing carbon offsets	0	0	-	-	0	-
2050	Traffic Lights-Steele and Clarence	Purchasing carbon offsets	0	0	-	-	0	-
2050	550 Elizabeth St, Pump Stn 66 Elizabeth St	Purchasing carbon offsets	0	0	-	-	0	-
2050	69 Lake Rd, Pump House Nickel Beach	Purchasing carbon offsets	0	0	-	-	0	-
2050	69 Lake Rd, Trl Pumps Nickel Beach	Purchasing carbon offsets	0	0	-	-	0	-
2050	Bulk Water Station 2	Purchasing carbon offsets	0	0	-	-	0	-
2050	Johnson St Pumping Station	Purchasing carbon offsets	0	1	-	-	0	-
2050	Scholl Field Pump	Purchasing carbon offsets	0	7	-	-	0	-
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A.4 Most Achievable Pathway ECMs

The full list of recommended measures for the Most Achievable pathway is presented below.

Table 15: Recommended measures and timeline for Most Achievable pathway

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	00 Sugarloaf St, Splashpad	Conduct energy audit	2,934	0	5	0	-	-
2026	000 Weaver Rd, Sec Camera	Conduct energy audit	2,934	0	5	0	-	-
2026	1 Marina Rd (fuel docks)	Conduct energy audit	2,934	0	5	0	-	-
2026	145 Mellanby Ave, Lock 8 Viewing Stand	Conduct energy audit	2,934	0	5	0	-	-
2026	2 John St. Lockview	Conduct energy audit	2,934	0	5	0	-	-
2026	227 Catharine St, Market Square	Conduct energy audit	2,934	0	5	0	-	-
2026	280 King Street (Barn)	Conduct energy audit	2,934	0	5	0	-	-
2026	287 West Side Rd, Flow Meter	Conduct energy audit	2,934	0	5	0	-	-
2026	296 Fielden Ave, Business Roselawn Centre	Conduct energy audit	2,934	0	5	0	-	-
2026	296 Fielden Ave, Heritage Roselawn Centre	Conduct energy audit	6,228	0	5	0	-	-
2026	3 Marina St (Air Conditioning)	Conduct energy audit	2,934	0	5	0	-	-
2026	3 Marina St, Sugarloaf Marina docks	Conduct energy audit	2,934	0	5	0	-	-
2026	550 Elizabeth St, Ball Field	Conduct energy audit	2,934	0	5	0	-	-
2026	61 Princess Street (Garage)	Conduct energy audit	2,934	0	5	0	-	-
2026	78 Lakeshore Rd W, Heat Trace	Conduct energy audit	2,934	0	5	0	-	-
2026	Arabellas Tea Room	Conduct energy audit	2,934	0	5	0	-	-
2026	Arabellas Tea Room	Lighting upgrade	9,284	0	10	0	12,545,210	1,254,521
2026	Athletic Field Washrooms	Conduct energy audit	2,934	0	5	0	-	-
2026	Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Conduct energy audit	2,934	0	5	0	-	-

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Centennial Park Washrooms	Conduct energy audit	2,934	0	5	0	-	-
2026	City Hall	Conduct energy audit	5,772	0	5	0	-	-
2026	Clarence St Crosswalk	Conduct energy audit	12,534	0	5	0	-	-
2026	Clarence St, Seaway Lite Seaway Park	Conduct energy audit	12,534	0	5	0	-	-
2026	E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Conduct energy audit	12,534	0	5	0	-	-
2026	Eagle Marsh Drain Outlet Structure	Conduct energy audit	12,534	0	5	0	-	-
2026	Fielden Washrooms	Conduct energy audit	12,534	0	5	0	-	-
2026	Fielden Washrooms	Lighting upgrade	2,532	0	10	0	21,652,982	2,165,298
2026	Fire and Emergency Services	Conduct energy audit	12,534	0	5	0	-	-
2026	Fire and Emergency Services	Lighting upgrade	110,037	0	10	0	5,957,745	595,774
2026	Harbour Master	Conduct energy audit	12,534	0	5	0	-	-
2026	HH Knoll Park	Conduct energy audit	12,534	0	5	0	-	-
2026	Humberstone Hall Visitors Centre	Conduct energy audit	12,534	0	5	0	-	-
2026	Library	Conduct energy audit	12,534	0	5	0	-	-
2026	Lions Field Park Canteen and Kitchen	Conduct energy audit	12,534	0	5	0	-	-
2026	Lions Field Park Canteen and Kitchen	Lighting upgrade	8,544	0	10	0	3,953,168	395,317
2026	Lock 8 Washrooms	Conduct energy audit	12,534	0	5	0	-	-
2026	Market Square	Conduct energy audit	12,534	0	5	0	-	-
2026	Museum LR Wilson Archives	Conduct energy audit	12,534	0	5	0	-	-

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Museum Sharpe HRC	Conduct energy audit	12,534	0	5	0	-	-
2026	Museum Williams House	Conduct energy audit	12,534	0	5	0	-	-
2026	Museum Williams House	HVAC to heat pump	99,485	5	15	72	20,852	1,390
2026	Public Works (Engineering and Operations Centre)	Conduct energy audit	15,398	0	5	0	-	-
2026	Sugarloaf Marina Marlon Building	Conduct energy audit	12,534	0	5	0	-	-
2026	Tennis Courts	Conduct energy audit	12,534	0	5	0	-	-
2026	Vale Health and Wellness Centre	Conduct energy audit	60,765	0	5	0	-	-
2026	Vale Health and Wellness Centre	Ice resurfacers conversion	182,785	0	15	3	927,517	61,834
2026	Wignell Drain Outlet Structure	Conduct energy audit	12,534	0	5	0	-	-
2026	Archives Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	City Hall Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Fire Hall Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Library Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Museum Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Nickel Beach Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Operations Centre Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Park Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Roselawn Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Sugarloaf Marina Waste	Conduct waste audit	4,355	0	5	0	-	-
2026	Tea Room Waste	Conduct waste audit	4,355	0	5	0	-	-

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2026	Vale Health and Wellness Centre Waste	Conduct waste audit	4,355	0	5	0	-	-
2027	00 Sugarloaf St, Splashpad	Lighting upgrade	10,276	0	10	0	39,267,126	3,926,713
2027	000 Weaver Rd, Sec Camera	Lighting upgrade	1,516	0	10	0	19,584,161	1,958,416
2027	1 Marina Rd (fuel docks)	Lighting upgrade	34,163	0	10	0	53,424,988	5,342,499
2027	145 Mellanby Ave, Lock 8 Viewing Stand	Lighting upgrade	35,394	0	10	0	28,845,700	2,884,570
2027	227 Catharine St, Market Square	Lighting upgrade	1,343	0	10	0	39,260,081	3,926,008
2027	280 King Street (Barn)	Lighting upgrade	24,977	0	10	0	39,267,759	3,926,776
2027	287 West Side Rd, Flow Meter	Lighting upgrade	1,893	0	10	0	19,578,005	1,957,801
2027	296 Fielden Ave, Heritage Roselawn Centre	Lighting upgrade	406,366	0	10	0	28,018,234	2,801,823
2027	550 Elizabeth St, Ball Field	Lighting upgrade	15,167	0	10	0	46,766,579	4,676,658
2027	61 Princess Street (Garage)	Lighting upgrade	1,045	0	10	0	39,281,362	3,928,136
2027	Athletic Field Washrooms	Lighting upgrade	11,464	0	10	0	18,826,620	1,882,662
2027	Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Lighting upgrade	12,114	0	10	0	23,362,241	2,336,224
2027	Centennial Park Washrooms	Lighting upgrade	3,285	0	10	0	6,009,736	600,974
2027	City Hall	Lighting upgrade	188,650	0	10	0	4,579,427	457,943
2027	Clarence St Crosswalk	Lighting upgrade	3,161	0	10	0	19,580,107	1,958,011
2027	Clarence St, Seaway Lite Seaway Park	Lighting upgrade	18,821	0	10	0	39,268,435	3,926,843
2027	E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Lighting upgrade	2,737	0	10	0	39,274,657	3,927,466

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2027	Eagle Marsh Drain Outlet Structure	Lighting upgrade	32,577	0	10	0	39,268,697	3,926,870
2027	Harbour Master	Lighting upgrade	2,165	0	10	0	2,998,920	299,892
2027	HH Knoll Park	Lighting upgrade	39,454	0	10	0	26,954,643	2,695,464
2027	Humberstone Hall Visitors Centre	Lighting upgrade	11,145	0	10	0	18,820,931	1,882,093
2027	Library	Lighting upgrade	75,389	0	10	0	4,652,530	465,253
2027	Lock 8 Washrooms	Lighting upgrade	3,149	0	10	0	2,564,824	256,482
2027	Market Square	Lighting upgrade	9,927	0	10	0	42,692,767	4,269,277
2027	Museum LR Wilson Archives	Lighting upgrade	15,620	0	10	0	7,158,114	715,811
2027	Museum Williams House	Lighting upgrade	13,957	0	10	0	8,040,396	804,040
2027	Public Works (Engineering and Operations Centre)	Lighting upgrade	232,469	0	10	0	6,911,185	691,119
2027	Sugarloaf Marina Marlon Building	Lighting upgrade	23,990	0	10	0	1,309,665	130,967
2027	Wignell Drain Outlet Structure	Lighting upgrade	676	0	10	0	42,716,871	4,271,687
2027	Building Dept Fleet	Fleet optimization	2,968	0	10	1	22,550	2,255
2027	By-Law Dept Fleet	Fleet optimization	2,968	0	10	2	12,031	1,203
2027	Canal Days Fleet	Fleet optimization	2,968	0	10	1	28,324	2,832
2027	Comm & Ecdev Fleet	Fleet optimization	2,968	0	10	0	-	-
2027	Drains Fleet	Fleet optimization	2,968	1	10	15	2,010	201
2028	1 Marina Rd (fuel docks)	HVAC system optimization	6,997	0	15	0	242,969	16,198
2028	296 Fielden Ave, Business Roselawn Centre	DHW to heat pump	10,855	0	15	6	28,814	1,921

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2028	296 Fielden Ave, Business Roselawn Centre	HVAC system optimization	34,603	1	15	8	67,373	4,492
2028	296 Fielden Ave, Heritage Roselawn Centre	HVAC system optimization	83,037	3	15	42	29,768	1,985
2028	3 Marina St (Air Conditioning)	HVAC system optimization	7,926	0	15	1	170,660	11,377
2028	3 Marina St, Sugarloaf Marina docks	HVAC system optimization	6,295	2	15	33	2,866	191
2028	3 Marina St, Sugarloaf Marina docks	Lighting upgrade	30,917	0	10	0	1,816,029	181,603
2028	550 Elizabeth St, Ball Field	HVAC system optimization	3,107	0	15	0	262,544	17,503
2028	Arabellas Tea Room	HVAC system optimization	1,922	0	15	4	7,160	477
2028	City Hall	HVAC system optimization	39,456	1	15	18	32,218	2,148
2028	Fire and Emergency Services	HVAC system optimization	23,396	0	15	7	49,205	3,280
2028	Harbour Master	HVAC system optimization	458	0	15	0	21,351	1,423
2028	HH Knoll Park	HVAC system optimization	8,096	0	15	1	207,459	13,831
2028	Humberstone Hall Visitors Centre	HVAC system optimization	2,223	1	15	8	4,195	280
2028	Library	HVAC system optimization	15,464	2	15	37	6,270	418
2028	Lions Field Park Canteen and Kitchen	HVAC system optimization	1,827	0	15	1	34,553	2,304
2028	Lock 8 Washrooms	HVAC system optimization	670	0	15	0	20,466	1,364
2028	Market Square	HVAC system optimization	2,035	0	15	0	294,329	19,622
2028	Museum LR Wilson Archives	HVAC system optimization	3,179	0	15	7	6,384	426
2028	Museum Sharpe HRC	HVAC system optimization	4,673	0	15	5	14,940	996
2028	Museum Sharpe HRC	Lighting upgrade	23,478	0	10	0	28,994,973	2,899,497

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2028	Museum Williams House	HVAC system optimization	2,822	1	15	8	5,129	342
2028	Public Works (Engineering and Operations Centre)	HVAC system optimization	48,248	1	15	15	48,249	3,217
2028	Scouts Hall	Demolish building	0	4	-	-	0	-
2028	Sugarloaf Marina Marlon Building	HVAC system optimization	5,229	1	15	12	6,652	443
2028	Tennis Courts	Lighting upgrade	12,276	0	10	0	8,101,014	810,101
2028	Vale Health and Wellness Centre	HVAC system optimization	105,087	35	15	529	2,979	199
2028	Vale Health and Wellness Centre	Lighting upgrade	929,455	0	10	2	4,382,227	438,223
2028	Building Dept Fleet	Fleet equipment decarbonization	392,741	2	5	12	157,916	31,583
2028	By-Law Dept Fleet	Fleet equipment decarbonization	261,827	5	5	23	56,168	11,234
2028	Canal Days Fleet	Fleet equipment decarbonization	130,914	1	5	7	97,957	19,591
2028	Engineering Fleet	Fleet optimization	3,033	0	10	0	-	-
2028	Facility Maint Fleet	Fleet optimization	3,033	0	10	4	8,571	857
2028	Fire Fleet	Fleet optimization	3,033	2	10	23	1,308	131
2028	Fleet Fleet	Fleet optimization	3,033	0	10	1	29,016	2,902
2028	Marina Fleet	Fleet optimization	3,033	0	10	5	6,438	644
2028	Museum Fleet	Fleet optimization	3,033	0	10	0	231,136	23,114
2028	Nickel Beach Fleet	Fleet optimization	3,033	0	10	0	-	-
2028	Parks Fleet	Fleet optimization	3,033	5	10	47	646	65
2028	Project Management Fleet	Fleet optimization	3,033	0	10	3	10,891	1,089

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2028	Transportation Fleet	Fleet optimization	3,033	10	10	97	314	31
2028	Utilities Fleet	Fleet optimization	3,033	0	10	0	-	-
2028	WasteWater Fleet	Fleet optimization	3,033	1	10	6	4,671	467
2028	Water Fleet	Fleet optimization	3,033	2	10	18	1,682	168
2029	296 Fielden Ave, Business Roselawn Centre	HVAC to heat pump	97,876	4	15	65	22,592	1,506
2029	296 Fielden Ave, Business Roselawn Centre	Lighting upgrade	176,856	0	10	0	65,517,831	6,551,783
2029	Library	DHW to heat pump	10,891	2	15	27	6,069	405
2029	Lions Field Park Canteen and Kitchen	DHW to heat pump	11,145	0	15	0	346,325	23,088
2029	Museum LR Wilson Archives	DHW to heat pump	11,096	0	15	6	30,029	2,002
2029	Vale Health and Wellness Centre	HVAC to heat pump	4,502,122	278	15	4,170	16,197	1,080
2029	Wignell Drain Outlet Structure	HVAC system optimization	142	0	15	0	300,909	20,061
2029	Comm & Ecdev Fleet	Fleet equipment decarbonization	133,794	0	5	0	-	-
2029	Drains Fleet	Fleet equipment decarbonization	802,762	19	5	94	42,678	8,536
2029	Engineering Fleet	Fleet equipment decarbonization	401,381	0	5	0	-	-
2029	Facility Maint Fleet	Fleet equipment decarbonization	668,969	5	5	23	147,050	29,410
2030	296 Fielden Ave, Heritage Roselawn Centre	DHW to heat pump	16,797	2	15	31	8,203	547
2030	Arabellas Tea Room	DHW to heat pump	11,365	0	15	3	55,854	3,724

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2030	Fire Fleet	Fleet equipment decarbonization	136,737	25	5	124	5,527	1,105
2030	Fleet Fleet	Fleet equipment decarbonization	136,737	1	5	7	98,837	19,767
2030	Marina Fleet	Fleet equipment decarbonization	2,461,269	6	5	30	408,568	81,714
2030	Museum Fleet	Fleet equipment decarbonization	136,737	0	5	1	551,401	110,280
2030	Nickel Beach Fleet	Fleet equipment decarbonization	546,949	0	5	0	-	-
2031	Fire and Emergency Services	Solar PV	154,327	3	15	38	61,154	4,077
2031	Humberstone Hall Visitors Centre	DHW to heat pump	11,586	0	15	6	28,248	1,883
2031	Library	Solar PV	77,164	1	15	19	61,154	4,077
2031	Museum Sharpe HRC	DHW to heat pump	11,611	0	15	4	48,867	3,258
2031	Museum Williams House	DHW to heat pump	11,586	0	15	6	27,926	1,862
2031	Sugarloaf Marina Marlon Building	DHW to heat pump	11,582	0	15	7	26,450	1,763
2031	Parks Fleet	Fleet equipment decarbonization	14,673,267	60	5	301	244,002	48,800
2031	Project Management Fleet	Fleet equipment decarbonization	139,745	5	5	26	26,554	5,311
2031	Transportation Fleet	Fleet equipment decarbonization	14,114,285	45	5	226	312,388	62,478
2032	296 Fielden Ave, Heritage Roselawn Centre	Solar PV	277,246	4	15	66	62,778	4,185
2032	3 Marina St, Sugarloaf Marina docks	DHW to heat pump	11,643	2	15	27	6,479	432
2032	3 Marina St, Sugarloaf Marina docks	Solar PV	316,853	5	15	76	62,778	4,185

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2032	Vale Health and Wellness Centre	DHW to heat pump	139,894	20	15	304	6,895	460
2032	Utilities Fleet	Fleet equipment decarbonization	3,427,675	0	5	0	-	-
2032	WasteWater Fleet	Fleet equipment decarbonization	3,713,315	8	5	42	446,765	89,353
2032	Water Fleet	Fleet equipment decarbonization	3,856,135	23	5	115	167,285	33,457
2033	296 Fielden Ave, Business Roselawn Centre	Solar PV	60,981	1	15	14	64,439	4,296
2033	City Hall	Solar PV	243,924	4	15	57	64,439	4,296
2033	Vale Health and Wellness Centre	Pool heat to heat pump	1,016,349	63	15	952	16,007	1,067
2034	Library	HVAC to heat pump	531,512	21	15	310	25,756	1,717
2034	Lions Field Park Canteen and Kitchen	HVAC to heat pump	9,532	0	15	6	25,757	1,717
2034	Public Works (Engineering and Operations Centre)	Solar PV	333,795	5	15	76	66,135	4,409
2034	Vale Health and Wellness Centre	Solar PV	1,335,179	20	15	303	66,135	4,409
2035	296 Fielden Ave, Heritage Roselawn Centre	HVAC to heat pump	622,391	24	15	353	26,431	1,762
2035	3 Marina St, Sugarloaf Marina docks	HVAC to heat pump	271,401	17	15	260	15,630	1,042
2035	Arabellas Tea Room	HVAC to heat pump	61,851	2	15	35	26,431	1,762
2035	Humberstone Hall Visitors Centre	HVAC to heat pump	124,672	5	15	71	26,431	1,762
2035	Museum LR Wilson Archives	HVAC to heat pump	112,319	4	15	64	26,431	1,762
2035	Museum Sharpe HRC	HVAC to heat pump	72,224	3	15	41	26,432	1,762

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2035	Vale Health and Wellness Centre	Install low GWP refrigerant equipment	0	0	-	-	-	-
2042	Vale Health and Wellness Centre	Equipment electrification	639,752	14	18	258	44,674	2,482
2044	Sugarloaf Marina Marlon Building	HVAC to heat pump	167,282	5	15	76	33,218	2,215
2050	00 Sugarloaf St, Splashpad	Purchasing carbon offsets	0	0	-	-	0	-
2050	000 Weaver Rd, Sec Camera	Purchasing carbon offsets	0	0	-	-	0	-
2050	1 Marina Rd (fuel docks)	Purchasing carbon offsets	0	0	-	-	0	-
2050	11 King St (Metal Shed)	Purchasing carbon offsets	0	0	-	-	-	-
2050	11 King St (Storage Bldg) 14 King St	Purchasing carbon offsets	0	0	-	-	-	-
2050	145 Mellanby Ave, Lock 8 Viewing Stand	Purchasing carbon offsets	0	0	-	-	0	-
2050	2 John St. Lockview	Purchasing carbon offsets	0	0	-	-	0	-
2050	227 Catharine St, Market Square	Purchasing carbon offsets	0	0	-	-	0	-
2050	280 King Street (Barn)	Purchasing carbon offsets	0	0	-	-	0	-
2050	287 West Side Rd, Flow Meter	Purchasing carbon offsets	0	0	-	-	0	-
2050	296 Fielden Ave, Business Roselawn Centre	Purchasing carbon offsets	0	6	-	-	0	-
2050	296 Fielden Ave, Heritage Roselawn Centre	Purchasing carbon offsets	0	33	-	-	0	-
2050	3 Marina St (Air Conditioning)	Purchasing carbon offsets	0	0	-	-	0	-
2050	3 Marina St, Sugarloaf Marina docks	Purchasing carbon offsets	0	27	-	-	0	-
2050	550 Elizabeth St, Ball Field	Purchasing carbon offsets	0	0	-	-	0	-

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	550 Elizabeth St, Charg Stn	Purchasing carbon offsets	0	1	-	-	0	-
2050	61 Princess Street (Garage)	Purchasing carbon offsets	0	0	-	-	0	-
2050	78 Lakeshore Rd W, Heat Trace	Purchasing carbon offsets	0	0	-	-	-	-
2050	Arabellas Tea Room	Purchasing carbon offsets	0	3	-	-	0	-
2050	Athletic Field Washrooms	Purchasing carbon offsets	0	0	-	-	0	-
2050	Bandshell at HH Knoll Park 160 Sugarloaf St, Pedestal	Purchasing carbon offsets	0	0	-	-	0	-
2050	Centennial Park Washrooms	Purchasing carbon offsets	0	0	-	-	0	-
2050	City Hall	Purchasing carbon offsets	0	21	-	-	0	-
2050	Clarence St Crosswalk	Purchasing carbon offsets	0	0	-	-	0	-
2050	Clarence St, Seaway Lite Seaway Park	Purchasing carbon offsets	0	0	-	-	0	-
2050	E Side S of Playground (Pedestal) 160 Sugarloaf St, Festival	Purchasing carbon offsets	0	0	-	-	0	-
2050	Eagle Marsh Drain Outlet Structure	Purchasing carbon offsets	0	0	-	-	0	-
2050	Fielden Washrooms	Purchasing carbon offsets	0	0	-	-	0	-
2050	Fire and Emergency Services	Purchasing carbon offsets	0	9	-	-	0	-
2050	Harbour Master	Purchasing carbon offsets	0	0	-	-	0	-
2050	HH Knoll Park	Purchasing carbon offsets	0	1	-	-	0	-
2050	Humberstone Hall Visitors Centre	Purchasing carbon offsets	0	6	-	-	0	-
2050	Library	Purchasing carbon offsets	0	30	-	-	0	-

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	Lions Field Park Canteen and Kitchen	Purchasing carbon offsets	0	1	-	-	0	-
2050	Lock 8 Washrooms	Purchasing carbon offsets	0	1	-	-	0	-
2050	Market Square	Purchasing carbon offsets	0	0	-	-	0	-
2050	Museum LR Wilson Archives	Purchasing carbon offsets	0	6	-	-	0	-
2050	Museum Sharpe HRC	Purchasing carbon offsets	0	4	-	-	0	-
2050	Museum Williams House	Purchasing carbon offsets	0	6	-	-	0	-
2050	Nickle Beach Washrooms	Purchasing carbon offsets	0	0	-	-	-	-
2050	Pleasant Beach Rd security camera	Purchasing carbon offsets	0	0	-	-	-	-
2050	Public Works (Engineering and Operations Centre)	Purchasing carbon offsets	0	17	-	-	0	-
2050	Sugarloaf Marina Marlon Building	Purchasing carbon offsets	0	12	-	-	0	-
2050	Tennis Courts	Purchasing carbon offsets	0	1	-	-	0	-
2050	Vale Health and Wellness Centre	Purchasing carbon offsets	0	601	-	-	0	-
2050	Wignell Drain Outlet Structure	Purchasing carbon offsets	0	0	-	-	0	-
2050	Archives Waste	Purchasing carbon offsets	0	1	-	-	0	-
2050	Archives Waste	Waste mitigation	14,686	1	20	29	9,993	500
2050	City Hall Waste	Purchasing carbon offsets	0	15	-	-	0	-
2050	City Hall Waste	Waste mitigation	14,686	15	20	294	999	50
2050	Fire Hall Waste	Purchasing carbon offsets	0	4	-	-	0	-
2050	Fire Hall Waste	Waste mitigation	14,686	4	20	88	3,331	167
2050	Library Waste	Purchasing carbon offsets	0	3	-	-	0	-

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	Library Waste	Waste mitigation	14,686	3	20	59	4,996	250
2050	Museum Waste	Purchasing carbon offsets	0	1	-	-	0	-
2050	Museum Waste	Waste mitigation	14,686	1	20	29	9,993	500
2050	Nickel Beach Waste	Purchasing carbon offsets	0	14	-	-	0	-
2050	Nickel Beach Waste	Waste mitigation	14,686	14	20	281	1,045	52
2050	Operations Centre Waste	Purchasing carbon offsets	0	32	-	-	0	-
2050	Operations Centre Waste	Waste mitigation	14,686	32	20	642	457	23
2050	Park Waste	Purchasing carbon offsets	0	61	-	-	0	-
2050	Park Waste	Waste mitigation	14,686	61	20	1,213	242	12
2050	Roselawn Waste	Purchasing carbon offsets	0	0	-	-	0	-
2050	Roselawn Waste	Waste mitigation	14,686	0	20	7	39,970	1,999
2050	Sugarloaf Marina Waste	Purchasing carbon offsets	0	68	-	-	0	-
2050	Sugarloaf Marina Waste	Waste mitigation	14,686	68	20	1,365	215	11
2050	Tea Room Waste	Purchasing carbon offsets	0	1	-	-	0	-
2050	Tea Room Waste	Waste mitigation	14,686	1	20	29	9,993	500
2050	Vale Health and Wellness Centre Waste	Purchasing carbon offsets	0	64	-	-	0	-
2050	Vale Health and Wellness Centre Waste	Waste mitigation	14,686	64	20	1,285	229	11
2050	Building Dept Fleet	Purchasing carbon offsets	0	3	-	-	0	-
2050	By-Law Dept Fleet	Purchasing carbon offsets	0	5	-	-	0	-
2050	Canal Days Fleet	Purchasing carbon offsets	0	2	-	-	0	-
2050	Comm & Ecdev Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2050	Drains Fleet	Purchasing carbon offsets	0	30	-	-	0	-

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	Engineering Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2050	Facility Maint Fleet	Purchasing carbon offsets	0	7	-	-	0	-
2050	Fire Fleet	Purchasing carbon offsets	0	46	-	-	0	-
2050	Fleet Fleet	Purchasing carbon offsets	0	2	-	-	0	-
2050	Marina Fleet	Purchasing carbon offsets	0	9	-	-	0	-
2050	Museum Fleet	Purchasing carbon offsets	0	0	-	-	0	-
2050	Nickel Beach Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2050	Parks Fleet	Purchasing carbon offsets	0	94	-	-	0	-
2050	Project Management Fleet	Purchasing carbon offsets	0	6	-	-	0	-
2050	Transportation Fleet	Purchasing carbon offsets	0	193	-	-	0	-
2050	Utilities Fleet	Purchasing carbon offsets	0	0	-	-	-	-
2050	WasteWater Fleet	Purchasing carbon offsets	0	13	-	-	0	-
2050	Water Fleet	Purchasing carbon offsets	0	36	-	-	0	-
2050	000Clarence St, Traf Light Elm St	Purchasing carbon offsets	0	0	-	-	0	-
2050	160 Sugarloaf St, Lighting 200A Service-Cenotaph, etc	Purchasing carbon offsets	0	0	-	-	0	-
2050	160 Sugarloaf St, Park Light	Purchasing carbon offsets	0	0	-	-	0	-
2050	183 Main St West Lights	Purchasing carbon offsets	0	0	-	-	0	-
2050	212 West, No. 5 Panel Promenade lights	Purchasing carbon offsets	0	0	-	-	0	-
2050	3 Marina St (Marina Lighting) master	Purchasing carbon offsets	0	2	-	-	0	-
2050	Church&Main St. W Light Pedestal	Purchasing carbon offsets	0	1	-	-	0	-

Table 15: Recommended measures and timeline for Most Achievable pathway (*continued*)

Year	Facility / Asset	Measure	Effective project cost (\$)	Reduction in GHG emissions (tCO ₂ e/yr)	Measure life (years)	Lifetime GHG reduction (tCO ₂ e)	Project cost per GHG reduction (\$/tCO ₂ e/yr)	Project cost per lifetime GHG reduction (\$/tCO ₂ e)
2050	Light House and Sign	Purchasing carbon offsets	0	0	-	-	0	-
2050	Main St West Lights	Purchasing carbon offsets	0	1	-	-	0	-
2050	Near 48 Main St. W Light Pedestal	Purchasing carbon offsets	0	0	-	-	0	-
2050	Street Lights - General	Purchasing carbon offsets	0	30	-	-	0	-
2050	Traffic Lights-King St	Purchasing carbon offsets	0	0	-	-	0	-
2050	Traffic Lights-Steele and Clarence	Purchasing carbon offsets	0	0	-	-	0	-
2050	550 Elizabeth St, Pump Stn 66 Elizabeth St	Purchasing carbon offsets	0	0	-	-	0	-
2050	69 Lake Rd, Pump House Nickel Beach	Purchasing carbon offsets	0	0	-	-	0	-
2050	69 Lake Rd, Trl Pumps Nickel Beach	Purchasing carbon offsets	0	0	-	-	0	-
2050	Bulk Water Station 2	Purchasing carbon offsets	0	0	-	-	0	-
2050	Johnson St Pumping Station	Purchasing carbon offsets	0	1	-	-	0	-
2050	Scholl Field Pump	Purchasing carbon offsets	0	7	-	-	0	-
*								

B Carbon Offsets

B.1 Carbon Offset Details

The Canadian Green Building Council (CAGBC) defines net carbon emissions for a facility as in the following formula.

$$\text{Net emissions} = \text{Embodied carbon} + \text{Operational carbon} - \text{Avoided emissions}$$

The terms of this formula are defined as follows.

- **Embodied carbon.** GHG emissions associated with the construction, maintenance and final end-of-life disposal of the facility.
- **Operational carbon.** GHG emissions associated with the use of energy of the facility while in operation.
- **Avoided emissions.** GHG emissions avoided through activities such as exporting green power to local grids, or the purchase of carbon offsets.

Net Zero emissions are achieved when the Net emissions from this formula is zero or less.

Carbon offsets focus on the ongoing use of avoided emissions (as defined above) to offset operational carbon associated with ongoing energy use at the facility. Note that embodied carbon emissions tend to be a one-time event, in contrast to the on-going emissions associated with operations, which must also be accounted for through avoided emissions.

As defined above, emission avoidance activities recognized by the CaGBC definition of Net-Zero include exporting green power, or the purchase of carbon offsets. Green power exports include the exporting of on-site renewable energy, as well as the injection of renewable energy into local grids through off-site renewable energy generation facilities. The latter approach is typically accomplished through the purchase of Renewable Energy Certificates (RECs). RECs are utility-specific and are purchased by unit energy of the utility in question (e.g. kWh for electricity, or m³ for natural gas), and can only be used to offset GHG emissions associated with the specific utility in question. For example, electricity RECs can be purchased to offset up to 100% of electricity used by the building, but cannot be used to offset natural gas used by the building (and vice versa). RECs are typically considered best practise because they facilitate an immediate injection of renewable energy into grids. RECs can be purchased through REC providers such as Bullfrog Power.

The purchase of carbon offsets is the second approach for avoided emissions recognized by CaGBC. Carbon offsets are purchased per tonne of GHG emissions, and can be used to offset either direct (e.g. natural gas combustion on-site) or indirect (e.g. electricity use on-site, which is generated offsite) GHG emissions. Carbon offsets must be certified as stipulated within the CaGBCs Zero Carbon Building Standard, which is required to uphold quality standards of the carbon offsets. Carbon offsets can be purchased through certified providers such as Less Emissions Inc.

Cost rates for RECs and carbon offsets are summarized as follows.

- Electricity REC cost rate (Bullfrog Power): 0.025 \$/kWh.
- Natural gas REC cost rate (Bullfrog Power): 0.186 \$/m³.
- Carbon offset cost rate (Less Emissions Inc.): 24 \$/mtCO₂e.