IMAGINING OUR FUTURE
GUIDING OUR GROWTH

LIBERTY LAKE – 2046

Appendix 1: Setting GHG Goals and Targets for the Climate Element

Prepared for
City of Liberty Lake

FUNDED BY WASHINGTON'S CLIMATE COMMITMENT ACT

August 2025

Parametrix

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1. Introduction

1.1 The Climate Element of the Comprehensive Plan and Greenhouse Gas Emissions Reduction Sub-Element

In 2023, Washington State passed legislation (HB 1181) that added a climate goal to the Growth Management Act (GMA). This legislation requires that planning communities, including Liberty Lake, complete a Climate Element as part of the 2025 Comprehensive Plan update. The Climate Element consists of two parts: (1) Greenhouse Gas (GHG) Emissions Reduction Sub-Element that requires that communities quantify their baseline GHG emissions and include policies to decrease those emissions and (2) a Resilience Sub-Element that requires communities to analyze and plan for future climate vulnerabilities.

Completion of the Climate Element is required for state-funded grant and loan programs such as the Public Works Board, Drinking Water State Revolving Fund, Centennial Clean Water Fund, Recreation and Conservation Office, and Pre-Disaster Mitigation Grants.

1.2 Purpose of this Document

This document includes an overview of Liberty Lake's GHG emissions inventory results, an emissions forecast based on existing state policies, and emissions reduction goals and policies to include in the GHG Emissions Reduction Sub-Element. Its purpose is to provide the necessary context and data to support the goals and policies that are set out in the GHG Sub-Element.

The project team conducted a GHG emissions inventory to identify community-wide GHG emissions sources and to establish an emissions baseline to measure against in the future. The project team has forecast various emissions scenarios, both with and without local policy action, and emissions reduction targets were set based on the achievable potential determined by this analysis. Goals and policies were selected based on the Commerce Menu of Measures, input from the Climate Policy Advisory Team, and various meetings with individual interested parties.

1.3 Glossary of Terms

- Electrification – The conversion of a machine or system to the use of electrical power. Building electrification refers to converting appliances that run on natural gas and/or other fuels to electricity. Transportation or fleet electrification refers to converting gas or diesel-powered vehicles to electric vehicles.
- Environmental justice – The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, rules, and policies. Environmental justice includes addressing disproportionate environmental and health impacts in all laws, rules, and policies by prioritizing vulnerable populations and overburdened communities, striving for the equitable distribution of resources and benefits, and eliminating harm.[1]

[1] Climate Element Planning Guidance (p. 138) – December 2023 Intermediate Version https://deptofcommerce.app.box.com/s/fpg3h0lbwln2ctqjg7jg802h54ie19jx

- Global Warming Potential (GWP) – GWPs provide a common unit of measure to allow comparisons of the global warming impacts of different greenhouse gases. Specifically, the GWP is a measure of how much energy the emission of 1 ton of a gas will absorb over a given period of time, relative to the emission of 1 ton of carbon dioxide (CO_2). The larger the GWP, the more that a given gas warms the Earth compared to CO_2 over that time period. The time period usually used for GWPs is 100 years.[2]
- GHG emissions – The release of gases into the atmosphere that trap heat and contribute to the greenhouse effect, leading to climate change. These gases, such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), are emitted from various sources, both natural and human-caused.
- Net-zero emissions – A state in which the total amount of GHGs released into the atmosphere by human activities is balanced by the amount removed or sequestered, resulting in no net increase in atmospheric GHG concentration. This means that any emissions that are unavoidable are offset by measures that remove or store carbon dioxide from the atmosphere.
- Metric ton of carbon dioxide equivalent (MT CO_2e) – Some GHGs are more potent than others. A MT CO_2e is a unit of measurement used to compare the warming potential of different GHGs by converting them into an equivalent amount of carbon dioxide (CO_2) emissions. It is a way to quantify the total impact of various GHGs on climate change.
- Upstream fuel production – Refers to the initial stages of producing fuels such as gasoline, diesel, and natural gas. This includes activities such as mining and extracting raw materials, processing and refining them, and distributing the final products to fuel retailers. These processes generate emissions before the fuel is sold to consumers
- Vehicle miles traveled (VMT) – Measures the total number of miles driven by all vehicles in a specific area over a period of time (e.g., 1 day, 1 year). VMT is a key tool used in transportation planning and policy decisions, as it reflects the demand for vehicle travel and impacts on infrastructure and the environment.
- Vulnerable and overburdened communities – Communities that experience the consequences of climate change first and worst—for example, communities with higher rates of poverty and limited English proficiency. These communities are more vulnerable to climate change due to historical trends, including the impact of redlining.[3]

2. GHG Inventory

2.1 2022 Inventory Results

What is a GHG inventory and what is it used for?

A GHG emissions inventory is a comprehensive accounting of GHGs released into the atmosphere from various sources within a specific area or organization (e.g., the City of Liberty Lake) over a set

[2] Environmental Protection Agency – Understanding Global Warming Potentials
https://www.epa.gov/ghgemissions/understanding-global-warming-potentials

[3] Climate Element Planning Guidance (p. 3, p. 12) – December 2023 Intermediate Version
https://deptofcommerce.app.box.com/s/fpg3h0lbwln2ctqjg7jg802h54ie19jx

period of time (e.g., calendar year 2022). Inventories are used to track emissions, to identify major sources, and to inform strategies for reducing climate impact and meeting environmental goals. An initial inventory can serve as a baseline that future inventories can be compared against to track progress. Commerce guidance stipulates that 2022 should be used as the emissions baseline year to track progress toward achieving net-zero emissions by 2050, which is consistent with Washington's statewide emissions reduction target.[4]

Every community has a unique carbon footprint. The purpose of completing an inventory is not to judge any given place in relation to others, but rather to establish a baseline against which a community can assess its own progress in reducing emissions over time.

Overall Results

In 2022, the Liberty Lake community was responsible for nearly **258,000 MT CO_2e**, made up of both locally produced and imported emissions. Local emissions are released directly within a specific geographic area and include emissions from buildings and energy use, transportation, waste disposal, refrigerants, and land use (Figure 1). Local emissions totaled just over **118,000 MT CO_2e**. Imported emissions refer to the emissions generated outside the area on behalf of city residents, such as the production of food and goods purchased by residents in the city. Imported emissions totaled nearly **140,000 MT CO_2e**.

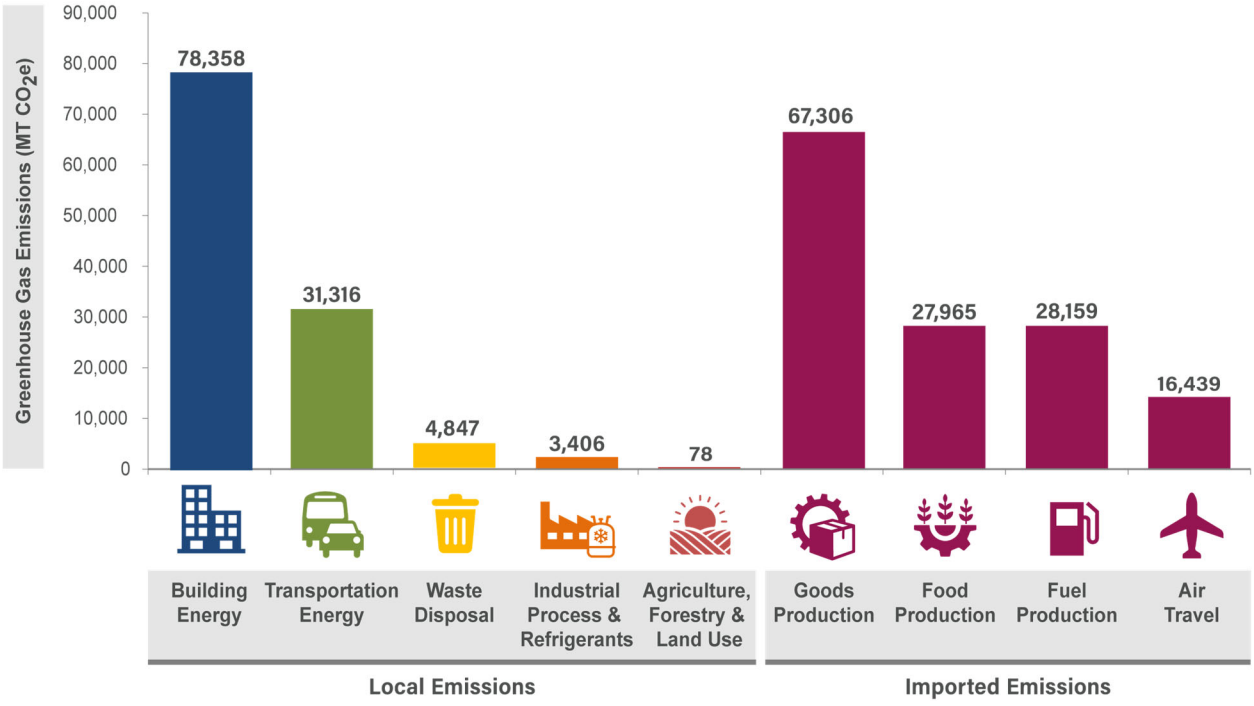

Figure 1. Communitywide Greenhouse Gas Emissions

Liberty Lake's per capita emissions **(10.5 MT CO_2e)** were lower than the statewide average **(13.5 MT CO_2e)**. Per capita emissions are useful to understand because they may help identify areas

[4] Climate Element Planning Guidance (p. 43) – December 2023 Intermediate Version https://deptofcommerce.app.box.com/s/fpg3h0lbwln2ctqjg7jg802h54ie19jx

of opportunity for policy and planning. Per capita emissions for electricity and natural gas were higher in Liberty Lake than the statewide average, but transportation emissions were lower than the state average (Figure 2). The relatively high building emissions in Liberty Lake are likely due to more extreme seasonality that requires more heating and cooling.

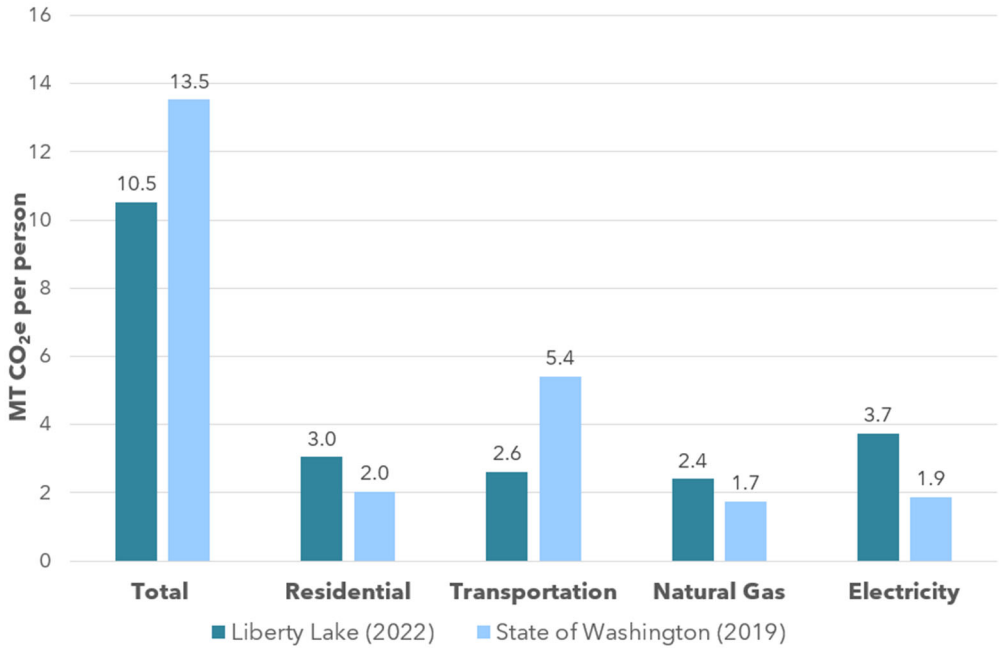

Figure 2. Per Capita Emissions in Liberty Lake and Washington State

Buildings

Building emissions come from the use of electricity, natural gas, and other building fuels such as propane. Communitywide building emissions in 2022 totaled over **78,000 MT CO_2e**, about **62%** of Liberty Lake's local emissions.[5] Figure 3 shows that residential electricity and natural gas use, and commercial electricity use, are the largest drivers of building emissions in Liberty Lake.

[5] Electricity and natural gas emissions are based on Liberty Lake sales data from Avista, and other sources are downscaled from state averages, for more information see section 2.2 Methodology.

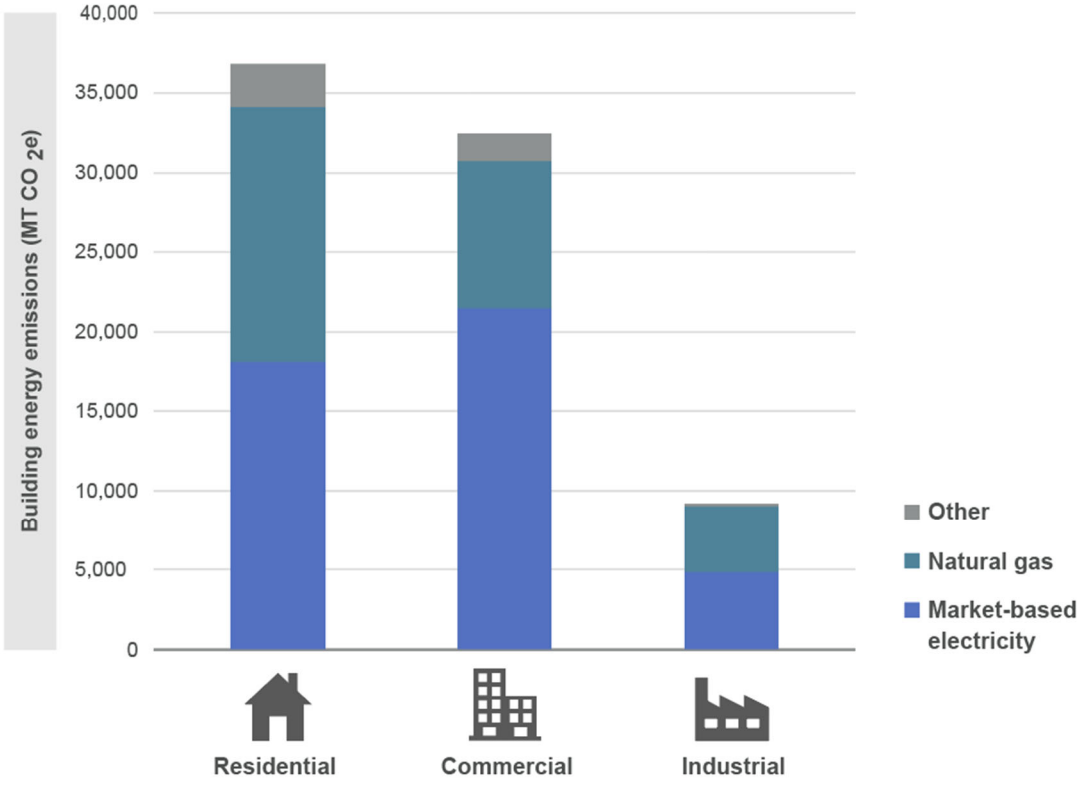

Figure 3. Building Emissions by Building Type and Energy Source

The Washington Clean Energy Transformation Act requires that all electric utilities in the state produce 100% fossil free electricity by 2045. Electricity emissions will decrease over time because of a cleaner electricity grid, but looking at energy usage over time can help Liberty Lake determine whether its buildings are becoming more efficient. Existing buildings can be made more efficient by upgrading appliances and fixtures with energy-efficient options and adding weatherization features such as increased insulation. New buildings can be built to be more efficient with more insulation, better windows, and more efficient HVAC and lighting systems, among other things. Energy efficiency improvements can also save users money, particularly as energy prices increase.

Transportation

Transportation emissions come from the use of fuels such as gasoline and diesel, and from electricity for charging. Communitywide transportation emissions totaled over **31,000 MT CO_2e in 2022**, about **25%** of Liberty Lake's local emissions. Figure 4 shows that the majority of communitywide transportation emissions came from the use of passenger vehicles, followed by freight and off-road vehicles.

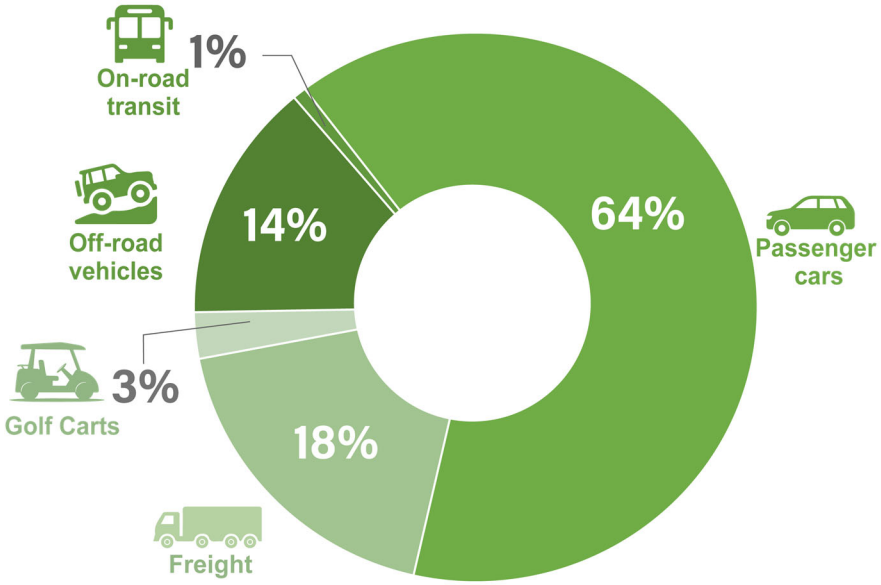

Figure 4. Communitywide Transportation Emissions by Source

One way to measure the intensity of transportation in a jurisdiction is through VMT, which measures the total miles driven by all the vehicles in a given time period (e.g., daily or yearly). **Total annual VMT was estimated to be over 85 million miles** in 2022, with over 95% of those miles from passenger cars, about 4% from freight vehicles, and less than 1% from transit vehicles. Average per capita VMT was estimated to be over **7,000 miles per person**.

The VMT estimate in this inventory includes local traffic (i.e., trips within Liberty Lake's geographic boundary) and passthrough traffic (i.e., trips taken on the stretch of I-90 that goes through Liberty Lake's geographic boundary). While some of those trips are not generated by the Liberty Lake community, the purpose of this inventory is to provide a repeatable measure, against which to measure progress. Reductions in local traffic would lead to a reduction in overall VMT. If future increases in pass-through traffic are so large that they obscure local VMT reduction progress, it would likely be helpful to revisit this methodology.

Waste, Refrigerants, and Land Use

Collectively, emissions from waste, refrigerants, and land use were over **8,000 MT CO_2e**, about **7%**, of local emissions in Liberty Lake in 2022. Waste emissions totaled nearly **5,000 MT CO_2e** and include emissions from solid waste and wastewater. Emissions from solid waste and wastewater result from materials breaking down in the landfill or wastewater treatment facility and releasing methane, a potent GHG. The most common chemical gases in most HVAC and refrigeration equipment are thousands of times more potent than CO_2 at trapping heat in the atmosphere.[6] Emissions from refrigerants totaled over **3,000 MT CO_2e.** Land use emissions were based on fertilizer applications to golf courses and land use changes. These emissions totaled less than **80 MT CO_2e**.

[6] California Air Resources Board – https://ww2.arb.ca.gov/resources/documents/high-gwp-refrigerants

Imported Emissions

Imported emissions refer to the emissions generated outside the area during the production and transport of goods and services that are consumed locally. Imported emissions totaled nearly 140,000 MT CO_2e. The Washington State Department of Commerce does not require communities to report on imported emissions as part of the Climate Element, but doing so provides a more complete picture of Liberty Lake's emissions profile and provides insight into areas where individuals can take action to reduce their carbon footprint (Figure 5). For example, the production of goods is the highest portion of imported emissions. Community members can choose to buy less, buy used, and/or repair and reuse broken items to reduce emissions. For food, meat production—specifically beef production—drives emissions, and community members can reduce their personal carbon footprint by consuming fewer beef products. These examples are included for educational purposes only; the goals and policies included in the Climate Element address local emissions only and do not address imported emissions.

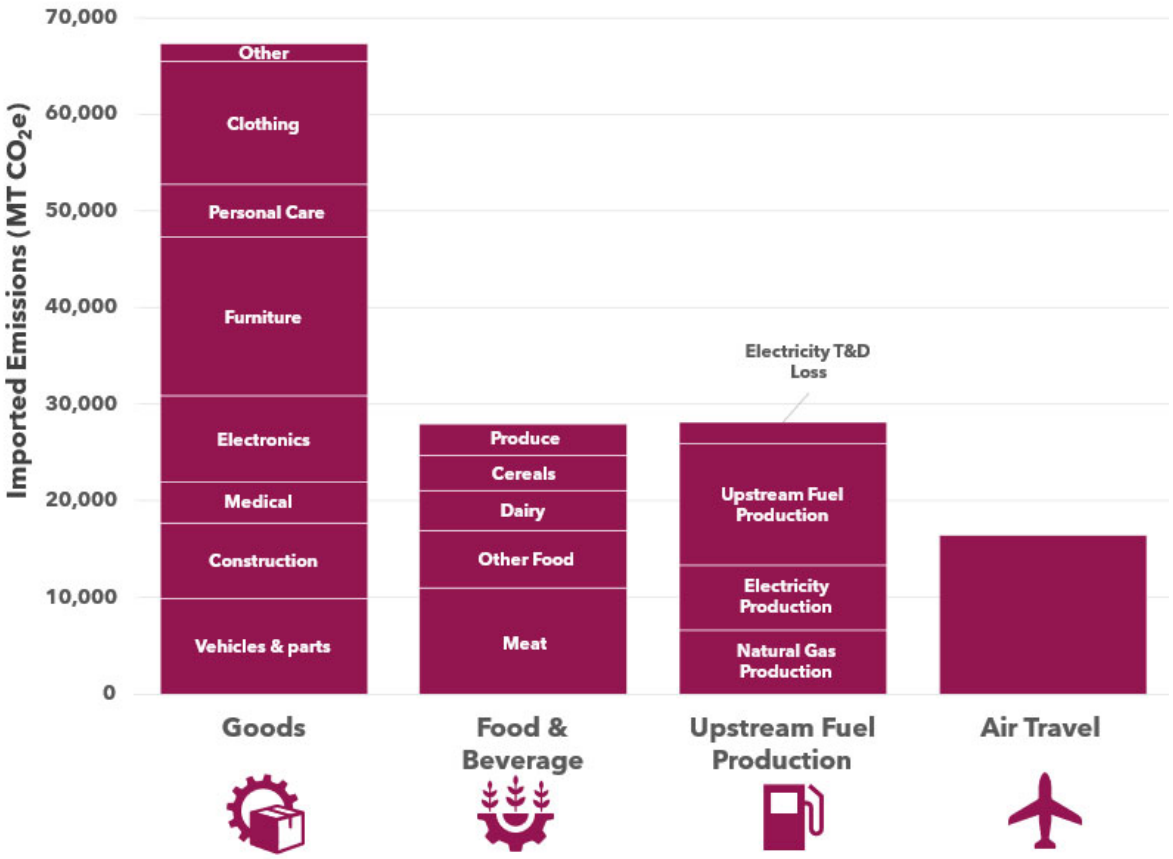

Figure 5. Breakdown of Imported Emissions

2.2 Methodology

Buildings

Includes emissions from electricity, natural gas, and other stationary sources (propane, diesel). Electricity and natural gas usage data were provided by Avista. The emissions associated with electricity use are based on Avista's specific utility emissions intensity, as reported by Avista. This method of electricity emissions accounting is referred to "market-based" accounting. With this method, credit is also given for renewable electricity purchases residents made from the utility. Solar production from rooftop or privately owned solar panels decreases the total kWh purchased from the utility and so represents emissions-free electricity. Propane and diesel usage were estimated based on state averages and scaled down by population.

Transportation

Includes emissions from passenger cars, freight, golf carts, and off-road vehicles.

Passenger car and freight emissions were estimated using Replica software, which provides VMT estimates from cell phone data for a given area. The VMT estimates were then converted to emissions based on passenger car population data from the Washington State Department of Licensing and fuel efficiency estimates from the US Department of Energy. The Spokane Transit Authority provided transit fuel usage data.

Golf cart emissions were estimated based on the number of golf carts in the City's fleet, the City's fuel budget, and golf cart registration data from the City.

Off-road vehicle emissions were estimated based on the statewide inventory and scaled down by population.

Waste and Wastewater

Includes emissions from wastewater treatment and from exported solid waste.

Waste emissions were estimated by entering data from the local wastewater utilities into the U.S. Environmental Protection Agency's (EPA's) Local GHG Inventory Tool.

Waste haulers provided weight (wet short tons) of solid waste collected in Liberty Lake. The EPA FLIGHT tool was used to look up the destination landfill (Greater Wenatchee Landfill), and landfill emissions were estimated proportionally based on tons of solid waste.

Refrigerants

Includes emissions from all high GWP refrigerants.

Refrigerants are used in air conditioners, vehicles, refrigerators, and industrial cooling systems. Liberty Lake refrigerant use was downscaled from EPA data based on population. This estimate is considered of medium accuracy.

Agriculture, Forestry, and Land Use

Includes emissions from agriculture, forestry, and land use change from the conversion of bluegrass land to development and synthetic fertilizer applications to golf courses.

Land use change emissions were calculated based on estimates of previous land area that was assumed to be rangeland. The associated emissions were then calculated using an EPA emissions factor per acre of rangeland converted. This total was averaged over 20 years of development.

Emissions from synthetic fertilizer use were calculated based on fertilizer use and type data from the three golf courses in Liberty Lake.

Imported Emissions

Imported emissions are comprised of the emissions from the production of all the goods, food and beverages, fuel production, and air travel for residents of Liberty Lake. Emissions estimates for goods, food and beverages, and air travel are based on income data from the U.S. Census Bureau and the Berkeley CoolClimate Calculator.

Emissions from upstream fuel production are based on statewide and national fuel production averages for electricity, natural gas, gasoline, and diesel usage.

2.3 Emissions Forecast With Existing State Policies

Forecast

The emissions inventory detailed above gives a snapshot of Liberty Lake's emissions in 2022, but the city is growing quickly and the state has many policies in place that will affect emissions over the next 25 years. Commerce guidance stipulates that the GHG Emissions Reduction Sub-Element, "should be developed with an overall target of reaching net-zero emissions by 2050," which is consistent with Washington's statewide target.[7] To understand where Liberty Lake should focus its policies to coordinate with the state's efforts and fill in any gaps, Figure 6 shows Liberty Lake's forecast emissions through 2050 including population growth and the impacts of state policies. Under this scenario, natural gas and diesel are the primary remaining sources of emissions in 2050.

[7] Climate Element Planning Guidance (p. 42-43) – December 2023 Intermediate Version https://deptofcommerce.app.box.com/s/fpg3h0lbwln2ctqjg7jg802h54ie19jx

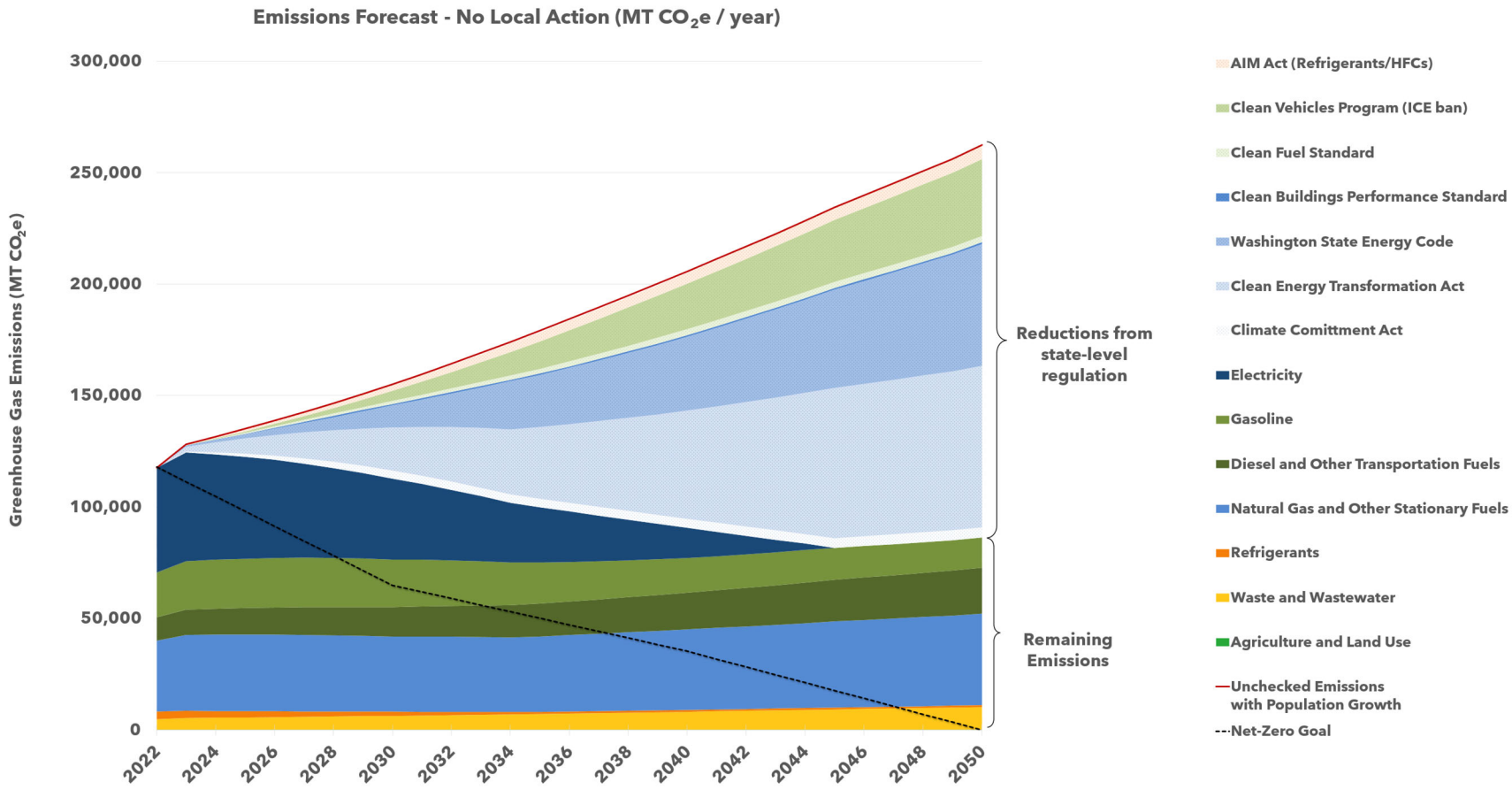

Figure 6. Communitywide Emissions Forecast – 2022–2050[8]

[8] This figure is revised from a previous version and contains a new, more conservative estimate of the effect of the Clean Vehicles Program on the population of electric vehicles and consequent gasoline emissions in Liberty Lake.

- The red line shows Liberty Lake's unchecked emissions growth over time, based on population growth projections. It shows that emissions would be increasing, instead of decreasing, over time.
- State policies that will reduce emissions are shown in the lighter-colored wedges. In 2050, Liberty Lake's emissions are expected to be about 65% lower than projected unchecked emissions if state policies achieve their emissions reduction targets as intended. The list of policies included in the forecast is included below in the Emissions Forecast Methodology section.
- The darker-colored wedges show Liberty Lake's remaining emissions—those emissions that will need to be addressed by local policy and action if they are to be reduced to net zero by 2050 in line with Commerce guidance. Remaining emissions come from gasoline, diesel and other transportation fuels, natural gas and other stationary fuels, refrigerants, and waste and wastewater.

Emissions Forecast Methodology

Unchecked Emissions Growth

The red "Unchecked Emissions with Population Growth" line (Figure 6) represents forecast emissions over time if there were no policy interventions and 2022 emissions grew proportionally with population growth. Growth projections were based on the observed growth rate of 9% in 2023 and forecasted growth rate of 2.1% to 2.5% (based on Spokane County Growth allocations) from 2024 to 2050.

Net Zero by 2050

The black "Net-Zero Goal" line (Figure 6) shows a linear decrease in emissions to reach the goal of net zero by 2050. Net-zero emissions could include some credit for carbon sequestration or the purchase of offsets.

Reductions From Regulation

There are several state policies in place that will reduce emissions from buildings and energy use, transportation, and refrigerants. The effects of these policies were included in the forecast to demonstrate remaining emissions that Liberty Lake will need to address with local policy to reach net zero by 2050 goal.

- Clean Buildings Performance Standard – Aims to improve energy efficiency and reduce GHG emissions from existing large commercial buildings by setting performance standards and requiring energy use benchmarking.
- Clean Fuel Standard – Requires fuel suppliers to gradually reduce the carbon intensity of transportation fuels to 20% below 2017 levels by 2034.
- Clean Energy Transformation Act – Requires all electric utilities in the state to transition to 100% clean electricity by 2045. It sets interim goals of eliminating coal-fired electricity by 2025 and achieving a GHG-neutral electricity supply by 2030, promoting cleaner energy and environmental justice.
- Clean Vehicles Program rule – A state target to phase out the sale of new gasoline-powered passenger vehicles by 2035. This policy promotes the adoption of electric vehicles to reduce air pollution and GHG emissions from the transportation sector.

- Climate Commitment Act (CCA) – Established a cap-and-invest program that sets a statewide limit on GHG emissions, which declines over time. The goal of the CCA is to help reduce GHG emissions by 95% by 2050.[9] It requires large emitters to purchase allowances at auction and reinvests the proceeds into programs that support clean energy, climate resilience, and environmental justice.
- Washington State Energy Code – Sets efficiency standards for new residential and commercial buildings, requiring features such as improved insulation, efficient heating systems, and electrification of space and water heating.
- Washington State HFC Regulations – WAC 173-443 restricts the use of hydrofluorocarbons (HFCs) and other fluorinated gases with a Global Warming Potential of more than 150. It also prohibits the manufacture and sale of products containing restricted refrigerants in Washington State. The state estimates that this will decrease HFC emissions by 75% by 2035.[10]

Remaining Emissions in 2050

The remaining emissions include those from natural gas and other stationary fuels, gasoline, diesel and other transportation fuels, waste and wastewater, and refrigerants. In order to achieve zero emissions, the City will need to target the darker-colored emissions above the black line in Figure 6. Local policies and actions will be needed to reduce these remaining emissions to achieve net-zero emissions by 2050.

2.4 Climate Element Targets

Commerce Requirements

Liberty Lake's Climate Element was developed between April 2024 and June 2025 based on the Intermediate Planning Guidance issued by Commerce in December 2023.[11] The GHG Emissions Reduction Sub-Element requires the following.

Overall reduction in GHG emissions from transportation and land use without increasing emissions elsewhere in Washington.

The top emissions sources in Liberty Lake are building energy (62% of local emissions) and transportation energy (25% of local emissions). To ensure that Liberty Lake can reach its emissions targets, policies that affect buildings, land use, and transportation are included here. Transportation policies include policies to reduce VMT and to switch fuels to lower-carbon options.

[9] The CCA established a goal of reducing Washington State's GHG emissions by 95% by 2050, while Commerce guidance directs cities and counties to develop the GHG Emissions Reduction Sub-Element with an overall target of reaching net-zero emissions by 2050 (Climate Element Planning Guidance (p. 42) – December 2023 Intermediate Version https://deptofcommerce.app.box.com/s/fpg3h0lbwln2ctqjg7jg802h54ie19jx)

[10] Washington State HFC Page: Hydrofluorocarbons - Washington State Department of Ecology

[11] Climate Element Planning Guidance – December 2023 Intermediate Version https://deptofcommerce.app.box.com/s/fpg3h0lbwln2ctqjg7jg802h54ie19jx

Per capita reduction in VMT without increasing emissions elsewhere in Washington.

In 2008, Washington State established statewide per capita VMT reduction benchmarks, which are codified in RCW 47.01.440.3. These benchmarks were established relative to a forecast 2020 VMT baseline for passenger vehicles (motorcycles, cars, SUVs, and pickup trucks) estimated at 75 billion minus the VMT from vehicles over 10,000 pounds. These targets call for an 18% reduction in VMT per capita by 2020, a 30% reduction by 2030, and a 50% reduction by 2050.

The climate element—combined with the land use and transportation elements—include policies designed to reduce Liberty Lake's VMT while improving the transportation system and quality of life.

Prioritize reductions that benefit vulnerable and overburdened communities to maximize the co-benefits of reduced air pollution and environmental justice.

Climate change disproportionately impacts populations with health-related sensitivities, as well as vulnerable populations such as the very young, the elderly, and people with lower incomes.[12] Therefore, it is important to consider and consult these populations specifically when designing climate strategies.

Report progress on implementation every 5 years.

Commerce guidance states that jurisdictions should use 2022 as their emissions baseline year and set incremental targets that lead to achieving net-zero emissions in 2050, consistent with Washington's statewide target. Reports to Commerce must detail progress implementing policies to reduce emissions and per capita VMT to achieve local goals and targets. Reporting can include both quantitative and qualitative reporting.

The GMA requires cities, counties, and Commerce to report progress toward implementing Comprehensive Plan commitments and goals. Cities and counties must provide Commerce with an implementation report that details progress achieved 5 years after updating their Comprehensive Plan, including the climate element. The estimated cost for collection, analysis and reporting as required by Commerce is estimated to cost $45,000 to $50,000 per reporting cycle, in today's dollars. Any updating of goals, policies, and specific implementation strategies, as may be needed due to underperformance, would require additional resources. Reporting every 5 years strikes a good balance between administrative cost and time and sufficient monitoring to understand progress or lack thereof. The City could opt to assess progress more frequently dependent on available funding and staff resources.

Commerce must evaluate and report on the impact adopted climate elements have had on local GHG and VMT reduction goals and include this information in guidance published after 2025. The evaluation will reference information from the 5-year progress reports and, at a minimum, include results from local emissions inventories and an index of climate elements with a correlation of impacts on local emissions.

To track progress toward the goal of net-zero emissions by 2050, Commerce guidance states that, "When tracking progress, targets should be evaluated on a total and per capita basis so that progress is not masked by population growth."[13]

[12] ibid.

[13] Climate Element Planning Guidance (p. 43) – December 2023 Intermediate Version https://deptofcommerce.app.box.com/s/fpg3h0lbwln2ctqjg7jg802h54ie19jx

Outreach Efforts

Outreach for the Climate Element is ongoing and is intentionally seeking input with a focus on vulnerable and overburdened populations and the broad array of viewpoints and needs present in the community. Specifically, the outreach team is scheduling targeted focus groups with the following identified communities:

- Retirement age adults.
- Lower-income individuals.
- Youth.
- Community members for whom English is not their first language.

The project team also conducted two workshops focused on building and transportation emissions and invited participants from across the community who have a stake in Liberty Lake's building and land use planning or transportation systems.

In accordance with climate element guidance, the City assembled the Climate Policy Advisory Team: a group of Liberty Lake residents that was assembled through an open and advertised selection process. The team has been working to ensure that the policies included in the Climate Element are consistent with needs and goals of the Liberty Lake community.

Finally, the City has been reaching out to representatives of citizens who may not be inclined to support climate action to ensure that their concerns are taken seriously.

Setting Targets

Even with the estimated maximum reductions from the policies currently under consideration, the City is not projecting the ability to reduce emissions linearly to zero by 2050. The City's future development is nearly entirely entitled, it is not a utility provider, and it is a relatively small member of the regional transportation system; all of these factors reduce its ability to affect its overall emissions. The City has a strong role to play in public education and in using its permits and fees to encourage and incentivize changes in purchases and behavior. Given that the technological and social landscapes are both rapidly changing, it is likely that some reductions that are difficult or impossible to achieve now will be within reach in the coming decades. **Therefore, targets for this current Comprehensive Plan are in line with currently achievable reductions.** Current policies are also designed to leverage future reductions when they become achievable.

3. Emissions Reduction Goals

3.1 Sources of Significant Remaining Emissions and Reductions Potential

The goals and policies in the GHG Emissions Reduction Sub-Element are intended to reduce the local emissions that are not addressed by state or federal policy, including emissions from buildings, transportation, and waste. This section discusses the emissions sources that will not be fully addressed by state-level actions and provides an estimate of the reduction potential of (currently technologically achievable) actions, termed "scaled measures" in this report. The quantitative results presented in Table 1 assumes best-case implementation of actions to decrease building, transportation, and other emissions.

Table 1. Emissions Reductions by Measure

Scaled Measure #	Scaled Measure Name	Total Emissions Reduction (MT CO_2e)[14]
B-1	Building Efficiency	108,000
B-2	Building Electrification	147,000
B-3	Solar Installation	217,000
T-1	Densification	21,000
T-2	Multifamily EV	107,000
T-3	City Fleet Conversion	2,000

Buildings

After state and federal policies are factored in, the largest source of remaining emissions from buildings is natural gas usage. In most buildings, the biggest end uses for natural gas are space and water heating. Best practices to reduce emissions from natural gas include wide-ranging efficiency measures, switching from gas furnaces and water heaters to electric heat pumps and heat pump water heaters, and solar installation.

Existing Building Efficiency

Over the course of the next 20 years, if all the homes in Liberty Lake were to be upgraded to the greatest possible efficiency (reducing both natural gas and electricity usage), Liberty Lake homes could decrease emissions by 108,000 MT CO_2e. (Scaled Measure B-1.)

Efficiency measures include weatherization, upgraded water heating insulation and optimization, and upgraded appliances such as air conditioners, clothes dryers, electronics, food preparation, refrigeration, conventional heaters, and lighting. All appliance upgrades are assumed to occur at the end of the appliance's natural life.

If in addition to efficiency upgrades, Liberty Lake also upgraded all residential natural gas air and water heating to energy-efficient electric heat pumps, at the end of the existing appliance's life, an additional 147,000 MT CO_2e could be saved. (Scaled Measure B-2.)

Rooftop Solar

For electrification to provide the maximum potential GHG reductions, the electricity must be as low emissions as possible. While statewide regulations are driving down the emissions associated with utility-provided electricity, Liberty Lake can reduce its emissions sooner, reduce electricity costs, and increase resilience by installing rooftop solar on as many rooftops as are cost-effective over the life of the panel. Project Sunroof[15],which analyzes the solar potential of roofs based on angle of exposure, surrounding vegetation, and local climate, estimates that Liberty Lake could generate up to 162,000 MWh of solar energy per year. This is in excess of the 145,000 MWh of electricity that the city currently uses, including commercial and industrial uses. If Liberty Lake were to install all

[14] These numbers are revised from a previous version.

[15] https://sunroof.withgoogle.com/

current solar capacity (excluding future development) over the next 20 years (5% per year), 217,000 MT CO_2e could be saved. (Scaled Measure B-3)

Transportation

After state and federal policies are considered, the largest sources of remaining emissions from transportation are emissions from gasoline and diesel usage in passenger vehicles and freight vehicles. Best practices to reduce emissions from transportation include (1) decreasing VMT, (2) switching from gasoline-powered cars to electric vehicles (EVs), and (3) using lower-carbon diesel alternatives.

VMT Reduction

For Liberty Lake, many of the measures to reduce VMT are achieved through land use and transportation design. VMT reduction will become increasingly disconnected from transportation emissions as zero-emission vehicles become more common over time, but VMT reduction remains a standalone goal as part of the Climate Element.

Liberty Lake's planned infill and entitled development will increase the city's density. When cities are denser, people are closer to the places where they need to go each day, reducing their need to drive. More density also means that services such as public transit are more effective and convenient. If density increases proceed as planned, Liberty Lake can expect a future decrease of 21,000 MT CO_2e due to VMT reduction alone. (Scaled Measure T-1.)

Electric Vehicles

The switch to EVs is being mandated by the state, but the City can help make that switch easier and more convenient by increasing the availability of EV chargers (especially in multifamily housing that predates new building codes) and by converting its own fleet.

Residents of multifamily housing have a lower rate of EV adoption than those living in single-family homes.[16] One possible reason is due to the relative difficulty of charging at home without a dedicated garage or driveway to charge in. Especially in the future as the costs of new EVs come down and used EVs become more available, the ease of at-home charging will become an important driver of EV adoption rates for multifamily residents. If Liberty Lake were to increase charging capacity at existing multifamily housing such that multifamily residents were as likely to adopt EVs as single-family residents, they could save up to 107,000 MT CO_2e. (Scaled Measure T-2.)

In addition, if Liberty Lake were to convert its own fleet of vehicles from gas to electric, it could save 2,000 MT CO_2e, assuming that vehicles are converted at the end of their natural lives and that only those with appropriate battery replacements are converted (light and medium duty). (Scaled Measure T-3.)

Cumulative Effect

The above actions decrease remaining emissions in 2050 by an additional 34% over state actions, but they do not achieve the zero-by-2050 goal set by the state (Figure 7). They do, however, come very close to achieving interim 2035 targets. As alternative technologies and fuels become available, Liberty Lake will be able to continue to adapt its policies to reduce its emissions.

[16] Plug in America, "The Expanding EV Market: Observations in a year of growth", 2022 https://pluginamerica.org/wp-content/uploads/2022/03/2022-PIA-Survey-Report.pdf

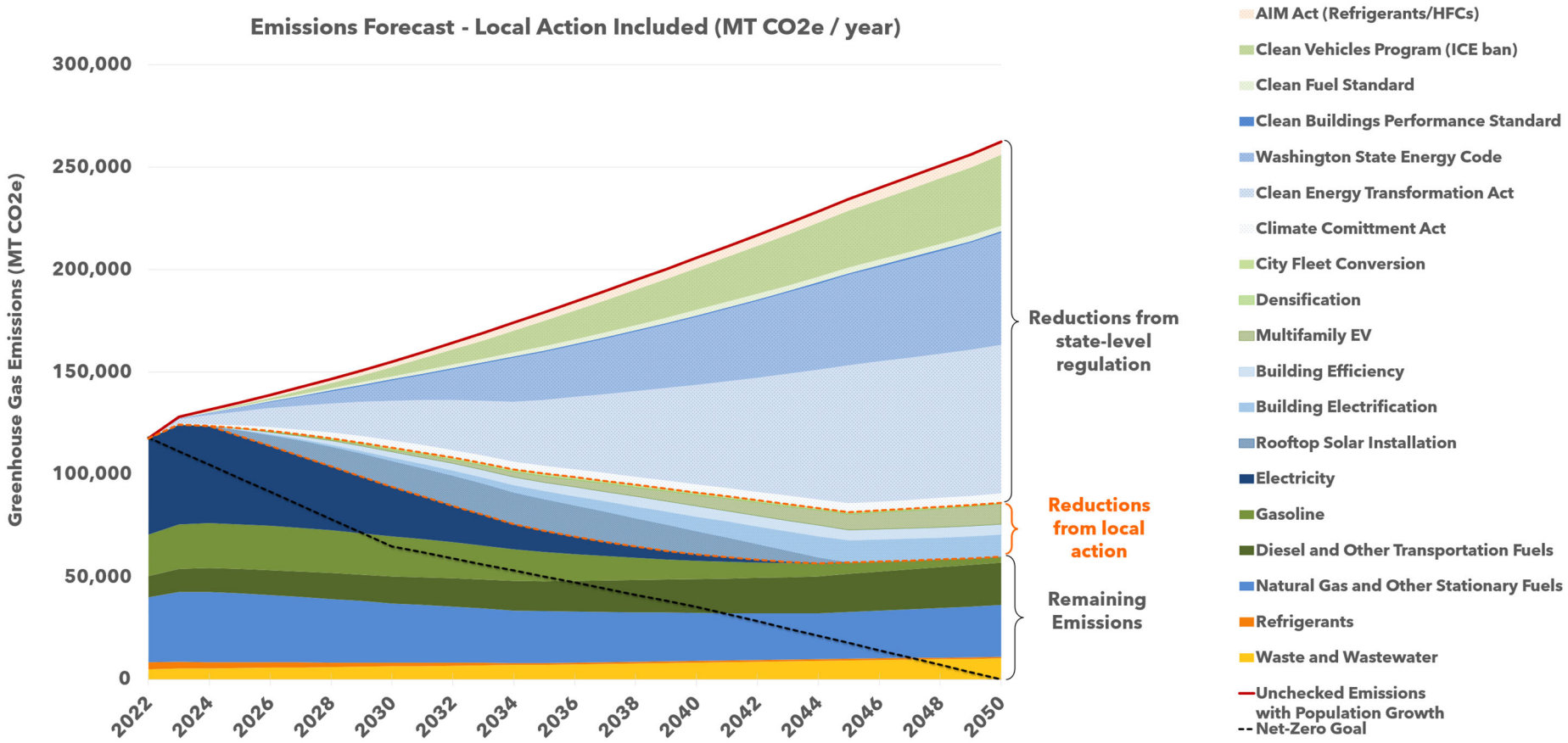

Figure 7. Emissions Reductions from Local Actions

Annual Reduction Targets

Despite action from the state as well as actions from Liberty Lake, The policies contained in this document are not expected to lead to net zero by 2050 without other substantial changes in both technology and legislation.

These targets are set to allow Liberty Lake to track their progress through time and to take advantage of new mitigation opportunities as they come up. Positive reduction values indicate an increase in emissions due to population growth.

Table 2. Annual Reduction Targets

Year	Total Remaining Emissions (MT CO_2e)	% Reduction from 2022	% Reduction from projected with population growth	% Reduction in per-capita emissions
2022	118,004	0%	0%	0%
2023	124,078	5%	-3%	-2%
2024	123,375	5%	-6%	-5%
2025	118,558	0%	-12%	-11%
2026	113,749	-4%	-18%	-17%
2027	108,860	-8%	-23%	-22%
2028	103,901	-12%	-29%	-28%
2029	98,959	-16%	-34%	-33%
2030	93,961	-20%	-39%	-38%
2031	89,459	-24%	-44%	-42%
2032	84,972	-28%	-48%	-46%
2033	80,507	-32%	-52%	-51%
2034	76,072	-36%	-56%	-54%
2035	72,914	-38%	-59%	-57%
2036	70,235	-40%	-62%	-60%
2037	67,824	-43%	-64%	-62%
2038	65,677	-44%	-66%	-64%
2039	63,786	-46%	-68%	-66%
2040	62,147	-47%	-70%	-68%
2041	60,892	-48%	-71%	-69%

Year	Total Remaining Emissions (MT CO_2e)	% Reduction from 2022	% Reduction from projected with population growth	% Reduction in per-capita emissions
2042	59,787	-49%	-72%	-71%
2043	58,986	-50%	-73%	-72%
2044	58,488	-50%	-74%	-73%
2045	59,077	-50%	-75%	-73%
2046	59,536	-50%	-75%	-73%
2047	60,032	-49%	-75%	-74%
2048	60,562	-49%	-76%	-74%
2049	61,128	-48%	-76%	-74%
2050	62,045	-47%	-76%	-75%

3.2 Climate Element GHG Goals

The draft GHG Emissions Reduction Sub-Element includes eight goals across six focus areas. Goals are based on the Commerce Menu of Measures and were updated to fit the Liberty Lake context based on feedback from City staff and the Climate Policy Advisory Team. This section provides the rationale behind the inclusion of the draft goals and sub-goals. Table 3 through Table 8 provide a summary of the draft goals and sub-goals. *Note: None of the goals or policies in the GHG Sub-element are standalone or "silver bullet" solutions. Meeting the goal of net zero by 2050 will require coordinated efforts across sectors, creative use of the tools and mechanisms at the City's disposal, and further technological advances.*

What is required?

As required by the Department of Commerce, the Climate Element is one of several elements of the Comprehensive Plan update. The policies included in the GHG Sub-Element must reduce VMT per capita, reduce GHG emissions overall, and do so in a way that does not unjustly burden already struggling communities. Many of the policies included in this element tie into other parts of the Comprehensive Plan update including Housing, Land Use, Transportation, and Natural Environment. In addition, new State building codes put out by Commerce also bolster the GHG reduction goals set out in this document.

What role can the City play?

Incentivize

The main way that the City can incentivize change is through permitting and plan review fees. Permit-based incentives often offer fee discounts for desired outcomes such as energy-saving features in buildings. In this way, the City can offer financial benefits and endorse climate-friendly actions.

Educate

The City has a role in informing and educating its residents. The City can hold events and conduct outreach at events.

Partner

There are many regional actors that the City can work and collaborate with to achieve its goals; local utilities, water and sewer purveyors, schools, builders, and transit agencies all have a role to play, and the City can partner with them to decrease GHG emissions.

Support

For some issues where the City does not have direct control over operations and outcomes (such as wastewater), the City can officially support GHG reduction measures and make it a policy to speak out in favor of such policies.

Lead by Example

The City should lead by example by implementing climate-friendly reforms within its own operations. This has the dual advantage of lowering the City's operational emissions and being an ambassador for lower emissions policies.

3.3 Building Energy Reductions

Existing Buildings

Existing buildings are and will remain the biggest source of GHG emissions for Liberty Lake—now and in the future. Building energy emissions come from the use of electricity and natural gas appliances. As mentioned, electricity emissions are expected to decrease to zero by 2045 to comply with the Washington Clean Energy Transformation Act. This means that remaining emissions will be primarily from the use of natural gas.

Space and water heating are the primary end uses for natural gas. On average, 33% of natural gas used in residential buildings is used for space heating and 36% for water heating.[17] In commercial buildings, 57% of natural gas is used for space heating and 14% for water heating.[18] Switching from gas-powered furnaces and water heaters to electric heat pump and heat pump water heater options as those appliances reach the end of their useful life provides the biggest opportunity to decrease natural gas emissions. Switching from gas-powered appliances to electric appliances is known as *building electrification*.

Heat pumps result in efficiency gains because they work by transferring heat instead of generating it. Heat pumps can reduce electricity use for heating up to 75% compared to electric resistance heating such as furnaces and baseboard heaters, saving energy and money.[19] New models of heat pumps

[17] Residential Energy Consumption Survey 2020 survey data, Table HC 1.8, Total West averages.

[18] Commercial Buildings Energy Consumption Survey 2018 survey data, Table E8, Total West averages.

[19] Energy.Gov – Heat Pump Systems: https://www.energy.gov/energysaver/heat-pump-systems

are rated to work down to -5˚F, and so they can function effectively, even in Liberty Lake's cold winters.[20]

In addition to using the most efficient technology, improvements can be made by weatherizing existing buildings. Even with homes built as recently as 1990, efficiency improvements can significantly cut energy usage.

To support efficiency improvements in existing buildings, the City can educate the community, partner with other organizations to promote energy efficiency programs (e.g., Avista or Spokane Neighborhood Action Partners), and/or offer incentives by reducing or waiving permit fees for high-efficiency equipment (e.g., electric heat pumps).

New Buildings

Liberty Lake is a growing community, and there is an opportunity to reduce future emissions by making sure that new buildings are built to be as energy efficient as possible.

Liberty Lake encompasses an area of approximately 4,001 acres, or just over 6.25 square miles. As of August of 2024, the city had a total of 5,021 parcels of land. The vast majority of vacant residential and mixed-use lands within the city are already approved for development, either through an approved preliminary plat or an approved binding site plan. Based upon population and development trends within the city, Liberty Lake is expected to reach full buildout within the next 20 years.[21]

The Washington State Energy Code is set by the Washington State Building Code Council and is typically updated every 3 years. It is based on the International Energy Conservation Code and includes state-specific amendments to meet Washington's energy efficiency goals. Local jurisdictions are required to enforce the state energy code and cannot adopt a less stringent code.

As with existing buildings, the City can educate about and/or incentivize the adoption of efficient technologies such as electric heat pumps and heat pump water heaters to increase energy efficiency in new buildings,

Streetlights and Traffic Signals

Streetlights and traffic signals are big electricity users and improving their efficiency will help to reduce communitywide emissions. This can be done by upgrading streetlights and traffic signals from high-pressure sodium (HPS) options to light-emitting diode (LED) options when it's time to replace them. LED options have become increasingly more affordable due to technological advancements and increased production volume, resulting in lower upfront costs and lower energy bills for consumers due to efficiency gains from LED bulbs.

Additionally, the City could consider pursuing Dark Sky Certification through Dark Sky International – an organization that supports and advocates for reducing light pollution and its negative effects on wildlife, human health, energy usage, and aesthetics. Because many of the lighting codes were already developed with Dark Sky compliance in mind, gaining certification is not expected to require major changes in existing code.

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[20] DOE Factsheet on Air Source Heat Pumps: https://www.energystar.gov/sites/default/files/asset/document/ES_ASHPs_Factsheet_2023_508.pdf

[21] Liberty Lake Land Capacity Analysis: https://www.libertylakewa.gov/DocumentCenter/View/8795/Land-Capacity-Analysis-Tech-Memo---v-2-4-2025?bidId=

Local Renewables – Solar

The energy emissions reductions outlined above all require shifting from a fossil fuel (such as natural gas) to electricity. However, realizing the maximum emissions reductions requires a zero-emissions electricity grid. The Washington Clean Energy Transformation Act requires utilities to transition to 100% clean electricity by 2045, but Liberty Lake can play its part in facilitating this transition and make progress more quickly by increasing local solar generation.

Additional benefits to increased local solar generation, especially if it incorporates battery storage, include increasing resilience by providing a source of energy when the regional grid is unavailable and saving money on energy over time.

The City can help to increase local solar generation by installing solar on its own facilities, partnering with other public entities to install solar on public buildings, educating homeowners and realtors, and partnering with Avista on local projects and incentive options.

Building Energy Reduction Goals

Table 3. Building Energy Reduction Goals and Sub-Goals

Goal 1	**Encourage buildings to use renewable energy, conserve resources, and implement efficient technologies and practices to reduce greenhouse gas emissions.**
Sub-goal 1.1	Increase community awareness of energy efficiency measures and benefits.
Sub-goal 1.2	Make existing buildings more energy efficient.
Sub-goal 1.3	Make future buildings more energy efficient.
Sub-goal 1.4	Increase efficiency of streetlights and traffic signals
Goal 2	**Promote solar electricity generation and storage.**
Sub-goal 2.1	Install solar on public buildings.
Sub-goal 2.2	Promote solar on private buildings.
Sub-goal 2.3	Increase small-scale battery storage to pair with local solar generation.

3.4 VMT Reductions

As mentioned, one of the requirements of the Climate Element is that it results in reductions in per capita VMT without increasing emissions elsewhere in the state. Per capita VMT reductions can be achieved through a variety of actions and policies that affect land use, active transportation, and public transit. Many of the goals that support reducing VMT align with other elements of the Comprehensive Plan, such as the Housing, Land Use, and the Transportation Elements.

Land Use

One way to reduce VMT is to make it so that people are closer to the places they need to go by fostering higher-intensity land uses in mixed-use development and transit corridors. This can be accomplished by supporting land use changes that increase density, improve transportation network connectivity, and site key community locations such as schools closer to where people live.

This is a collaboration with the Land Use Element.

Active Transportation

Another way to reduce VMT is to increase the number of trips that are taken via active transportation modes such as walking or biking instead of in cars. This means improving safety and connectivity by improving and expanding the sidewalk network, bike lanes, bike paths, and bike parking facilities to ensure that people feel safe and comfortable traveling outside of their cars. People are also most likely to walk or bike if their destination is closer (see the Land Use section above).

Public Transportation

Public transportation is a regional service provided by Spokane Transit Authority (STA). Liberty Lake can support increased transit ridership by partnering with STA to provide free or reduced-cost fares, increase service frequency, provide better routes, and educate the community about STA's service offerings.

VMT Reduction Goals

Table 4. VMT Reduction Goal and Sub-Goals

Goal 3	Reduce vehicle miles traveled to achieve greenhouse gas reduction goals.
Sub-goal 3.1	Foster higher-intensity land uses in mixed-use development and transit corridors.
Sub-goal 3.2	Increase housing diversity and supply within urban growth areas to reduce greenhouse gas emissions and support environmental justice.
Sub-goal 3.3	Partner with STA and support improvements to public transit reliability and convenience.
Sub-goal 3.4	Improve the active transportation network.

3.5 Remaining Transportation Emissions Reductions

Even with VMT reductions, Liberty Lake will not meet its goal of net-zero emissions by 2050 without reducing remaining transportation emissions from passenger cars, freight vehicles, and off-road vehicles. Reducing remaining transportation emissions will require electrification of vehicles and use of renewable fuels such as renewable diesel.

Electric Vehicle Charging

Washington's Clean Vehicles Program rule sets a target to phase out the sale of new gasoline-powered passenger vehicles in Washington State by 2035. Currently, a vast system of gas stations supports gas-powered cars. With more EVs on the road, additional infrastructure is required to ensure that drivers feel confident that they will be able to charge EVs quickly and conveniently. Many people can and do charge at home, but at present this is more difficult for people who live in multifamily housing. Building codes require that *new* multifamily housing provides more EV infrastructure, but that still leaves over 1,600 *existing* units underserved. Making it easy for multifamily residents to charge at home will support the transition to EVs.

The City can support EV adoption by educating residents and supporting EV infrastructure projects, particularly at multifamily housing.

Renewable Diesel (R99)

Some vehicle types are more difficult to electrify than others. For very heavy-duty vehicles and some other specialty vehicles, affordable or feasible electric options do not exist yet. For these vehicles and while the fleet is electrifying, there are renewable fuel options. Renewable diesel (R99) is chemically equivalent to fossil diesel and can be used as a "drop-in fuel" in nearly all engines that run on conventional diesel. This product is different from biodiesel that must be blended (usually 5%, also known as B5) with fossil diesel to avoid engine damage.

The Climate Commitment Act (CCA) established a Cap-and-Invest program that sets a statewide limit on GHG emissions, which declines over time to help meet the state's climate goal of reducing GHG emissions by 95% by 2050. While R99 has not been previously widely available in Washington, it is commonly used in California and Oregon. Because the Cap-and-Invest program in Washington is subsidizing the market, the supply of R99 in Washington is expected to increase substantially, especially once planned refineries in the Pacific Northwest come online.

The City can directly ask its fuel suppliers to provide R99 and provide education to local fuel distributors to do the same. It can also stay up to date on emerging technologies like hydrogen fuel and support those options as they become more available and affordable.

Transportation Emission Reduction Goals

Table 5. Transportation Emissions Reduction Goals and Sub-Goals

Goal 4	**Increase electric vehicle (EV) adoption.**
Sub-goal 4.1	Provide education about EVs, including education about life cycle emissions and batteries.
Sub-goal 4.2	Expand alternative fueling infrastructure, including but not limited to EV charging infrastructure.
Goal 5	**Explore opportunities for renewable diesel blends.**
Sub-goal 5.1	Provide education about renewable diesel blends.

3.6 Natural Spaces and Local Biodiversity

As a relatively small and suburban geographic area, carbon sequestration opportunities are limited. However, preserving and enhancing natural spaces and local biodiversity will provide cooling relief in the height of summer and sequester a small amount of carbon.

There are more goals and policies about protecting natural resources in the Resilience Sub-element, but for the purposes of the GHG Sub-element, the City can support natural spaces and local biodiversity by requiring open space set-asides for new development, improving and expanding urban forest management, and maximizing tree canopy coverage in parking lots.

Table 6. Natural Spaces And Local Biodiversity Goal

Goal 6	Protect local biodiversity, such as fire-resistant trees, to boost carbon sequestration, reduce heat islands, and improve air quality, prioritizing overburdened communities.

3.7 Waste and Wastewater

Waste and wastewater are projected to increase through time as Liberty Lake grows. The main way to decrease waste emissions is by decreasing waste. Waste reduction has multiple benefits including cost reduction, reduction of upstream emissions involved in producing food and goods, reduced landfill emissions, and extension of the life of current landfills.

Wastewater treatment is a source of potent methane and nitrous oxide GHG emissions. Programs that capture methane from wastewater can have a double benefit of reducing emissions and producing renewable natural gas that can be used in place of fossil natural gas.

The City can support waste and wastewater emissions reduction by educating the community about waste reduction, partnering with solid waste haulers to increase waste diversion efforts, and supporting new waste diversion programs (e.g., composting, recycling for construction and demolition debris).

Table 7. Waste and Wastewater Goal and Sub-Goals

Goal 7	Develop targeted campaigns for reducing and managing waste to reduce GHG emissions.
Sub-goal 7.1	Provide education about reducing waste.
Goal 8	Reduce emissions from waste and wastewater.
Sub-goal 8.1	Reduce emissions from solid waste.
Sub-goal 8.2	Reduce emissions from wastewater treatment.

3.8 City Operations

The City of Liberty Lake can lead by example by adopting lower-emission practices in its own operations to reduce emissions from buildings and energy use, fleet fuels, employee commutes, supply-chain purchasing, and waste management.

Maintaining continuity of essential City services is critical, particularly during an emergency. The City should refer to the Hazard Mitigation Plan to ensure that operational changes do not impede the City's ability to maintain essential services in case of emergency (e.g., preserving backup power and fueling options).

Table 8. City Operations Goal and Sub-Goals

Goal 9	Reduce emissions from City operations.
Sub-goal 9.1	Reduce emissions from City buildings and energy use.

Goal 9	Reduce emissions from City operations.
Sub-goal 9.2	Convert public fleets to zero-emission vehicles and develop supporting infrastructure and programs (e.g., charging stations).
Sub-goal 9.3	Reduce emissions from employee commute.
Sub-goal 9.4	Reduce supply chain emissions from City operations and purchasing.
Sub-goal 9.5	Increase recycling at City facilities.

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