

APPENDIX E: WEDGE ANALYSIS

Forecast Results

Cascadia completed a customized “wedge analysis” model that forecasts anticipated future GHG emissions and depicts emissions reduction scenarios for the Shoreline community. This wedge estimated business-as-usual (BAU) and adjusted business-as-usual (ABAU) scenarios. To provide context for selecting GHG emissions reduction targets, Cascadia forecasted two future GHG emissions scenarios, described in detail below and presented in **Figure 1**. Key takeaways include:

- Without federal, state, or local climate action, Shoreline’s total GHG emissions are expected to **increase** by 45% from 2019 to 2050.
- When considering the anticipated impacts of state and federal policies, Shoreline’s total GHG emissions are expected to **decrease** overall by 16% from 2019 to 2050.
- When also considering the anticipated impacts of existing local actions in Shoreline, emissions are expected to **decrease** by an additional 14%.
- Through implementation of several key CAP actions, emissions are anticipated to **decrease** by an additional 64% from 2019 to 2050.

Figure 1. Shoreline BAU and ABAU Emissions Forecast through 2050 (in thousands of MT CO₂e).

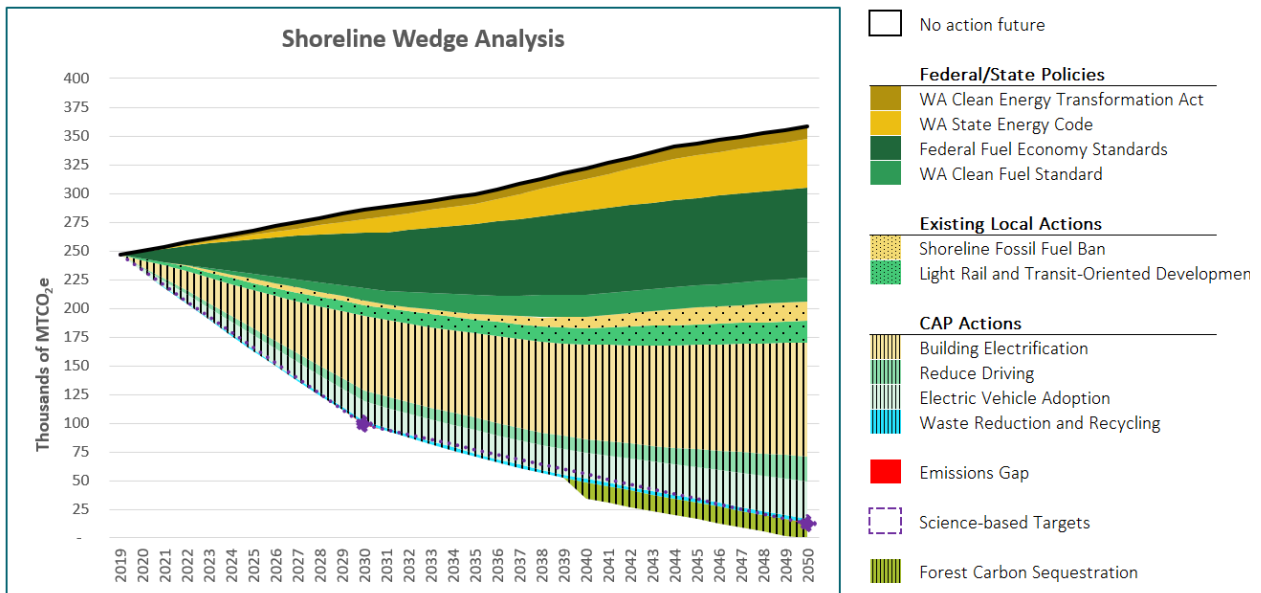


Table 1. Summary of emissions forecast estimates (in MT CO₂e).

Description	2019	2030	2040	2050
Business-as-usual (BAU) emissions – emissions forecast based on Shoreline’s 2019 GHG emissions profile*, assuming no climate action (programs, policies, standards) at the local, state, or federal level.	246,579	285,658	322,052	358,350
Impact of Clean Energy Transformation Act (CETA) – see Table 3 .	-	-7,925	-9,413	-10,910
Impact of Washington State Energy Code – see Table 3 .	-	-12,166	-27,660	-42,115
Impact of Corporate Average Fuel Economy (CAFE) standards – see Table 3 .	-	-48,051	-73,392	-78,994
Impact of Washington Clean Fuel Standard – see Table 3 .	-	-10,644	-18,817	-20,253
Adjusted business-as-usual (ABAU) emissions – adjusted BAU forecast to account for the impacts of adopted federal and state policies (still assuming no climate action at the local level).	246,579	206,873	192,770	206,078
Difference between BAU and ABAU emissions	-	78,785	129,282	152,272
Existing action emissions – expanded scenario that accounts for the impacts of existing climate action at the local level, in addition to adopted federal and state policies.	-	193,170	168,279	170,407
CAP action emissions – expanded scenario that accounts for the impacts of proposed future climate actions to be included in the 2022 Shoreline CAP update, in addition to adopted federal and state policies and existing action emission reduction.	-	99,347	48,443	12,966

*The 2019 community-wide GHG emissions inventory does not include emissions from wastewater in the total emissions count due to lack of comparable data from previous years, and instead includes these emissions as information only. This forecast includes 2019 wastewater emissions in the emissions baseline, resulting in a slight discrepancy between the 2019 inventory results and the wedge “baseline.”

Forecast Growth Rates

The forecast uses the projected changes in demographics in Table 2 to approximate growth in activity associated GHG emissions over time:

- The number of residential housing units in Shoreline (Housing Units)
- The number of people who live in Shoreline (Population)
- The number of people who work in Shoreline (Employment)
- The number of people who live and/or work in Shoreline (Service Population)

Table 2. Projected changes in Shoreline's demographics*

	2019	2030	2040	2050
Housing Units	23,953	26,717	33,006	39,378
Population	56,370	60,650	65,020	69,320
Employment	16,932	22,250	24,850	27,410
Service Population	73,302	82,900	89,870	96,730

*Data Sources: Puget Sound Regional Council Growth Projections

The “adjusted business-as-usual” (ABAU) forecast adjusts the BAU forecast to account for the impacts of adopted federal and state policies (still assuming no climate action at the local level). The emissions reductions associated with these policies count toward Shoreline’s overall emissions reductions and progress towards targets. **Table 3** summarizes four key policies reflected in the ABAU forecast.

Table 3. Key federal and state policies reflected in ABAU forecast.

Policy	Level	Key Assumptions in Forecast/Model
<p>Clean Energy Transformation Act (CETA)</p> <p>Requires all electric utilities to eliminate coal-fired electricity from their state portfolios by 2025 and GHG neutral by 2030.</p>	State	<ul style="list-style-type: none"> Adjust the Puget Sound Energy (PSE) emissions factor used to calculate MT CO₂e per kWh consumed to reflect the following adjustments in PSE's energy mix: (1) coal decreases linearly to zero from 2019 to 2025; (2) other fossil fuels decrease linearly to zero from 2019 to 2030. Assumes electricity will be greenhouse gas neutral (electricity emissions factor equals zero) in 2030 and beyond with a straight line emissions factor reduction from 2019 to 2030.
<p>State Energy Codes</p> <p>Requires adoption of state energy codes (new buildings) from 2013 through 2031 that incrementally move towards achieving a 70% reduction in annual net energy consumption (compared to a 2006 baseline).</p>	State	<ul style="list-style-type: none"> Reduce projected BAU electricity and natural gas consumption associated with new buildings linearly up to 70% by 2031. Assume no energy consumption reductions in existing buildings.
<p>Clean Fuel Standard</p> <p>Washington state's Clean Fuel Standard (HB 1091) requires a 20% reduction in the carbon intensity of transportation fuels by 2038, compared to a 2017 baseline, beginning January 1, 2023.</p>	State	<ul style="list-style-type: none"> Reduce gasoline and diesel emissions factor linearly by 20% from 2023 to 2038.
<p>Corporate Average Fuel Economy (CAFE) standards</p> <p>National Highway Traffic Safety Administration standards regulate light- and heavy-duty vehicle fuel economy standards (how many miles the vehicle can drive per gallon of fuel).</p>	Federal	<ul style="list-style-type: none"> Assume emissions factor (MT CO₂e per VMT) for total vehicles on the road will decrease incrementally over time in accordance with U.S. Environmental Protection Agency's (EPA) OMEGA 1.4.1 Model to determine the impact of CAFE standards for the 2017-2025 model years.

Assumptions

Action	Key Assumptions in Forecast/Model
Shoreline Building Code	Shoreline's updated building code bans fossil fuel in new commercial/large multifamily space and water heating, plus increased efficiency measures. The ban goes into effect July 2022.
Light Rail and Transit Oriented Development	This model used the transportation demand model developed for Shoreline's Transportation Master Plan update to model VMT and Mode Share estimates. This model was generated from PSRC's regional transportation forecast model that accounts for the light rail coming online, overall transit and transportation system improvements, and the impact of transportation-oriented development forecasted for Shoreline. Assume zero emissions from light rail (carbon free energy).
Building Electrification	Assumes an 60% reduction in natural gas use and 100% reduction in heating oil use by 2030, and a 98% reduction of natural gas use by 2050.
Reduce Driving	This scenario assumes a 20% decrease in per capita VMT by 2030 and 50% by 2050 from a 2019 baseline (an additional 14% below the ABAU in 2030 and an additional 23% reduction beyond ABAU in 2050).
Electric Vehicle Adoption	Assumes that 30% of Passenger/Light Duty VMT and 1% of Heavy Duty is from Electric Vehicles by 2030, and 95% light duty/passenger VMT and 20% of heavy duty VMT is electric by 2050.
Waste Reduction/ Recycling	Assumes a BAU reduction of solid waste 70% by 2030 (30% of that diverted to compost) and solid waste reduction of 80% below BAU by 2030.
Forest Carbon Sequestration	Assumes a BAU increase of carbon sequestration by 5% by 2050 (from the City's 2019 i-Tree canopy analysis).