

# Appendix D

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GHG Reduction Measures Quantification and Evidence

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# Hayward Climate Action Plan

## Greenhouse Gas Reduction Measures Quantification and Evidence Appendix

*prepared for*

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# 1 GHG Measures Quantification Approach and Timeframe

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The California Environmental Quality Act (CEQA) Guidelines Section 15183.5(b) establishes criteria to guide the preparation of a “plan for the reduction of greenhouse gas emissions.” Subsection (D) notes that a CEQA Guideline-consistent greenhouse gas (GHG) Climate Action Plan (CAP) must include, “measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level.” This appendix includes the CAP GHG reduction measures quantification approach, quantification, and substantial evidence.

## 1.1 GHG Measures Quantification Approach

GHG measures and actions can be either quantitative or supportive, defined as follows:

- **Quantitative:** When implemented, quantitative measures and actions result in quantifiable GHG emissions reductions. GHG emissions reduction were calculated using published evidence provided through adequately controlled investigations, studies, and articles carried out by qualified experts that establish the effectiveness for the reduction measures and actions. In this appendix, GHG emissions are quantified at the measure level rather than at the specific level of each action.
- **Supportive:** Supportive measures and actions may also be quantifiable and have substantial evidence to support their overall contribution to GHG reduction. However, due to one of several factors – including a low GHG reduction benefit, indirect GHG reduction benefit, or potential for double-counting– they have not been quantified and do not contribute directly to the total GHG reduction quantification. Despite not being quantified, supportive measures/actions are nevertheless critical to the overall success of the CAP and provide support so that the quantitative measures and actions will be successfully implemented.

## 1.2 GHG Measures Quantification Timeframe

This appendix provides estimates for GHG emissions reduction associated with the implementation of CAP measures and actions. These estimates are based on projected activity data for each source and relative emission factors. The GHG emissions reduction associated with the CAP measures and actions were calculated and compared to the adjusted 2030 and 2045 forecast to determine whether the City is anticipated to meet the established 2030 and 2045 targets. Table 1 shows Hayward’s existing (2019) and projected (2030 and 2045) population.<sup>1</sup>

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<sup>1</sup> Forecasted demographic data for Hayward is based on the Alameda CTC Zone from plan Bay Area 2040 and is consistent with the projections used for the Housing Element and traffic analysis conducted by Kittleson & Associates, Inc.

**Table 1 Hayward Existing and Projected Population<sup>2</sup>**

Year	2019	2030	2045
Population	160,197	167,425	184,358

Table 2 provides a summary of emissions reduction achieved by CAP measure as well as presents the total emissions reduction achieved on a mass emissions basis and a per capita basis using the population projections included in Table 1.

**Table 2 GHG Measures Reduction Quantification in 2030 and 2045**

Measure ID	Measure	Anticipated GHG Emissions Reduction/Sequestration (MT CO <sub>2</sub> e) in 2030	Anticipated GHG Emissions Reduction/Sequestration (MT CO <sub>2</sub> e) in 2045
BE-1	Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026.	5,393 MT CO <sub>2</sub> e	18,764 MT CO <sub>2</sub> e
BE-2	Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.	13,874 MT CO <sub>2</sub> e	68,032 MT CO <sub>2</sub> e
BE-3	Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.	20,670 MT CO <sub>2</sub> e	114,220 MT CO <sub>2</sub> e
BE-4	Support Ava Community Energy in providing 100% carbon-free electricity by 2030.	4,802 MT CO <sub>2</sub> e	0 MT CO <sub>2</sub> e
BE-5	Continue to promote energy efficiency improvement, in alignment with the existing 2014 Climate Action Plan (2014).	Supportive	Supportive
BE-6	Generate on City facilities carbon-neutral electricity meeting 80% of the City's electricity needs by 2030.	Supportive	Supportive
T-1	Increase active transportation mode share to 15% by 2030 and to 20% by 2045.	6,485 MT CO <sub>2</sub> e	8,755 MT CO <sub>2</sub> e
T-2	Implement public and shared transit programs to reduce communitywide VMT 15% by 2030 and 30% by 2045.	7,585 MT CO <sub>2</sub> e	25,092 MT CO <sub>2</sub> e

<sup>2</sup> Association of Bay Area Governments & Metropolitan Transportation Commission. 2017. Plan Bay Area 2040: Final Regional Forecast of Jobs, Population and Housing. [http://2040.planbayarea.org/files/2020-02/Regional%20Forecast%20Supplemental%20%20Report\\_Final\\_7-2017\\_0.pdf](http://2040.planbayarea.org/files/2020-02/Regional%20Forecast%20Supplemental%20%20Report_Final_7-2017_0.pdf). Accessed June 27, 2023

GHG Measures Quantification Approach and Timeframe

Measure ID	Measure	Anticipated GHG Emissions Reduction/Sequestration (MT CO <sub>2</sub> e) in 2030	Anticipated GHG Emissions Reduction/Sequestration (MT CO <sub>2</sub> e) in 2045
T-3	Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-2 and T-3.	Supportive	Supportive
T-4	Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045.	16,014 MT CO <sub>2</sub> e	88,718 MT CO <sub>2</sub> e
T-5	Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.	3,161 MT CO <sub>2</sub> e	37,461 MT CO <sub>2</sub> e
T-6	Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045.	4,312 T CO <sub>2</sub> e	22,542 MT CO <sub>2</sub> e
T-7	Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.	Supportive	Supportive
SW-1	Implement and enforce SB 1383 requirements to reduce communitywide landfilled organics by 75% by 2030 and 90% by 2045.	35,925 MT CO <sub>2</sub> e	47,101 MT CO <sub>2</sub> e
SW-2	Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045.	Supportive	Supportive
WW-1	Reduce water consumption by 15% by 2030 and maintain it through 2045.	35 MT CO <sub>2</sub> e	0 MT CO <sub>2</sub> e
CS-1	Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.	212 MT CO <sub>2</sub> e	743 MT CO <sub>2</sub> e
CS-2	Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030 and 2045.	3,081 MT CO <sub>2</sub> e	3,392 MT CO <sub>2</sub> e
<b>Total GHG Emissions Reduction</b>		<b>121,543 MT CO<sub>2</sub>e</b>	<b>434,784 MT CO<sub>2</sub>e</b>
<b>Total GHG Emissions Reductions – per capita</b>		<b>0.73 MT CO<sub>2</sub>e/person</b>	<b>2.36 MT CO<sub>2</sub>e/person</b>
<b>Percent Reductions from Adjusted Forecasted Emissions</b>		<b>19%</b>	<b>70%</b>

## 2 GHG Measures Quantification and Evidence

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The CAP measures and actions are summarized by the overarching GHG reduction sector categories, which include:

- Building Energy
- Transportation
- Waste
- Water
- Carbon Sequestration

The following discussion is organized similarly and the substantial evidence for each quantifiable measure and action is detailed below.

### 2.1 Building Energy

**Measure BE-1 Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026.**

#### *Background*

To reach carbon neutrality by 2045, most of the buildings in the City, including those that have not yet been constructed, will need to be carbon neutral. Electrification of new construction will eliminate the use of natural gas for space heating, water heating, clothes drying, and cooking. Natural gas combustion for heating and cooking in commercial and residential buildings is projected to account for 29 percent and 32 percent of the City's total GHG emissions, for 2030 and 2045, respectively.<sup>3</sup> By transitioning buildings from the consumption of natural gas to electricity, emissions from this source can be reduced through Senate Bill (SB) 100 requirements for increased renewable electricity and the associated GHG emissions. A variety of studies have found that electrification of buildings, combined with renewable power generation is a potential path towards reaching carbon neutrality.<sup>4</sup> Additionally, the benefits in annual utility bill savings and decreased cost associated with piping of natural gas into new construction makes all-electric buildings more cost effective in some California Building Climate Zones; including, Zone 3 and Zone 12, where

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<sup>3</sup> 2019 Community GHG Inventory. See Appendix B of the CAP.

<sup>4</sup> Williams, James et al., Pathways to Deep Decarbonization in the United States (San Francisco: Energy and Environmental Economics, 2014); Northeastern Regional Assessment of Strategic Electrification (Northeast Energy Efficiency Partnerships, 2017); Steinberg, Daniel et al., Electrification and Decarbonization: Exploring US Energy Use and Greenhouse Gas Emissions in Scenarios with Widespread Electrification and Power Sector Decarbonization (National Renewable Energy Laboratory, 2017). Accessed June 27, 2023

Hayward is located.<sup>5,6</sup> As of June 2023, over 65 California cities have adopted all-electric only ordinances.<sup>7</sup>

Quantifiable GHG emissions reduction is associated with the implementation of Action BE-1.1, enforcing the Hayward Electrification Ordinance for new residential buildings banning natural gas and Action BE-1.2, establishing mandatory requirements to eliminate natural gas in all newly constructed building, by transitioning energy consumption from natural gas consumption to electricity. All other actions under Measure BE-1 would incrementally support the overall goal of the measure by sharing informational resources with the community to enhance awareness around the cost savings, environmental benefits, and health and safety benefits of all-electric construction (Actions BE-1.3, BE-1.4, BE-1.5, BE-1.6, BE-1.5, BE-1.8, and BE-1.9).

### *Methodology and Assumptions*

Adoption of mandatory requirements to eliminate natural gas in all newly constructed buildings by 2026 would align with the California Building Code three-year cycle, stopping growth of natural gas consumption from new construction after 2026. The City's existing all electric ordinance requires that, as of 2023, all newly constructed residential buildings eliminate natural gas for detached accessory dwelling units, single-family homes, condominium buildings, apartments, and mixed-use buildings. It also requires that all new non-residential buildings for which natural gas infrastructure is installed must be "electric ready," meaning the wiring, electrical capacity, and physical space needed is provided to allow the building to be converted to an all-electric building in the future.<sup>8</sup> These new mandatory requirements will require that all new non-residential buildings eliminate natural gas by 2026. The amount of future new development that will occur in the City is evaluated based on increases in employment and population provided for the Alameda CTC Zone from plan Bay Area 2040 and is consistent with the projections used for the Housing Element and traffic analysis conducted by Kittleson & Associates, Inc. Data was provided for year 2020 and 2040, therefore interim years were linearly interpolated. To estimate demographic growth past 2040, the annual compound growth rate between 2020 and 2040 was applied to the demographic data to estimate demographic projections in 2045. This growth is assumed to be constant year-over-year in the GHG emissions forecast, with each additional resident's or employee's contribution towards natural gas consumption being equivalent to the per capita or per employment natural gas consumption in the 2019 Community GHG Inventory year, while also accounting for efficiency increases from future Title 24 requirements. The resulting calculated increase in natural gas consumption is conservative as it is assumed to be purely from new construction, and any increases beyond the time the ordinance is adopted would be shifted to electricity consumption.

Emissions reduction calculations assume mandatory requirements to eliminate natural gas in all newly constructed residential and non-residential buildings will be adopted by 2023 and 2026, respectively; therefore, increased natural gas consumption from population and employment growth beyond 2023 and 2026 would be replaced by electricity consumption. Since electric appliances are approximately three times more efficient over similar natural gas burning equipment and appliances, the use of electric equipment instead of natural gas would result in improved

<sup>5</sup> California Energy Codes and Standards. 2022. Cost Effectiveness Study New Residential Building. <https://explorer.localenergycodes.com/jurisdiction/hayward-city/summary>. Accessed June 27, 2023

<sup>6</sup> California Energy Codes and Standards. 2022. Cost Effectiveness Study New Nonresidential Building. <https://explorer.localenergycodes.com/jurisdiction/hayward-city/summary>. Accessed June 27, 2023

<sup>7</sup> California Energy Codes and Standards. 2023. 2022 Code Cycle Locally Adopted Energy Ordinances. <https://localenergycodes.com/content/adopted-ordinances>. Accessed June 27, 2023

<sup>8</sup> City of Hayward. Reach Code. 2023. <https://www.hayward-ca.gov/reach-code#:~:text=The%20new%20Reach%20Code%20requires,apartments%20and%20mixed%2Duse%20buildings>. Accessed July 2023

energy efficiency and a reduction in overall energy consumption for replaced natural gas equipment.<sup>9,10,11</sup> The electricity consumption would generate GHG emissions that would partially offset the reduction in natural gas emissions from electrification. The calculations and assumptions used to estimate emissions reduction from Measure BE-1 are provided in Table 3.

**Table 3 Measure BE-1 GHG Emissions Reduction Calculations**

Year	2030	2045
<b>Residential Reductions</b>		
Adjusted Forecast Residential NG usage (therms) <sup>1</sup>	19,724,708	21,101,309
NG usage in implementation year (therms)	19,082,294	19,082,294
NG usage avoided (therms)	642,414	2,019,015
Emissions from NG usage avoided (MT CO <sub>2</sub> e) <sup>2</sup>	3,412	10,722
Electricity usage from converting to electric (kWh) <sup>3</sup>	6,274,478	19,719,788
Residential weighted electricity Emissions Factor (MT CO <sub>2</sub> e/kWh) <sup>4</sup>	0.0000028	0
Emissions from converted electricity usage (MT CO <sub>2</sub> e)	17	0
Residential emission reductions (MT CO <sub>2</sub> e)	3,394	10,722
<b>Commercial Reductions</b>		
Adjusted Commercial NG usage (therms) <sup>1</sup>	15,609,224	16,744,501
NG usage in implementation year (therms)	15,230,798	15,230,798
NG usage avoided (therms)	378,426	1,513,703
Emissions from NG usage avoided (MT CO <sub>2</sub> e) <sup>2</sup>	2,010	8,039
Electricity usage from converting to electric (kWh) <sup>3</sup>	3,696,098	14,784,390
Commercial weighted electricity EF (MT CO <sub>2</sub> e/kWh) <sup>4</sup>	0.0000031	0
Emissions from converted electricity usage (MT CO <sub>2</sub> e)	12	0
Commercial emission reductions (MT CO <sub>2</sub> e)	1,997	8,039
<b>Total Reductions (MT CO<sub>2</sub>e)</b>	<b>5,392</b>	<b>18,761</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; kWh =-kilowatt-hour

1. Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP.
2. Based on an emission factor of 0.00531051 MT CO<sub>2</sub>e/therms, per EPA’s Emission Factors for Greenhouse Gas Inventories. [https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors\\_2014.pdf](https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf)
3. Based on a conversion factor of 29.3001 kWh/therms and the assumption that electric appliances are generally three times more efficient than gas appliances. <https://help.leonardo-energy.org/hc/en-us/articles/203047881-How-efficient-is-a-heat-pump->
4. Weighted electricity emission factors were developed for residential and non-residential uses and incorporate the differing current opt-out rates for residential (5% opt-out) and non-residential (6% opt-out) sectors. Additionally, the emission factor used assumes implementation of Measure BE-4 to avoid double counting of GHG emission reductions.

\*Values may not add up due to rounding

<sup>9</sup> According to the EIA 2020 Annual Energy Outlook, electric heat pumps for commercial space heating and cooling are two to five times more efficient than natural gas fueled equipment. EIA. 2020. Annual Energy Outlook. Table 22. Commercial Sector Energy Consumption, Floorspace, Equipment Efficiency, and Distributed Generation. <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=32-AEO2020&cases=ref2020&sourcekey=0>. Accessed June 27, 2023.

<sup>10</sup> Residential electric heat pumps for space heating and cooling are six to 20 times more efficient than natural gas equipment. EIA. 2020. Annual Energy Outlook. Table 21. Residential Sector Equipment Stock and Efficiency, and Distributed Generation. <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=30-AEO2020&cases=ref2020&sourcekey=0>. Accessed June 27, 2023.

<sup>11</sup> Dennis, Keith. 2015. Environmentally Beneficial Electrification: Electricity as the End-Use Option. *The Electricity Journal*. 28(9). pp. 100-112. <https://doi.org/10.1016/j.tej.2015.09.019>. Accessed June 27, 2023.

**Table 4 GHG Emissions Reduction Associated with Measure BE-1**

Action ID	Pillar	Action	Emissions Reduction (MT CO <sub>2</sub> e)	
			2030	2045
BE-1.1	Structural Change	Continue to enforce the adopted Hayward Electrification Ordinance for new residential buildings banning natural gas.	5,392	18,761
BE-1.2	Structural Change	Continue to monitor the 9th circuit court of appeals of the CRA vs City of Berkley ruling. Based on current legislative feasibility, establish mandatory requirements to eliminate natural gas in all newly constructed buildings by 2026.	Supportive	Supportive
BE-1.3	Education/Funding	Compile case studies conducted by BayREN, the Building Decarbonization Coalition and other relevant sources that show cost effective strategies for electric buildings by prototype and detail the cost savings associated with all-electric construction. Share the information on the City's website.	Supportive	Supportive
BE-1.4	Education/ Partnership	Partner with BayREN to provide/share technical resources, including hosting workforce development training for installers, local contractors, and building owners/operators, to discuss benefits and technical requirements of electrification within Hayward. Promote the cost savings, environmental benefits, and versatility of electrification to builders, property owners, and contractors on the City website and at the City permit counters.	Supportive	Supportive
BE-1.5	Partnerships/Equity	Engage with stakeholders, both internal stakeholders, such as City staff and officials, and external stakeholders, such as local developers and community groups regarding the purpose and impact of the Hayward Electrification Reach Code and to identify equity concerns.	Supportive	Supportive
BE-1.6	Partnership	Engage with an organization such as Building Decarbonization Coalition to work with local building industry stakeholders in educating developers and other stakeholders on new appliances and approaches to building electrification.	Supportive	Supportive
BE-1.7	Feasibility Studies	Partner with Ava Community Energy to conduct an electrification infrastructure and capacity feasibility study to identify expected increases in electricity demand due to building and vehicle electrification, ensure capacity to meet that demand, and identify any infrastructure improvements.	Supportive	Supportive
BE-1.8	Feasibility Studies	Utilize the Low Carbon Concrete Code Amendment Toolkit and review current best practices to develop implementation strategies, compliance forms, and specifications for compliant mixes.	Supportive	Supportive
BE-1.9	Education	Promote the use of low carbon concrete in construction projects (residential and commercial). Coordinate with the California Air Resources Board as they develop rules and guidance pursuant to AB2446.	Supportive	Supportive

## **Measure BE-2 Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.**

### *Background*

In the 2019 Community Inventory, residential (single-family and multi-family) natural gas usage is about 112 therms/person/year and accounts for 14 percent of the City’s total GHG emissions. Through Measure BE-2, the City commits to electrifying existing single-family residential buildings.

Action BE-2.1 and BE-2.2 commit the City to adopting an existing single-family residential building decarbonization ordinance by 2026 to eliminate expansion of natural gas infrastructure and require decarbonization of appliances, upon replacement. These actions also commit the City to adopting an ordinance requiring existing single-family homes to be 100 percent electric by 2045. The 2026 decarbonization ordinance will establish mandatory requirements eliminating expansion of natural gas in existing single-family residential buildings. HVAC system and hot water heaters should be targeted in the ordinance due to their large contribution to residential natural gas end-uses and the cost-effectiveness associated with their replacement on burnout.<sup>12</sup> To support this, Action BE-2.3 commits the City to adopting a time of retrofit ordinance that requires all buildings with retrofit work that meet a certain threshold, to complete energy efficiency/electrification actions, to be part of the 2026 ordinance. Additionally, before adopting an existing single-family residential building decarbonization ordinance, the City will develop a single-family residential building electrification feasibility study (Action BE-2.5), to better understand cost implications, equity concerns, and potential strategies to address those concerns whilst implementing an ordinance.

While there is substantial momentum and resources behind electrification of existing buildings, some approaches are still being clarified through the legal process. On April 17, 2023, the Ninth Circuit Court of Appeals determined an ordinance enacted by the City of Berkeley that prohibited gas piping in new construction was preempted by the federal Energy Policy and Conservation Act (“EPCA”). Preemption generally means that a law or rule of an inferior government entity is of no effect if it is in conflict with a law or rule of a superior government entity. Among other things, the EPCA preempts state and local regulations concerning the energy use of covered appliances. The term covered appliances includes appliances such as water heaters, furnaces, clothes dryers, and kitchen ranges. As of July 2023, Berkeley has the opportunity request further review by the Ninth Circuit Court of Appeals or the United States Supreme Court. However, neither the Ninth Circuit Court of Appeals nor the United States Supreme Court is obligated to entertain any additional review. An existing single-family residential building decarbonization ordinance is a foundational measure in the City’s CAP. However, as the City of Berkeley is anticipated to appeal the Ninth Circuit’s ruling, the legal support for some ordinance types remains uncertain. Based on the findings of this or other rulings, the City should continue to adapt its approach to decarbonization.

In addition to efforts regarding structural changes and feasibility studies, the City will work to identify further electrification measures that can be implemented to reach the long-term target of electrifying 100 percent of the buildings in the City, through continued partnerships with the Bay Area Air Quality Management District (BAAQMD), local realtors and contractors, Bay Area Regional Energy Network (BayREN), Ava Community Energy (ACE), Pacific Gas & Electric (PG&E), BlocPower, and StopWaste (Actions BE-2.6, BE-2.4, BE-2.7, BE-2.11, BE-2.12, and BE-2.14). Partnerships and engagement efforts will range from developing a comprehensive building code and compliance training program to discuss benefits and technical requirements of electrification (Action BE-2.6) to

conducting engagement efforts targeting low-income communities of color to better understand the community's concerns around electrification and provide guidance (Action BE-2.8 and Action BE-2.10). Action BE-2.13 seeks to provide funding options to disadvantaged community members while Action BE-2.9 commits the City to partnering with the Hayward Below Market Rate (BMR) housing stock owners to develop a plan to electrify all BMR housing by 2045. The impacts associated with promotional and educational outreach for electrification have not been well documented due to the cutting-edge nature of the strategy. Electrification as a GHG reduction strategy has only begun to gain traction in California mostly due to the implementation of SB 100 and the expansion of community choice aggregations. While it is not clear how the community will respond to electrification, energy efficiency outreach has been conducted since as early as the 1970's and some research has been conducted on the effects of outreach and education on energy. One study in New York showed that out of the 8,991 people who participated in informational programs, 69 percent implemented the recommended practices.<sup>13</sup> Another research meta-analysis reviewed dozens of papers covering various energy efficiency, water efficiency, and waste outreach and found that education-only campaigns could produce between 10-12 percent energy savings.<sup>14</sup> Due to the City's recent leadership in adopting and implementing reach codes, including the new residential building natural gas ban (Action BE-1.1), it is anticipated that community members will comply with electrification efforts.

### *Methodology and Assumptions*

Natural gas usage from existing residential buildings accounted for 14 percent of emissions in the City in 2019. Based on 2021 U.S. Census Bureau American Community Survey estimates for Hayward, approximately 67 percent of housing units in the City are considered single-family. Therefore, it was assumed for this calculation that 67 percent of natural gas usage and associated emissions from existing residential buildings was attributed to single-family buildings specifically.<sup>15</sup> GHG emission reduction calculations were developed assuming the implementation of BE-1.1, starting in 2023, for residential buildings. GHG emissions reductions were calculated based on the percentage of natural gas attributed to water heaters, HVAC systems, and stoves, the average lifespan of each natural gas consuming devices, as seen in Table 5. Based on information from the United State Energy Information Administration (EIA), the average gas-fired water heater, HVAC, and stovetop were assumed to be 13, 21.5, and 12 years, respectively. Although studies indicate that permit compliance for appliances ranges from 10-25 percent, regardless of permit status, there is generally a high compliance rate with mandatory requirements related to energy efficiency. The ordinances developed through this measure, the efforts by BAAQMD to require zero-NOx appliances, incentive programs available and the increasing affordability and efficiency of electric appliances over natural gas appliances all will contribute to a high replacement rate of natural gas appliances with electric at time of burnout. Therefore, it is assumed that approximately 94 percent of the time, natural gas equipment would be replaced with an electric alternative. Calculations for Measure BE-2 also assumed that 38 percent, 39 percent, and 9 percent of residential natural gas usage comes from water heaters, space heating/cooling, and cooking, respectively. Natural gas saved after ordinance implementation was converted to electricity usage (i.e., therms converted to

<sup>13</sup> [https://www.joe.org/joe/2009december/pdf/JOE\\_v47\\_6a6.pdf](https://www.joe.org/joe/2009december/pdf/JOE_v47_6a6.pdf)

<sup>14</sup> Skumatiz Economic Research Associated Inc. N.d. Evaluating the Impacts of Education/Outreach Programs Lessons On Impacts, Methods, and Optimal Education [https://aceee.org/files/proceedings/2000/data/papers/SS00\\_Panel8\\_Paper10.pdf](https://aceee.org/files/proceedings/2000/data/papers/SS00_Panel8_Paper10.pdf). Accessed June 27, 2023

<sup>15</sup> Single-family residential share of the residential units in Hayward was calculated to be 33 percent, based on the 1-unit detached and 1-unit attached totals presented in the DP04 Selected Housing Characteristics Census 2021 American Community Survey Table. [https://data.census.gov/table?g=040XX00US06\\_160XX00US0633000&d=ACS+5-Year+Estimates+Data+Profiles&tid=ACSDP5Y2021.DP04](https://data.census.gov/table?g=040XX00US06_160XX00US0633000&d=ACS+5-Year+Estimates+Data+Profiles&tid=ACSDP5Y2021.DP04). Accessed June 27, 2023

kWh). Since electric appliances are approximately three times more efficient over similar natural gas burning equipment and appliances,<sup>16</sup> the use of electric equipment instead of natural gas would result in improved energy efficiency and a reduction in overall energy consumption for replaced natural gas equipment. A weighted electricity emissions factor assuming implementation of Measure BE-4 was used to calculate GHG emission associated with electricity usage. The calculations and assumptions used to estimate emissions reduction from Measure BE-2 are provided in Table 5.

**Table 5 Measure BE-2 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Residential NG usage after new building electrification ordinance is implemented (therms) <sup>1</sup>	19,082,294	19,082,294
Percentage of homes with replaced water heaters, assuming some non-compliance <sup>2</sup>	29%	94%
NG reduction from water heater replacement (%) <sup>3</sup>	11%	35%
Percentage of homes with replaced HVAC, assuming some non-compliance <sup>4</sup>	17%	83%
NG reduction from HVAC replacement (%) <sup>5</sup>	7%	32%
Percentage of homes with replaced stoves, assuming some non-compliance <sup>6</sup>	31%	94%
NG reduction from stove replacement (%) <sup>7</sup>	3%	8%
<b>Total percent reduction of NG/% of existing buildings electrified (%)</b>	<b>20%</b>	<b>100%</b>
Total NG saved (therms)	3,911,403	19,082,294
Emissions from total NG saved (MT CO <sub>2</sub> e) <sup>8</sup>	20,775	101,355
Electricity usage from converting to electric (kWh) <sup>9</sup>	38,201,496	186,371,042
Weighted residential electricity Emission Factor (MT CO <sub>2</sub> e/kWh) <sup>10</sup>	0.0000028	0
Emissions from converted electricity usage (MT CO <sub>2</sub> e)	105	0
Total Residential Reductions (MT CO <sub>2</sub> e)	20,670	101,355
Percentage of housing units that are single-family residential <sup>11</sup>	67%	67%
<b>Total GHG Emissions Reductions (MT CO<sub>2</sub>e)</b>	<b>13,872</b>	<b>68,020</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; kWh = kilowatt-hour

<sup>1</sup> Assumes implementation of Measure BE-1.

<sup>2</sup> Assumes electrification ordinance implementation year of 2026 and average gas-fire water heat lifespan of 13 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf>. Access June 27, 2023

<sup>3</sup> Assumes 38 percent of natural gas usage comes from water heaters, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf>. Access June 27, 2023.

<sup>4</sup> Assumes electrification ordinance implementation year of 2026 and average HVAC lifespan of 21.5 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf>. Access June 27, 2023

<sup>5</sup> Assumes 39 percent of natural gas usage comes from HVAC, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf>. Access June 27, 2023.

<sup>6</sup> Assumes electrification ordinance implementation year of 2026 and average stovetop lifespan of 12 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf>. Access June 27, 2023

<sup>7</sup> Assumes 6 percent of natural gas usage comes from cooking, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf>. Access June 27, 2023.

<sup>16</sup> Dennis, Keith. 2015. Environmentally Beneficial Electrification: Electricity as the End-Use Option. The Electricity Journal. 28(9). pp. 100-112. <https://doi.org/10.1016/j.tej.2015.09.019>. Accessed June 27, 2023

Calculation Factor	2030	2045
<sup>8</sup> Assumes a NG emission factor of 0.005311 (MT CO <sub>2</sub> e/therm), per EPA’s Emission Factors for Greenhouse Gas Inventories. <a href="https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf">https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf</a> .		
<sup>9</sup> Assumes a conversion factor of 29.3 (kwh/therm) and that electric equipment is three times as efficient as natural gas, per European Copper Institute. 2018. Heat Pumps Integrating technologies to decarbonize heating and cooling. <a href="https://help.leonardo-energy.org/hc/en-us/article_attachments/360010981780/ehpa-white-paper-111018.pdf">https://help.leonardo-energy.org/hc/en-us/article_attachments/360010981780/ehpa-white-paper-111018.pdf</a> . Accessed June 27, 2023		
<sup>10</sup> Electricity Emission Factor is weighted to account for opt-out rates of residential customers and assumes implementation of BE-4.		
<sup>11</sup> Single-family residential share of the residential units in Hayward was calculated to be 67 percent, based on the 1-unit detached and 1-unit attached totals presented in the DP04 Selected Housing Characteristics Census 2021 American Community Survey Table. <a href="https://data.census.gov/table?g=040XX00US06_160XX00US0633000&amp;d=ACS+5-Year+Estimates+Data+Profiles&amp;tid=ACSDP5Y2021.DP04">https://data.census.gov/table?g=040XX00US06_160XX00US0633000&amp;d=ACS+5-Year+Estimates+Data+Profiles&amp;tid=ACSDP5Y2021.DP04</a> . Accessed June 27, 2023		
*Values may not add up due to rounding ( ) denotes negative		

**Table 6 GHG Emissions Reductions Associated with Measure BE-2**

Action ID	Pillars	Action	Emissions Reduction (MT CO <sub>2</sub> e)	
			2030	2045
BE-2.1	Structural Change	Once costs and funding/financing options are identified (BE-2.5), adopt a decarbonization ordinance for existing single-family residential buildings by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure, and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective.	13,872	68,020
BE-2.2	Structural Change	Adopt an ordinance requiring existing single-family homes to be 100% all-electric by 2045.	Supportive	Supportive
BE-2.3	Structural Charge	Adopt a time of retrofit ordinance that requires all buildings with retrofit work who meet a certain threshold, to complete energy efficiency/electrification actions. To be part of reach code to take effect January 2026.	Supportive	Supportive
BE-2.4	Structural Change/Partnership	Work with community stakeholders including realtors and contractors to develop electrification readiness requirements to be completed within 120 days of completion of a home sale. Include a potential waiver process for distressed sales.	Supportive	Supportive
BE-2.5	Feasibility Studies	Develop a single-family residential building electrification feasibility study with a detailed existing building analysis and electrification costs analysis to understand cost implications, identify potential equity concerns/impacts, and develop strategies to electrify existing buildings such that natural gas usage in single-family residential buildings is reduced by 10% by 2030.	Supportive	Supportive
BE-2.6	Partnership	Support BAAQMD’s efforts to require zero-NOx furnaces and water heaters at time of replacement with compliant technologies such as electric heat pumps. Advocate that BAAQMD ensure discounted electric appliances are offered to lower income households and upfront rebates are available.	Supportive	Supportive

Action ID	Pillars	Action	Emissions Reduction (MT CO <sub>2</sub> e)	
			2030	2045
BE-2.7	Partnership/ Education	Partner with BayREN, Ava Community Energy and StopWaste to work with the local contractors, realtors, homeowner associations, and labor unions to develop a comprehensive building code and compliance training program, including hosting workforce development trainings discussing the benefits and technical requirements of electrification.	Supportive	Supportive
BE-2.8	Education	Conduct engagement efforts for the general public and targeted to low-income communities of color during development of the electrification strategy to understand the community's concerns around electrification.	Supportive	Supportive
BE-2.9	Equity	Partner with Hayward Below Market Rate (BMR) housing stock owners (such as Eden Housing) to commit to electrifying all BMR housing by 2045. Establish a plan, financing strategies, and schedule for implementing this action by 2026 <sup>17</sup>	Supportive	Supportive
BE-2.10	Equity	Identify and partner with local community-based organizations with connections to low-income communities of color to assist in development of the electrification strategy	Supportive	Supportive
BE-2.11	Partnership/Funding	Devote staff time to collaborate with PG&E, Ava Community Energy, and other cities in the region to advocate for regulatory changes at the State level (e.g., CARB) to allow neighborhood level electrification and pruning of natural gas to reduce the change of stranded asset, provide potential funding, and establish an efficient transition to carbon neutral buildings.	Supportive	Supportive
BE-2.12	Partnership/Funding	Work with Pacific Gas & Electric (PG&E), and Ava Community Energy (ACE) to conduct a feasibility study assessing the cost and funding strategy for incentivizing all-electric retrofits through on-bill financing.	Supportive	Supportive
BE-2.13	Equity	Review incentives, rebates, and financing options for procedural equity and ensure that existing and updated incentive programs are being equitably distributed to the community. Hurdles to equitable implementation could include credit checks, excessive procedural hurdles and lack of targeted outreach.	Supportive	Supportive
BE-2.14	Partnerships	Partner with a financing/management company such as BlocPower to provide electrification services and financing to the community with prioritization of historically under-invested communities.	Supportive	Supportive

<sup>17</sup> <https://www.hayward-ca.gov/services/city-services/finding-affordable-housing>

## **Measure BE-3 Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.**

### *Background*

In line with Measure BE-2, the City is committed to decarbonizing existing commercial and multi-family buildings through the adoption of building decarbonization requirements requiring electrification building retrofits and electric appliances.

Through Action BE-3.4, the City commits to developing a commercial and multi-family residential building electrification feasibility study, outlining costs, equity concern/impacts, and strategies to reduce natural gas usage and support future adoption of a commercial and multi-family building decarbonization ordinance. Actions BE-3.1 and BE-3.2 commit the City to adopting a decarbonization ordinance by 2026 for commercial and multi-family buildings separately to eliminate expansion of natural gas infrastructure and require decarbonization of appliances, upon replacement for multi-family and commercial building. The 2026 decarbonization ordinances establish mandatory requirements eliminating expansion of natural gas in existing commercial and multi-family buildings. Information regarding systems and appliances targeted in the ordinances and the Ninth Circuit Court of Appeals is described above in the Measure BE-2 background section. Through Action BE-3.3, the City will adopt a commercial energy performance assessment and disclosure ordinance for commercial and multi-family buildings, requiring energy disclosure consistent with State law and the use of ENERGY STAR Portfolio Manager benchmarking tool. The City will work to identify further electrification measures that can be implemented to reach the long-term target of electrifying 100 percent of the buildings in the City, through partnering with electrification experts to provide guidance to commercial building owners (Action BE-3.5) and developing education campaigns to promote commercial electrification, targeting builders, developers, local contractors, and property managers and advertising electric appliance rebates and incentives (Action BE-3.6). The City will also conduct targeted outreach to small business and minority-owned business to understand equity challenges associated with building decarbonization and will partner with BayRen, ACE, and StopWaste to continue to provide rebates and other financing option (Action BE-3.7 and Action BE-3.9). Through Action BE-3.8, the City will conduct a feasibility study to evaluate the current effectiveness of Property Assessed Clean Energy (PACE) financing for installation of renewable energy systems in commercial and industrial properties. If found effective through the study the City should continue to provide this financing option. As outlined above for Measure BE-2, studies show that education and engagement around energy efficiency has historically led to increased implementation of recommended practices and ultimately resulted in energy savings.

### *Methodology and Assumptions*

Calculations used for Measure BE-2 were similarly used to quantify the GHG emission reductions associated with implementation of Measure BE-3. Based on 2021 U.S. Census American Community Survey estimates for Hayward, approximately 33 percent of housing units in the City are considered to be multi-family units. Emissions reduction calculations were developed for multi-family

residential buildings in alignment with this percentage.<sup>18</sup> The calculations and assumptions used to estimate emissions reduction from Measure BE-3 are provided in Table 7.

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<sup>18</sup> Multi-family residential share of the residential units in Hayward was calculated to be 33 percent, based on the 2-unit or greater totals presented in the DP04 Selected Housing Characteristics Census 2021 American Community Survey Table.  
[https://data.census.gov/table?g=040XX00US06\\_160XX00US0633000&d=ACS+5-Year+Estimates+Data+Profiles&tid=ACSDP5Y2021.DP04](https://data.census.gov/table?g=040XX00US06_160XX00US0633000&d=ACS+5-Year+Estimates+Data+Profiles&tid=ACSDP5Y2021.DP04) .  
Accessed June 27, 2023

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**Table 7 Measure BE-3 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
<b>Multi-Family Residential</b>		
Residential NG usage after new building electrification ordinance is implemented (therms) <sup>1</sup>	19,082,294	19,082,294
Percentage of homes with replaced water heaters, assuming some non-compliance <sup>2</sup>	29%	94%
NG reduction from water heater replacement (%) <sup>3</sup>	11%	35%
Percentage of homes with replaced HVAC, assuming some non-compliance <sup>4</sup>	17%	83%
NG reduction from HVAC replacement (%) <sup>5</sup>	7%	32%
Percentage of homes with replaced stoves, assuming some non-compliance <sup>6</sup>	31%	94%
NG reduction from stove replacement (%) <sup>7</sup>	3%	8%
<b>Total percent reduction of NG/% of existing buildings electrified (%)</b>	<b>20%</b>	<b>100%</b>
Total NG saved (therms)	3,911,403	19,082,294
Emissions from total NG saved (MT CO <sub>2</sub> e) <sup>8</sup>	20,775	101,355
Electricity usage from converting to electric (kWh) <sup>9</sup>	38,201,496	186,371,042
Weighted residential electricity Emission Factor (MT CO <sub>2</sub> e/kWh) <sup>10</sup>	0.0000028	0
Emissions from converted electricity usage (MT CO <sub>2</sub> e)	105	0
Total Residential Reductions (MT CO <sub>2</sub> e)	20,666	101,337
Percentage of housing units that are multi-family residential <sup>11</sup>	33%	33%
<b>Total Multi-Family Residential Reductions (MT CO<sub>2</sub>e)</b>	<b>6,794</b>	<b>33,317</b>
<b>Commercial</b>		
Commercial NG usage after new building electrification ordinance is implemented (therms) <sup>1</sup>	15,230,798	15,230,798
Percentage of buildings with replaced water heaters, assuming some non-compliance <sup>12</sup>	38%	94%
NG reduction from water heater replacement (%) <sup>13</sup>	10%	26%
Percentage of commercial buildings with replaced HVAC, assuming some non-compliance <sup>14</sup>	16%	78%
NG reduction from HVAC replacement (%) <sup>15</sup>	7%	32%
<b>Total percent reduction of NG (%)</b>	<b>17%</b>	<b>100%</b>
Total NG saved (therms)	2,628,232	15,230,798
Emissions from total NG saved (MT CO <sub>2</sub> e) <sup>8</sup>	13,960	80,898
Electricity usage from converting to electric (kWh) <sup>9</sup>	25,669,157	148,754,636
Weighted commercial electricity EF (MT CO <sub>2</sub> e/kWh) <sup>10</sup>	0.0000033	0
Emissions from converted electricity usage (MT CO <sub>2</sub> e)	85	0
Total Commercial Reductions (MT CO <sub>2</sub> e)	13,872	80,883
<b>Total GHG Emissions Reductions (MT CO<sub>2</sub>e)</b>	<b>20,667</b>	<b>114,200</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; kWh = kilowatt-hour

<sup>1</sup> Assumes implementation of Measure BE-1.

<sup>2</sup> Assumes electrification ordinance implementation year of 2026 and average gas-fire water heat lifespan of 13 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf>. Access June 27, 2023

Calculation Factor	2030	2045
3.		
Assumes 38 percent of natural gas usage comes from water heaters, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <a href="https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf">https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf</a> . Access June 27, 2023.		
4.		
Assumes electrification ordinance implementation year of 2026 and average HVAC lifespan of 21.5 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <a href="https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf">https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf</a> . Access June 27, 2023		
5.		
Assumes 39 percent of natural gas usage comes from HVAC, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <a href="https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf">https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf</a> . Access June 27, 2023.		
6.		
Assumes electrification ordinance implementation year of 2026 and average stovetop lifespan of 12 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <a href="https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf">https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf</a> . Access June 27, 2023		
7.		
Assumes 6 percent of natural gas usage comes from cooking, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <a href="https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf">https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf</a> . Access June 27, 2023.		
8.		
Assumes a NG emission factor of 0.005311 (MT CO <sub>2</sub> e/therm), per EPA’s Emission Factors for Greenhouse Gas Inventories. <a href="https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf">https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf</a> .		
9.		
Assumes a conversion factor of 29.3 (kwh/therm) and that electric equipment is three times as efficient as natural gas, per European Copper Institute. 2018. Heat Pumps Integrating technologies to decarbonize heating and cooling. <a href="https://help.leonardo-energy.org/hc/en-us/article_attachments/360010981780/ehpa-white-paper-111018.pdf">https://help.leonardo-energy.org/hc/en-us/article_attachments/360010981780/ehpa-white-paper-111018.pdf</a> . Accessed June 27, 2023		
10.		
Electricity Emission Factor is weighted to account for the specific opt-out rates of residential and non-residential customers and assumes implementation of BE-4.		
11.		
Single-family residential share of the residential units in Hayward was calculated to be 67 percent, based on the 1-unit detached and 1-unit attached totals presented in the DP04 Selected Housing Characteristics Census 2021 American Community Survey Table. <a href="https://data.census.gov/table?g=040XX00US06_160XX00US0633000&amp;d=ACS+5-Year+Estimates+Data+Profiles&amp;tid=ACSDP5Y2021.DP04">https://data.census.gov/table?g=040XX00US06_160XX00US0633000&amp;d=ACS+5-Year+Estimates+Data+Profiles&amp;tid=ACSDP5Y2021.DP04</a> . Accessed June 27, 2023		
12.		
Assumes electrification ordinance implementation year of 2026 and average gas-fire water heat lifespan of 10 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <a href="https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf">https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf</a> . Access June 27, 2023		
13.		
Assumes 28 percent of natural gas usage comes from water heaters, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <a href="https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf">https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf</a> . Access June 27, 2023.		
14.		
Assumes electrification ordinance implementation year of 2026 and average HVAC lifespan of 23 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <a href="https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf">https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf</a> . Access June 27, 2023		
15.		
Assumes 42 percent of natural gas usage comes from HVAC, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <a href="https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf">https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf</a> . Access June 27, 2023.		
*Values may not add up due to rounding ( ) denotes negative		

**Table 8 GHG Emissions Reduction Associated with Measure BE-3**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
BE-3.1	Structural Change	Based on the results of the feasibility studies (BE- 3.4) adopt a decarbonization ordinance for <b>existing commercial buildings</b> by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective. As part of this ordinance include the following steps: <ol style="list-style-type: none"> <li>1. Develop the ordinance such that it satisfies the federal Energy Policy and Conservation Act (EPCA's) seven criteria for an exemption from preemption.</li> <li>2. Establishes zero-NOx standards for replacement appliances.</li> <li>3. Establishes a building performance standard for commercial buildings over 100,000 square feet. Identify and adopt a GHG per square foot benchmark to be lowered over time. Compliance would be measured through the Commercial Energy Performance Assessment and Disclosure Program.</li> <li>4. Enforces ordinance compliance through the same permitting compliance program as for residential building electrification.</li> </ol>	20,667	114,200
BE-3.2	Structural Change	Based on the results of the feasibility studies (BE- 3.4) adopt a decarbonization ordinance for <b>existing multi-family buildings</b> by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective. As part of this ordinance include the following steps: <ol style="list-style-type: none"> <li>1. Develop the ordinance such that it satisfies the federal Energy Policy and Conservation Act (EPCA's) seven criteria for an exemption from preemption.</li> <li>2. Establish a zero-NOx standard for furnaces and water heaters through a building code amendment.</li> <li>3. Establish a time of renovation energy efficiency performance requirement and electrification requirement that includes a checklist of cost-effective efficiency and electrification options for renovations to be completed based on scale of project.</li> <li>4. Enforces ordinance compliance through the same permitting compliance program as for residential building electrification.</li> </ol>	Supportive	Supportive
BE-3.3	Structural Change	Adopt a Commercial Energy Performance Assessment and Disclosure Ordinance for commercial and multi-family buildings, which requires energy use disclosure consistent with State law (AB 1103) and the use of the ENERGY STAR Portfolio Manager benchmarking tool.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
BE-3.4	Feasibility Studies	Conduct feasibility studies to identify commercial and multi-family building decarbonization barriers and develop a commercial and multi-family building decarbonization strategy with analysis supporting future adoption of a commercial and multi-family building decarbonization ordinance.	Supportive	Supportive
BE-3.5	Education/ Partnership	Partner with an electrification/efficiency expert to provide guidance to commercial buildings covered by the building performance standard.	Supportive	Supportive
BE-3.6	Education	<p>Develop an education campaign to promote commercial electrification and include items in the program such as:</p> <ul style="list-style-type: none"> <li>▪ Continue to engage with local business and business organizations (e.g., Chamber of Commerce, the Alameda County Green Business Program) to inform and facilitate electrification for commercial business owners.</li> <li>▪ Continue to promote the use of the Energy Star Portfolio Manager program and energy benchmarking training programs for nonresidential building owners.</li> <li>▪ Advertise via utility bill inserts the incentive programs or grants available and the cost benefits of electric appliances.</li> <li>▪ Targeted outreach to builders, developers, local contractors, and property managers with an informational brochure describing the financial benefits of replacing natural gas appliances with all electric appliances when they apply for permits.</li> <li>▪ Provide informational webinars and an updated website to advertise and promote All-Electric Building Initiative rebates and incentives.</li> </ul>	Supportive	Supportive
BE-3.7	Equity	Conduct outreach to small businesses and minority-owned businesses to understand potential equity impacts of a decarbonization policy as part of the existing building decarbonization study.	Supportive	Supportive
BE-3.8	Funding	Conduct feasibility study to evaluate the current uptake and effectiveness of Property Assessed Clean Energy (PACE) financing for installation of renewable energy systems in commercial and industrial properties. If feasibility study indicates effectiveness, continue to offer PACE financing for commercial and industrial properties to install renewable energy systems.	Supportive	Supportive
BE-3.9	Partnerships	Continue to work with Bay Area Regional Energy Network (BayREN), ACE, and StopWaste to continue to improve and implement commercial electrification rebates and financing opportunities and other offered incentives.	Supportive	Supportive

## Measure BE-4: Support Ava Community Energy in providing 100% carbon-free electricity by 2030

### Background

Electricity in the City is currently supplied by Ava Community Energy (ACE) and Pacific Gas & Electric (PG&E). PG&E provides a power mix with 39 percent renewable resources, and 89 percent GHG free overall (including nuclear and large hydro).<sup>19</sup> While the portion of renewables in PG&E's grid mix is relatively high compared to other utility providers in the state, the emission factor associated with its electricity is not expected to decrease to zero until the state-mandated year of 2045, due to SB 100. In order to reduce GHG emissions in the short-term, the City will provide 100 percent carbon free electricity to the community through ACE, City's Community Choice Aggregation (CCA) energy provider by 2030. In general, CCAs use the purchasing power of the community to procure electricity directly from electricity generators. This allows the community to choose its own grid mix, with an option to procure electricity from 100 percent carbon free renewable generation sources. PG&E will continue to deliver power, maintain lines and infrastructure, and coordinate billing. ACE currently provides two power mix options<sup>20</sup> for residents to choose from:

- **Bright Choice:** Base option with 42.3% eligible renewable energy, with prices five percent below PG&E rates
- **Renewable 100:** 100% eligible renewable option. Price is 1/4 cent per kilowatt hour above PG&E rates.

To maximize the GHG reduction opportunity this presents, the City will continue to automatically enroll all community accounts in Renewable 100 (Action BE-4.1), as many cities in California have already done today.<sup>21</sup> The Hayward City Council voted to set the default electricity option for City residents, except low-income residents, and businesss to ACE's Renewable 100 service, starting in January 2022.<sup>22</sup> Although, ACE is planning on Bright Choice being 100 percent carbon free by 2030. Customers have the option to opt-out of the CCA back to PG&E or opt-down to another grid mix option. Currently, about 5 percent of Hayward residential customers and 6 percent of commercial customers currently choose to opt-out of the ACE programs.<sup>23</sup> Action BE-4.2 will focus on conducting outreach and educating citizens about the benefits of opting in to ACE electricity. Purchasing 100 percent carbon free electricity through ACE is one of the most cost-effective actions the City can take to meaningfully reduce GHG emissions within the City. The cost of opting up into carbon free electricity with ACE is five percent below the PG&E rate and 100 percent renewable rates with both PG&E and ACE are only a few dollars a month extra for most residential rate schedules.<sup>24</sup> However, even a small increase on monthly bills can make a big difference for the most vulnerable populations. Both PG&E and ACE provides a CARE rate schedule for low-income households. Action BE-4.3 commits the City to ensuring no cost increase to CARE/FERA customers, potentially through subsidization cost to CARE/FERA customers to be funded by a rate increase for non-discounted customers. Action BE-4.4 requires the City to work with ACE to conduct a feasibility study to

<sup>19</sup> PG&E. 2021. Power Mix. [https://www.pge.com/en\\_US/about-pge/environment/what-we-are-doing/clean-energy-solutions/clean-energy-solutions.page?WT.mc\\_id=Vanity\\_cleanenergy](https://www.pge.com/en_US/about-pge/environment/what-we-are-doing/clean-energy-solutions/clean-energy-solutions.page?WT.mc_id=Vanity_cleanenergy). Accessed June 27 2023.

<sup>20</sup> EBCE. 2023. Compare Your Options. <https://ebce.org/compare-plans-residential/>. Accessed June 27, 2023.

<sup>21</sup> UCLA Luskin Center for Innovation. 2019. <https://innovation.luskin.ucla.edu/2019/09/04/50-cities-are-quietly-leading-the-nations-100-clean-energy-wave/>. Accessed June 27, 2023

<sup>22</sup> EBCE. Hayward is Going Green with 100% Renewable Energy. <https://ebce.org/hayward/>. Accessed July 19, 2023

<sup>23</sup> Opt-out rates were calculated based on electricity data included in the 2019 Hayward Community Inventory.

<sup>24</sup> PG&E – EBCE Join Rate Comparisons. 2023. [https://www.pge.com/pge\\_global/common/pdfs/customer-service/other-services/alternative-energy-providers/community-choice-aggregation/ebce\\_rateclasscomparison.pdf](https://www.pge.com/pge_global/common/pdfs/customer-service/other-services/alternative-energy-providers/community-choice-aggregation/ebce_rateclasscomparison.pdf). Accessed June 27, 2023

understand reason for opt outs and to track changes in rates, which can in-turn allow for more targeted efforts to reduce opt-out rates over time.

*Methodology and Assumptions*

The GHG reduction quantification below is based on the forecasted electricity consumption under the adjusted forecast as well as the forecasted electricity emission factor in each year. Additional electricity load expected from Measure BE-1, BE-2, and BE-3 is not included here due to reductions for Measure BE-4 being accounted for in each measure’s respective quantification. It is assumed in all other electrification measures that the City completes this measure by 2030. GHG emissions reduction were calculated by multiplying all electricity obtained from ACE by an emission factor of zero compared with the current emission factor. As such, the emissions remaining from electricity use would be from the customers that opted out of ACE back to PG&E. The electricity purchased from PG&E was calculated by applying the current ACE opt-out rates for residential and commercial of 5 and 6 percent, respectively, to the total residential and commercial electricity forecasted in 2030 and 2045. In the quantification of this measure, these baseline opt-out rates were assumed to remain the same through 2045. The forecasted PG&E electricity quantity was then multiplied by the forecasted PG&E emission factor in the corresponding year. The measure residential and commercial weighted emission factors were calculated per the equation below:

$$Measure\ Weighted\ EF = EBCE\ EF * (1 - EBCE\ Opt - Out\ Rate) + PG\&E\ EF * EBCE\ Opt - Out\ Rate$$

The ACE Emission Factor in the equation above is assumed to be zero by 2030.

**Table 9 Measure BE-4 GHG Emissions Reduction Calculations**

<b>Year</b>	<b>2030</b>	<b>2045</b>
<b>Residential</b>		
Forecasted Electricity Purchased Residential (kWh) <sup>1</sup>	234,194,499	239,471,069
Forecasted Residential Emission Factor (MT CO2e/kWh) <sup>2</sup>	0.00002	0
Forecasted Emissions (MT CO2e)	3,586	0
PG&E Opt out Electricity (kWh)	11,709,725	11,973,553
ACE Electricity (kWh)	222,484,774	227,497,516
Electricity Emissions with Measure Implementation (MT CO2e)	646	0
Measure Weighted Residential Emission Factor (MT CO2e/kWh) <sup>3</sup>	0.0000028	0
Emissions Reduced with Measure Implementation (MT CO2e)	2,940	0
<b>Commercial</b>		
Forecasted Electricity Purchased Commercial (kWh) <sup>1</sup>	508,611,741	516,310,524
Forecasted Commercial Emission Factor (MT CO2e/kWh) <sup>2</sup>	0.000007	0
Forecasted Emissions (MT CO2e)	3,548	0
PG&E Opt out Electricity (kWh)	30,516,704	30,978,631
ACE Electricity (kWh)	478,095,036	485,331,892
Electricity Emissions with Measure Implementation (MT CO2e)	1,685	0
Measure Weighted Residential Emission Factor (MT CO2e/kWh) <sup>4</sup>	0.0000033	0
Emissions Reduced with Measure Implementation (MT CO2e)	1,863	0
<b>Total Reductions (MT CO2e)</b>	<b>4,802</b>	<b>0</b>
Notes: MT CO2e = metric tons of carbon dioxide; kWh =kilowatt-hour		

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- <sup>1</sup> Legislative Adjusted Forecast. See Appendix B of the CAP. Additional electricity load expected from Measure BE-1, BE-2, and BE-3 is not included here due to CCA reductions for the added electricity being accounted for in each measure's respective quantification.
  - <sup>2</sup> The Forecasted Residential and Commercial Emission Factors are based on the weighted average residential emission factors for PG&E and ACE residential accounts.
  - <sup>3</sup> The Measure Residential Emission Factor assumes a baseline residential ACE opt-out rate of 5%, that the ACE emission factor is zero by 2030, and applies the PG&E forecasted emission factor for the 5% opt-out.
  - <sup>4</sup> The Measure Commercial Emission Factor assumes use a baseline commercial ACE out-out rate of 6%, that the ACE emission factor is zero by 2030, and applies the PG&E forecasted emission for the 6% opt-out.
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**Table 10 GHG Emissions Reduction Associated with Measure BE-4**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
BE-4.1	Structural Change	Adopt a resolution establishing a policy that if Ava Community Energy does not meet the 2030 goal of its entire portfolio being 100% carbon-free, all Hayward customers will be enrolled in Renewable 100 by 2030. Resolution should include identification of funding or subsidies to ensure no cost increase to CARE/FERA customers. This may include subsidization cost to CARE/FERA customers to be funded by a rate increase for non-discounted customers.	4,802	0
BE-4.2	Education	Engage with community (residential and non-residential) to advertise/highlight Ava Community Energy’s plan to provide 100% carbon-free electricity by 2030. Provide information on the importance of this goal and the impact of buying electricity from Ava Community Energy .	Supportive	Supportive
BE-4.3	Equity	In collaboration with Ava Community Energy , implement a pilot program to provide Hayward’s affordable housing units Ava Community Energy’s Renewable 100 service. Identify funding options with Ava Community Energy such as subsidies funded by non-discounted customers or grant funding.	Supportive	Supportive
BE-4.4	Feasibility Studies	Work with Ava Community Energy to conduct an annual analysis of opt-out rates in the City of Hayward to understand why residents and businesses opt out of Ava Community Energy or opt-down to Bright Choice over Renewable 100.	Supportive	Supportive

**Measure BE-5 Continue to promote energy efficiency improvement, in alignment with the 2014 Climate Action Plan**

*Background*

Reducing both electricity and natural gas use is a fundamental strategy for the City to encourage and support as the electrical grid becomes increasingly cleaner and ultimately carbon-free. Measure BE-5 aims to reduce GHG emissions by increasing energy efficiency in homes and businesses by reducing electricity and natural gas use. Measure BE-5’s energy efficiency actions build on successful actions included in the existing Hayward Climate Action Plan (2014), with a focus on promoting energy efficient design, construction, maintenance, and operation of facilities and infrastructure (Action BE-5.1), collaborating with utility providers and regional entities to promote incentive programs for energy efficient retrofits, appliances, and equipment (Action BE-5.2 and Action BE-5.3), and prioritizing funding for low-income homeowners, landlords, and renters (Action BE-5.5). The City will also continue to support non-residential building owners by promoting the use of the Energy Star Portfolio management program and energy benchmarking training programs (Action BE-5.4).

Measures BE-1, BE-2, and BE-3 promote energy efficiency through electrification. Furthermore, all-electric versions of equipment contribute to on-bill energy savings, since electric heat-pumps used for water and space heating have up to 400 percent efficiency improvement compared with natural

gas powered appliances.<sup>25</sup> This reduction in energy bill burden can help low-income households maintain equitable access energy when energy needs for space heating and cooling are high.

### *Methodology and Assumptions*

GHG reductions for Measure BE-5 are not quantified for the years 2030 and 2045 in this analysis to minimize double counting associated with GHG emissions reductions from other the building energy measures in the CAP.

**Table 11 GHG Emission Reductions Associated with Measure BE-5**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
BE-5.1	Structural Change	Continue to promote the efficient use of energy in the design, construction, maintenance, and operation of public and private facilities, infrastructure, and equipment.	Supportive	Supportive
BE-5.2	Partnership/Education	Continue to collaborate with partner agencies, utility providers, and the business community to support a range of energy efficiency, conservation, and waste reduction measures, including the development of green buildings and infrastructure, weatherization programs, installation of energy-efficient appliances and equipment in homes and offices, promotion of energy efficiency retrofit programs, use of green power options, and heightened awareness of the benefits of energy efficiency and conservation issues.	Supportive	Supportive
BE-5.3	Partnership/Funding	Continue to collaborate with regional entities and others to promote incentive programs for energy efficiency retrofits such as the Energy Upgrade California program for residential properties.	Supportive	Supportive
BE-5.4	Structural Change	Continue to promote the use of the Energy Star Portfolio Manager program and energy benchmarking training programs for nonresidential building owners.	Supportive	Supportive
BE-5.5	Equity/Funding	Obtain and prioritize funding for the weatherization program specifically for low, very low, and low-income homeowners, landlords, and renters, to make energy efficiency improvement and improve health and safety of residences.	Supportive	Supportive

<sup>25</sup> Dennis, Keith. 2015. Environmentally Beneficial Electrification: Electricity as the End-Use Option. *The Electricity Journal*. 28(9). pp. 100-112. <https://doi.org/10.1016/j.tej.2015.09.019>. Accessed June 27, 2023

**Measure BE-6 Generate carbon-neutral electricity on City facilities meeting 80% of the municipal operational electricity needs by 2030.**

*Background*

Measure BE-6 commits the City to generating carbon-neutral electricity meeting 80 percent of the City’s electricity needs by 2030. The City has already made progress towards reaching this goal by completing a citywide study to estimate the total potential for renewable energy generation on City facilities including estimated cost and benefits. Actions BE-6.5 and BE-6.6 build upon these efforts to develop an Energy Assurance Plan, outlining locations for installation of local renewable energy generation, energy storage projects and locations for development of a micro-grid and scheduling the implementation of prioritized projects, considering potential funding sources and partnerships needed for successful implementation. The Energy Assurance Plan will also identify which City facilities can serve as cooling centers for disadvantaged communities (Action BE-6.4). Additionally, Actions BE-6.1, BE-6.3, BE-6.9, and BE-6.11 serve to increase battery storage and energy resilience of critical City facilities and operations. These actions will increase community resilience to power outages during extreme weather events, improving the City’s ability to adapt to future impacts of climate change. Actions BE-6.2 and BE-6.7 outline partnership opportunities with the Urban Sustainability Directors Network, California Resilience Partnership (CRP), PG&E, ACE, and the Water Pollution Control facility to identify locations for resilience hubs, ensure smooth integration of renewable energy systems, and expand methane recovery, respectively. Action BE-6.8 seeks to provide incentives to community members and businesses to install solar and battery storage options. Through Action BE-6.12, the City will prepare a plan to facilitate the transition of natural gas appliances to electric in City facilities.

*Methodology and Assumptions*

GHG reductions for Measure BE-6 are not quantified for the years 2030 and 2045 in this analysis as this reduction is a subset of the community emissions (municipal electricity use is included in the overall community electricity use) and was not quantified to avoid double counting.

**Table 12 GHG Emission Reductions Associated with Measure BE-6**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
BE-6.1	Structural Change	Obtain battery storage in City buildings and critical facilities, including community-based resilience hubs, identified to need power during emergencies or power outages.	Supportive	Supportive
BE-6.2	Partnership/ Feasibility Study	Develop partnerships with organizations, such as the Urban Sustainability Directors Network (USDN) or California Resilience Partnership (CRP), to conduct a feasibility study to identify locations for community resilience hubs within the City, identify grant opportunities, and to develop a plan to implement a resilience hub.	Supportive	Supportive
BE-6.3	Structural Change	Conduct analysis on risks and benefits associated with relying on battery storage to achieve carbon neutral electricity and grid resiliency goals in the City and set a MW capacity goal for installed battery storage by 2030 and 2045.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
BE-6.4	Equity	Formally include City facilities that serve as cooling centers to disadvantaged communities in the Energy Assurance Plan (Community Safety program 13) and develop and implement energy resiliency strategies like on-site renewable energy generation or energy storage to ensure center remains active even in power shortages.	Supportive	Supportive
BE-6.5	Feasibility Study	As part of Energy Assurance Plan (Community Safety program 13), include identifications of locations or complexes (i.e., City facilities, college campuses, critical facilities) in the City for installation of local renewable energy generation, energy storage projects, and/or ideal locations for development of a micro-grid as evaluated in Ava Community Energy feasibility study.	Supportive	Supportive
BE-6.6	Feasibility Study	Develop the plan and schedule for implementation of the prioritized solar projects identified. The plan should include an identification of barriers and needs for implementation of the prioritized projects as well as identify funding sources and partnerships needed for successful implementation.	Supportive	Supportive
BE-6.7	Partnership	Partner with PG&E and/or Ava Community Energy to ensure smooth integration of renewable energy systems from the identified prioritized projects or other individual solar projects into the grid.	Supportive	Supportive
BE-6.8	Funding/Education	Identify and advertise incentives available for the community members for installing solar on homes such as Net Metering Programs through PG&E for bill credits, or the Disadvantaged Communities-single-family Solar Homes (DAC_SASH) program. Identify incentives available for businesses and homeowners to install energy storage systems, such as Self Generation Incentive Program (SGIP) and Equity Resiliency rebates that provides an upfront rebate for battery storage and/or the federal investment tax credit for solar batteries installed. Provide resource information to the community through websites, workshops, and partnerships.	Supportive	Supportive
BE-6.9	Funding /Equity	Partner with affordable housing providers to conduct a feasibility analysis of battery storage and solar projects at the affordable housing in Hayward that are eligible for Equity Resilience Incentives under the SGIP Program.	Supportive	Supportive
BE-6.10	Funding/Partnership	Determine opportunities for the Water Pollution Control Facility to expand of methane recovery systems and digester gas combustion systems at the facility, consistent with General Plan policy PFS-4.12.	Supportive	Supportive
BE-6.11	Education	Provide educational materials and workshops to large commercial developers and large business property owners of the benefits of microgrids and energy resiliency. Provide resources to identify opportunities for solar installations and/or battery storage on site.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
BE-6.12	Feasibility Study	Prepare a plan to facilitate the transition of natural gas appliances to electric in City Facilities. Plan should include an inventory of appliances available for replacement, identify cost where possible, and establish a timeline for replacement.	Supportive	Supportive

## 2.2 Transportation

### **Measure T-1 Increase active transportation mode share to 15% by 2030 and to 20% by 2045.**

#### *Background*

Reducing transportation emissions and becoming a carbon neutral City means reducing the number of miles driven by fossil fuel-powered vehicles, particularly passenger vehicles. According to Hayward’s 2019 GHG Inventory, transportation emissions accounted for 61 percent of total emissions in the City. The City will prioritize reducing vehicles miles travelled (VMT) first, by improving active and public transportation mode share. Reducing VTM through an increase in active transportation mode share carries innumerable benefits outside of GHG emissions reductions, including reduced congestion, reduced space needed for roadways and parking, local economic revitalization, and lifestyle improvements.<sup>26</sup>

As of 2019, bicycle and pedestrian mode share in the City is low – 0.4 percent and 1.5 percent, respectively.<sup>27</sup> Studies show that investments in active transportation infrastructure in other cities have demonstrated improvements in active transportation mode shifts and GHG emissions reduction.<sup>28</sup> Recently, the City adopted the 2020 Bicycle and Pedestrian Master Plan, which details the City’s plan to establish a network of accessible, safe and integrated bicycle and pedestrian facilities.<sup>29</sup> The new plan recommends 153 miles of new bicycles facilities, including 32 miles of multi-use paths for both pedestrians and cyclists. Action T-1.5 commits the City to continuing the implementation of the Bicycle and Pedestrian Master Plan. Several other actions under Measure T-1 commit the City to continuing structural changes to further investments in active transportation mode shifts, including Action T-1.3, which seeks to implement complete streets improvements such as retrofits, design standards, and green infrastructure that would accommodate walking, biking, transit use and carpooling. Other actions to promote mode shift include continuing to identify streets for permanent through traffic closure (Action T-1.8) and removing parking and/or additional traffic lanes to priority outdoor seating (Action T-1.9). In Action T-1.2, the City commits to update the General Plan to facilitate complete and walkable neighborhoods, maximize infill development, support the regional Sustainable Communities Strategy, and promote a job-housing match. Through Action T-1.6, the City will evaluate and update the relevant codes and plans to encourage active

<sup>26</sup> Richard Campbell and Margaret Wittgens. March 2004. The Business Case for Active Transportation. [http://thirdwavecycling.com/pdfs/at\\_business\\_case.pdf](http://thirdwavecycling.com/pdfs/at_business_case.pdf). Accessed June 27, 2023

<sup>27</sup> U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023

<sup>28</sup> Andrew Glazener and Haneen Khreis. January 2019. Transforming our Cities: Best Practices Towards Clean Air and Active Transportation. <https://link.springer.com/article/10.1007/s40572-019-0228-1>. Accessed June 27, 2023

<sup>29</sup> City of Hayward. 2020. Bike and Pedestrian Master Plan Update. <https://www.hayward-ca.gov/content/bike-and-pedestrian-master-plan-update>. Accessed June 27, 2023.

transportation. The City will also conduct an underused rights-of-way study to understand community perspectives on potential barriers to conversions and identify solutions (Action T-1.7). Action T-1.1 seeks to amend the Off-Street Parking Regulation of the Municipal Code to incorporate smart growth principles and to incentivize walking, biking, and public transit. Other actions focused on partnerships, education, equity, and engagement, including Actions T-1.10, T-1.11, T-1.13, T-1.12, and T-1.14, identify partners to collaborate with to obtain funding, expand rebates, and promote incentives to promote active transportation and disseminate information regarding the environmental and health benefits of walking and bicycling. Additionally, Action T-1.4 commits the City to adopting a micro-mobility policy in the City. Studies suggest that micro-mobility programs, like e-bike share, can reduce VMT and associated GHG emissions. For example, a 2019 report from the City of Santa Monica found that 49 percent of shared mobility trips replaced trips that would have otherwise been made by car, either driving alone or ride-hailing. Findings were based on answers to survey questions asking participants how shared electric scooters and bikes helped them get around the City.<sup>30</sup> Actions T-1.15 and Action T-1.16 commit the City to devoting staff time to identify solutions, tracking and apply for funding, and eliminate barriers.

### *Methodology and Assumptions*

GHG reductions are determined by quantifying the effect the active transportation interventions have on shifting trips from single occupancy vehicles (SOV) to walking and biking. Reduction calculations are based on increasing bike mode shares by 13 percent and 18 percent for 2030 and 2045, respectively, and maintaining a walking mode share of 1.5 percent for both 2030 and 2045. Current bicycle mode share (0.4 percent) and walking mode share (1.5 percent) were estimated based on statistics in the U.S. Census Bureau American Community Survey (2019) for Hayward.<sup>31</sup> The CARB EMFAC2021 model is used to determine the GHG emissions reduced as a result of reduced SOV VMT. Total passenger VMT was converted into average car trips using an average trip length for Alameda County obtained from EMFAC2021. This number of vehicle trips was then multiplied by the target percent increase in bike mode share to determine the number of vehicle trips that would be replaced by bike mode share with Measure implementation. The number of bike trips was converted to VMT replaced based on a study by CARB finding that on average bike trips are 1.5 miles.<sup>32</sup> The replaced VMT was multiplied by the emission factors for passenger vehicles from CARB's EMFAC2021 model. The calculations and assumptions used to estimate GHG emission reductions from Measure T-1 are provided in Table 13.

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<sup>30</sup> City of Santa Monica. November 2019. Shared Mobility Pilot Program Summary Report. [https://www.smgov.net/uploadedFiles/Departments/PCD/Transportation/SantaMonicaSharedMobilityEvaluation\\_Final\\_110419.pdf](https://www.smgov.net/uploadedFiles/Departments/PCD/Transportation/SantaMonicaSharedMobilityEvaluation_Final_110419.pdf). Accessed June 27, 2023

<sup>31</sup> U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023

<sup>32</sup> CARB. 2019. Quantifying Reductions in Vehicle Miles Traveled from new Bike Paths, Lanes , and Cycle Tracks Summary Report. [https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle%20facilities\\_summary\\_032519.pdf](https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle%20facilities_summary_032519.pdf). Accessed July 20, 2023

**Table 13 Measure T-1 GHG Emission Reduction Calculations**

Calculation Factor	2030	2045
Bike mode share increase from baseline <sup>1</sup>	13%	18%
Walk mode share increase from baseline <sup>2</sup>	0%	0%
Passenger VMT <sup>3</sup>	951,249,744	1,022,153,281
Passenger trips <sup>4</sup>	118,915,731	128,286,370
New bike trips substituted for vehicle trips	15,577,961	23,219,833
New walk trips substituted for vehicle trips	0	0
Passenger VMT reduced with bike trips (Miles) <sup>5</sup>	23,366,941	34,829,749
Passenger VMT reduced with walk trips (Miles) <sup>6</sup>	0	0
Total VMT reduced with bike and walk trips (miles)	23,366,941	34,829,749
Passenger Emissions Factor from EMFAC2021 (MT CO <sub>2</sub> e/VMT) <sup>7</sup>	0.000278	0.000251
<b>Total GHG Emissions Reductions (MT CO<sub>2</sub>e)</b>	<b>6,485</b>	<b>8,755</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; VMT = vehicle miles traveled

1. Assumes a bicycles mode share target of 14% by 2030 and 19% by 2045 as well as an existing bicycle mode share of 0.4%, per U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023
2. Assumes a walk mode share target of 2% by 2030 and maintain through 2045 as well as an existing walk mode share of 1.5%, per U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023
3. Legislative Adjusted Emissions Forecast. See Appendix B of the CAP.
4. Passenger trips are calculated using trips per mile traveled in a combustion vehicle, as obtained from CARB’s vehicle emission factor database, EMFAC2021 times forecasted passenger VMT.
5. Assumes an average bike trip length of 1.5 miles, per CARB. 2019. Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks. [https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle\\_facilities\\_technical\\_041519.pdf](https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle_facilities_technical_041519.pdf). Accessed June 27, 2023
6. Assumes an average walk trip length of 0.3 miles, per CARB. 2019. Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks. [https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle\\_facilities\\_technical\\_041519.pdf](https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle_facilities_technical_041519.pdf). Accessed June 27, 2023
7. Passenger Emissions Factor calculated from data from CARB’s vehicle emission factor database, EMFAC2021.

\*Values may not add up due to rounding

**Table 14 GHG Emission Reductions Associated with Measure T-1**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-1.1	Structural Change	<p>Amend the Off-Street Parking Regulation of Municipal Code to incorporate smart growth principles and to incentivize walking, biking, and public transit.</p> <ol style="list-style-type: none"> <li>1. Creating a single “blended” parking requirement for commercial uses to facilitate future changes of use (i.e., changing a retail store to a restaurant). Providing requirements or incentives for bicycle parking.</li> <li>2. Allowing on-street parking along the property’s frontage to count towards satisfying a portion of the property’s off-street parking requirements.</li> <li>3. Creating parking preferences or incentives for residents who rideshare or use low- or zero-emissions vehicles.</li> <li>4. Allowing property owners to develop and implement parking demand management plans that consider ways to reduce the need for off-street parking by using shared parking arrangements, valet parking services, paid parking, and other appropriate techniques.</li> <li>5. Establish design standards or retrofit standards from the Complete Streets.</li> <li>6. Assessment to promote multi-modal use.</li> </ol>	6,485	8,755
T-1.2	Structural Change	Update the General Plan to facilitate complete and walkable neighborhoods, maximize infill development, support the regional Sustainable Communities Strategy, and promote a jobs-housing match. Consider hiring specialist to evaluate the Jobs-Housing Balance in the City and develop strategies to incorporate into community planning and local land-use regulations to address a mismatched Jobs-Housing Balance to reduce VMT from commuting.	Supportive	Supportive
T-1.3	Structural Change	Based on the completed Complete Streets Assessment and the Complete Streets Inventory Baseline, develop a priority list of complete streets improvements such as retrofits, design standards, and green infrastructure that would accommodate walking, biking, transit use and carpooling. This effort should include a schedule for implementation, prioritization of improvements, identification of whether improvement will aid in walking, biking or transit access, and the plan should ensure equitable roll-out to that low-income communities.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-1.4	Structural Change	Adopt and implement a micro-mobility policy that promotes ownership of micro-mobility devices, especially among lower income community members. Promote equitable access to charging facilities for electric micro-mobility devices.	Supportive	Supportive
T-1.5	Structural Change	Continue to implement 2020 Bicycle and Pedestrian Master Plan goals of developing 153 new bicycle facilities and 32 miles of multi-use paths for pedestrians and cyclists.	Supportive	Supportive
T-1.6	Structural Change	Evaluate and update the City's Zoning Code, Transportation Demand Management Plan (or Administrative Rule 2.26), and California Green Building Code to ensure the City requires sufficient bicycle parking for new commercial development and retrofits.	Supportive	Supportive
T-1.7	Structural Change/ Feasibility Study	Update and conduct Underused Rights-of-Way Study such that a community/business survey and evaluation is completed to understand community perspective on potential barriers to conversions and identify barrier solutions.  Based on findings, convert recommended amount miles of under used roadways thoroughfare to active transportation corridors to create a connected environment City (i.e., downtown areas). As part of the program, launch a public campaign to gain public and business support to ensure success of such efforts. Consider having pilot programs (i.e., shutting down street lanes for specific events/periods of time) to demonstrate the advantages of proposed improvements.	Supportive	Supportive
T-1.8	Structural Change	Identify streets for permanent through traffic closures to promote walking, biking, and other forms of active transportation.	Supportive	Supportive
T-1.9	Structural Change	Identify areas of the City to remove parking and/or additional traffic lanes to prioritize outdoor seating and make permanent outdoor dining established during Covid 19.	Supportive	Supportive
T-1.10	Equity	Prioritize active transportation and mobility projects in historically under-invested neighborhoods.	Supportive	Supportive
T-1.11	Partnership/ Education	Partner with schools, employers, transit agencies, Hayward Area Recreation and Park District (HARD), and community groups to teach bicycle and pedestrian safety in schools and workplaces and to educate residents and businesses about the health and environmental benefits of walking, bicycling, and using public transit.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-1.12	Partnership	Partner with community organizations and local bike shops to provide rebates for low-income community members to purchase bicycles, helmets, pumps, e-bikes, e-scooters, and other related equipment. Work with community partners to provide incentives to promote bicycle, e-bike and e-scooter ownership.	Supportive	Supportive
T-1.13	Equity/ Funding	Partner with community groups to obtain funding through the California Air Resources Board Car Sharing and mobility Options program for a pilot bike-share program in low-income communities and to connect low-income communities with the E-Bike Purchase Incentive Program through CalBike.	Supportive	Supportive
T-1.14	Equity	Ensure there is equitable access to safe bicycle and pedestrian infrastructure in all areas of the city. Prioritize the development of pedestrian and bicycle infrastructure in low-income communities where there is currently no or limited pedestrian and bicycle infrastructure	Supportive	Supportive
T-1.15	Feasibility Studies	Based on the identified barriers to completing the Complete Streets Evaluation including limited staff and fiscal resources, develop strategies to reduce or eliminate barriers, such as identifying staff to assign the Complete Streets Evaluation to.	Supportive	Supportive
T-1.16	Funding	Devote staff time to tracking and applying for grant funding to complete projects that would improve active transportation or mobility in the community.	Supportive	Supportive

## Measure T-2 Implement public and shared transit programs to increase mode shift to public and shared transit mode to 15% by 2030 and 30% by 2045.

### Background

The City is served by the public transiting agencies Alameda-Contra Costa Transit (AC Transit) and Bay Area Rapid Transit (BART). Improving transit ridership is key to reducing SOV VMT in the City, as transportation GHG emissions are estimated to be the largest contributor to communitywide emissions in the 2019 GHG Inventory, accounting for 61 percent of total GHG emissions (excluding AC Transit and BART emissions which both account for less than one percent of emissions). Similar to Measure T-1, Measure T-2 focuses on reducing transportation related emissions by reducing VMT through programs and policies that shift VMT away from SOV to other modes including transit, e-mobility, and transportation demand management programs and policies. As outlined for Measure T-1, these mode shifts generate many co-benefits such as reduced congestion, safer conditions for walking and biking, and improved air quality. One of the best ways to improve a transit system and reduce driving is to expand its geographical reach and increase the frequency and reliability of transit service. Each new mile of transit usage replaces VMT on much more than a 1:1 basis. Approximately 1 percent increase in transit frequency saves 0.5 percent in VMT.<sup>33</sup> Furthermore,

<sup>33</sup> Todd Litman. Victoria Transport Policy Institute. August 2021. Evaluating Public Transit Benefits and Costs Best Practices Guidebook. Accessed at: <https://www.vtpi.org/tranben.pdf>. Accessed June 27, 2023

improving transit access has the potential to shift trips from cars to transit, which may reduce vehicle trips, VMT, and greenhouse gas emissions, with time spent getting to a transit stop being the key indicator of transit access.<sup>34</sup>

The City is committing to several structural change actions to implement public and share transit programs to increase communitywide transit mode share to 15 percent by 2030 and to 30 percent by 2045. Through Action T-2.2, the City is adopting a policy or code into the Municipal code to establish new development of public space to be transit accessible. In addition to improving transit connection in the City, Action T-2.9 strives to reduce the GHG emissions associated with the AC Transit bus fleet, by partnering with AC Transit to understand how they can address the Innovative Clean Transit Rule. The City is committing to promoting e-mobility through the development and adoption of an ordinance requiring new multi-family development projects to install a car share or provide e-bikes/e-scooters to each new tenant (Action T-2.4). Other actions commit the City to prioritizing and updating transit stops to include trees or shade structures (Action T-2.5), requiring employers to develop Transportation Demand Management Plans (TDM) and incentives (Action T-2.7), and expanding the Student Transit Pass Program (STPP) to provide free AC transit to college students and low-income community members (Action T-2.8). Other structural change actions commit the City to continuing to promote transit-oriented infill development and/or new development, adopting parking requirements into the Municipal code that are appropriate for a transit-oriented district, and allowing developers to build housing without off-street parking if near transit stops (Actions T-2.1, T-2.3, and T-2.6).

Other actions prioritize conducting surveys and studies to better understand the community's need and motivations for traveling by car versus other alternatives such as AC Transit or BART (Action 2.11). Action T-2.10 commits the City to dedicating staff time to implementing planned City transit/TDM projects and programs while through Action T-2.13 the City looks to partner with AC Transit to conduct a study to determine transit property corridors and prioritize infrastructure improvements in existing neighborhoods that enable people to better access and use public transit. Through Action T-2.12, the City will assess the feasibility and GHG reduction impacts of banning cars in high-traffic zone(s) or on individual roads in the City where other transit options are available by implementing a congestion charge.

### *Methodology and Assumptions*

GHG reductions associated with Measure T-2 were calculated in a similar manner to those calculated for Measure T-1. Reduction calculations are based on the target transit mode shares of 15 percent and 30 percent for 2030 and 2045, respectively. Current transit mode share (8.8 percent) was estimated based on statistics in the U.S. Census Bureau American Community Survey (2019) for the City.<sup>35</sup> The CARB EMFAC2021 model is used to determine the GHG emissions reduced as a result of reduced SOV VMT. To avoid double counting the reduced VMT from implementation of Measure T-1 was subtracted from the total passenger VMT. The adjusted passenger VMT was converted to trips using the average trip length for Alameda County obtained from EMFAC2021. This number of vehicle trips was then multiplied by the target percent increase in transit mode share to determine the number of vehicle trips that would be replaced by transit mode share with Measure implementation. Transit trips were translated into VMT using an average transit trip length of 3.8

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<sup>34</sup> California Air Resources Board (CARB). August 2017. Methods to Assess Co-Benefits of California Climate Investments: Vehicle Miles Travelled. Accessed at: [http://ww2.arb.ca.gov/sites/default/files/auction-proceeds/carb\\_vehicle\\_miles\\_traveled.pdf](http://ww2.arb.ca.gov/sites/default/files/auction-proceeds/carb_vehicle_miles_traveled.pdf)

<sup>35</sup> U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023

miles based on a study developed by the American Public Transportation Association.<sup>36</sup> Emissions associated with the reduced VMT were calculated using the passenger emission factors from CARB's EMFAC2021 model. The calculations and assumptions used to estimate emission reductions from Measure T-1 are provided in Table 15.

**Table 15 Measure T-2 GHG Emission Reduction Calculations**

Calculation Factor	2030	2045
Transit mode share increase from baseline <sup>1</sup>	6%	21%
Passenger VMT <sup>2</sup>	927,882,803	987,323,531
Passenger trips <sup>3</sup>	115,994,629	123,915,027
New transit trips substituted for vehicle trips	7,191,667	26,269,986
Passenger VMT reduced with transit trips (Miles) <sup>4</sup>	27,328,335	99,825,946
Passenger EF from EMFAC2021 (MT CO <sub>2</sub> e/VMT) <sup>5</sup>	0.000278	0.000251
<b>Total GHG Emissions Reductions (MT CO<sub>2</sub>e)</b>	<b>7,585</b>	<b>25,092</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; VMT = vehicle miles traveled

- Assumes a transit mode share target of 15% by 2030 and 30% by 2045 as well as an existing transit mode share of 8.8%, per U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023
- Passenger VMT assumes implementation of Measure T-1, therefore reducing the forecasted passenger VMT with bike and walk trips.
- Passenger trips are calculated using trips per mile traveled in a combustion vehicle, as obtained from CARB's vehicle emission factor database, EMFAC2021 times forecasted passenger VMT.
- Assumes an average intercity bus trip length of 3.8 miles, per American Public Transportation Association. 2018. Public Transportation Fact Book. <https://www.apta.com/wp-content/uploads/Resources/resources/statistics/Documents/FactBook/2018-APTA-Fact-Book.pdf>. Accessed June 27, 2023
- Passenger Emissions Factor calculated from data from CARB's vehicle emission factor database, EMFAC2021.

\*Values may not add up due to rounding

**Table 16 GHG Emission Reductions Associated with Measure T-2**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-2.1	Structural Change	Continue to promote infill development and/or new development that is compact, mixed use, pedestrian friendly, and transit oriented.	7,585	25,092
T-2.2	Structural Change	Adopt a policy or code into the Municipal code that establishes specific standards for new development of public space to be transit accessible and multi-functional by co-locating public facilities.	Supportive	Supportive
T-2.3	Structural Change	Consistent with the Downtown Parking Management Plan and Downtown Specific Plan, adopt parking requirements into the Municipal code that are appropriate for a mixed-use, walkable, and transit-oriented district. Evaluate opportunities in the Downtown area to designate streets for transit only.	Supportive	Supportive

<sup>36</sup> American Public Transportation Association. 2018. 2018 Public Transportation Fact Book. <https://www.apta.com/wp-content/uploads/Resources/resources/statistics/Documents/FactBook/2018-APTA-Fact-Book.pdf>. Accessed June 30<sup>th</sup>, 2023

City of Hayward  
**Hayward Climate Action Plan**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-2.4	Structural Change	Develop and adopt an ordinance requiring new multi-family development projects to install a car share or provide e-bikes/e-scooters to each new tenant.	Supportive	Supportive
T-2.5	Structural Change	Evaluate and prioritize transit stops needing renovations that do not meet the adopted Pedestrian Design Standard for Transit Stop. Upgrade transit stops such that they include shade trees or structures and are designed to promote use.	Supportive	Supportive
T-2.6	Structural Change	Consistent with the intention of Senate Bill 10, allow developers to build housing without off-street parking if they're close to frequent transit service	Supportive	Supportive
T-2.7	Funding/ Structural Change	Through the adoption of an ordinance or incorporation into large commercial building codes, require all employers to develop a Transportation Demand Management (TDM) Plan. TDM plans should include money-based incentives for employees to bike, walk, carpool, or take the bus to work. In alignment with BAAQMD requirement, require large employers (more than 50 employees) to subsidize biking, walking, or bus travel.	Supportive	Supportive
T-2.8	Partnership/Equity	Expand the Student Transit Pass Program (STPP), which provides free youth clipper cards with unlimited bus rides to middle and high schools students, to provide free AC transit to college students and low-income community members.	Supportive	Supportive
T-2.9	Partnership	Collaborate and engage with AC Transit to understand how they are addressing the Innovative Clean Transit Rule and their plan to electrify their bus fleet.	Supportive	Supportive
T-2.10	Funding	Dedicate staff time or create a staff position to pursue funding opportunities to implement planned City transit/TDM projects and programs and to support AC Transit in obtaining grant funding for regionwide service expansion.	Supportive	Supportive
T-2.11	Feasibility Study	Conduct local transportation surveys to better understand the community's needs and motivation for traveling by car versus other alternatives such as AC Transit or BART. Use survey results to inform policy development and education/outreach campaigns that are transit focused. Consistent with the previous CAP policy M-3 (Survey Transportation and Transit Gaps and Barriers)	Supportive	Supportive
T-2.12	Feasibility Study	Assess the feasibility and GHG reduction impact of banning cars in high-traffic zone(s) or on individual roads in the City where other transit options are available by implementing a congestion charge that applies to passenger cars and car-sharing services like Uber and Lyft with exceptions for handicap drivers and residents of those areas.	Supportive	Supportive
T-2.13	Feasibility Studies/ Partnerships	Partner with AC Transit to conduct a study to determine transit priority corridors and prioritize infrastructure	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
		improvements in existing neighborhoods that enable people to better access and use public transit		

**Measure T-3 Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-1 and T-2.**

*Background*

While Measures T-1 and T-2 can be effective in changing community choices around transportation, the impacts of incentive-based policies increase when coupled with disincentives for less favorable choices, such as making it less convenient to drive a gasoline-fueled single passenger vehicle.<sup>37</sup> However, disincentive-based policies can be unpopular and place a burden on the community if not implemented carefully. Structural change actions reducing parking minimums and parking maximums citywide (Action T-3.3), developing disincentive options to achieve reductions in peak hour traffic as part of a Citywide Transportation Demand Management (TDM) Plan (Action T-3.1), updating development requirements, ordinances, and/or building codes requiring TDM as part of new developments (Action T-3.2), and increasing broadband internet access (Action T-3.11) should be supported by feasibility planning, funding opportunities, and engagement efforts, to minimize the burden placed on vulnerable community members. Action T-3.5 commits the City to conducting feasibility planning for implementing disincentives for driving gasoline-fueled single passenger vehicles, including analyzing and engaging the community on potential impacts and benefits of limiting parking options while Action T-3.6 requires that the City conduct engagement efforts targeting low-income communities of color to better understand the community’s potential concerns. The City will also evaluate parking pricing structures that best work for the community, through Action T-3.4. Through Action T-3.7, the City will define equity metrics for implementation of disincentives based on feedback from low-income communities. Actions T-3.8, T-3.9, and T-3.10 seek to minimize financial burdens on community-members by providing funding options.

*Methodology and Assumptions*

Measure T-3 is intended to be supportive to Measures T-1 and T-2 in reducing communitywide VMT, and therefore GHG emissions reductions were not calculated.

<sup>37</sup> Gabriel Ayobami Ogunkunbi et al. August 2021. Evidence-Based Market Overview of Incentives and Disincentives in Electric Mobility as a Key to the Sustainable Future. <https://www.mdpi.com/2673-7590/1/2/17/pdf>. Accessed June, 27 2023

**Table 17 GHG Emission Reductions Associated with Measure T-3**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-3.1	Structural Change	Develop and adopt a Citywide Transportation Demand Management (TDM) Plan including strategies to reduce peak-hour traffic, such as staggered work hours, flexible schedule options, and telecommuting from home offices. Include updated policy incentives or disincentive options to achieve reductions in peak-hour traffic, reduce traffic congestions and promotes alternative transportation (biking, walking, and use of transit)	Supportive	Supportive
T-3.2	Structural Change	Continue to require new development adopt transportation demand management strategies to reduce use of single occupancy vehicles and encourage the use of alternative modes of travel. Update development requirements, ordinances, and/or building codes requiring TDM as part of new developments as part of enforcement.	Supportive	Supportive
T-3.3	Structural Change	Develop consistent standards for parking minimums and maximums across the city. Reduce parking minimums and parking maximums citywide, as improved active and public transit infrastructure becomes more available. Additionally, price all public parking spaces for all areas of the city based on available transportation options, travel demand, and land use.	Supportive	Supportive
T-3.4	Feasibility Study/ Funding	Evaluate parking pricing structures that would best work with the City of Hayward. Based on evaluation, implement dynamic parking pricing in downtown parking areas and earmark parking revenues to implement other active transportation and transit projects.	Supportive	Supportive
T-3.5	Feasibility Study	Conduct an analysis of the potential community impacts and benefits of implementing disincentive-based policies for driving single passenger vehicles, including a congestion charge program, limiting parking options, increased local taxes (income tax, gasoline tax, or car registration tax), and Transportation Network Company (TNC) user taxes.	Supportive	Supportive
T-3.6	Equity	Conduct engagement efforts for the general public and targeted to low-income communities of color during analysis of the disincentive-based transportation policies to understand the community's potential concerns	Supportive	Supportive
T-3.7	Equity	Define equity metrics for implementation of disincentives based on feedback from local low-income communities of color and structure the disincentive programs to meet these metrics	Supportive	Supportive
T-3.8	Funding	Fund active and public transit programs through a local gasoline tax and/or through paid parking fees.	Supportive	Supportive
T-3.9	Funding	Implement a Transportation Network Company (TNC) user tax which would put a small fee on the use of Uber and Lyft and generate funds to pay for transit and mobility infrastructure.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-3.10	Funding/Equity	Implement a gasoline/diesel car registration tax starting in 2028 with exemption criteria established for low-income residents.	Supportive	Supportive
T-3.11	Structural Change	Increase Broadband Internet Access. Add a program to encourage more working from home and reducing the need to travel for work.	Supportive	Supportive

**Measure T-4 Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045.**

*Background*

The State of California has adopted ambitious goals for ZEV adoption, with the Advanced Clean Cars II regulation striving to achieve 100 percent ZEV vehicle sales by 2035. To align with these aggressive State goals, the City seeks to increase ZEV adoption to 15 percent by 2030, while striving to set in place the framework to reach a long-term goal of 50 percent ZEV adoption by 2045. This regulation puts the total number of ZEVs on the road by 2035 at approximately 15 million.<sup>38</sup> As of 2020, the City has 1,363 electric vehicles and 1,066 plug-in hybrid vehicles out of 155,531 vehicles currently registered, together accounting for 1.6 percent of the vehicles registered within the City.<sup>39</sup>

Reaching these targets will require significant investment in electric vehicle charging infrastructure to facilitate the transition to electric vehicles. While the City cannot require residents to buy and use EVs rather than gas-powered vehicles, the City will take actions to incentivize this behavior change and support this level of EV adoption. Adding and supporting the addition of electric vehicle chargers within the City will be the main mechanism through which the City will encourage zero-emission vehicle (ZEV) adoption within the community.

As a part of this measure, the City’s primary target will be to provide one public EV charger for every 20 EV’s and ensure as many privately owned chargers are installed in new development as practicable, in line with the leading cities in California (San Francisco, Los Angeles, and San Jose) and recent charging infrastructure studies. Since the City of Hayward already has 152 existing public charging stations, there is currently one public EV charger for every 16 EVs, and the City will need to have 1,365 new public chargers installed to meet the forecasted demand from passenger vehicles by 2030.

A 2015 report by Idaho National Laboratory, *Plugged In: How Americans Charge Their Electric Vehicles*, found that nearly 98 percent of all EV charging events occurred at home or work.<sup>40</sup> In support of these findings, and to address the challenges faced by those who may not be able to install their own home chargers, as part of Action T-4.1, the City will continue to enforce the Hayward EV Charge Reach Code. EV-ready building codes are one of the most effective and low-cost

<sup>38</sup> Susan Carpenter. Spectrum News 1. October 2020. What it will take to get 100% EV sales in California. Accessed at: <https://spectrumnews1.com/ca/la-west/transportation/2020/10/05/what-it-will-take-to-sell-100--evs-in-california>. Accessed June, 27 2023

<sup>39</sup> DMV. 2020. Fuel Type by County. [https://www.dmv.ca.gov/portal/uploads/2020/09/MotorVehicleFuelTypes\\_City\\_01012020.pdf](https://www.dmv.ca.gov/portal/uploads/2020/09/MotorVehicleFuelTypes_City_01012020.pdf) Accessed June 27, 2023

<sup>40</sup> Osti.Gov. 2018. Plugged In: How American Change Their Electric Vehicles. <https://www.osti.gov/biblio/1369632-plugged-how-americans-charge-electric-vehicles>. Accessed June, 27 2023

strategies for states and local governments to encourage consumers to buy or lease electric vehicles and can save consumers thousands of dollars in installation costs.<sup>41</sup>

Through Action T-4.3, the City will continue to maintain a streamlined EV infrastructure permitting process and ordinance to minimize barriers and inefficiencies. Action T-4.4 promotes ZEVs by requiring new private parking lots grant ZEV access to preferred parking spaces. The City recognizes the barriers associated with the procurement of ZEVs, particularly to low-income community members. Actions T-4.5, T-4.6, T-4.7, T-4.8, and T-4.9 seek to provide funding opportunities to minimize costs associated with the purchase of ZEVs and associated charging equipment and develop and disseminate educational information on the costs/benefits of owning ZEVs. The City will also seek to partner with the Alameda County Transportation Commission, ACE, PG&E, and car share companies to expand infrastructure, provide incentives, and increase ZEV infrastructure accessibility (Actions T-4.2, T-4.8, T-4.9, T-4.10, T-4.11, and T-4.12).

### *Methodology and Assumptions*

GHG emission reductions for the increased adoption of ZEVs are based on replacing fossil fueled vehicles with electric versions in the community. GHG emissions reductions from the adoption of ZEVs assumed a 15 percent adoption of ZEVs by 2030 and 50 percent by 2045. The GHG emissions forecast performed as part of the 2019 Community GHG Inventory and GHG Emissions Forecast assume that approximately 9 percent of total Hayward passenger vehicle VMT in 2030 would be by ZEVs, and 10 percent in 2045.<sup>42</sup> This results in a 6 percent and 40 percent increase in ZEV adoption by 2030 and 2045, respectively, compared with the forecasted ZEV adoption levels in those target years. GHG emissions reduction are calculated by multiplying the percent of ZEV adoption beyond the forecasted values by the passenger VMT after implementation of Measure T-1 and T-2 in the target year. The weighted average passenger vehicle emission factor for internal combustion engines in the target years was applied to the calculated VMT reduction. This GHG reduction would be offset by electricity consumption which would generate GHG emissions in 2030. The calculations and assumptions used to estimate emission reductions from Measure T-4 are provided in Table 18.

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<sup>41</sup> SWEEP. 2018. Cracking the Code on EV-Ready Building Codes. <https://www.swenergy.org/cracking-the-code-on-ev-ready-building-codes>. Accessed June 27, 2023

<sup>42</sup> Projected EV adoption rates were obtained from the California Air Resources Board (CARB) EMFAC2017 vehicle emissions model. The model was run for 2030 and 2045 for Los Angeles County. <https://arb.ca.gov/emfac/2017/>.

**Table 18 Measure T-4 GHG Emission Reduction Calculations**

Calculation Factor	2030	2045
Passenger ICE VMT after mode shift to active and shared transit (miles) <sup>1</sup>	823,467,006	796,706,583
Passenger VMT ICE Emission Factor (MT CO <sub>2</sub> e/VMT) <sup>2</sup>	0.0003	0.0003
EV adoption beyond baseline	6.4%	39.8%
EV electricity usage (kWh/mile) <sup>3</sup>	0.37	0.369708000
EV electricity usage from increased EV adoption (kWh)	19,648,777	117,142,057
Weighted electricity Emissions Factor (MT CO <sub>2</sub> e/kWh) <sup>4</sup>	0.0000028	0
Emission Reduction from EV increased adoption (MT CO <sub>2</sub> e)	16,068	88,718
Emissions from electricity usage for EVs (MT CO <sub>2</sub> e)	54	0
<b>Total GHG Emissions Reductions (MT CO<sub>2</sub>e)</b>	<b>16,014</b>	<b>88,718</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; kWh = kilowatt-hour; VMT = vehicle miles traveled; EV = electric vehicle

- <sup>1</sup> Assumes the implementation of Measures T-1 and T-2 and uses the projected baseline passenger EV adoption rates for Alameda County from the CARB EMFAC2021 vehicle emissions model.
- <sup>2</sup> Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP. Forecasted Passenger ICE Emission Factors based on the CARB EMFAC2021 vehicle model for Alameda County.
- <sup>3</sup> EV electricity usage is based on passenger fuel efficiency (kwh/mile) from the CARB EMFAC2021 vehicle model for Alameda County.
- <sup>4</sup> Electricity Emission Factor is weighted to account for the specific opt-out rates of residential and non-residential customers and assumes implementation of BE-4.

\*Values may not add up due to rounding

**Table 19 GHG Emission Reductions Associated with Measure T-4**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-4.1	Structural Change	Continue to enforce the Hayward EV Charger Reach Code requiring electric vehicle charging stations in new development projects.	16,014	88,718
T-4.2	Structural Change	Work with Ava Community Energy to install 100 new publicly accessible EV chargers by 2030 through public private partnerships and on City owned properties.	Supportive	Supportive
T-4.3	Structural Change	Continue to maintain a streamlined EV infrastructure permitting process and ordinance in accordance with AB 1236.	Supportive	Supportive
T-4.4	Structural Change	Require that new private parking lots grant zero emission vehicles (ZEVs) access to preferred parking spaces.	Supportive	Supportive
T-4.5	Structural Change	Coordinate with local agencies and community-based organizations, agencies, and non-profits to conduct zero-emission vehicle (ZEV) education events for residents and targeted events for low-income communities that would evaluate the barriers to ZEV adoption, include information on costs/benefits of owning ZEVs, steps on how to receive incentives for ZEVs, and other benefits.	Supportive	Supportive
T-4.6	Education/Equity	Explore opportunities with CARB, BAAQMD, or other agencies to start a purchase rebate program and provide higher trade-in value for combustion vehicles to assist lower-income households to purchase EVs.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-4.7	Equity	Develop outreach and education materials and distribute to local businesses and organizations on the financial, environmental, and health and safety benefits of ZEVs. Provide information on available funding opportunities.	Supportive	Supportive
T-4.8	Education	Work with Ava Community Energy and PG&E to incentivize residential electric vehicle charger installations through on-bill financing	Supportive	Supportive
T-4.9	Funding	Evaluate opportunities for EV or hydrogen charging infrastructure through State and utility programs, like LCFS or PG&E EV Fast Charge Program. Disseminate information via outreach and education materials.	Supportive	Supportive
T-4.10	Funding	Partner with Ava Community Energy to aid in Ava Community Energy’s survey of existing publicly accessible electric vehicle chargers and their locations and identify a prioritized list of locations in Hayward for new electric vehicle charging stations with particular consideration for equitable distribution of chargers to residents of multi-family homes, low-income people, people on a fixed income, and communities of color.	Supportive	Supportive
T-4.11	Feasibility Study/Partnership	Support zero-emission vehicle (ZEV) car share companies in coming to the City. Coordinate with car share companies and community-groups to develop an affordable, zero-emission vehicle (ZEV) car share to serve affordable housing and/or multifamily developments with a priority to target low-income communities of color.	Supportive	Supportive
T-4.12	Partnership	Collaborate with neighboring jurisdictions and the Alameda County Transportation Commission to develop a connected network of ZEV car share.	Supportive	Supportive

**Measure T-5 Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045.**

*Background*

The City has also adopted commercial ZEV adoption goals, with 10 percent by 2030 and 80 percent by 2045. This is backed by regulations that CARB adopted in June 2020, requiring truck manufacturers to transition from diesel trucks and vans to electric zero-emission trucks beginning in 2024, and establishing a target for every new truck sold in California to be zero-emission by 2045.<sup>43</sup> In 2023, CARB approved the Advanced Clean Fleets regulation, which requires a phased-in transition toward zero-emission medium-and-heavy duty vehicles. The regulation includes an end to combustion truck sales in 2036, a first-of-its-kind requirement.<sup>4445</sup> Commercial ZEV adoption is

<sup>43</sup> CARB. <https://ww2.arb.ca.gov/news/california-takes-bold-step-reduce-truck-pollution#:~:text=SACRAMENTO%20E2%80%93%20Today%2C%20the%20California%20Air,California%20will%20be%20zero%2Demission.> Accessed June 2023

<sup>44</sup> CARB. Advanced Clean Fleets. <https://ww2.arb.ca.gov/news/california-approves-groundbreaking-regulation-accelerates-deployment-heavy-duty-zevs-protect#:~:text=The%20Advanced%20Clean%20Fleets%20rule%20includes%20an%20end%20to%20combustion,accelerated%20benefits%20for%20California%20communities..> Accessed June 2023

<sup>45</sup> Insider. Amazon says it has more than a thousand electric Rivian vans making deliveries across the US – see how they were designed. <https://www.businessinsider.com/amazon-creating-fleet-of-electric-delivery-vehicles-rivian-2020-2> . Accessed June 2023

projected to occur at a slower rate than passenger vehicle adoption, with the greatest decarbonization success projected in light-duty commercial vehicles.<sup>46</sup> To accelerate commercial electric vehicle adoption in the City, the City plans to actively identify and engage businesses/employers with vehicle fleets to accelerate ZEV adoption. Actions T-6.2 and T-6.3 commit the City to engaging with local employers and business fleet owners in the City to identify incentives and opportunities for accelerated fleet conversion to ZEV. With Actions T-6.4 and T-6.1, the City has also committed to collaborating with key stakeholders, including local major employers, to develop best practices and resources outlining funding for ZEV infrastructure. For businesses in the City subject to CARB’s Advanced Clean Fleets rule and for those targeting accelerated ZEV adoption, the City will conduct a study to investigate specific opportunities for transitioning these vehicle fleets to ZEV (Action T-6.5).

*Methodology and Assumptions*

GHG reduction calculations for Measure T-5 were applied the same as those for Measure T-4, for passenger ZEVs. GHG emissions reductions from the adoption of ZEVs assumed a 10 percent adoption of ZEVs by 2030 and 80 percent by 2045. This results in a 3 percent and 50 percent increase in ZEV adoption by 2030 and 2045, respectively, compared with the forecasted ZEV adoption levels in those target years. GHG emissions reduction are calculated by multiplying the percent of ZEV adoption beyond the forecasted values by the commercial VMT. The weighted average commercial vehicle emission factor for internal combustion engines in the target years was applied to the calculated VMT reduction. This GHG reduction would be offset by electricity consumption which would generate GHG emissions in 2030. The calculations and assumptions used to estimate emission reductions from Measure T-5 are provided in Table 20.

**Table 20 Measure T-5 GHG Emission Reduction Calculations**

Calculation Factor	2030	2045
Commercial IC VMT (miles) <sup>1</sup>	75,010,498	61,580,840
Commercial VMT ICE Emission Factor (MT CO <sub>2</sub> e/VMT) <sup>2</sup>	0.00126	0.00121
EV adoption beyond baseline	3.4%	50.2%
EV electricity usage (kWh/mile) <sup>3</sup>	1.1	1.1
EV electricity usage from increased EV adoption (kWh)	2,776,090	32,872,322
Weighted electricity Emission Factor (MT CO <sub>2</sub> e/kWh) <sup>4</sup>	0.000003	0
Emission Reduction from EV increased adoption (MT CO <sub>2</sub> e)	3,171	37,461
Emissions from electricity usage for EVs (MT CO <sub>2</sub> e)	9	0
<b>Total GHG Emissions Reductions (MT CO<sub>2</sub>e)</b>	<b>3,161</b>	<b>37,461</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; kWh = kilowatt-hour; VMT = vehicle miles traveled; EV = electric vehicle

- <sup>1</sup> Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP.
- <sup>2</sup> Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP. Forecasted Passenger ICE Emission Factors based on the CARB EMFAC2021 vehicle model for Alameda County.
- <sup>3</sup> EV electricity usage is based on commercial fuel efficiency (kwh/mile) from the CARB EMFAC2021 vehicle model for Alameda County.
- <sup>4</sup> Electricity Emission Factor is weighted to account for the specific opt-out rates of residential and non-residential customers and assumes implementation of BE-4.

\*Values may not add up due to rounding

<sup>46</sup> Erica Schueller. FleetOwner. July 2021. What it will take to accelerate electric truck adoption. Accessed at: <https://www.fleetowner.com/drivers-seat/article/21167635/what-it-will-take-to-accelerate-electric-truck-adoption>

**Table 21 GHG Emission Reductions Associated with Measure T-5**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-5.1	Structural Change	Work with stakeholders to develop and implement a plan for City-supported accelerated fleet electrification. As part of the plan, identify opportunities for accelerated fleet electrification and promote ZEV/EV adoption within business fleets.	3,161	37,461
T-5.2	Funding	Identify incentives for accelerated business fleet electrification and communicate that information to local businesses.	Supportive	Supportive
T-5.3	Education	Engage with local employers and business fleet owners in the City to identify opportunities for accelerated fleet conversion to ZEV/EV. Provide information on the requirements of the Advanced Clean Fleets rule and available funding sources for fleet replacements (e.g., LCFS, Clean Truck and Bus Voucher).	Supportive	Supportive
T-5.4	Partnership	Develop and maintain a collaborative of stakeholders (e.g., local major employers, commercial business) to lead the creation of best practices and the pursuit of funding for ZEV/EV infrastructure as well as public and private zero-emission business vehicle fleets.	Supportive	Supportive
T-5.5	Feasibility Studies	Conduct an investigation of business vehicle fleets in Hayward and identify employers and businesses subject to the Advanced Clean Fleets rule as well as those to target for accelerating ZEV/EV adoption.	Supportive	Supportive

**Measure T-6 Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045**

*Background*

As estimated in the 2019 GHG inventory, off-road equipment in the City accounts for almost 4 percent of the community’s GHG emissions. While this is only a small part of GHG emissions in the City, getting to carbon neutrality will involve decarbonizing most of the off-road equipment, which currently runs on gasoline, diesel, and natural gas. To support a gasoline and diesel phase-out ordinance for off-road equipment, Action T-6.1 commits the City to enforcing CARB’s regulations requiring most newly manufactures small off-road engines such as those found in leaf blowers, lawn mowers, and other equipment be zero emission starting in Model Year 2024. CARB regulations will also require generators and large pressure washers to be zero emission starting in Model Year 2028.<sup>47</sup> Action T-6.2 commits the City to development and implementing a plan to replace all City owned end-of-life off-road equipment with zero-emission equipment and outlines a timeline for replacements that align with a transition of 15 percent of off-road equipment to zero-emission by 2030 and 80 percent by 2045.

Actions T-6.3, T-6.4, and T-6.5 promote more likely implementation of the regulations outlined above through increased funding opportunities for the City contractors, residents, and fleet operators, as well as providing stakeholders with information on carbon free off-road equipment

<sup>47</sup> CARB.2021. CARB approves updated regulations requiring most new small off-road engines be zero emission by 2024

through the development of an off-road equipment replacement program/outreach campaign. Through Actions T-7.6 and T-7.7, the City seeks to assess the technology and economic feasibility of replacing the City-owned off-road equipment fleets and identify fleets in the City with the highest decarbonization potential.

*Methodology and Assumptions*

In the 2019 GHG Inventory, a majority of off-road emissions (60 percent) were associated with diesel-powered equipment, 20 percent were associated with gasoline equipment, and 19 percent were associated with natural gas. While some off-road equipment does not have market-ready zero-emissions alternatives, lawn and garden equipment, light-duty off-road equipment, and portable off-road equipment can generally be electrified or use biodiesel today. In 2030, it is forecasted that portable and lawn and garden equipment would make up 25% total off-road equipment in the City.<sup>48</sup> Therefore, a 15% reduction in overall offroad emissions is feasible through the enforcement of CARB’s regulations requiring zero emission small off-road engines, including leaf blowers and lawn mowers, starting in model year 2024. The GHG reductions for Measure T-6 were quantified by assuming that actions, when implemented, would achieve a 15 percent reduction and 80 percent reduction in total off-road emissions by 2030 and 2045, respectively. Off-road diesel, gasoline, and natural gas emissions were estimated by using CARB EMFAC2021 fuel usage data for Alameda County apportioned to the City of Hayward and multiplied by respective emissions factors.<sup>49</sup> Emissions associated with electricity usage from increased use of electric alternatives was calculated by converting the forecasted gallons of fuel consumed to gasoline gallon equivalents which was then converted to electricity usage. The weighted communitywide electricity emission factor was applied to the electricity usage to estimate reduced emissions associated with that amount of fuel reduction. Sources for the emission and conversion factors used are detailed in Table 22.

**Table 22 Measure T-6 GHG Emission Reduction Calculations**

Inputs and Assumptions			
Off-Road Emissions from Diesel, Gasoline and LPG in 2019 (MT CO <sub>2</sub> e) <sup>1</sup>		24,287	
GHG Emissions Reductions Calculations			
Year	2030	2045	
Decarbonized Percentage	15%	80%	
Forecasted Total Off-Road Emissions (MT CO <sub>2</sub> e) <sup>2</sup>	29,084	28,177	
Total Fuel Used (GGE) <sup>2,3</sup>	3,346,962	3,025,552	
Reduced Off-road Emissions (MT CO <sub>2</sub> e)	4,363	22,542	
Total Fuel Reduced (GGE) <sup>2,3</sup>	502,044	2,420,442	
Electricity usage from increased electric option adoption (kWh) <sup>3</sup>	16,194,976	78,078,773	
Weighted Communitywide Electricity EF (MT CO <sub>2</sub> e/kWh) <sup>4</sup>	0.0000031	0	
Emissions from electricity usage for electric equipment (MT CO <sub>2</sub> e) <sup>2</sup>	51	0	

<sup>48</sup> Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP.

<sup>49</sup> CARB. 2021. EMFAC21. <https://arb.ca.gov/emfac/emissions-inventory/c58cfe3d0072dfc3ea8eae4234049042e52ed4df>. Accessed June 27, 2023

<b>Total Reductions (MT CO<sub>2</sub>e)</b>	<b>4,312</b>	<b>22,542</b>
Notes: MT CO <sub>2</sub> e = metric tons of carbon dioxide; VMT = vehicle miles traveled; NA = Not Applicable		
1. 2019 Community GHG Emissions Inventory. See Appendix B of the CAP.		
2. Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP.		
3. Fuel Conversion Factors to Gasoline Gallon Equivalent are sourced from the U.S. Department of Energy. <a href="https://epact.energy.gov/fuel-conversion-factors">https://epact.energy.gov/fuel-conversion-factors</a> .		
4. Weighted communitywide electricity emission factors assumes the implementation of Measure BE-4.		
*Values may not add up due to rounding		

**Table 23 GHG Emission Reductions Associated with Measure T-6**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-6.1	Structural Change	Support and enforce CARB’s regulations requiring most newly manufactured small off-road engines such as those found in leaf blowers, lawn mowers, and other equipment be zero emission starting in Model Year 2024. Phase 2 of the regulations will be implemented in Model Year 2028, when the emission standards for generators and large pressure washers will be zero.	4,312	22,542
T-6.2	Structural Change	Develop and implement a plan to replace all City owned end-of-life off-road equipment with zero-emission equipment. Plan should include evaluation of current City-owned equipment, alternative low or zero-emission options, prioritize equipment to replace first (e.g., largest GHG emission reduction potential), and a timeline for replacements that align with goals and feasibility of replacement.	Supportive	Supportive
T-6.3	Education	Develop an Off-road Equipment Replacement Program and Outreach Campaign that provides information to contractors, residents, and fleet operators in Hayward regarding alternatives to fossil-fueled off-road equipment, public health and safety benefits of alternative equipment technology, and funding opportunities available (i.e., Clean Off-Road Equipment Voucher Incentive Program [CORE]).	Supportive	Supportive
T-6.4	Funding	Partner with BAAQMD to identify funding opportunities to encourage residents to replace gas-powered landscaping equipment and off-road engines with zero emission equipment.	Supportive	Supportive
T-6.5	Partnership/ Funding	Partner with BAAQMD to develop a rebate and incentive program for upgrading off-road equipment and switching to biofuels.	Supportive	Supportive
T-6.6	Feasibility Study	Conduct a study to assess the technological and economic feasibility of replacing the City-owned off-road equipment fleets.	Supportive	Supportive
T-6.7	Feasibility Study	Conduct an investigation of major off-road equipment fleets in Hayward and identify fleets with highest decarbonization potential.	Supportive	Supportive

**Measure T-7 Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.**

*Background*

Measure T-7 seeks to align the City’s municipal vehicle fleet with the State of California’s Zero emission vehicle (ZEV) goals outlined in the Advanced Clean Cars II regulation, to achieve 100 percent ZEV vehicle sales by 2035, and the Advanced Clean Fleets regulation, requiring a phased-in transition toward zero-emission medium-and-heavy duty vehicles.<sup>50,51</sup> To align with these aggressive State goals, the City seeks to increase municipal passenger ZEV adoption to 75 percent by 2030 and 100 percent by 2045 and decarbonize emergency and heavy-duty vehicles as feasible. These targets, once achieved, will make Hayward a leader in California municipal fleet decarbonization. Specific structural changes action for Measure T-7, include establishing and adopting a ZEV fleet conversion and purchase policy including a schedule for replacement of fleet vehicles to transition 15 percent of the fleet to ZEV by end of FY2023 and 50 percent by end of FY2030 (Action T-7.1). To support this, the City will conduct a feasibility and cost assessment to determine the number of EV/ZEV charge and funds needed to support the fleet transition (Action T-7.2). The City will pursue funding opportunities to support this transition through the California Air Resources Board’s Clean Vehicle Rebate Project, the Clean Truck and Bus Voucher Incentive Program (Action -T-7.3), and the Low Carbon Fuel Standard (LCFS) program (Action T-7.4).

*Methodology and Assumptions*

Since vehicles that are included in the City vehicle fleet are also registered to an address in the City, there is risk for double counting emission reductions and are therefore, not separately quantified.

**Table 24 GHG Emission Reductions Associated with Measure T-7**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
T-7.1	Structural Change	Establish and adopt Zero-emission Fleet Conversion and Purchase Policy that requires new, and replacement municipal fleet vehicle purchases are EVs or ZEVs. The policy will also include a schedule for replacement of fleet vehicles to meet a 100% carbon neutral fleet by 2040.	Supportive	Supportive
T-7.2	Structural Change/ Feasibility Study	Conduct feasibility and cost assessment to determine the number of EV/ZEV chargers and funds needed to support the fleet transition to 50% EV/ZEV by 2030. Expand EV/ZEV charging infrastructure for city fleet and employees in alignment with feasibility study.	Supportive	Supportive
T-7.3	Funding	Secure funding from programs such as the California Air Resources Board's Clean Vehicle Rebate Project and the Clean Truck and Bus Voucher Incentive Program to increase procurement of EV or ZEV	Supportive	Supportive

<sup>50</sup> State of California. 2022. Advanced Clean Cars II. <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii>. Accessed June, 27 2023

<sup>51</sup> CARB. Advanced Clean Fleets. <https://ww2.arb.ca.gov/news/california-approves-groundbreaking-regulation-accelerates-deployment-heavy-duty-zevs-protect#:~:text=The%20Advanced%20Clean%20Fleets%20rule%20includes%20an%20end%20to%20to%20combustion,accelerated%20benefits%20for%20California%20communities..> Accessed June 2023

		cars, trucks, and other vehicles and installation of EV/ZEV charging/fueling infrastructure at municipal facilities.		
T-7.4	Funding	Evaluate credit generation opportunities within the Low Carbon Fuel Standard (LCFS) program for ZEV/EV fueling and charging stations for the municipal fleet to offset cost of infrastructure development needed to support transition.	Supportive	Supportive

## 2.3 Water

### **Measure WW-1. Reduce water consumption by 15% by 2030 and maintain it through 2045.**

#### *Background*

The City’s primary source of potable water is purchased from San Francisco Public Utilities Commission (SFPUC) Regional Water System (RWS). Approximately 85 percent of the water supply to the SFPUC RWS originate in the Hetch Hetchy watershed, located in Yosemite National Park.<sup>52</sup> GHG emissions from water supply are generated by the electricity used to convey, treat, and distribute water. Although the water and wastewater sector GHG emissions only account for less than one percent of communitywide emissions in the City and will decrease to zero in 2045 as electricity becomes 100 percent carbon-free, access to clean and safe water supply has innumerable quality of life benefits. Residential and commercial buildings use water both indoors for cooking, cleaning, bathing, and toilet flushing, and outdoors to irrigate landscaping and maintain pools and fountains. Water efficiency measures not only reduce the amount of water used but also reduce the amount of energy needed to heat water because of conservation. Additionally, water consumption and wastewater generation are interconnected, therefore water conservation efforts will lead to decreases in wastewater generated, as less water is treated through the wastewater system.

The City has been successful in reducing potable water consumption through implementation of programs, policies, and regulations including the Bay-Friendly Water Efficient Landscape ordinance (Action WW-1.1), Water Conservation Standards (Action WW-1.2), and Recycled Water Program (Action WW-1.4). Measure WW-1 seeks to continue these same programs and efforts, while also focusing efforts on several new actions, including Action WW-1.11, developing a recycled water master plan to further expand recycled water use and establish a road for potable water replacement, where appropriate. The City’s efforts to lessen dependence on imported water through increased use of recycled water can improve the City’s adaptive capacity to climate change by enhancing the capacity of local sources of water and reducing the GHG emissions associated with the high energy-intensity of imported water. While the GHG emission reductions from these efficiencies are not quantified due to the complexity of interactions with various agencies, they provide more evidence that the City will be able to achieve the established water reduction targets as part of Measures WW-1.

Actions including WW-1.3, WW-1.4, WW-1.5, WW-1.6, WW-1.7, WW-1.8, WW-1.9, WW-1.10, and WW-1.12 will further support the City’s water conservation efforts through continuing and expanding public education campaigns and programs to highlight water conservation practices, promote rebates and incentives for water conserving devices, and ensure access to information and resources to low-income and disadvantaged communities. Engagement on these topics has been

<sup>52</sup> City of Hayward. 2021. 2020 Urban Water Management Plan. [https://www.hayward-ca.gov/sites/default/files/Hayward\\_2020%20UWMP\\_Public%20Release\\_2021%20July%202021.pdf](https://www.hayward-ca.gov/sites/default/files/Hayward_2020%20UWMP_Public%20Release_2021%20July%202021.pdf). Access June 27, 2023

shown to improve the efficacy of structural changes to water systems and build communitywide trust and stewardship.<sup>53</sup>

### *Methodology and Assumptions*

The GHG emission reductions associated with Measure WW-1 are a result of the decreased energy consumption required to convey, pump, treat, and distribute potable water to end users. Additionally, water conservation efforts will lead to decreased wastewater generation and therefore reduced energy consumption required to treat wastewater. It is expected that the collective efforts of all actions under Measure WW-1 will result in a per-capita reduction of water consumption of 15 percent by 2030 and maintain that 15 percent reduction through 2045, below the 2019 baseline. The reduced quantity of water was multiplied by the energy intensity factor for potable water and wastewater to determine the electricity consumption for water and wastewater conveyance and treatment. Assumptions regarding the average water and wastewater energy intensity and emission factors are provided in Table 25. Additional details regarding energy intensity can be found in Appendix B of the CAP.

**Table 25 Measure WW-1 GHG Emission Reduction Calculations**

Calculation Factor	2030	2045
<b>Water</b>		
Baseline Water Use per Service Population (MG) <sup>1</sup>	0.0002	0.0002
Service Population <sup>2</sup>	239,498	261,673
Forecasted Water Use (MG) <sup>2</sup>	52	57
Targeted Water Use (MG) <sup>3</sup>	44	48
Saved Water (MG)	7.81	8.53
Average Energy Intensity of Water Supply (kWh/MG) <sup>1</sup>	1,318	1,318
Electricity Saved (kwh)	10,289	11,242
Electricity Emission Factor Adjusted for SB 100 (MT CO <sub>2</sub> e/kWh) <sup>4</sup>	0.00006	0
Total Water Emissions Reductions (MT CO <sub>2</sub> e)	1	0
<b>Wastewater</b>		
Baseline Wastewater Generation per Service Person (MG) <sup>1</sup>	0.0263	0.0263
Service Population <sup>1</sup>	167,425	184,358
Forecasted Wastewater Generation (MG) <sup>2</sup>	4,409	4,855
Targeted Wastewater Generation (MG) <sup>3</sup>	3,748	4,127
Reduced Wastewater (MG)	661	728
Average Energy Intensity of Wastewater (kWh/MG) <sup>1</sup>	955	955
Electricity Saved (kwh)	631,655	695,539
Electricity Emission Factor Adjusted for SB 100 (MT CO <sub>2</sub> e/kWh) <sup>4</sup>	0.00006	0
Total Wastewater Emissions Reductions (MT CO <sub>2</sub> e)	35	0
<b>Total GHG Emissions Reductions (MT CO<sub>2</sub>e)</b>	<b>36</b>	<b>0</b>

<sup>53</sup> Dean AJ, Fielding KS, Ross H and Newton F. (2016) Community Engagement in the Water Sector: An outcome-focused review of different engagement approaches. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities. Accessed here: [https://watersensitivecities.org.au/wp-content/uploads/2016/05/TMR\\_A2-3\\_CommunityEngagementWaterSector-1.pdf](https://watersensitivecities.org.au/wp-content/uploads/2016/05/TMR_A2-3_CommunityEngagementWaterSector-1.pdf). Accessed June 27, 2023

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; kWh = kilowatt-hour; MG = million gallons

1. 2019 Community GHG Emissions Inventory. See Appendix B of the CAP.
2. GHG Emissions Forecast. See Appendix B of the CAP.
3. Targeted water use determined as a 15% reduction in per capita water usage (15%) multiplied by the service population.
4. The electricity emission factor used is based on the forecasted emission factors for PG&E.

\*Values may not add up due to rounding

**Table 26 GHG Emission Reductions Associated with Measure WW-1**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
WW-1.1	Structural Change	Continue to implement the City’s Bay-Friendly Water Efficient Landscape ordinance applicable to all land use types to decrease water consumption.	36	0
WW-1.2	Structural Change	Continue to implement and enforce the Water Conservation Standards within the Municipal Code via the Nonessential water Use Ordinance for households, businesses, industries, and public infrastructure.	Supportive	Supportive
WW-1.3	Structural Change	Continue to implement rebate and water conservation device tracking system to track the number of rebates and water devices distributed.	Supportive	Supportive
WW-1.4	Structural Change	Continue to implement the Recycled Water Program which includes expanding facilities if necessary to deliver recycled water to additional customers, working with customers to complete site retrofits, connecting customers to the recycled water system, and ensuring customer deliveries.	Supportive	Supportive
WW-1.5	Education/ Funding	Continue to offer water conservation programs to the community including educational programs like water education program for schools and water wise landscape classes as well as incentives like free water conserving devices, and rebates for rain barrels and turf replacement.	Supportive	Supportive
WW-1.6	Education/ Equity	As part of the water conservation programs offered implement a public education campaign that in addition to highlighting water conservation practices, with focus on low-income households with high utility bill burdens.	Supportive	Supportive
WW-1.7	Equity	Ensure that water conservation educational materials, programs and outreach efforts are in multiple languages and accessible for low-income or disadvantaged communities.	Supportive	Supportive
WW-1.8	Equity	Perform targeted outreach to low-income communities and elderly households to provide free water conservation devices and aid disadvantaged community members in obtaining available rebates for water conservation devices.	Supportive	Supportive
WW-1.9	Partnerships/ Equity	Partner with programs such as Green House Call or other similar programs to support community members with installation of water saving devices with a particular focus of support for low-income, elderly, or disadvantaged elderly residents.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
WW-1.10	Partnership	Continue to coordinate with commercial and industrial customers including the Hayward Area Recreation and Park District and the Hayward Unified School District to advance water recycling programs.	Supportive	Supportive
WW-1.11	Feasibility Studies	Develop a Recycled Water Master Plan to assess the feasibility of expanding the recycled water system and establish a roadmap for a recycled water expansion program. The plan will identify the locations available for recycled water use, the capacity needed to fully replace potable water use at identified locations and establish a schedule for potable water replacement with recycled water for appropriate applications.	Supportive	Supportive
WW-1.12	Education	Promote the use of on-site gray water and rainwater collection systems	Supportive	Supportive

## 2.4 Waste

### Measure SW-1 Implement and enforce SB 1383 requirements to reduce communitywide landfilled organics 75% by 2030 and 90% by 2045.

#### Background

Organic materials are the focus of the recent landmark legislation SB 1383 (Short-Lived Climate Pollutants: Organic Waste Reductions). This new State law has the immediate goal of reducing organic waste sent to landfills and the ultimate objective of reaching statewide methane emissions reduction goals. Specifically, it sets a statewide goal for the reduction in organic waste to landfills – 50 percent by 2020 and 75 percent by 2025 – in addition to the recovery of 20 percent of edible food waste for human consumption. SB 1383 requires local governments to provide organics collection to all generators and require all generators to subscribe. It also has specific mandates for container systems, education, and outreach programs, monitoring and contamination reporting, and enforcement of regulations. Full SB 1383 implementation began in 2022.<sup>54</sup>

The City is adopting and continuing the implementation of several structural changes including procurement policies to comply with SB 1383, exclusive hauling agreement with Waste Management of Alameda County (WMAC), edible food recovery ordinance, a fee system for incorrectly sorted materials with sensitivity to shared collection (Action SW-1.1, Action SW-1.2, Action SW-1.3, and Action SW-1.4). The City will support these structural changes with various education and engagement efforts to promote waste diversion and implementation of SB 1383 requirements to business owners, generators, haulers, facilities, schools, local community organizations, and local public agencies (Action SW-1.5, SW-1.6, SW-1.7, SW-1.9, SW-1.10, SW-1.11, and SW-1.13). The City will also support increased landfill diversion through partnerships to increase funding opportunities associated with edible food recovery and composing/waste containers (Actions SW-1.8 and SW-1.12). Additionally, through Action SW-1.14, the City will partner with

<sup>54</sup> California Air Resources Board. 2017. Short-Lived Climate Pollution Reduction Strategy. <https://ww2.arb.ca.gov/resources/documents/slcp-strategy-final#:~:text=The%20Short%2DLived%20Climate%20Pollutant,%2C%20and%20anthropogenic%20black%20carbon>. Accessed June 27, 2023.

StopWaste to conduct a feasibility study and identify next steps to ensure there is sufficient edible food reuse infrastructure in Hayward to achieve the recovery goals.

*Methodology and Assumptions*

Through the combination of all actions for Measure SW-1, as discussed above, it is assumed that waste reduction targets in line with SB 1383 will be met. A landfilled organic waste reduction target consistent with SB 1383 requirements is assumed in the GHG emissions calculations for Measure SW-1. This reduction target is applied to the total emissions associated with solid waste disposal because nearly all GHG emissions from the natural decay of solid waste come from organic waste.<sup>55</sup> The calculations and assumptions used to estimate emission reductions from Measure SW-1 are provided in Table 27.

**Table 27 Measure SW-1 GHG Emission Reduction Calculations**

Calculation Factor	2030	2045
Solid Waste Emissions <sup>1</sup>	47,899	52,334
Organic Waste Target Achievement	75%	90%
<b>Total GHG Emissions Reductions (MT CO<sub>2</sub>e)</b>	<b>35,924</b>	<b>47,101</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide

<sup>1</sup> GHG Emissions Forecast. See Appendix B of the CAP.

\*Values may not add up due to rounding

**Table 28 GHG Emission Reductions Associated with Measure SW-1**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
SW-1.1	Structural Change	Adopt procurement policies to comply with SB 1383 requirements for jurisdictions to purchase recovered organic waste products.	35,924	47,101
SW-1.2	Structural Change	Continue to implement exclusive hauling agreement with Waste Management of Alameda County (W/MAC) that regulates haulers collecting organic waste, including collection program requirements and identification of organic waste receiving facilities.	Supportive	Supportive
SW-1.3	Structural Change	Continue to implement edible food recovery ordinance for edible food generators, food recovery services, or organizations that are required to comply with SB 1383. Ordinance requires all residential and commercial customers to subscribe to an organic waste collection program and/or report self-hauling or backhauling of organics.	Supportive	Supportive
SW-1.4	Structural Change	Implement enforcement and fee for incorrectly sorted materials with sensitivity to shared collection. Utilize funding to implement programs and efforts to increase communitywide organic waste diversion.	Supportive	Supportive

<sup>55</sup> According to the Local Governments for Sustainability (ICLEI) U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Appendix E – Solid Waste Emission Activities and Sources, GHG emissions are generated by non-biologic wastes only if they are combusted.

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
SW-1.5	Education	Work with StopWaste to conduct targeted outreach with food recovery organizations, generators, haulers, facilities, and local agencies to promote strategies to implement requirements of SB 1383	Supportive	Supportive
SW-1.6	Education	Encourage businesses to educate their employees about organic waste diversion and proper sorting annually by providing training resources and rebate program to fund employee time for training.	Supportive	Supportive
SW-1.7	Partnership	Partner with local community organizations, public agencies like StopWaste and businesses to implement all required activities under SB 1383.	Supportive	Supportive
SW-1.8	Equity	Provide free compost bins and kitchen-top food waste containers to low-income communities of colors and elderly households in order to increase compost participation. Evaluate opportunities to have a community compost hub that is easily accessible to disadvantaged neighborhoods	Supportive	Supportive
SW-1.9	Equity	Establish relationships with multi-family property owners/managers to develop signage for their properties. Present at all Home-Owner Associations in Hayward annually and provide supplies and education for proper sorting.	Supportive	Supportive
SW-1.10	Partnership	Establish an edible food recovery program to minimize food waste. Leverage CalRecycle support for projects that prevent food waste or rescue edible food. Partner with existing food pantries like CSUEB, South Hayward Parish to identify and advertise locations for surplus food to be taken in the community.	Supportive	Supportive
SW-1.11	Partnership	Work with contracted hauler to: <ul style="list-style-type: none"> <li>▪ Provide quarterly route reviews to identify prohibited contaminants potentially found in containers that are collected along route.</li> <li>▪ Clearly label all new containers indicating which materials are accepted in each container, and by January 1, 2024 place or replace labels on all containers.</li> <li>▪ Develop and implement a comprehensive monitoring and quality control program with a focus on consumer behavior change.</li> </ul>	Supportive	Supportive
SW-1.2	Partnership/Funding	Work with local organizations, StopWaste, and investigate various funding/ grant opportunities to fund edible food recovery organizations so they can expand and handle increased volume.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
SW-1.13	Partnerships	Partner with schools, retirement communities, and other large institutions to create waste diversion and prevention program/procedure/plan.	Supportive	Supportive
SW-1.14	Feasibility Studies/ Partnership	Partner with StopWaste to conduct a feasibility study and identify next steps to ensure edible food reuse infrastructure in Hayward is sufficient to accept capacity needed to recover 20% of edible food disposed of within Hayward.	Supportive	Supportive

**Measure SW-2 Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045.**

*Background*

To reach its zero waste goals, the City must increase community-wide overall landfill diversion of waste. Measure SW-2 and associated actions are anticipated to move the City towards an overall reduction in inorganic waste disposal but will not contribute to quantified emissions reductions targets. Measure SW-2 will contribute to the City’s goal to reduce overall waste generation but will not directly contribute to the City’s quantified emissions reduction target, which is associated with organic waste reduction, as supported by Measure SW-1. Emphasis is placed on reduction of organic waste sent to landfills, as landfilled organic waste is the major source of Hayward’s waste-related greenhouse gas emissions.

The City is developing, adopting, and continuing the implementation of several structural changes actions including the Organics Reduction and Recycling Ordinance (ORRO), the hauling agreements and municipal codes with recent circular economy bills integrated, the Hayward Construction and Demolition Debris Recycling Ordinance, a Zero Waste Strategic Plan, a requirement for large events to hire an event waste management team, a fee for single-use foodware, post-consumer recycled content requirements, and bans on “problem materials” (i.e., items without means of recycled or recycling markets) (Actions SW-2.1, SW-2.2, SW-2.3, SW-2.4, SW-2.5, SW-2.7, SW-2.12, SW-2.14). Other actions, including Action SW-2.6, Action SW-2.8, Action SW-2.9, Action SW-2.10, and Action SW.13, commit the City to partnering with Waste Management of Alameda County, StopWaste, the business community, local organizations, schools, and libraries to promote waste prevention and waste diversion best practices by creating multi-lingual education materials and providing technical assistance. Through Action SW-2.11, the City will conduct a consumption-based GHG emissions inventory to understand community habits and potential emission reduction opportunities. Action SW-2.15 commits the City to continue participation in the Alameda County All in Eats initiative by identifying funding opportunities to increase the circular food economy.

*Methodology and Assumptions*

Measure SW-2 is intended to be supportive of the overall zero waste goals of the CAP and to the GHG emission reductions associated with Measure SW-1. As such, Measure SW-2 does not have any direct GHG emissions reduction that can be quantified and is considered to GHG emissions reduction elsewhere.

**Table 29 GHG Emission Reductions Associated with Measure SW-2**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
SW-2.1	Structural Change	Continue to implement the Organics Reduction and Recycling Ordinance (ORRO) adopted in November 2021 in alignment with the Countywide ORRO ordinance. Support StopWaste and County Environmental Health in the enforcement of the ORRO within the City.	Supportive	Supportive
SW-2.2	Structural Change	Review recent circular economy bills signed by the governor (i.e., SB 343, AB 881, AB 1201, AB 962, AB 1276) and incorporate requirements into hauling agreements, and municipal codes for full-service restaurants and local manufacturing businesses.	Supportive	Supportive
SW-2.3	Structural Change	Continue to enforce the Hayward Construction and Demolition Debris Recycling Ordinance.	Supportive	Supportive
SW-2.4	Structural Change	Adopt a Citywide Zero Waste Goal and develop a Zero Waste Strategic Plan to increase diversion from the landfill by 85% 2045.	Supportive	Supportive
SW-2.5	Structural Change	Create a requirement for large events to hire an event waste management team.	Supportive	Supportive
SW-2.6	Partnership	Regularly evaluate and update new franchise agreement with Waste Management of Alameda County to meet SB 1383 requirements and to implement new components to further divert waste from landfills. Work with (WMAC) to determine data necessary to meet zero waste goals and establish protocol for regular collection and reporting of associated metrics. Identify dedicated staff responsible for this.	Supportive	Supportive
SW-2.7	Structural Change/ Funding	Require food service providers to implement a fee for single-use food ware.	Supportive	Supportive
SW-2.8	Education/ Equity	Partner with StopWaste to conduct targeted, multi-lingual, culturally appropriate, and geographically diverse waste prevention educational and technical assistance campaigns based on outcomes of a waste characterization study (WCS). Such as food waste prevention, edible food recovery strategies, proper storage, how to fix clothes/electronics, how to donate, reusable alternatives, effects of over consumption, sustainable consumption habits, buying second hand, buying durable, sharing, repurposing. Continue to conduct outreach regarding AB 1276 to full-service restaurants.	Supportive	Supportive
SW-2.9	Partnership	Continue to work with StopWaste and haulers to monitor participation in residential recycling programs, create education materials for the community, provide technical assistance to business to implement mandatory recycling, and identify other opportunities and means to promote zero waste efforts.	Supportive	Supportive
SW-2.10	Partnership	Work with StopWaste and the business community to design and promote extended producer responsibility such as take-back programs.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
SW-2.11	Feasibility Study	Conduct a consumption-based GHG emissions inventory to understand the community’s worst consumption habits and emission reduction potential and provide educational materials on a closed-loop circular economy.	Supportive	Supportive
SW-2.12	Structural Change	Work with local businesses to establish post-consumer recycled content requirements that meet SB 343 recyclability claims as part of their purchasing criteria.	Supportive	Supportive
SW-2.13	Partnership/Equity	Partner with local organizations, schools, and libraries to establish pop-up repair cafes for commonly broken and easily repaired items. Partner with the library to promote reuse by increasing accessibility to shared tools through a tool lending library.	Supportive	Supportive
SW-2.14	Structural Change	Based on existing StopWaste waste characterization studies and Litterati litter assessment, increase bans on “problem materials” (i.e., items without means of recycling or recycling markets, such as sale of polystyrene, plastic packaging, straws, plastics #4-7, mixed materials). Enforce the single-use plastic pre-checkout ban, by January 1, 2025, in alignment with SB-1046.	Supportive	Supportive
SW-2.15	Funding	Explore funding opportunities to increase the circular food economy.	Supportive	Supportive

## 2.5 Carbon Sequestration

### **Measure CS-1 Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.**

#### *Background*

The City is generally considered a built-out City where a majority of new development or growth will involve the redevelopment of underutilized parcels or renovation of existing structures. Although built-out, the City has the opportunity to engage in carbon sequestration activities through enhancing open space, urban greening, and protecting and increasing the City’s urban forest or tree stock. Over time as emissions are removed from more and more sectors, carbon sequestration will play an increasingly important role in California’s ability to achieve carbon neutrality. The City currently has approximately 30,000 trees within its borders.<sup>56</sup> Measure CS-1 strives to enhance the City’s ability to plant more trees in the public right of way and preserve or replace trees that are intended to be removed from private property. Specifically, Action CS-1.1, proposed an update to the tree preservation ordinance by Q2 2024 to ensure existing carbon stock is maintained and that replacement trees are climate resilient and rough tolerant. The updated ordinance would include a development requirement to protect or replace value-to-value existing trees and greenspace and require a cash mitigation fee equal to the value of tree removed. In order to reach the target of

<sup>56</sup> City of Hayward Landscape Maintenance Division. 2023. Urban Forest. <https://www.hayward-ca.gov/your-government/departments/landscape-maintenance-division>. Accessed June 27, 2023

planting 7,000 net new trees by 2030, the City will need to maintain the current tree stock and plant about 1,000 net new trees each year. Potential for planting new trees to meet the targets would be identified through an Urban Forest Management Plan developed as part of Action CS-1.2. The City is also committed to conducting several feasibility studies to identify the best locations for new greenbelts for wildfire defense and risk reduction (CS-1.13), identify areas in the City that have below average canopy coverage (CS-1.6), and identify and map public spaces that can be converted to green space (CS-1.3). To encourage tree planting, the City is committed to pursuing partnerships, providing educational information on climate appropriate trees and providing funding options to community members, community groups and businesses through Actions CS-1.4, Action CS-1.7, Action CS-1.8, Action CS-1.9, Action CS-1.10, Action CS-1.11, Action CS-1.12. Through Action CS-1.5, the City committed to adopting a standard policy and set of practices to expand trees and vegetation between busy roadways and development to minimize pollutants from traffic.

*Methodology and Assumptions*

The actions making up this measure align with the best practices in urban forestry that have been shown to be effective ways to increase and maintain tree stocks within the urban environment.<sup>57</sup> As such, it is assumed that through implementation of these actions that the goal of this measure will be reached and the tree stock maintained. GHG emission reductions were estimated based on the number of trees to be added to the inventory and the average CO<sub>2</sub>e accumulation factor per tree (0.0354 MT CO<sub>2</sub>e/tree/year).<sup>58</sup> The calculations and assumptions used to estimate emission reductions from Measure CS.1 are provided in Table 30.

Although not quantified herein, urban greening can further reduce building carbon emissions by reducing the heat island effect in cities which reduces the need to rely on air conditioning in homes.<sup>59</sup>

**Table 30 Measure CS-1 GHG Emission Reduction Calculations**

Calculation Factor	2030	2045
Newly Planted Trees	6,000	21,000
Tree Sequestration Factor (MT CO <sub>2</sub> e/tree/year) <sup>1</sup>	0.0354	0.0354
<b>Total GHG Emissions Sequestered (MT CO<sub>2</sub>e)</b>	<b>212</b>	<b>743</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; kWh =kilowatt-hour

<sup>1</sup> Default annual CO<sub>2</sub>e sequestration per tree per year with a maximum lifespan of 20 years per tree is 0.0354 MT CO<sub>2</sub>e/tree/year was obtained from CAPCOA. 2010. Quantifying Greenhouse Gas Mitigation Measures.

\*Values may not add up due to rounding

<sup>57</sup> Michael Leff, The Sustainable Urban Forest: A Step-by-Step Approach. U.S. Forest Service and Davey Institute, 2016. [https://www.itreetools.org/documents/175/Sustainable\\_Urban\\_Forest\\_Guide\\_14Nov2016.pdf](https://www.itreetools.org/documents/175/Sustainable_Urban_Forest_Guide_14Nov2016.pdf). Accessed July 20, 2023

<sup>58</sup>CAPCOA. 2011. Quantifying Greenhouse Gas Mitigation Measures. <http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>. Accessed June 27, 2023

<sup>59</sup> The Trust for Public Land (TPL). Quantifying the greenhouse gas benefits of urban parks. August 2008. Accessed June 27, 2023

**Table 31 GHG Emission Reductions Associated with Measure CS-1**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
CS-1.1	Structural Change	Update the Tree Preservation Ordinance by Q2 2024 to maintain existing carbon stock and identify replacement trees that are climate resilient and drought tolerant for Hayward’s climate. Ordinance updates may include development requirements to protect or replace value-to-value existing trees and greenspace; and a requirement for a cash mitigation fee equal to the value of trees removed.	212	743
CS-1.2	Structural Change	Develop and adopt an Urban Forest Management Plan that identifies: City’s potential capacity for new tree planting; timeframe and mechanism for implementation; a management plan for existing trees; and a tracking system to assess progress towards annual benchmark. (Replaces existing General Plan program HQL-5.)	Supportive	Supportive
CS-1.3	Feasibility Study	Identify and map public spaces that can be converted to green space, including public parking that can be converted to parklets, freeway airspace that can be made into green space, vertical walls that can be planted with vines, and rooftops of public buildings that can be developed into gardens.	Supportive	Supportive
CS-1.4	Partnership/Funding	Partner with community groups to apply for community garden grants and develop new or expand existing community gardens based on the identified public spaces available for green space conversion.	Supportive	Supportive
CS-1.5	Equity	Adopt a standard policy and set of practices for expanding the urban tree canopy and placing vegetative barriers between busy roadways and developments to reduce exposure to air pollutants from traffic.	Supportive	Supportive
CS-1.6	Feasibility Study/Equity	Conduct an urban canopy study to identify areas in Hayward that have below average canopy coverage and implement a tree planting program focusing on the least covered portions of the City. Establish a goal of having no significant difference in canopy coverage between high and low-income areas citywide by 2030.	Supportive	Supportive
CS-1.7	Education	In addition, or as an expansion to the Adopt-a-Block Program establish an adopt-a-tree or adopt-a-street program that is specific to further greening and tree planting. The program will enable individuals, businesses, and community organizations to plant and care for trees in selected communities. Program should provide formalized information on appropriate trees eligible for planting in Hayward (i.e., native, drought tolerant, locations)	Supportive	Supportive
CS-1.8	Funding	Dedicate staff time to obtaining grant funding for tree planting. Identify and apply for applicable federal (e.g., USDA) and state (e.g., California ReLeaf, Affordable Housing and Sustainable Communities Program (AHSC), Urban and Community Forestry Program) grants for tree planting and maintenance projects.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
CS-1.9	Funding	Explore opportunities to fund the Urban Forest Management Program. Possibilities include use of general tax revenues, permit fees, or revenues from the municipal tree ordinance enforcement.	Supportive	Supportive
CS-1.10	Funding	Establish a Tree Trust or Tree Endowment where the interest on the principal can be used for purchasing trees, paying for tree maintenance, or for staff resources for the Urban Forest Management Program.	Supportive	Supportive
CS-1.11	Partnerships	Partner with private developers, CSU, Chabot College, HARD, HUSD, and other community-based organizations to support and contribute to the Urban Forest Management Program	Supportive	Supportive
CS-1.12	Funding	Establish alternative fee mechanisms, similar to the SF Carbon Fund, to fund nature-based solutions. By 2026, create permanent code and financial incentives for homeowners and other private landowners to preserve existing mature trees and shrubs and to plant local native species.	Supportive	Supportive
CS-1.13	Feasibility Study	Identify existing greenbelts and the best locations for new greenbelts for wildfire defense and risk reduction. Incorporate these locations into comprehensive wildfire planning at regional, county, city, and community levels and in all municipal service reviews.	Supportive	Supportive

**Measure CS-2 Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030.**

*Background*

SB 1383 requires each jurisdiction in California to procure recycled organics products to meet specific procurement targets, as notified by CalRecycle by 2022. Measure CS-2 commits the City to meeting these procurement requirements. The City expects to meet these requirements through the procurement of compost and will work with Alameda County and StopWaste to identify opportunities for a regional compost procurement program (Action CS-2.8), resulting in carbon sequestration benefits for the City. The application of suitable composted organic material to existing open spaces can be used to enhance the sequestration of CO<sub>2</sub>e. The application of compost allows for carbon to be stored in the soil and, over time, to be captured in the stems, leaves, and roots of grasses, woody plants, and trees.

The City is committed to enforcing and adopting structural changes including a minimum level of compost application per year on applicable/appropriate land throughout the City (Action CS-2.1), procurement policies to comply with SB 1383 requirements to purchase recovered organic waste products (Action CS-2.2) and urban park guidelines promoting carbon sequestration (Action CS-2.3). Through Action CS-2.4 and Action CS-2.10, the City will conduct a feasibility study to identify location in the City to apply compost and opportunities to enhance or create new natural areas to increase carbon sequestration potential. The City is seeking to partner with StopWaste, Chabot College, Cal State East Bay, and local schools to promote best practices for using compost in landscaping and increase application (Action CS-2.5, Action CS-2.7, and Action CS-2.9). Through

Action CS-2.11, the City will create and distribute resources to train residents, City gardening staff and other entities on how to both increase carbon sequestration and biodiversity through landscaping. Finally, the City will explore funding opportunities associated with the use of the parkland in-lieu fees from the updated City’s Property Developers- Obligations for Parks and Recreation Ordinance to implement the Carbon Management Activities Program (Action CS-2.6).

*Methodology and Assumptions*

Guidance from CalRecycle has set a total population procurement target for the City of 158,089 tons of recovered organic waste products (e.g., compost).<sup>60</sup> The City procurement requirement per capita, 0.08 tons/person, was calculated using the total population procurement target for the City and the total population forecasted for 2030 and 2045. Based on this procurement target, the City’s population, and the carbon sequestration potential per ton of mixed organics compost (0.23 MT CO<sub>2</sub>e/ton)<sup>61</sup>, the carbon sequestration potential for the City’s compost procurement for 2030 and 2045 was calculated. The methods and assumptions used to calculate the GHG emissions reductions associated with Measure CS-2 are shown in the Table 32.

**Table 32 Measure CS-2 GHG Emission Reduction Calculations**

Calculation Factor	2030	2045
Population	167,425	184,358
Estimated procurement requirement <sup>1</sup>	13,394	14,748
Per Capita Sequestration (MT CO <sub>2</sub> e/person) <sup>2</sup>	0.018	0.018
<b>Total GHG Emissions Sequestered (MT CO<sub>2</sub>e)</b>	<b>3,081</b>	<b>3,392</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide; kWh =kilowatt-hour

<sup>1</sup> Hayward procurement requirement per capita = 0.08. CalRecycle

<sup>2</sup> Emissions avoided from mixed organics compost application (MT CO<sub>2</sub>e/ton) =0.23. CARB. Method for Estimating GHG Emission Reductions from Diversion of Organic Waste from Landfills to Compost Facilities.

\*Values may not add up due to rounding

**Table 33 GHG Emission Reductions Associated with Measure CS-2**

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
CS-2.1	Structural Change	Enforce compliance with SB 1383 by establishing a minimum level of compost application per year on applicable/appropriate land throughout the City including City-owned land.	3,081	3,392
CS-2.2	Structural Change	Adopt procurement policies to comply with SB 1383 requirements for jurisdictions to purchase recovered organic waste products.	Supportive	Supportive

<sup>60</sup> CalRecycle. 2021. Jurisdiction Procurement Targets Based on January 1, 2021 Population Estimates.

<https://calrecycle.ca.gov/organics/slcp/procurement/recoveredorganicwasteproducts>. Accessed June 27, 2023.

<sup>61</sup> Industrial Strategies Division, Transportation and Toxics Division, California Air Resources Board, & California Environmental Protection Agency. 2017. Method for Estimating Greenhouse Gas Emission Reductions from Diversion of Organic Waste from Landfills to Compost Facilities. <https://ww2.arb.ca.gov/sites/default/files/classic/cc/waste/cerffinal.pdf>. Accessed June 27, 2023.

Action ID	Pillars	Action	Emission Reductions (MT CO <sub>2</sub> e)	
			2030	2045
CS-2.3	Structural Change/ Equity	Work with Hayward Area Recreation and Park District to develop and adopt urban park guidelines that 1. Provide flexible solutions for developing urban parks in infill areas where traditional neighborhood and community parks are not feasible; 2. Establishes guidelines for achieving the greatest carbon sequestration potential of parks via design; 3 Are equitable in ensuring such urban parks are accessible for lower-income residents while avoiding displacement, in alignment with Parks Master Plan.	Supportive	Supportive
CS-2.4	Feasibility Study	Identify locations within Hayward to apply compost to help meet the procurement requirements of SB 1383.	Supportive	Supportive
CS-2.5	Education	Work with StopWaste to provide residents, businesses, and developers with educational material on best practices for using compost in landscaping.	Supportive	Supportive
CS-2.6	Funding	Explore opportunities to use the parkland in-lieu fees from the updated City's Property Developers - Obligations for Parks and Recreation Ordinance (Article 16 of City's municipal code) to implement the Carbon Management Activities Program (NR 15).	Supportive	Supportive
CS-2.7	Partnerships	Collaborate with Chabot College, CSUEB, and local schools to identify opportunities to apply compost to landscaping.	Supportive	Supportive
CS-2.8	Partnerships	Work with Alameda County and StopWaste to identify opportunities for a regional compost procurement program to help meet the organics procurement provisions of SB 1383.	Supportive	Supportive
CS-2.9	Partnership	Work with the City's franchisee under the new franchise agreement with Waste Management of Alameda County to provide compost throughout the community.	Supportive	Supportive
CS-2.10	Feasibility Study	Conduct a study to identify opportunities to enhance or create new natural areas in existing open spaces, parklands, and fields with native species, biodiverse ecology, higher carbon sequestration potential and improved recreational connectivity for the community.	Supportive	Supportive
CS-2.11	Education	Create and deliver a range of resources to train residents, city gardening staff, and other institutions on how to incorporate biodiversity, soil, and carbon sequestration techniques into landscaping and gardening projects.	Supportive	Supportive

### 3 Total GHG Measures Reduction Achievement

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Table 34 shows the GHG emission reductions achieved from implementation of the CAP measures, GHG emissions forecast after measure reductions, and the City’s 2030 and 2045 targets for both per-capita and mass emissions. With the implementation of the CAP measures and actions, the City is projected to meet its 2030 per capita target. 2045 GHG emission reductions quantified in the CAP are not yet enough to meet the per capita goal. The CAP document discusses the City’s trajectory towards achieving the 2045 climate action target in further detail.

**Table 34 GHG Emissions Reductions and Targets**

Year	2030	2045
1990 Baseline GHG Emissions – Per Capita (MT CO <sub>2</sub> e) <sup>1</sup>	5.9	5.9
Climate Action Targets – Per Capita (MT CO <sub>2</sub> e)	3.12	0
GHG Emission Reduction – Mass Emissions (MT CO <sub>2</sub> e)	121,656	436,200
GHG Emission Reductions – Per Capita (MT CO <sub>2</sub> e)	0.73	2.37
GHG Emissions after Measure Reduction – Per Capita (MT CO <sub>2</sub> e)	3.11	1
Gap to Climate Action Target – Per Capita (MT CO <sub>2</sub> e)	-0.1	1
Percent Reduction from 1990 Baseline Levels – Per Capita	47%	81%

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide

<sup>3</sup> 1990 per capita GHG emissions level is estimated as 15% below the 2005 baseline per capita emissions level of 6.9. The 2005 per capita emissions level was calculated by dividing the 2005 mass emissions (973,244 MT CO<sub>2</sub>e) determined in the 2009 CAP by the 2005 population (140,530).

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