Appendix A

GHG Inventory, Forecast, and Targets Technical Memorandum

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Rincon Project No. 22-13600

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401 Grove Street
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Via email: asturmfels@healdsburg.gov
CC: email: Terra Sampson(tsampson@healdsburg.gov)

Subject: Healdsburg Climate Mobilization Strategy, Future GHG Emissions Forecasts and Gap Analysis Memorandum
Healdsburg, CA

Dear Mr. Sturmfels:

As part of the Healdsburg Climate Mobilization Strategy (CMS) Rincon Consultants, Inc. (Rincon) has calculated the 2025, 2030, 2035, 2040, and 2045 greenhouse gas (GHG) emissions forecasts based on the Healdsburg 2018 GHG emission inventory. Although the most recently prepared GHG emissions inventory for the City is the 2020 emissions inventory, the activity data for the year was impacted both by a wildfire at the geothermal plant impacting energy emissions and by COVID-19 which significantly changed community behaviors including energy use and transportation. Due to these anomalies, the 2018 GHG emission inventory was selected to serve as the baseline for the forecast as it is considered the most recent emission inventory representative of typical conditions in the community.

The 2018 GHG emissions inventory identifies the major sources and quantities of GHG emissions produced by communitywide activities within Healdsburg's city limits (i.e., the Healdsburg General Plan planning area). The inventory was developed by Sonoma County Regional Climate Protection Authority (RCPA) and provides the City with the data necessary to establish a GHG emissions baseline for the CMS, track GHG emissions trends, and identify the greatest sources of GHG emissions within their jurisdiction.

The GHG emissions forecast discussed in this memorandum provides an estimate of how Healdsburg's GHG emissions are expected to change in the years 2025 (interim year), 2030 (initial Senate Bill 32 compliance year), 2035 (interim year), 2040 (interim year), and 2045 (initial AB 1279 compliance year) as a result of anticipated Healdsburg economic and population growth, as well as the impacts that California climate-related legislation would have on these future GHG emissions. This memorandum also discusses the 2030 GHG emission reduction target of carbon neutrality adopted by RCPA and the states 2030 GHG emissions reduction target of 40 percent below 1990 levels as well as the total quantity of GHG emissions reduction that Healdsburg needs to achieve in order to contribute their fair share reduction of California's GHG emission reduction goal.[1] The gap between the 2030 adjusted forecast and Healdsburg's 2030 target would be addressed through local actions to be included in the CMS.

[1] California's long-term GHG emission reduction goals were established by the landmark Assembly Bill 32, Senate Bill 32, Executive Order B-55-18, and codified by Assembly Bill 1279. Collectively, these legislative actions provide a GHG reduction trajectory of reducing Statewide GHG emissions to 1990 GHG emission levels by 2020, 40% below 1990 GHG emissions levels by 2030, and carbon neutrality by 2045.

The following sections provide a summary of the results for the 2018 GHG emission inventory, GHG emission forecasts, and GHG reduction target options to be included in the Healdsburg CMS.

GHG Emissions Sectors and Sources

The GHG emissions forecasts presented herein are based on the 2018 GHG emissions inventory calculated for Healdsburg by RCPA as well as population and economic growth projections for Healdsburg. The GHG emissions sources included in the 2025, 2030, 2035, 2040, and 2045 forecasts analysis align with those in the 2018 GHG inventory. The GHG emissions sectors and associated sources included in the inventory and forecasts are provided in Table 1.

Table 1 Healdsburg GHG Emissions Sectors and Sources

GHG Emissions Sector	GHG Emissions Source
Transportation	On-Road Transportation
	Off Road - Diesel
	Off Road - Gasoline
	Off Road - Natural Gas (LPG)
Electricity[1]	Residential Electricity Consumption
	Non-Residential Electricity Consumption
Natural Gas	Residential Natural Gas Consumption
	Non-Residential Natural Gas Consumption
Stationary Sources	Emissions from Other Stationary Sources in Buildings
Water	Indirect Electricity Consumption from Water Delivery
Wastewater	Direct Wastewater Treatment Emissions[2]
Solid Waste	Solid Waste Generated by Community

1. Electricity Consumption includes electricity provided by Healdsburg Electric and Pacific Gas and Electric (PG&E).
2. Direct wastewater treatment emissions are from the following sources: digester gas from anaerobic digesters at wastewater treatment plants.

Healdsburg GHG Emissions Inventory Summary

The GHG emissions forecast analysis presented here is based upon the calculated GHG emissions from each source included in the 2018 GHG emissions inventory developed by RCPA. A detailed summary of the 2018 GHG emissions inventory is provided in Table 2.

Table 2 Healdsburg 2018 GHG Emissions Inventory Summary

GHG Emissions Sector/Source[1]	Emissions (MT CO_2e)	Activity Data	Activity Data Units
Transportation			
On-Road Transportation[1]	51,033	121,325,224	VMT
Off Road - Diesel	1,240	120,418	Gallons
Off Road - Gasoline	1,299	146,795	Gallons
Off Road - Natural Gas (LPG)	198	33,729	Gallons
Electricity			
Residential Electricity	4,657	26,186,905	kWh
Non-Residential Electricity	8,427	47,404,624	kWh
Natural Gas			
Residential Natural Gas	10,976	2,041,137	Therms
Non-Residential Natural Gas	7,525	1,399,284	Therms
Stationary Sources			
Other Stationary Sources	119	N/A	N/A
Water			
Indirect Electricity from Water Delivery[2]	274	1,513,826	kWh
Wastewater			
Direct Emissions from Wastewater Treatment	101	N/A	N/A
Solid Waste			
Solid Waste Generated/Disposal	7,898	13,754	Tons Landfilled
Total[2]	**93,473**	**N/A**	**N/A**

Notes: MT CO_2e = metric tons carbon dioxide equivalents; kWh = kilowatt hours; VMT = vehicle miles traveled; N/A = not applicable

1. Activity data and calculated emissions are the values utilized by RCPA in the 2018 GHG Inventory

2. The City utilities include Healdsburg Electric and water utilities, therefore indirect electricity from water conveyance is already included in the electricity sector. Emissions are shown in this table for informational purposes but to avoid double counting are not added in the overall total.

Healdsburg GHG Emissions Forecasts

Healdsburg's 2018 inventory establishes a reference point for communitywide emissions in a specific year. However, annual GHG emissions change over time and GHG emissions forecasts provide a way to estimate future emission levels based on both the continuation of current activities and external factors such as population and job growth. Forecasts also account for California legislative actions that are anticipated to reduce GHG emissions. Thus, the emissions forecast provides detail on the level of GHG reductions needed to achieve the GHG emissions reduction targets in a future year. Calculating the difference between the forecasted GHG emissions and the reduction target determines the gap to be closed through local actions and policies. This section includes an estimate of the future emissions for Healdsburg in the years 2025, 2030, 2035, 2040, and 2045 in a *baseline scenario* (baseline) forecast and an *adjusted scenario* (adjusted) forecast, which are defined as follows:

- *Baseline scenario*- Provides a forecast of how future GHG emissions would change if future activities continued as they did in 2018 and no changes in local or state policies or legislation that would reduce local emissions take place. Emission factors in a baseline forecast remain constant over time. The baseline forecast is based on growth trends projected in population, housing, employment, and transportation activity over time, consistent with regional projections.

- *Adjusted scenario*- Provides a forecast of how future GHG emissions would change if future activities continued as they did in 2018 and accounts for the future effects of currently adopted State legislation that would reduce GHG emissions compared from the *baseline scenario*. The *adjusted scenario* represents the State's contribution to reducing local GHG emissions to meet State goals without any additional contribution from local policies or actions.

Baseline GHG Emissions Forecast

The baseline forecast provides an estimate of what the communities GHG emissions would look like in forecast years if current activities continued as in 2018 and emission factors remained constant over time. The baseline forecast does not include new activities or policies since 2018, already planned activities, or state mandates. (State mandates are included in the *adjusted forecast*.) The purpose of the baseline forecast is to demonstrate the GHG reductions achieved through State legislation over time when compared to the *adjusted* forecast. The baseline forecast is based on projected trends in population and employment over time and is consistent with local and regional projections. The baseline GHG emissions projections were calculated based on the guidance of the Association of Environmental Professionals 2012 whitepaper, Forecasting Communitywide GHG Emissions and Setting Reduction Targets. The result is a baseline forecast in which GHG emissions change over time in relation to demographics, with the assumption that GHG emissions rates and activity data will continue in the future as they did in the year of the 2018 GHG emissions inventory. This methodology is used for all GHG emissions sectors and sources included in the 2018 GHG emissions inventory except for on-road and off-road transportation. On-road vehicle GHG emissions and off-road equipment GHG emissions were alternatively projected using modeled activity data and emission factors as detailed below. A description of the demographic metrics used to project activity data and associated growth factors for each forecasted GHG emission source are provided in Table 3 and were developed based on the 2018 community GHG emissions inventory. Detailed calculations for the baseline forecast are included in Attachment A.

Table 3 Growth Metrics and Associated GHG Emissions Sectors

GHG Emissions Sector	GHG Emission Source	Associated Growth Metric	Growth Metric Data Source
Electricity	Residential GHG Emissions Sources	Households	CA Dept of Finance; RCPA Climate Action Plan 2020; Healdsburg Housing Element Update Revised Draft
	Non-Residential GHG Emissions Sources	Employment	
Natural Gas	Residential GHG Emissions Sources	Households	
	Non-Residential GHG Emissions Sources	Employment	
Stationary Sources	All GHG Emissions Sources	Service Population	
Water	All GHG Emissions Sources	Service Population	
Wastewater	All GHG Emissions Sources	Service Population	
Solid Waste	All GHG Emissions Sources	Service Population	

The baseline forecast for the Healdsburg planning area relies on the growth and demographic projections used in the RCPA Climate Action Plan 2020[2], and the CA Dept of Finance projections on

[2] RCPA Climate Action Plan accessed here: https://rcpa.ca.gov/what-we-do/climate-action-2020/

population growth[3]. These growth projections were developed prior to the approval of the most recent Regional Housing Needs Allocation (RHNA) for the 2023-2031 housing cycle. As such, the household projections obtained from the RCPA CAP were adjusted to account for Healdsburg's 2023-2031 RHNA of 476 additional households. Population projections were similarly adjusted to account for the increase in housing in Healdsburg by multiplying the adjusted household numbers by the average persons per household obtained from the RCPA CAP by projection year. Additionally, the Healdsburg Housing Element currently being drafted states that in 2018 the jobs to household ratio in Healdsburg was 1.53. Jobs in Healdsburg were projected assuming the jobs to household ratio remained consistent over time and by applying the ratio to the housing projections. Table 4 provides an overview of the growth metrics used to project GHG emissions for the forecast calculations.

Table 4 Growth Metrics for Healdsburg GHG Emissions Forecasts

Growth Metric[1]	2018	2025	2030	2035	2040	2045
Population[2]	11,976	12,025	12,746	12,882	13,018	13,127
Housing[3]	4,511	4,807	5,085	5,128	5,171	5,215
Jobs[4]	6,902	7,355	7,779	7,846	7,912	7,978
Service Population	18,878	19,380	20,525	20,727	20,930	21,105

Notes: Service Population = Population + Employment

1. Forecasted demographic data for Healdsburg is based on the RCPA Climate Action Plan 2020. Population data was provided for 2018, 2020, , 2040, and 2050. The City of Healdsburg provided 2021-2022 numbers sourced from the Department of Finance. Housing data was provided for 2015, 2020, 2040, and 2050.
2. Population has been adjusted from RCPA CAP projections to account for Healdsburg 2023-2031 RHNA by multiplying the adjusted households by the average persons per household. The average persons per household values were obtained from the RCPA CAP projections.
3. Healdsburg 2023-2031 RHNA of 476 households was added to the 2030 housing stock projections obtained from the RCPA CAP. Household numbers after 2031 were projected based on the 2020-2040 compound annual growth rate in housing stock in Healdsburg obtained from RCPA CAP.
4. Job projections are based on the household projections and the jobs to household ratio in 2018 of 1.53 obtained from the Healdsburg Housing Element currently being drafted. Jobs are counted by the place of work occurring within the jurisdiction.

The growth indicators for Healdsburg are provided in Table 5 for each GHG emissions source, excluding on-road vehicles miles traveled (VMT) and off-road fuel consumption which were modeled separately, described in more detail below.

[3] Department of Finance Demographic Estimates accessed here: https://dof.ca.gov/forecasting/demographics/estimates-e1/

Table 5 Growth Indicators for Baseline GHG Emissions Forecast

GHG Emissions Source	Activity Data	Units
Transportation		
On-Road VMT	N/A	SCTM Travel Demand Model
Off Road – Diesel	N/A	OFFROAD Model
Off Road – Gasoline	N/A	OFFROAD Model
Off Road – Natural Gas (LPG)	N/A	OFFROAD Model
Electricity		
Residential Electricity	5,804.86	kWh/Household
Non-Residential Electricity	6,868.11	kWh/Employment
Natural Gas		
Residential Natural Gas	452.46	Therms/Household
Non-Residential Natural Gas	202.73	Therms/Employment
Stationary Sources		
Other Stationary Sources	0.0063	MT CO_2e/Service Population
Water		
Indirect Electricity from Water Delivery	80.19	kWh/Service Population
Wastewater		
Direct Emissions from Wastewater Treatment	0.005	MT CO_2e/Service Population
Solid Waste		
Solid Waste Generation	0.73	Tons Landfilled/Service Population

Notes: SCTM = Sonoma County Travel Model; N/A = not applicable; MT CO2e = metric ton carbon dioxide equivalent; kWh = kilowatt-hour; MG = million gallons

On-Road Activity Data

The Sonoma County Transportation Authority (SCTA) provided the City with VMT data obtained from SCTA's transportation demand model (SCTM). The current transportation demand model uses 2019 as a baseline year and 2040 as a horizon year. The SCTA attributes all VMT from trips beginning and ending within city boundaries to the city, as well as apportions one-half of the trip distance for any trip with an origin or destination within the community. Trips that begin and end outside of the city boundary are not attributed to the community and are considered pass-through trips. On-road VMT data is not differentiated by vehicle class and is provided as daily VMT which is converted to annual VMT using the annualization factor of 347 days per year, as described in EMFAC2021 documentation. SCTA scales the VMT data to better represent real-world conditions. This is done by adjusting the VMT data using a Caltrans Highway Performance Monitoring System (HPMS) correction factor developed from HPMS data obtained for a given year. The adjusted VMT data is further adjusted to account for any Sphere-of-influence (SOI) and/or City limit shifts that occurred in a given year by multiplying the HPMS adjusted VMT by the SOI scaling factors for the year. Because the HPMS correction factor and SOI scaling factor rely on actual roadway and City limit data collected during a given inventory year, the HPMS correction factor and SOI scaling factor cannot be forecasted. As such, for the purposes of forecasting VMT that is representative of the inventory VMT data used, it was assumed that the 2018 HPMS correction factor of 1.22 and the SOI scaling factor of 0.93 will remain constant over time and the raw SCTM VMT data for 2040 was adjusted following SCTA methodology described above.

SCTA develops weighted emission factors for each speedbin using EMFAC2021 web-based model that was run in emission rate model mode for Sonoma County for each inventory year. The settings were annual average, aggregated model years, all speeds, and all fuels. To ensure that the forecasted on-road emissions data is representative of the methodology used for the inventory, the vehicle categories identified by SCTA as light duty (LDV) or heavy duty (HD) were similarly applied to allocate the total VMT to the passenger or LDV VMT and commercial or HD VMT. Further, the same approach used by SCTA to develop weighted emissions factors from EMFAC2021 data was utilized for the forecast years.

Rincon utilized EMFAC2021 to determine electric vehicle (EV) penetration percent for LDVs and HDs and the quantity of electricity anticipated. For the baseline forecast, EV penetration of 0 percent and the vehicle emission factors remained the same as in 2018. The total VMT and VMT differentiated as passenger or commercial VMT used to calculated baseline emissions is presented in Table 6.

Table 6 Healdsburg Baseline GHG Emissions Forecast On-Road Transportation Data

	2018[1]	2025[3]	2030[3]	2035[3]	2040[2]	2045[4]
Total VMT[2]	121,325,224	134,170,813	143,346,234	152,521,655	161,697,077	177,948,622
Passenger VMT[5]	116,981,432	129,509,112	138,181,316	146,748,605	155,227,390	170,353,381
Commercial VMT[5]	4,343,791	4,661,701	5,164,918	5,773,051	6,469,687	7,595,241

Notes: VMT = vehicle miles traveled; MTCO2e = metric tons carbon dioxide equivalents; LDV = light-duty vehicle; HD = heavy-duty vehicles kWh = kilowatt hour; EV = electric vehicle;

1. VMT data was provided by SCTA for 2018 as used in the 2018 inventory with the HPMS correction factor and SOI scaling factor already applied to the raw VMT data.
2. SCTA provided raw SCTM VMT data for 2040 horizon model year. The 2018 HPMS correction factor and SOI scaling factor were applied to the raw SCTM 2040 VMT to forecast the VMT in alignment with the inventory data.
3. VMT for 2025, 2030, and 2040 were linearly interpolated between the 2018 VMT data and adjusted 2040 VMT data.
4. Annual growth between the SCTM baseline year of 2019 and horizon year of 2040 was used to estimate that VMT data for 2045.
5. Total VMT was allocated to passenger and commercial vehicles using the County-wide distribution of VMT obtained from EMFAC2021. Passenger VMT included the EMFAC vehicles classes LDA, LDT1, LDT2, MDV, MH, MCY, LHD1, LHD2, T6TS, UBUS, and OBUS. Commercial VMT included all other MHDT and HHDT vehicle classes, and SBUS, Motor Coach, and All Other Buses. The classification as LDV or HV was determined by SCTA.

Off-Road Activity Data

Activity data for off-road GHG emissions forecast was modeled separately from the above growth metrics and growth indicators, using the outputs from the CARB web-based OFFROAD2021 model. The OFFROAD2021 database was queried for Sonoma County for the forecast years to obtain fuel consumption for gasoline, diesel, and natural gas. The inclusion of specific equipment sectors from the database query was determined based on their relevance to activities occurring within Healdsburg and remained consistent with previous Healdsburg inventories developed by RCPA. The following equipment sectors are included in the 2018 baseline year inventory and the GHG emissions forecast:

- Agricultural
- Airport Ground Support
- Commercial Harbor craft
- Construction and Mining
- Industrial
- Lawn and Garden
- Light Commercial
- Oil Drilling

- Pleasure Craft
- Recreational Vehicles
- Transportation Refrigeration Units

The fuel consumption results of the database query were summarized for all equipment sectors in Sonoma County. Healdsburg was allocated a percentage of county fuel consumption for each sector relative to Healdsburg's proportion of jobs, population or specific activity (i.e., agriculture or airport) in the county. Specific apportionment factors used to calculate Healdsburg fuel consumption by off-road equipment from countywide fuel consumption were obtained from the 2018 Healdsburg inventory prepared by RCPA and are based on RCPA demographic data presented in the RCPA CAP. For the purposes of forecasting, the same apportionment factors from the 2018 inventory were used for the forecasts and are provided in Table 7. GHG emissions by off-road equipment fuel type are summarized in Table 8.

Table 7 Healdsburg Off-Road Transportation Attribution Metrics

Off-road Equipment Category	Attribution (% of countywide)	Attribution Metric
Agriculture	0.36%	Agriculture Activity
Airport Ground Support	13.79%	Airport Operations
Commercial Harbor Craft	2.39%	Population
Construction and Mining	2.32%	Employment
Industrial	2.32%	Employment
Lawn and Garden	2.42%	Households
Light Commercial	2.32%	Employment
Oil Drilling	2.32%	Employment
Pleasure Craft	2.39%	Population
Recreational Vehicles	2.39%	Population
Transportation Refrigeration units	2.32%	Employment

Table 8 Healdsburg Baseline GHG Emissions Forecast Off-Road Fuel Consumption

Off-road Fuel Category	2018	2025	2030	2035	2040	2045
Diesel	120,418	141,313	150,994	156,109	161,410	166,506
Gasoline	146,795	163,183	171,905	180,306	188,831	195,626
Natural Gas	33,729	37,007	39,535	42,144	45,026	45,026

Notes: All values are of the unit gallons of fuel

Data Source: California Air Resources Board. 2021. OFFROAD2021 v1.0.3 Emissions Inventory. Available: https://arb.ca.gov/emfac/emissions-inventory/b3e3139ff7a2304c48acb2a0684ab41b38c5c26e. Accessed February 1, 2023.

Emissions Factors

The baseline GHG emissions forecast is representative of a scenario where community activities are generally similar to that of the most recent GHG emissions inventory. As previously described, the activity data for the most recent GHG inventory year of 2020 was impacted both by a wildfire at the geothermal plant impacting energy emissions and by COVID-19 which significantly changed community behaviors including energy use and transportation. As such, the 2018 GHG emission inventory was

selected to serve as the baseline for the forecast as it is considered the most recent emission inventory representative of typical conditions in the community. Baseline activity data growth is multiplied by the emissions factors used to calculate GHG emissions from the 2018 GHG emissions inventory to generate an estimate of future GHG emissions without influence from GHG reduction policies at the State or local level. The baseline GHG emissions factors for the relevant GHG emissions sources and sectors are provided in Table 9, reported in MT CO_2e.

Table 9 Baseline GHG Emissions Factors

GHG Emissions Source	GHG Emissions Factor	Units
Transportation		
On-Road[1]	0.0004206	MT CO_2e/VMT
Off Road - Diesel	0.0103	MT CO_2e/Gallons
Off Road - Gasoline	0.0089	MT CO_2e/Gallons
Off Road - Natural Gas (LPG)	0.0059	MT CO_2e/Gallons
Electricity[2]		
Weighted Residential Electricity	0.00017782	MT CO_2e/kWh
Weighted Non-Residential Electricity	0.00017776	MT CO_2e/kWh
Natural Gas		
Residential Natural Gas	0.00538	MT CO_2e/Therm
Non-Residential Natural Gas	0.00538	MT CO_2e/Therm
Stationary Sources		
Other Stationary Sources	0.00629	MT CO_2e/service person
Water		
Indirect Electricity from Water Delivery	0.0001807	MT CO_2e/kWh
Wastewater		
Direct Emissions from Wastewater Treatment	0.00536	MT CO_2e/service person
Solid Waste		
Solid Waste Generation	0.574	MT CO_2e/Tons Landfilled

Notes: NA = not applicable; VMT = vehicle miles traveled; MT CO_2e = metric ton carbon dioxide equivalent; kWh = kilowatt-hour; ADC = alternative daily cover

1. VMT data used in the 2018 inventory does not differentiate between vehicle classification so a single weighted emission factor was developed for all VMT.
2. Electricity emission factors for residential and non-residential are weighted based on the quantity of electricity consumed by each category by provider and the associated emission factor. It is assumed for the baseline forecast that the emission factors for all providers will not change from the 2018 year.

Baseline GHG Emissions Forecast Results

The following provides a summary of the results of the baseline GHG emissions forecast for each source in Healdsburg. The results have been reported in MT CO_2e. The baseline forecast projects a gradual increase in GHG emissions above the baseline 2018 GHG emissions inventory from the energy sector, water and wastewater sector, and from solid waste due to projected population growth. Emissions associated with transportation show a significant increase over time attributed to an anticipated increase in VMT for the city. Table 10 and Figure 1 provide a summary of the Healdsburg baseline GHG emissions forecast.

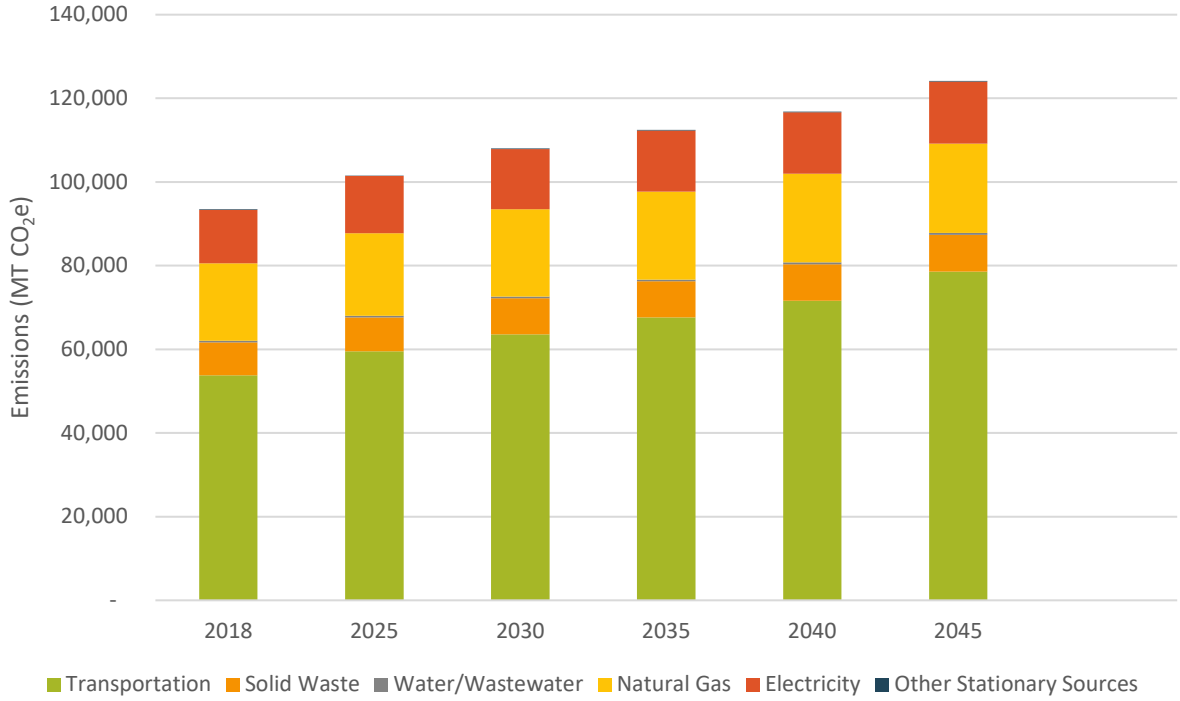
Table 10 Healdsburg Baseline GHG Emissions Forecast Summary

GHG Emissions Source	2018	2025	2030	2035	2040	2045
Transportation						
On-Road Transportation	51,033	56,436	60,295	64,155	68,014	74,850
Off Road – Transportation and Equipment	2,738	3,117	3,309	3,451	3,598	3,711
Electricity[1]						
Residential Electricity	4,657	4,962	5,248	5,293	5,338	5,383
Non-Residential Electricity	8,153	8,699	9,200	9,278	9,356	9,435
Natural Gas						
Residential Natural Gas	10,976	11,697	12,371	12,477	12,582	12,688
Non-Residential Natural Gas	7,525	8,018	8,481	8,553	8,626	8,698
Stationary Sources						
Other Stationary Sources	119	122	129	130	132	133
Water[1]						
Indirect Electricity from Water Delivery	274	281	297	300	303	306
Wastewater						
Direct Emissions from Wastewater Treatment	101	104	110	111	112	113
Solid Waste						
Solid Waste Generation	7,898	8,108	8,587	8,672	8,757	8,830
TOTAL	**93,473**	**101,544**	**108,029**	**112,421**	**116,818**	**124,145**

Notes: Values in this table may not add up to totals due to rounding. All values are of the unit metric tons of carbon dioxide equivalent (MT CO_2e)

1. The City utilities include Healdsburg Electric and water utilities, therefore indirect electricity from water conveyance is already included in the electricity sector. Emissions are shown in this table for informational purposes but to avoid double counting are not added in the overall total.

Figure 1 Healdsburg Baseline GHG Emissions Forecast (MT CO_2e) through 2045



Adjusted GHG Emissions Forecast

Several federal and State regulations have been enacted that would reduce Healdsburg's GHG emissions in 2025, 2030, 2035, 2040, and 2045. The impact of these regulations was quantified and incorporated into the adjusted forecast to project future emissions growth and the responsibility of the City and community once established State regulations have been implemented. The State legislation included in the adjusted forecast result in GHG emission reductions related to transportation, building efficiency and renewable electricity. A brief description of each regulation and the methodology used to calculate associated reductions is provided in the following, as well as a description of why specific legislation was excluded from the analysis. The following State legislation were applied to the Adjusted Forecasts based on the unique sectors within Healdsburg:

- **Title 24 Building Energy Efficiency Standards:** The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption, which in turn reduces fossil fuel consumption and associated GHG emissions. The standards are updated triennially to allow consideration and possible incorporation of new energy-efficient technologies and methods. The 2019 Title 24 Energy Efficiency Standards have come into effect, creating significantly more efficient new building stock. The California Energy Commission (CEC) estimates that non-residential buildings will use 30 percent less energy and that residential homes would use 7 percent less energy compared with 2016 standards, which would increase to 53 percent when new residential developments must include on-site solar generation and near-zero net energy use starting in 2020. While the 2022 Title 24 Energy Efficiency Standards became effective in January 2023, the CEC has not provided specific levels of anticipated reduction in energy use associated with the recent 2022 standards. To remain conservative, the adjusted forecast only accounts for the

estimated energy savings related to 2019 Title 24 Standards. The impact of electrification will be addressed through measure development and quantification.

- **Renewable Portfolio Standard, Senate Bill 100, and Senate Bill 1020:** Established in 2002 under Senate Bill 1078, enhanced in 2015 by Senate Bill 350, and accelerated in 2018 and 2022 under Senate Bill 100 and Senate Bill 1020, respectively, California's Renewables Portfolio Standard (RPS) is one of the most ambitious renewable energy standards in the country. The RPS program requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026 and 60 percent of total procurement by 2030. The RPS program further requires these entities to increase procurement from eligible renewables and GHG-free sources to 90 percent by 2035, 95 percent by 2040, and 100 percent of total procurement by 2045.
- **Transportation Legislation:** Major regulations incorporated into CARB's 2021 transportation model (EMFAC2021) include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards. Additional reductions were calculated for the newly promulgated Innovative Clean Transit (ICT) regulations from CARB. Signed into law in 2002, AB 1493 (Pavley Standards) required vehicle manufacturers to reduce GHG emissions from new passenger vehicles and light trucks from 2009 through 2016. Regulations were adopted by CARB in 2004 and took effect in 2009 when the United States Environmental Protection Agency (USEPA) issued a waiver confirming California's right to implement the bill. The CARB anticipates that the Pavley I standard will reduce GHG emissions from new California passenger vehicles by about 30 percent in 2016, while simultaneously improving fuel efficiency and reducing motorists' costs.[4] Prior to 2012, mobile emissions regulations were implemented on a case-by-case basis for GHG and criteria pollutant emissions separately. In January 2012, CARB approved a new emissions-control program combining the control of smog, soot-causing pollutants, and GHG emissions into a single coordinated package of requirements for passenger cars and light trucks for model years 2017 through 2025. The Advanced Clean Cars program coordinates the goals of the Low Emissions Vehicles, Zero Emissions Vehicles, and Clean Fuels Outlet programs into a single coordinated package of requirements for model years 2017 to 2025. The new standards are anticipated to reduce GHG emissions by 34 percent in 2025.[5] Public transit GHG emissions will also be reduced in the future through the Innovative Clean Transit (ICT) regulation, which was adopted in December 2018. It requires all public transit agencies to gradually transition to a 100-percent zero-emission bus fleet by 2040. Under ICT, large transit agencies are expected to adopt Zero-Emission Bus Rollout Plans to establish a roadmap towards zero emission public transit buses.[6]

Table 11 summarizes the legislation that was applied to each sector in the adjusted forecast.

[4] CARB. Clean Car Standards – Pavley, Assembly Bill 1493. May 2013. http://www.arb.ca.gov/cc/ccms/ccms.htm
[5] CARB. Facts About the Advanced Clean Cars Program. December 2011. http://www.arb.ca.gov/msprog/zevprog/factsheets/advanced_clean_cars_eng.pdf
[6] Innovative Clean Transit. Approved August 13, 2019. https://ww2.arb.ca.gov/sites/default/files/2019-10/ictfro-Clean-Final_0.pdf?utm_medium=email&utm_source=govdelivery

Table 11 Healdsburg Adjusted GHG Emissions Forecast Sectors and Applicable Legislation

GHG Emissions Sector	GHG Emissions Source	
Transportation	On-Road Transportation	Transportation Legislation (Advanced Clean Cars Standards, Pavley Standards, Phase 2 Federal GHG Standards)
	Off Road - Diesel	None
	Off Road - Gasoline	None
	Off Road - Natural Gas (LPG)	None
Electricity[1]	Residential Electricity Consumption	Title 24 – applied to new buildings SB 100 – all electricity use
	Non-Residential Electricity Consumption	Title 24 – applied to new buildings SB 100 – all electricity use
Natural Gas	Residential Natural Gas Consumption	Title 24 – applied to new buildings
	Non-Residential Natural Gas Consumption	Title 24 – applied to new buildings[1]
Stationary Sources	Other Stationary Sources in Buildings	None
Water	Indirect Electricity Consumption from Water Delivery	SB 100
Wastewater	Direct Wastewater Treatment Emissions	None
Solid Waste	Methane Commitment of Solid Waste Generated by Community	None

1. As detailed below, though Title 24 impacts new building it is not anticipated to have a natural gas reduction impact on non-residential buildings under the 2019 Energy Efficiency Standards.

The following State legislation was not included in the emissions forecast calculations:

- **Assembly Bill 939 and 341:** In 2011, AB 341 set the target of 75 percent recycling, composting, or source reduction of solid waste by 2020 calling for the California Department of Resources Recycling and Recovery (CalRecycle) to take a Statewide approach to decreasing California's reliance on landfills. This target was an update to the former target of 50 percent waste diversion set by AB 939. As actions under AB 341 are not assigned to specific local jurisdictions, AB 939 has not been included as part of the adjusted forecast and instead measures addressing compliance with AB 939 will be included in the CMS.
- **Senate Bill 1383:** In 2016, SB 1383 established a methane emission reduction target for short-lived climate pollutants (SLCP) in various sectors of the economy. Specifically, SB 1383 establishes targets to achieve a 50 percent reduction in the level of the Statewide disposal of organic waste from the 2014 level by 2020 and a 75 percent reduction by 2025 (CalRecycle 2019). Additionally, SB 1383 requires a 20 percent reduction in "current" edible food disposal by 2025. Although SB 1383 has been signed into law, compliance at the jurisdiction-level is un-proven. For example, Santa Clara County, in their SB 1383 Rulemaking Overview presentation (June 20, 2018),[7] suggest that the 75 percent reduction in organics is not likely achievable under the current structure; standardized bin colors are impractical; and the general requirement is too prescriptive. As such, SB 1383 has not been included as part of the adjusted forecast. Instead measures addressing compliance with SB 1383 will be included and quantified through GHG reduction measures included in the CMS.

[7] Santa Clara County. June 20, 2018. SB 1383 Rulemaking Overview.
https://www.sccgov.org/sites/rwr/rwrc/Documents/SB%201383%20PowerPoint.pdf

GHG Reduction Legislation Calculations

The following methodology was used to calculate energy related GHG emissions reduction related to Title 24 and SB 100.

- **Title 24:** It is assumed that all growth in building energy consumption is from new construction. Accordingly, Title 24 GHG emissions reduction for natural gas and electricity are calculated as a percentage of the projected increase in energy consumption beyond the baseline 2019 GHG emissions inventory, under the baseline forecast. For projects implemented after January 1, 2020, the California Energy Commission (CEC) estimates that the 2019 standards will have the following energy consumption reduction impact:
  - 53 percent reduction beyond the 2019 baseline for residential electricity;
  - 30 percent reduction beyond the 2019 baseline for commercial electricity; and
  - 7 percent reduction beyond the 2019 baseline for residential natural gas.[8]
- **SB 100 and SB 1020:** PG&E, Direct Access[9], and Healdsburg Electric that currently provide electricity in Healdsburg are subject to SB 100 and SB 1020 requirements. GHG emissions from electricity consumption are largely determined by the emissions factor associated with the supplied electricity. Legislative GHG emissions reductions from SB 100 and SB 1020 are calculated as the difference between GHG emissions under the baseline forecast electricity and GHG emissions calculated using a SB 100/ SB 1020-adjusted GHG emissions factor for a given forecast year. An adjusted GHG emission factor is calculated for PG&E and Healdsburg Electric Standard tier by scaling the current electricity GHG emissions factor with the RPS percentage for renewable and zero-carbon electricity required for compliance with SB 100 and SB 1020. Healdsburg Electric anticipates continuing to provide approximately 30 percent of electricity from a geothermal source[10] for the Standard Rate. Therefore, for forecasting the Healdsburg Electric Standard Rate emission factor, geothermal was considered to make up 30 percent of the electricity mix for all future years, while the remaining 70 percent of electricity was scaled to meet the SB 100 and SB 1020 requirements. Because there is a small amount of emissions associated with geothermal power, Healdsburg Electric electricity will have an emission factor even as the electricity mix eliminates the fossil-fuel power sources in compliance with SB 100 and SB 1020. PG&E and Healdsburg Electric have different electricity emissions factors due to differences in their electricity delivery mix. The RPS percentages and associated GHG emissions factors used to determine the adjusted forecast electricity emissions are provided in Table 12. The RPS percentage for Healdsburg Electric's Green tier of service is 100% with geothermal serving 100% of that power.[11] As such, Healdsburg Electric Green tier emission factor is based on the most recent power content label available (i.e., 2021) and is assumed to stay constant through 2045. Note that while both Title 24 and SB 100/SB 1020 influence GHG emissions reductions in the electricity sector, double counting of these reductions is avoided by accounting for Title 24 reductions first and then accounting for reductions from SB 100 and SB 1020.

[8] California Energy Commission. 2018. 2019 Building Energy Efficiency Standards Frequently Asked Questions. Available: <https://www.energy.ca.gov/sites/default/files/2020-03/Title_24_2019_Building_Standards_FAQ_ada.pdf>. Accessed June 21, 2021.
[9] Direct Access is a retail electric service option whereby customers may purchase electricity form a competitive non-utility entity called a Energy Service Provider (ESP). Electricity service providers are required to comply with SB100.
[10] Geothermal meets the requirements of the RPS as an eligible renewable source of electricity.
[11] Due to impacts from a wildfire in 2019, the power in 2020 was primarily served by geothermal sources and supplemented with other renewable sources.

Table 12 Electricity Provider Forecasted RPS and Electricity GHG Emissions Factors

Energy Provider	2025	2030	2035	2040	2045
PG&E					
Adjusted Electricity Emission Factor (MT CO_2e/kWh)	0.0000398	0.0000340	0.0000085	0.0000042	0.0[5]
Direct Access[1]					
Electricity Emission Factor (MT CO_2e/kWh)	0.0001856	0.0001392	0.0000928	0.0000464	0.0[5]
Green Rate – Healdsburg Electric					
Adjusted Electricity Emission Factor (MT CO_2e/kWh)	0.0000449	0.0000449	0.0000449	0.0000449	0.0000449
Standard Rate – Healdsburg Electric					
Adjusted Electricity Emission Factor (MT CO_2e/kWh)	0.00015	0.000102	0.000054	0.000034	0.000013
Weighted Community Electricity Emissions Factor[2,3,4]					
Residential Adjusted Electricity Emission Factor (MT CO_2e/kWh)[1]	0.000150	0.000102	0.000054	0.000034	0.000014
Non-residential Adjusted Electricity Emission Factor (MT CO_2e/kWh)[2]	0.000149	0.000102	0.000054	0.000034	0.000014

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; kWh = kilowatt hour

1. PG&E provides a small amount direct access electricity to non-residential customers. Direct access electricity emission factor based on the 2018 emission factor from the inventory and assumed to go to carbon free by 2045.
2. The Residential Weighted Electricity Emission Factor is developed based on the percent of residential electricity provided by each provider in 2018. It is assumed that the percent of residential electricity provided by each provider remains consistent over time. Based on the 2018 inventory, residential electricity was provided by the providers as follows: ~99.3% by Healdsburg Electric Standard Rate, ~ 0.7% by Healdsburg Electric Green Rate.
3. The Non-residential Weighted Electricity Emission Factor is developed based on the percent of non-residential electricity provided by each provider in 2018. It is assumed that the percent of non-residential electricity provided by each provider remains consistent over time. Based on the 2018 inventory, non-residential electricity was provided by the providers as follows:~0.1% by PG&E, <0.01% by Direct Access, ~99.3% by Healdsburg Electric Standard Rate, ~ 0.7% by Healdsburg Electric Green Rate.
4. Green Rate participation increased after 2018 when all City accounts were switched to the Green rate. The weighted factor for the overall community incorporates SB 100 and SB 1020 mandates requiring that renewable energy and zero-carbon sources supply 100 percent of retail electric sales by 2045.
5. PG&E's power content in 2021 had a large amount of electricity supply from nuclear power and relatively small amount from geothermal and biomass/biowaste. For the purposes of this forecast, the emissions factor is assumed to go to zero by 2045. It is likely that PG&E will need to incorporate eligible renewables that have a small amount of emissions associated with them to achieve RPS requirements. PG&E and Direct Access account for <1% of electricity supply in Healdsburg.

The following methodology was used to calculate transportation related GHG emissions reduction related to various State legislation.

- **Transportation Legislation:** Activity data for the adjusted forecasted on-road transportation VMT was similarly forecasted as the baseline forecast where the growth metrics were applied to the baseline growth indicators for VMT to forecast on-road VMT. Reductions in GHG emissions from the above referenced transportation standards were calculated using CARB's EMFAC2021 model for Sonoma County. The EMFAC2021 model integrates the estimated reductions into the mobile source emissions portion of the model.[12] The degree to which GHG emissions from on-road transportation

[12] Additional details are provided in CARB's EMFAC2021 Technical Documentation, March 2021. (https://ww2.arb.ca.gov/sites/default/files/2021-03/emfac2021_volume_3_technical_document.pdf). Note that the Low Carbon Fuel Standard (LCFS) regulation is excluded from EMFAC2021 because most of the emissions benefits due to the LCFS come from the production cycle (upstream emissions) of the fuel rather than the combustion cycle (tailpipe). As a result, LCFS is assumed to not have a significant impact on CO_2 emissions from EMFAC's tailpipe emission estimates.

will be reduced can be quantified as the difference between transportation emissions calculated using the 2018 provided emission factors and calculated using the reduced emission factors for the target years. In addition, passenger and commercial electric vehicle (EV) electricity consumption was calculated per forecast year based on EV penetration rates obtained from EMFAC 2021.

Passenger and commercial EV emissions from electricity consumption are subtracted from residential and commercial electricity emissions respectively in the adjusted forecast as emissions from EV charging in the forecast years are captured under the transportation sector. This emissions reallocation is labeled as an "EV adjustment" in the forecasts. The forecasted annual VMT and associated GHG emissions factors used to determine the adjusted forecast on-road emissions are provided in Table 13.

Table 13 Healdsburg Passenger On-Road Transportation Forecast

	2018	2025	2030	2035	2040	2045
Total VMT	121,325,224	134,170,813	143,346,234	152,521,655	161,697,077	177,948,622
Weighted Emission Factor (MT CO_2e/mile)	0.0004206	0.0003741	0.0003275	0.0002923	0.0002698	0.0002579
Passenger (LDV) VMT[1]	116,981,432	129,509,112	138,181,316	146,748,605	155,227,390	170,353,381
Commercial (HD) VMT[1]	4,343,791	4,661,701	5,164,918	5,773,051	6,469,687	7,595,241
% Passenger EV Penetration[2]	0.0%	5.2%	7.8%	9.9%	11.3%	12.0%
% Commercial EV Penetration[2]	0.0%	0.7%	7.1%	19.2%	29.5%	36.5%
Passenger EV (LDV) VMT	-	6,722,271	10,767,549	14,566,431	17,484,834	20,413,171
Commercial EV (HD) VMT	-	31,898	366,938	1,107,024	1,905,541	2,770,827
Passenger (LDV) Fuel Efficiency (kWh/mile)	0.343639	0.355876	0.369772	0.387224	0.401541	0.411350
Commercial (HD) Fuel Efficiency (kWh/mile)	-	1.410620	1.374296	1.355894	1.351219	1.348309
Passenger (LDV) kWh	-	2,392,298	3,981,534	5,640,468	7,020,872	8,396,950
Commercial (HD) kWh	-	44,996	504,282	1,501,008	2,574,802	3,735,932

Notes: VMT = vehicle miles traveled; MTCO2e = metric tons carbon dioxide equivalents; LDV = light-duty vehicle; HD = heavy-duty vehicles kWh = kilowatt hour; EV = electric vehicle;

1. Passenger and commercial VMT are calculated based on how SCTA assigned vehicle categories to a LDV or HD classification in emissions calculations where LDV included LDA, LDT1, LDT2, MDV, MH, MCY, LHD1, LHD2, T6IS, UBUS, and OBUS; all other vehicle classes of the EMFAC202x categorization were considered HD. This breakdown was used to estimate increased electricity usage by residential or non-residential buildings.
2. SCTA did not identify EVs as part of the VMT in the 2018 inventory, therefore it is assumed 0% penetration. EMFAC2021 was used to estimate % EV penetration for forecast years based on the vehicle classifications defined by SCTA.

Adjusted GHG Emissions Forecast Results

Compliance with State legislation is expected to result in GHG emissions reduction from the baseline GHG Emissions Forecast in the transportation and energy sectors for residential and non-residential activities. Compliance with the Pavley regulation, which requires automakers to control GHG emission from new passenger vehicles for the 2009 through 2016 model years, and the Advanced Clean Car Program, which combines the control of smog-causing (criteria) pollutants and GHG emissions into a

single package of regulations including the LEV regulations[13], are expected to reduce GHG emissions from transportation. Emissions associated with heavy-duty trucks and transit buses are also anticipated to be reduced through the Advanced Clean Trucks Regulation and Innovative Clean Transit, respectively. Compliance with Title 24 requirements are expected to reduce GHG emissions from reduced electricity and natural gas consumption in new buildings. Compliance with SB 100 requirements are expected to further reduce GHG emissions associated with the electricity sector by driving GHG emissions associated with electricity to zero by 2045. SB 100 is also anticipated to reduced indirect electricity emissions associated with water and wastewater conveyance and treatment. A detailed summary of the projected GHG emissions under the adjusted forecast by sector and year through 2045 can be found in Table 14 .

Table 14 Healdsburg Adjusted GHG Emissions Forecast Detail

GHG Emissions Source	2018	2025	2030	2035	2040	2045
Transportation						
On-Road Transportation	51,033	50,194	46,951	44,583	43,631	45,897
Off Road – Transportation and Equipment	2,738	3,117	3,309	3,451	3,598	3,711
Electricity[1]						
Residential Electricity	4,657	4,394	3,233	1,817	1,189	499
Non-Residential Electricity	8,153	7,346	5,234	2,822	1,785	694
Natural Gas						
Residential Natural Gas	10,976	11,646	12,274	12,372	12,470	12,568
Non-Residential Natural Gas	7,525	8,018	8,481	8,553	8,626	8,698
Stationary Sources						
Stationary Sources	119	122	129	130	132	133
Water[2,3]						
Indirect Electricity from Water Delivery	274	70	74	75	75	76
Wastewater						
Direct Emissions from Wastewater Treatment	101	104	110	111	112	113
Solid Waste						
Solid Waste Generation	7,898	8,108	8,587	8,672	8,757	8,830
TOTAL	**93,473**	**93,120**	**88,381**	**82,586**	**80,374**	**81,219**

Notes: Values in this table may not add up to totals due to rounding. All values are of the unit metric tons of carbon dioxide equivalent (MT CO_2e)

1. Electricity associated with EV charging due to EV penetration over the 2018 inventory year is added to the building energy sector in the adjusted forecast.
2. The City utilities include Healdsburg Electric and water utilities, therefore indirect electricity from water conveyance is already included in the electricity sector. Emissions are shown in this table for informational purposes but to avoid double counting are not added in the overall total.
3. The City indicated that starting in late 2018, the City switched all accounts to use all Green Rate electricity including water conveyance.

[13] The LEV III regulations adopted in 2012 increase emissions standards on GHG for new passenger vehicles through 2025 model year.

Figure 2 presents the GHG emissions trends in terms of MT CO_2e for the Adjusted forecast. Adjusted forecast emissions trend downward over time through 2045 with the decrease becoming more gradual between 2035 and 2045.

Figure 2 Healdsburg Adjusted GHG Emissions Forecast (MT CO_2e) through 2045

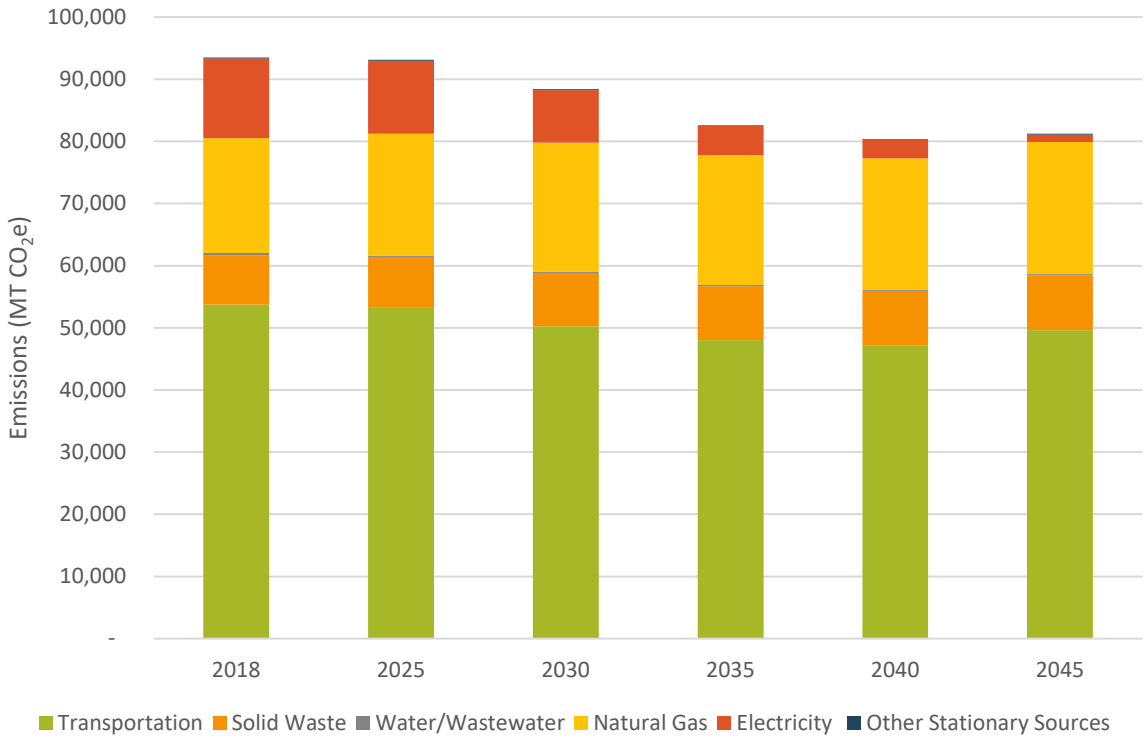


Table 15 provides the results summary of the GHG emissions forecast for Healdsburg, including the Baseline GHG Emissions Forecast, the Adjusted GHG Forecast, and the expected percentage GHG emissions reduction based on compliance with State GHG legislation.

Table 15 Healdsburg GHG Emissions Forecast Results Summary

	2018	2025	2030	2035	2040	2045
Baseline Forecast	93,473	101,544	108,029	112,421	116,818	124,145
Transportation Reductions	0	6,242	13,345	19,572	24,383	28,953
Title 24 Reductions	0	378	733	788	843	899
SB 100/SB 1020 Reductions	0	1,804	5,571	9,475	11,217	13,075
Legislative Adjusted Forecast	93,473	93,120	88,381	82,586	80,374	81,219
Percent Reduction in GHG Emissions from Legislation	0.0%	8.3%	18.2%	26.5%	31.2%	34.6%

SB = Senate Bill; GHG = greenhouse gas

Healdsburg GHG Emissions Targets

GHG reduction targets are used to establish measurable metrics intended to guide the community's commitment to achieve GHG emissions reduction and help gauge progress with reducing emissions over time. GHG targets are developed relative to a baseline emissions level. California has established Statewide GHG reduction goals for 2030 and 2045. The State has encouraged communities to adopt their own plans consistent with these goals in the CARB 2022 Scoping Plan. Thus, local agencies are recommended to establish at a minimum, equivalent reduction targets at the local level by establishing community wide GHG reduction goals for climate action that will help California achieve its 2030 and 2045 GHG emissions goals.

GHG reduction targets can be set as either an efficiency target (MT CO_2e per capita) or as a community-wide mass emissions target (total MT CO_2e). In CARB's 2017 Scoping Plan Update, efficiency metrics were identified as potential local targets to normalize population changes and not penalize cities which are growing at significant rates.[14] Within this section, targets are discussed in terms of absolute or mass emissions (MT CO_2e) and per capita emissions (MT CO_2e per person).

Healdsburg GHG Emissions Targets for 2030 and 2045

As the State is continuously setting new GHG emission targets, this allows Healdsburg to choose a variety of GHG emission targets to include in their CMS. These targets include:

- State-mandated target for a CEQA qualified Climate Action Plan (SB 32 Minimum Target)
  - Senate Bill (SB) 32/Assembly Bill (AB) 1279 – 40% below 1990 emissions level by 2030, carbon neutrality by 2045. The State-mandated target (or SB 32 minimum) requires a clear plan to reach the 2030 target of 40% below 1990 levels, and a pathway toward carbon neutrality by 2045. AB 1279 requires the reduction in GHG emissions by 85% below 1990 levels by 2045. The remaining 15% of emissions would be removed via carbon removal technology or natural working lands.
- Regional Aspirational targets
  - Carbon-neutrality by 2030. This target represents the most ambitious target that the RCPA has set for Sonoma County. This target also exceeds Governor Newsom's recent direction to CARB to explore feasibility of carbon neutrality by 2035. Achieving this target entails an 80% reduction in emissions from 1990 levels coupled with carbon sequestration to meet the remaining 20% of emissions removal to achieve carbon neutrality by 2030.

With GHG emission reduction targets in place, the reduction gap that Healdsburg will be responsible for through local action can be calculated. The CMS will assess the GHG emissions reduction gap based on the difference between the *legislative* adjusted GHG emissions forecast and the State and Regional GHG reduction targets.

There are two methodologies for calculating the minimum GHG emissions reductions the city will have to monitor to stay on track for supporting these goals. The City could choose to adopt mass emission or per capita targets. Mass emission targets describe emissions in terms of total MT CO_2e without any adjustment for population growth. The 2017 California Climate Change Scoping Plan Update includes guidance that details the methodology and benefits of developing per capita targets. The key benefit of a per capita target is that it corrects for population growth, as the target does not become more difficult

[14] California Air Resources Board. 2017. California's Climate Change Scoping Plan, p. 99-102.

to reach if the City grows faster than projected. Per capita emissions targets are developed by dividing the emissions in each target year by the forecasted population. Mass and per capita emissions targets for each of the potential targets listed above (i.e., state-mandated SB 32/AB 1279 target and RCPA target) are summarized below in Table 16.

Table 16 Summary of Healdsburg GHG Emission Reduction Targets and Gap Analysis

Metric	2025	2030[2]	2035	2040	2045[2]
Population[1]	12,025	12,746	12,882	13,018	13,127
Mass Emissions Adjusted Forecast (MT CO_2e)	93,120	88,381	82,586	80,374	81,219
Per Capita Adjusted Forecast (MT CO_2e per capita)	7.7	6.9	6.4	6.2	6.2
State Emissions Target and Gap					
State Mass Emissions Target (Pathway) (MT CO_2e)	71,339	55,530	37,020	18,510	0.0
Remaining Emissions Gap from State targets (MT CO_2e)	21,781	32,851	45,566	61,865	81,219
Per Capita State Targets (MT CO_2e per capita)	6.7	5.9	3.9	2.0	0.0
State Efficiency Emissions Target (Pathway) (MT CO_2e)	80,240	74,746	50,362	25,447	-
Remaining Emissions Gap from State targets (MT CO_2e)	12,881	13,636	32,224	54,927	81,219
RCPA Emissions Target and Gap[2]					
RCPA Mass Emissions Target (Pathway) (MT CO_2e)	49,744	0.0	0.0	0.0	0.0
Remaining Emissions Gap from RCPA targets (MT CO_2e)	43,376	88,381	82,586	80,374	81,219
Per Capita RCPA Targets (MT CO_2e per capita)	4.4	0.0	0.0	0.0	0.0
RCPA Efficiency Emissions Target (Pathway) (MT CO_2e)	52,816	0.0	0.0	0.0	0.0
Remaining Emissions Gap from RCPA targets (MT CO_2e)	40,304	88,381	82,586	80,374	81,219

Notes: MT CO_2e = Metric tons of carbon dioxide equivalent; N/A = not applicable

Emissions have been rounded to the nearest whole number and therefore sums may not match.

1. Population projections for the GHG inventories (1990,2010, 2015, 2018) and forecasted population projections obtained from CA Dept of Finance, RCPA Climate Action Plan 2020.
2. The RCPA has set a target to exceed the states target by reaching carbon neutrality by 2030 and urges cities within Sonoma County to adopt a similar target.

Table 17 provides further detail on the portion of the total emissions gap that would need to come from direct emission reductions that the city would achieve through local actions to align with the emission reduction targets. The difference between the total emissions gap and the direct emission reductions is the emission removals that would need to be achieved through carbon sequestration or other carbon removal technologies to reach carbon neutrality.

Table 17 GHG Emission Reduction versus Emission Removal Targets

Metric	2025	2030[2]	2035	2040	2045[2]
State Emissions Target and Gap – Mass Emissions Target Pathway					
Emissions Gap from State targets (MT CO_2e)[1]	21,781	32,851	45,566	61,865	81,219
Direct Emission Reductions (MT CO_2e)[2]	21,781	32,851	40,939	52,610	67,336
Emission Removals (MT CO_2e)[2]	0.0	0.0	4,627	9,255	13,882
State Emissions Target and Gap – Efficiency Emissions Target Pathway					
Emissions Gap from State targets (MT CO_2e)[1]	12,881	13,636	32,224	54,927	81,219
Direct Emission Reductions (MT CO_2e)[2]	12,881	13,636	25,928	42,204	61,974
Emission Removals (MT CO_2e)[2]	0.0	0.0	6,295	12,724	19,245
RCPA Emissions Target and Gap - Mass Emissions Target Pathway					
Emissions Gap from RCPA targets (MT CO_2e)[1]	43,376	88,381	82,586	80,374	81,219
Direct Emission Reductions (MT CO_2e)[2]	43,376	69,871	65,619	64,950	67,336
Emission Removals (MT CO_2e)[2]	0.0	18,510	16,967	15,425	13,882
RCPA Emissions Target and Gap – Efficiency Emissions Target Pathway					
Emissions Gap from RCPA targets (MT CO_2e)[1]	40,304	88,381	82,586	80,374	81,219
Direct Emission Reductions (MT CO_2e)[2]	40,304	63,466	59,503	59,168	61,974
Emission Removals (MT CO_2e)[2]	0.0	24,915	23,083	21,206	19,245

Notes: MT CO_2e = Metric tons of carbon dioxide equivalent; N/A = not applicable

Emissions have been rounded to the nearest whole number and therefore sums may not match.

1. Obtained from Table 16.
2. The targets specify the percent of the carbon neutrality goal that would be achieved through direct emission reductions versus carbon removals via carbon sequestration or other carbon removal technology.

Figure 3 presents the gap the city will be responsible for to meet the State's SB 32/AB 1279 emissions reduction targets of 60% and 85% emission reductions from 1990 levels in 2030 and 2045, respectively. The graph also shows the anticipated level of carbon removals that would be needed to achieve carbon neutrality by 2045 in alignment with AB 1279. Figure 4 presents the gap the city would need to meet to achieve the RCPA target of carbon neutrality by 2030 through an 80% reduction in emissions from 1990 levels coupled with 20% of carbon removals. The targets are shown as mass emissions and as efficiency targets converted to mass emissions.

Figure 3 GHG Emissions Gap Analysis for State Targets

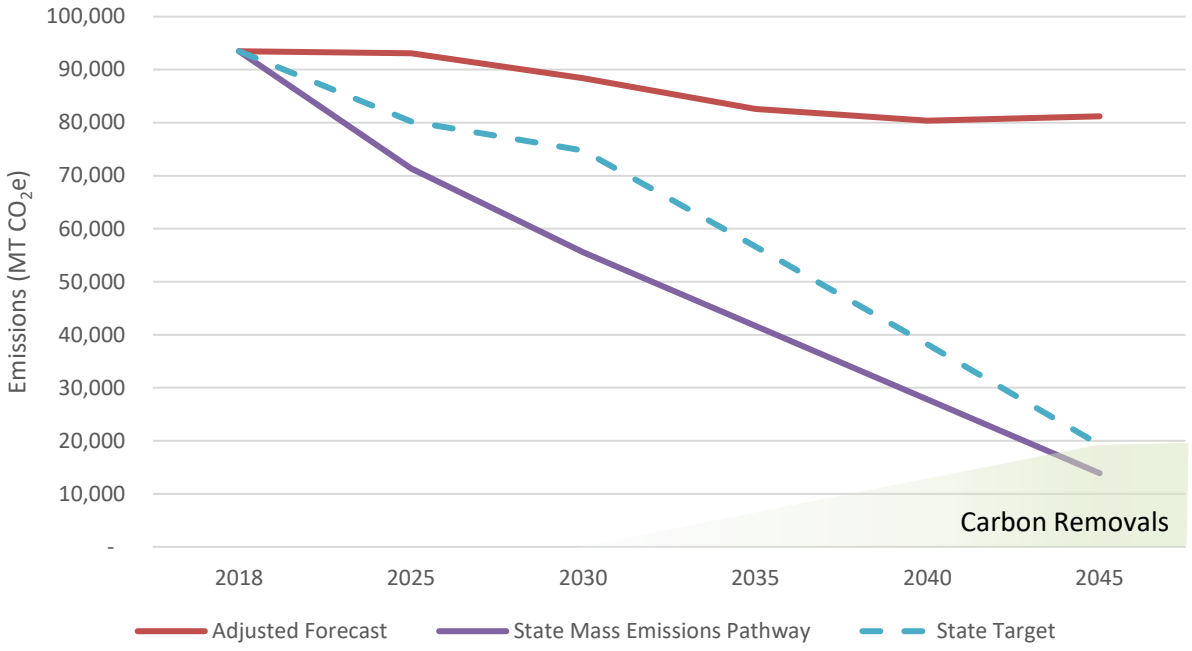
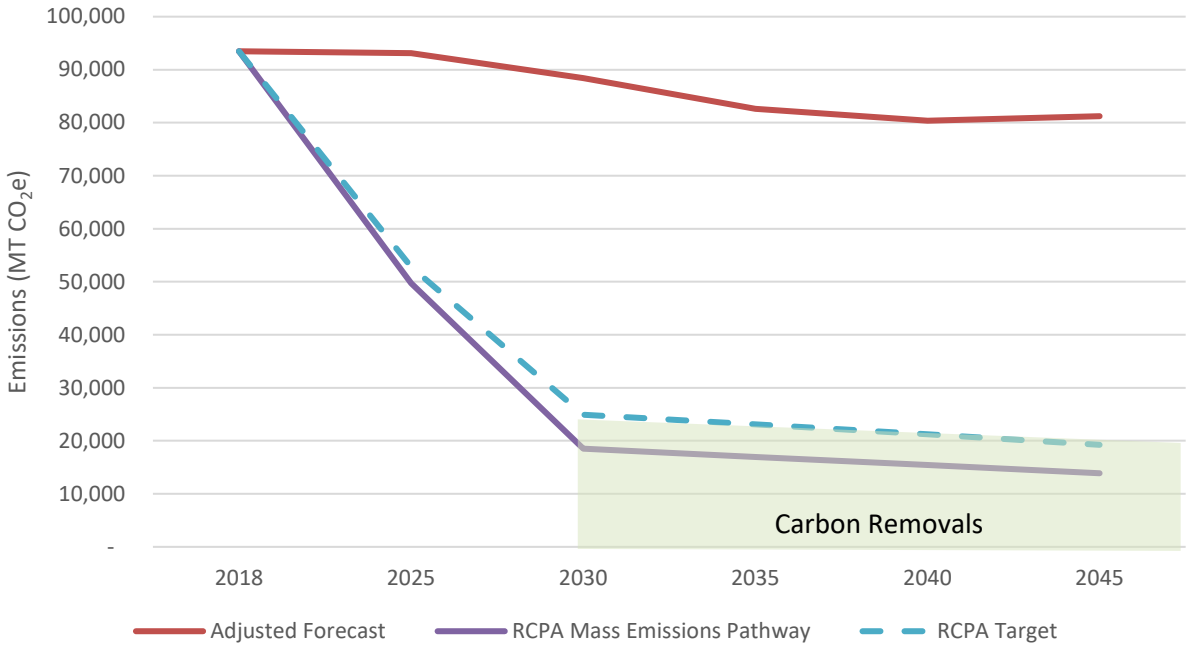


Figure 4 GHG Emissions Gap Analysis for RCPA Targets



Plan to Meet the Targets

The 2030 and 2045 targets identified above would be achieved through a combination of existing California measures and implementation of local measures identified in the Healdsburg CMS. Local measures will be identified through a comprehensive assessment of existing local and regional policies, programs, actions, and community ideas and by assessing any gaps and identifying additional opportunities. Additional measures will be developed from best practices of other similar and neighboring jurisdictions, as well as those recommended by organizations and agencies, such as the California Air Pollution Control Officers Association (CAPCOA), the Office of Planning and Research, CARB's 2022 Scoping Plan, and Association of Environmental Professionals (AEP). Measures will be vetted by City staff, interested parties, and the community and the top measures will be quantified to identify their overall contribution to the City's 2030 and 2045 GHG reduction targets in the Healdsburg CMS.