Memo

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Date: July 12, 2019
To: Danny Serrano, RICK Engineering
From: Andrew Martin and Kai Lord-Farmer, Ascent Environmental
Subject: City of Murrieta Climate Action Plan Update
Draft Technical Memorandum: Greenhouse Gas Emissions Inventory, Forecasts, and Reduction Targets

INTRODUCTION

The City of Murrieta (City) adopted a Climate Action Plan (CAP) on July 19, 2011, as part of the City's 2011 General Plan. The City's 2011 CAP included a goal to reduce emissions to 1990 levels by 2020 to remain consistent with the statewide greenhouse gas (GHG) emission reduction goal set forth in Assembly Bill 32. The City is currently updating its Climate Action Plan concurrent with efforts to prepare a focused update of the City's General Plan (GPU). The updated CAP will be consistent with new State legislation and guidance issued since the 2011 CAP was adopted. Ascent has completed several technical analyses required for the preparation of the CAP update, including: (1) a new 2016 GHG emissions inventory to serve as the baseline year for the CAP; (2) new GHG emission forecasts for 2020, 2030, 2035 (GPU horizon year) and 2050; (3) revised GHG emission reduction targets for the forecast years. This technical memorandum summarizes the results of the analyses, including methods, assumptions, emission factors, and data sources.

ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of four main sections:

- **Section 1: GHG Emissions Inventory** summarizes the 2016 GHG emissions inventory developed. The emissions inventory includes the following emissions sectors: building energy, on-road transportation, off-road transportation, solid waste, water use, and wastewater.

- **Section 2: GHG Emissions Forecasts** summarizes the forecasted GHG emissions under "business-as-usual" (BAU) and legislative-adjusted BAU scenarios. A BAU scenario is one in which no action is taken by local, State or federal agencies to reduce GHG emissions. A legislative-adjusted scenario is one in which BAU conditions are adjusted to reflect policy or regulatory actions enacted by State or federal agencies, but without considering any local actions to reduce GHG emissions.

- **Section 3: GHG Reduction Targets** identifies recommended GHG emission reduction targets for 2020, 2030, 2035, and the longer-term goal for 2050, and shows the calculated gap between estimated GHG reductions under the forecast scenarios and the recommended emission reduction targets. The recommended GHG emission reduction targets for each year are provided to demonstrate consistency between the City's GHG emissions and State GHG reduction targets established through legislation and executive order.

- **Section 4: Next Steps** briefly discusses the next steps in the climate action planning process and what is needed to achieve the GHG reduction targets discussed in Section 3.

1 EMISSION INVENTORY

1.1 2016 GREENHOUSE GAS EMISSIONS INVENTORY

The purpose of the GHG emissions inventory is to gain an understanding of the sources and levels of GHG emissions within the City's jurisdiction, as well as to establish a baseline against which future GHG emissions forecasts can be compared. The GHG emissions inventory for the City was prepared for the calendar year 2016. The 2016 GHG emissions inventory is considered the baseline year for the preparation of GHG emissions forecasts and GHG reduction targets that will be used in the City's CAP update.

The 2016 GHG emissions inventory is summarized below in Table 1. GHG emissions in this inventory include communitywide emissions resulting from activities occurring and permitted to occur within the existing city limits in 2016, which were approximately 890,520 metric tons of carbon dioxide equivalent ($MTCO_2e$). The emissions sectors included in the inventory are residential and commercial energy use, industrial energy use, on-road vehicles, off-road vehicles, solid waste, water use, and wastewater. The largest emissions sector is on-road vehicles, representing approximately 76 percent of all communitywide GHG emissions in 2016.

Table 1 2016 City of Murrieta Communitywide Greenhouse Gas Inventory

Sector	2016 ($MTCO_2e$/year)	Percent of Total
On-Road Vehicles	679,920	76%
Off-Road Vehicles	11,741	1%
Transportation Sector Total	691,661	77%
Residential Energy	104,352	12%
Commercial Energy	27,410	3%
Industrial Energy	24,784	3%
Building Sector Total	156,546	18%
Solid Waste	40,038	4%
Wastewater and Water-Related	2,275	0.3%
Total (All Sectors)	890,520	100%

Notes: Totals may not add due to rounding. $MTCO_2e$ = metric tons of carbon dioxide equivalent; GWP = Global Warming Potential

Source: Data compiled by Ascent Environmental in 2019.

2 EMISSIONS FORECASTS

2.1 GREENHOUSE GAS EMISSIONS FORECASTS TO 2020, 2030, 2035, 2050

Emission forecasts were calculated for two emissions scenarios, including (1) BAU conditions and (2) legislative-adjusted BAU conditions. The BAU forecast scenario accounts for future growth in emissions associated with future growth and activity levels in the City but assumes no future action to reduce GHG emissions by State or federal agencies. In contrast, the legislative-adjusted BAU (ABAU) forecast scenario accounts for future growth in emissions associated with future growth and activity levels in the City, along with legislative actions to reduce emissions due to State and federal regulations, programs, or other mandated actions. A summary of legislative reductions applied is provided below in Table 5. These forecast scenarios provide the City with the information needed to focus its GHG reduction efforts on the emission sectors and sources that have the most GHG reduction opportunities, considering what State and federal legislative reductions are already achieving or are expected to achieve in the future.

BAU forecasts described in this section for 2020, 2030, 2035 and 2050 are generally based on the State's GHG reduction target years established in key State legislation and policies, including Assembly Bill (AB) 32, Senate Bill (SB) 32, Executive Order (EO) B-30-15, and EO S-3-05; as well as the buildout year for the GPU (2035). The Statewide GHG reduction targets are as follows:

- 1990 levels by 2020 (AB 32);
- 40 percent below 1990 levels by 2030 (SB 32 and EO B-30-15); and,
- 80 percent below 1990 levels by 2050 (EO B-30-15 and S-3-05).

Estimated BAU emission forecasts were based on demographic forecasts, including annual population, jobs, and household growth between 2016 and 2050 for the City, as developed by Iteris and VRPA for the traffic and vehicle miles traveled (VMT) modeling of the GPU. To remain consistent with the demographic forecasts used for the GPU traffic and VMT modeling, Ascent has used forecast data provided by Iteris and VRPA regarding population, jobs, and household growth in the City through the year 2040. These forecasts are based on the land use configuration to be included in the GPU. Ascent has extrapolated a population, jobs, and household growth estimate for 2050 using the growth rates provided between 2016 and 2040. Table 2 below shows the annual growth rates for 2020, 2030, 2035 and 2050. To estimate long-term growth trends and account for variability in short-term growth trends (e.g., 2020-2030), Ascent has used the 2016-2050 annual growth rate in the forecasted BAU and ABAU scenarios.

Table 2 Annual Growth Factors (%)

Factor	2016 to 2020	2020 to 2030	2030 to 2035	2035 to 2050	2016 to 2050
Population	1.07	1.00	0.93	0.94	0.97
Jobs	7.68	5.07	3.63	4.21	4.78
Dwelling Units	1.25	1.15	1.06	1.00	1.00
Vehicle Miles Traveled	1.69	1.52	1.36	1.40	1.46

Source: Data compiled by Ascent Environmental in 2019.

Table 3 shows the population, jobs, household, and daily VMT forecast that was provided by Iteris and VRPA with 2050 projections extrapolated based on the 2016 through 2040 annual growth rate.

Table 3 Demographic and Daily Vehicle Miles Traveled Forecast (2016-2050)

Factor	2016	2020	2030	2035	2050
Population	110,897	115,718	127,772	133,798	154,003
Jobs	28,628	38,485	63,128	75,450	139,986
Dwelling Units	35,534	37,341	41,859	44,118	49,912
Daily Vehicle Miles Traveled	4,132,649	4,419,630	5,137,080	5,495,806	6,768,910

Source: Data compiled by Ascent Environmental in 2019.

Table 4 includes the BAU emissions forecast for each emissions sector from 2016 through 2050. Table 4 also includes the growth factor which was applied to each emissions sector and the annual activity data which was used to estimate emissions in each sector.

Table 4 Business-As-Usual Forecasts ($MTCO_2e$/year)

Sector	Activity Data	Growth Factor	2016	2020	2030	2035	2050
Residential Energy	Kilowatts (kW) and Therms	Population	114,112	131,204	190,170	139,230	161,409
Commercial Energy		Jobs	27,410	31,418	45,102	54,575	99,861
Industrial Energy		Jobs	24,784	29,872	47,643	60,169	121,191
On-Road Vehicles	VMT	VMT	679,920	727,135	845,173	904,192	1,113,648
Off-Road Vehicles	Diesel Fuel Use	OFFROAD Model[1]	11,741	12,580	15,237	16,755	19,781
Solid Waste	Landfill Disposal Rate (Tons)	Population	40,038	41,778	45,834	48,102	55,601
Wastewater and Water-Related	Million Gallons (MG) wastewater processer; kW	Population	2,275	2,008	2,063	2,165	2,239
Total			**900,280**	**963,647**	**1,133,343**	**1,225,187**	**1,573,729**

Notes: $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

1. **Off-Road Vehicle emissions were estimated using the California Air Resources Board 2017 OFFROAD Model which included annual forecast of off-road vehicle use in Riverside County through 2050.**

Source: Data compiled by Ascent Environmental in 2019.

By comparison with the BAU analysis, the City's GHG emissions, accounting for applicable legislative reductions, would decrease by 9 percent between 2016 and 2035 rather than increase by 36 percent without legislative reductions, as shown in Tables 3 and 4 and in Figure 1. Figure 1 also shows the emissions trend that would occur without anticipated legislative reductions and accounting for emission growth in the City without anticipated legislative reductions. Table 5 includes the ABAU emissions forecast for each emissions sector from 2016 through 2050. The legislative reductions applied to each GHG emissions sector are summarized below in Table 6.

Table 5 Legislative-Adjusted Business-As-Usual Forecasts ($MTCO_2e$/year)

Sector	2016	2020	2030	2035	2050
Residential Energy	114,112	114,180	113,865	114,775	116,927
Commercial Energy	27,410	42,071	51,518	59,829	101,023
Industrial Energy	24,784	4,274	3,389	3,004	266
On-Road Vehicles	679,920	669,154	592,254	585,860	591,645
Off-Road Vehicles	11,741	12,580	15,237	16,755	19,781
Solid Waste	40,038	34,182	37,501	39,356	45,491
Wastewater and Water-Related	2,275	1,916	1,410	1,208	456
Total	**900,280**	**878,357**	**815,174**	**820,787**	**875,589**

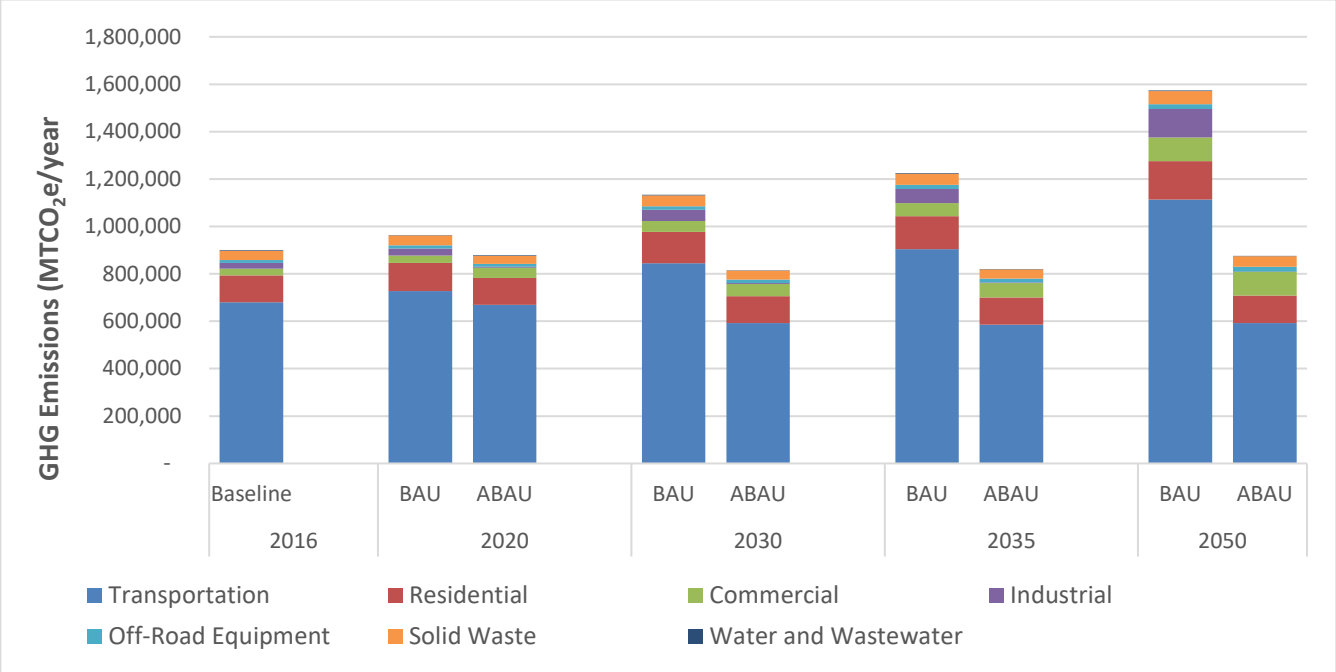
Notes: $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Source: Data compiled by Ascent Environmental in 2019.

Table 6 Legislative Reductions Summary

Source	Legislative Reduction	Description	Sectors Applied
State	RPS	Requires California energy utilities to procure 33 percent of electricity from renewable sources by 2020.	Building Energy, Water
State	SB 100	Requires California energy utilities to procure 60 percent of electricity from renewable sources by 2030 and 100 percent from renewable and zero-carbon sources by 2045.	Building Energy, Water
State	California Building Efficiency Standards (Title 24, Part 6)	Requires all new buildings in California to comply with energy efficiency standards established by CEC.	Building Energy
State	AB 341	California target to achieve a 75 percent solid waste diversion target by 2020.	Solid Waste
State	Pavley Clean Car Standards	Establishes GHG emission reduction standards for model years 2009 through 2016 that are more stringent than federal CAFE standards.	On-Road Vehicles
State	Advanced Clean Car Standards	Establishes GHG emission reduction standards for model years 2017 through 2025 that are more stringent than federal CAFE standards.	On-Road Vehicles
State	SBX7-7	Requires a 20 percent reduction in per capita water usage by 2020.	Water
Federal	Fuel Efficiency Standards for Medium- and Heavy-Duty Vehicles	Establishes fuel efficiency standards for medium- and heavy-duty engines and vehicles.	On-Road Vehicles

Notes: AB = Assembly Bill; CAFE = Corporate Average Fuel Economy; CEC = California Energy Commission; EPA = Environmental Protection Agency; GHG = greenhouse gas; RPS = Renewable Portfolio Standard; SB = Senate Bill; VMT = vehicle miles traveled. Source: Ascent Environmental 2019.



Notes: BAU = Business-As-Usual; ABAU = Legislative-Adjusted Business-As-Usual; GHG = greenhouse gas; $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Figure 1 Business-As-Usual and Legislative-Adjusted Business-As-Usual Emissions Forecasts

Emission forecasts under the legislative-adjusted BAU forecast scenario are detailed for each sector and discussed below.

2.1.2 Building Energy

Emissions from future electricity and natural gas use were estimated by multiplying anticipated energy use with forecasted emission factors. Future energy use was forecasted in three parts. First, energy use was scaled by growth factors detailed in Table 2. Second, energy emission factors were adjusted to reflect California's Renewables Portfolio Standard (RPS) targets. Electricity emission factors are anticipated to decline based on current regulations, while natural gas emission factors stay constant. Third, energy intensity factors were adjusted to reflect increased stringency expected under California's Title 24 building energy efficiency standards (i.e., 2019 standards which will go into effect on January 1, 2020) and are expected to achieve decreases in electricity and natural gas consumption in new construction. The residential building sector also accounts for emissions associated with residential electric vehicle (EV) charging which takes into account the percentage of VMT in future years based on projections in EMFAC 2017. The assumptions to energy efficiency and future electricity emission factors are described below. Table 7 summarizes the legislative factors used to scale building use by energy type.

Table 7 Building Energy Emissions Forecast Methods and Legislative Reductions by Source

Energy Type	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Electricity	Population growth for residential building energy; job growth for commercial/industrial building energy.	RPS achieved and scheduled targets (i.e., 33 percent renewable by 2020, 60 percent renewable by 2030, 100 percent renewable or zero-carbon by 2045) applied to SCE's emission factors. Accounts for 2016 to 2019 Title 24 energy efficiency gains in new construction.
Natural Gas	Population growth for residential building energy; job growth for commercial/industrial building energy.	Accounts for 2016 to 2019 Title 24 energy efficiency gains in new construction.

Notes: RPS = Renewable Portfolio Standard; SCE= Southern California Edison
Source: Ascent Environmental 2019.

RESIDENTIAL BUILDING ENERGY

Between 2016 and 2035, electricity and natural gas emissions from residential buildings would increase by 5 percent from 114,112 to 116,927 $MTCO_2e$ per year with legislative adjustments. Table 8 shows the baseline and legislative-adjusted BAU forecasted emissions from the residential building energy sector by energy type for 2016, 2020, 2030, 2035, and 2050.

Table 8 Residential Building Energy Legislative-Adjusted Business-As-Usual Emissions Forecasts (2016-2050) ($MTCO_2e$/year)

Energy Type	2016	2020	2030	2035	2050
Electricity (Associated with Residential EV Charging)	64	293	962	1,228	0
Electricity	29,849	26,372	16,514	16,928	0
Natural Gas	84,199	87,515	96,389	101,158	116,927
Total Residential Building Energy Emissions	**114,112**	**114,180**	**113,865**	**119,314**	**116,927**

Notes: Totals may not add due to rounding. $MTCO_2e$ = metric tons of carbon dioxide equivalent.
Source: Data compiled by Ascent Environmental in 2019.

COMMERCIAL AND INDUSTRIAL BUILDING ENERGY

Between 2016 and 2035, electricity and natural gas emissions from commercial and industrial buildings would increase by 58 percent from 42,489 to 65,391 $MTCO_2e$ per year with legislative adjustments. Table 9 shows the baseline and legislative-adjusted BAU forecasted emissions for the commercial and industrial building energy sector by energy type for 2016, 2020, 2030, 2035, and 2050.

Table 9 Commercial and Industrial Building Energy Legislative-Adjusted Business-As-Usual Emissions Forecasts (2016-2050) ($MTCO_2e$/year)

Energy Type		2016	2020	2030	2035	2050
Commercial Energy	Electricity	17,651	17,170	11,804	12,898	0
	Natural Gas	20,660	24,901	39,715	50,156	101,023
Industrial Energy	Electricity	4,124	4,208	3,285	3,829	0
	Natural Gas	54	66	105	132	266
Total Commercial and Industrial Building Energy Emissions		**42,489**	**46,345**	**54,908**	**67,015**	**101,289**

Notes: Totals may not add due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent.
Source: Data compiled by Ascent Environmental in 2019.

ELECTRICITY EMISSION FACTORS

Electricity emissions from the building energy sector would see declines through 2045 without additional City action, despite growth, due to State measures already in place. Electricity emission factors for carbon dioxide equivalent (CO_2e) are based on Southern California Edison's (SCE) emission factor reported for 2016 (SCE 2016). California utility providers, including SCE, are scheduled to reach a 33 percent renewable electricity generation mix by 2020 and 60 percent by 2030, and 100 percent by 2045 pursuant to statewide implementation of the RPS and 100 percent electricity from renewable or zero-carbon sources pursuant to SB 100. SCE's 2016 emission factor was 0.24 metric tons of CO_2 per megawatt hour of electricity generated ($MTCO_2e/MWh$). By 2030, the emission factor will be 0.060 $MTCO_2e/MWh$. Consistent with SB 100, it was assumed that SCE would generate 100 percent of its electricity from renewable sources by 2045. For the purposes of this forecast, it is assumed that SCE would continue to make progress towards achieving the 2045 zero-carbon goal after 2030 so their 2035 emissions factor would decrease to 0.045 $MTCO_2e/MWh$.

ENERGY EFFICIENCY

The State's Title 24 Building Energy Efficiency Standards apply to both new construction and existing buildings. The 2019 Title 24 standards will go into effect in January 2020. The California Energy Commission (CEC) estimates that new residential buildings built to the 2019 standards would be 53 percent more efficient than residential buildings built to the previous standards (CEC 2015). CEC estimates that new non-residential built to the 2019 standards would be 30 percent more efficient than non-residential buildings built to the previous standards (CEC 2018).

2.1.3 Water and Wastewater

Between 2016 and 2035, water- and wastewater-related emissions from the City would decrease by 34 percent from 2,275 to 1,479 $MTCO_2e$ per year. This change reflects an increase in water consumption and wastewater generation with lower electricity factors related to the 2020, 2030, and 2045 RPS targets, consistent with SB 100 legislative actions described above, as well as a 20 percent water efficiency reduction, consistent with SBX7-7. Table 10 summarizes the legislative reductions used to forecast water and wastewater emissions.

Table 10 Water and Wastewater Forecast Methods and Legislative Reductions by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Water Consumption	Population growth.	Assumes electricity use for pumping, conveyance, and treatment follow the 2020, 2030, and 2045 RPS and zero-carbon schedule. Assumes a 20 percent reduction in water-related energy due to 20 percent reduction in water usage per requirements of SBX7-7.
Wastewater Treatment	Population growth.	Assumes electricity use for pumping, conveyance, and treatment follow the 2020, 2030, and 2045 RPS and zero-carbon schedule. Assumes a 20 percent reduction in wastewater-related energy due to 20 percent reduction in water usage per requirements of SBX7-7.

Notes: RPS = Renewable Portfolio Standard.
Source: Ascent Environmental 2019.

Table 11 shows the baseline and legislative-adjusted BAU forecasted emissions from water- and wastewater-related sources for 2016, 2020, 2030, 2035, and 2050. Population growth rates and electricity emission factors are detailed in Table 3 and Section 1.2.1.

Table 11 Water and Wastewater Legislative-Adjusted Business-As-Usual Emissions Forecasts (2016-2050) ($MTCO_2e$/year)

Activity	2016	2020	2030	2035	2050
Water-Related	1,605	1,242	817	643	0
Wastewater Treatment	670	674	593	565	456
Total Water and Wastewater Emissions	**2,275**	**1,916**	**1,410**	**1,208**	**456**

Notes: Totals may not add due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent.
Source: Data compiled by Ascent Environmental in 2019.

2.1.4 Solid Waste

Between 2016 and 2030, solid waste emissions generated from the City would increase by two percent from 40,038 to 39,356 $MTCO_2e$ per year with legislative adjustments applied. Table 12 summarizes the legislative reductions used to forecast emissions from the solid waste sector.

Table 12 Solid Waste Forecast Methods and Legislative Reductions by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Landfill Disposal	Population growth.	Assumes California's 75 percent waste diversion goal would be achieved by 2020.

Source: Ascent Environmental 2019.

The forecasts shown in Table 13 below account for the CH_4 and CO_2 emissions from waste decay generated annually. With respect to solid waste generation, the California Department of Resources Recycling and Recovery (CalRecycle) established a target pursuant to AB 341 (Chapter 476, Statutes of 2011) to achieve a statewide waste diversion of 75 percent by 2020, which is equivalent to a disposal rate of 2.7 pounds of waste per resident per day. The City's waste disposal tonnage, disposal rates, and disposal targets are reported to CalRecycle by year. Emission forecasts for this sector assume the City will achieve a disposal rate of 2.7 pounds of waste per resident per day and would remain constant after 2020 through 2050.

Table 13 shows the baseline and legislative-adjusted BAU forecasted emissions from the solid waste sector for 2016, 2020, 2030, 2035, and 2050.

Table 13 Solid Waste Legislative-Adjusted Business-As-Usual Emissions Forecasts (2016-2050) ($MTCO_2e$/year)

Activity	2016	2020	2030	2035	2050
Total Solid Waste Emissions	40,038	34,182	37,501	39,356	45,491

Notes: Totals may not add due to rounding.
$MTCO_2e$ = metric tons of carbon dioxide equivalent.
Source: Data compiled by Ascent Environmental in 2019.

2.1.5 Transportation

ON-ROAD VEHICLES

Between 2016 and 2035, GHG emissions from on-road vehicles would increase by approximately 14 percent from 679,920 to 585,860 $MTCO_2e$ per year, accounting for an increase in total VMT of 33 percent, and future vehicle emission factors modeled in the California Air Resources Board's (CARB's) Emission Factor (EMFAC) 2017 model. With respect to the legislative adjustments included in this forecast, State and federal policies and associated regulations incorporated in the on-road vehicle sector include the Pavley Clean Car Standards, Advanced Clean Car Standards, and fuel efficiency standards for medium- and heavy-duty vehicles. These standards are included in EMFAC's emission factor estimates and forecasts. The Low Carbon Fuel Standard was excluded in EMFAC 2017 forecasts because most of the emission benefits originate from upstream fuel production and do not directly reduce emissions in the City's GHG inventory or forecasts. Table 14 summarizes the legislative reductions used to forecast on-road vehicle emissions.

Table 14 On-Road Vehicles Forecast Methods and Legislative Reductions by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
On-Road Vehicles	VMT estimates provided by VRPA.	EMFAC emission factor considerations include ACC, Pavley, and fuel efficiency standards for medium- and heavy-duty vehicles.

Notes: VMT = vehicle miles traveled; EMFAC = California Air Resources Board's EMisson FACtor model; ACC = Advanced Clean Cars; Pavley = Pavley Clean Car Standards.

Source: Ascent Environmental 2019.

Table 15 shows the baseline and legislative-adjusted BAU forecasted emissions from on-road vehicles for 2016, 2020, 2030, 2035, and 2050.

Table 15 On-Road Vehicles Legislative-Adjusted Business-As-Usual Emissions Forecasts (2016-2050) ($MTCO_2e$/year)

Source	2016	2020	2030	2035	2050
On-Road Vehicles	679,920	669,154	592,254	585,860	591,645

Notes: $MTCO_2e$ = metric tons of carbon dioxide equivalent.
Source: Data compiled by Ascent Environmental in 2019.

OFF-ROAD VEHICLES

Between 2016 and 2035, emissions associated with off-road vehicles used in the city would increase by 43 percent from 11,741 to 16,755 $MTCO_2e$ per year. Table 16 shows the baseline and legislative-adjusted BAU forecasted emissions from the off-road vehicle sector for 2016, 2020, 2030, 2035, and 2050.

Table 16 Off-Road Vehicles Legislative-Adjusted Business-As-Usual Emissions Forecasts (2016-2050) ($MTCO_2e$/year)

Source	2016	2020	2030	2035	2050
Off-Road Vehicles	11,741	12,580	15,237	16,755	19,781

Notes: $MTCO_2e$ = metric tons of carbon dioxide equivalent.
Source: Data compiled by Ascent Environmental in 2019.

2.1.6 Discussion

As discussed above and shown in Figure 1 and Table 5, the City's legislative-adjusted BAU emissions would decrease by two percent between 2016 and 2020. This is a result of anticipated growth, despite reductions that would result from the following:

- A greater renewable mix in California's electricity supply (33 percent by 2020);
- Building energy efficiency through compliance with 2019 Title 24 standards (53 percent energy reduction for residential, 30 percent for non-residential);
- Water consumption reduction of 20 percent by 2020 through compliance with SBX7-7;
- Reductions in on-road vehicle emission factors forecasted in EMFAC 2017; and
- Achieving the waste diversion goal of 75 percent, pursuant to AB 341.

From 2020 to 2035, the City's legislative-adjusted BAU emissions would decrease by 3 percent. This is a result of anticipated growth, despite reductions that would result from the following:

- A greater renewable mix in California's electricity supply (60 percent by 2030);
- Building energy efficiency through compliance with 2019 Title 24 standards (53 percent energy reduction for residential, 30 percent for non-residential);
- Water consumption reduction of 20 percent by 2020 through compliance with SBX7-7;
- Reductions in on-road vehicle emission factors forecasted in EMFAC 2017; and
- Maintaining waste diversion goal of 75 percent, pursuant to AB 341.

From 2030 to 2050, new or updated legislative actions that might be put into place by the State or federal government are not known at this time. Thus, the City's projected growth would outpace reductions from existing legislative actions. The main legislative reductions beyond 2030 known at this time would come from SB 100's target of 100 percent of electricity from renewable or zero-carbon sources by 2045 for all electricity providers. Other minor additional reductions would be in forecasted improvements in vehicle fuel economy and increased VMT share of EVs (3.3 percent of vehicles in Riverside County by 2050), as estimated in the EMFAC 2017 model. Existing legislative actions that reduce emissions are assumed to continue to apply from 2030 to 2050 but would not outpace projected growth in population and jobs in that timeframe.

3 GREENHOUSE GAS EMISSION REDUCTION TARGETS

3.1 REDUCTION TARGETS

As directed in AB 32, SB 32, EO B-30-15, EO S-3-05, and CARB's 2017 Climate Change Scoping Plan (Scoping Plan), the State aims to reduce statewide annual GHG emissions to:

- 1990 levels by 2020 (per AB 32);
- 40 percent below 1990 levels by 2030 (per SB 32 and EO B-30-15); and
- 80 percent below 1990 levels by 2050 (per EO S-3-05).

Because the necessary data are not available to estimate the City's 1990 emission levels, proportional targets for the CAP Update were developed that express the level of GHG emissions reductions that would be needed locally between 2016 and future target years to demonstrate consistency with statewide targets. As stated above, CARB aims to reduce statewide emissions to 1990 levels by 2020, 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050, per AB 32, SB 32, and EO B-30-15. However, without a 1990 baseline for the City, the State's targets are translated to be in relation to the State's 2016 emission inventory. This inventory update for 2016 was undertaken due to the availability of higher quality data and the evolution of data collection and emissions quantification methods.

CARB's *2017 Climate Change Scoping Plan* recommends that to be consistent with this statewide goal, local jurisdictions should emit no more than 6 MT CO_2e per capita by 2030 and 2 MT CO_2e per capita by 2050. According to CARB, these per-capita targets are consistent with the State's GHG reduction goals because, when applied to DOF's population forecasts for the state, the per-capita targets reflect a 40 percent reduction in statewide emissions from 1990 levels by 2030 and an 80 percent reduction in statewide emissions from 1990 levels by 2050. These targets are equivalent to the state emitting no more than 265 million MT CO_2e by 2030 and 100 million MT CO_2e by 2050.

According to the inventories available from CARB, Statewide emissions from all sectors were approximately 431 million MTCO2e (MMTCO2e) in 1990 and 429 MMTCO2e in 2016 (CARB 2018). Thus, 2016 Statewide emissions were 2 MMTCO2e (0.37 percent) less than the 1990 level and the State's 2020 GHG target. Consequently, no further reductions from 2016 emissions levels are needed to reach the 2020 target of returning emissions to 1990 levels. Because 2016 emissions are essentially equal to the 1990 emissions level, reduction percentages from 2016 levels needed to meet the State's 2030 and 2050 goals are equivalent to the reductions percentages when measured against 1990 levels: 40 percent by 2030 and 80 percent by 2050. Thus, the post-2020 target for the City that is consistent with the State's goals would be to reduce the City's emissions by 40 percent below 2016 levels by 2030 and 80 percent below 2016 levels by 2050. A 2035 target would be established based on interpolation of the 2030 and 2050 targets.

In order to stay consistent with the State's targets and to account for the City's 2016 inventory, the City's percent-based GHG reduction targets are matched with the state-level reduction targets relative to a 2016 baseline. The GHG emissions reduction targets for the City have been developed using the methodology explained above and shown in Table 17.

The following recommended GHG reduction targets would reduce the City's annual GHG emissions consistent with the State's GHG reduction targets:

- 2020 target: no reductions required;
- 2030 target: 40 percent below 2016 levels (542,686 MTCO2e);
- 2035 target: 50 percent below 2016 levels (452,238 MTCO2e); and
- 2050 target: 80 percent below 2016 levels (180,895 MTCO2e).

Table 17 City of Murrieta Emissions Forecasts and Targets (MT CO_2e/yr)

	2016	2020	2030	2035	2050
BAU Forecast	900,280	900,280	963,647	1,133,343	1,573,729
Percent Change from 2016		7%	26%	36%	75%
ABAU Forecast	900,280	900,280	878,357	815,174	875,589
Percent Change from 2016		N/A	-9%	-9%	-3%
State Reduction Target (percent change from 2016)		-2%[1]	40%	50%	80%
Target Emissions		N/A	542,686	452,238[2]	180,895
Reductions Needed from ABAU Forecast		3,917	272,488	368,549	694,694

Notes: ABAU = legislative-adjusted business-as-usual, BAU = business-as-usual, CO_2e = carbon dioxide equivalents, N/A = Not Available, MT = metric tons

[1] Based on the State's GHG inventory in 1990 and 2016. (CARB 2018).

[2] Interpolated between 2030 and 2050.

Source: Ascent Environmental 2019.

Figure 2 depicts the baseline and legislative-adjusted BAU GHG emission forecasts by sector, as distinguished by colored wedges. The sum of the wedges represents anticipated annual GHG emissions each year. Each wedge shows how an emissions sector is expected to contribute to the City's annual inventory over time. The black line indicates the recommended GHG reduction targets for 2030, 2035 and the longer-term goal for 2050. The additional reductions needed to meet these target to close the expected "gap" between the expected ABAU emission levels and the recommended targets are also apparent in Figure 2. While advances in new technologies and new State policy strategies may allow for additional reductions in the future, legislative reductions that may occur past 2030 are currently unknown. Additionally, many of the State's strategies outlined in the 2017 Scoping Plan either have not yet been implemented or sufficient detail regarding the timing and estimated effectiveness of implementation is not yet available.

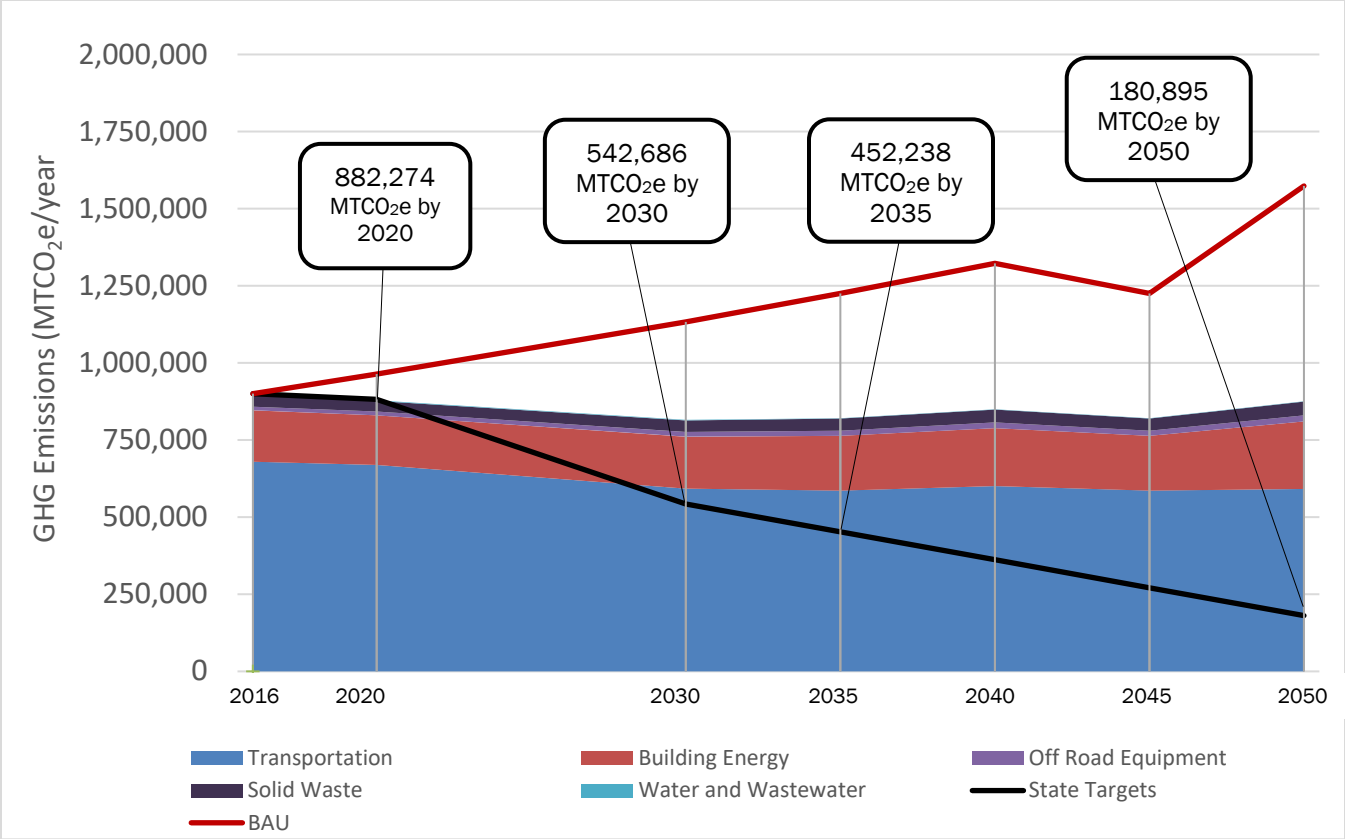


Figure 2 Legislative-Adjusted Business-As-Usual Forecast Emissions by Sector and Recommended Emission Reduction Targets: 2030, 2035, and 2050

A recent California Appellate Court decision, Cleveland National Forest Foundation v. San Diego Association of Governments (November 24, 2014) 231 Cal.App.4th 1056, examined whether EO S-3-05 should be viewed as having the equivalent force of a legislative mandate for specific emissions reductions. The case was reviewed by the California Supreme Court in January 2017 and a decision was released on July 13, 2017. The California Supreme Court ruled that SANDAG did not abuse its discretion by declining to adopt EO S-3-05 as a measure of significance for the specific GHG reduction target years, especially in analyzing the significance of impacts in 2050. Despite this, the California Supreme Court cautioned that future analyses may have a greater capacity to analyze impacts through 2050 and would be required to perform those analyses if that capacity is achievable. Thus, in addition to the other emission reduction targets set in the CAP, the CAP may include analysis of longer-term trends in view of the State's longer-term 2050 goal, as 2050 goals were established in EOs B-30-15 and S-3-05 and referenced in the 2017 Scoping Plan (CARB 2017:99).

4 NEXT STEPS: GHG REDUCTION MEASURES AND GAP ANALYSIS

GREENHOUSE GAS EMISSIONS REDUCTIONS

As discussed in Section 3, while legislative reductions would reduce future emissions and achieve the 2020 GHG reduction target, additional GHG reductions are needed to achieve the recommended GHG reduction targets and goals for 2030, 2035, and 2050.

The 2017 Scoping Plan relies on local action to help achieve statewide GHG reduction targets. As stated in the Scoping Plan, "local efforts can deliver substantial additional GHG and criteria emissions reductions beyond what State policy alone can do, and these efforts will sometimes be more cost-effective and provide more co-benefits than relying exclusively on top-down statewide regulations to achieve the State's climate stabilization goals" (CARB 2017:97). As shown in Table 17 and Figure 2, while the City will not need to reduce emissions to achieve the 2020 target, the GHG reductions required to meet the later targets will require a set of reduction measures with a particular focus on the larger emissions sectors of on-road transportation and building energy.

Next steps in the climate action planning process include (1) working with the City to decide which targets to include in the CAP and (2) developing a set of GHG reduction measures to be included in the CAP that can effectively reduce GHG emissions from the various sectors to achieve the targets established for the CAP.

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CARB. *See* California Air Resources Board.

CEC. *See* California Energy Commission.

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