APPENDIX B

AIR QUALITY AND GREENHOUSE GAS EMISSIONS DATA

Land Use Statistics - Santa Rosa

	Existing Conditions		Buildout Estimates		Projected Growth (Proposed Project)	
	City	Planning Area	City	Planning Area	2019-2050	%
Housing Units	71,033	75,853	93,592	99,943	24,090	32%
SFR	43,484	46,435	57,294	58,245	11,810	25%
MFR	27,549	29,418	36,298	41,698	12,280	42%
Population	185,396	197,976	246,983	263,742	65,766	33%
Employment	73,199	77,593	86,490	91,683	14,090	18%
Non-Residential SQFT	31,403,426	33,287,605	36,408,817	38,593,315	5,305,710	16%
Service Population	**258,595**	**275,569**	**333,473**	**355,425**	**79,856**	29%

AQMP Consistency Analysis

Comparison of the Change in Population and VMT in the Santa Rosa Planning Area (O-D Method)

Category	Existing	General Plan	Change from Existing	
			Change	Percent
Population	197,976	263,742	65,766	33%
Employment	77,593	91,683	14,090	18%
SP	275,569	355,425	79,856	29%
VMT per Day	2,229,977	2,745,678	515,701	23%
VMT/person	11.3	10.4	-0.9	-8%
VMT/SP	8.1	7.7	-0.4	-5%

Note Origin-Destination (O-D) Methodology may not be the same methodology for SB 743, which may only considers commute-trip VMT.

Modeling of vehicle miles traveled (VMT) is provided by WTrans is based on the SCTA Model. VMT from passenger vehicles and trucks that have an origin or destination in the City or SOI using a transportation origin-destination methodology. Accounting of VMT is based on the recommendations of CARB's Regional Targets Advisory Committee (RTAC) created under Senate Bill 375 (SB 375). For accounting purposes, there are three types of trips:

» Vehicle trips that originated and terminated within the Planning Area (Internal-Internal, I-I). Using the accounting rules established by RTAC, 100 percent of the length of these trips, and their emissions, are attributed to the City.

» Vehicle trips that either originated or terminated (but not both) within the Planning Area (Internal-External or External-Internal, I-X and X-I). Using the accounting rules established by RTAC, 50 percent of the trip length for these trips is attributed to the City.

» Vehicle trips that neither originated nor terminated within the Planning Area. These trips are commonly called pass-through trips (External-External, X-X). Using the accounting rules established by RTAC, these trips are not counted towards the City's VMT or emissions.

Santa Rosa Community GHG Emissions Inventory and Forecast

Source: Based on the emissions inventory and forecast being conducted for the City's GHG Reduction Strategy (see Appendix A of the General Plan 2050).

Category							Business-As-Usual															
	2007 - City		2019 - City		2019 - Planning Area		2030 City		2030 Planning Area		Planning Area Change from Existing (2030)		2045 City		2045 Planning Area		Planning Area Change from Existing (2045)		2050 City		2050 Planning Area		Planning Area Change from Existing (2050)	
	TOTAL		TOTAL		TOTAL		TOTAL		TOTAL		TOTAL		TOTAL		TOTAL		TOTAL		TOTAL		TOTAL		TOTAL	
On-Road Transportation	666,720	54%	507,810	58%	541,140	58%	515,890	56%	549,620	56%	8,480	2%	526,910	54%	561,180	54%	20,040	4%	530,570	54%	565,020	53%	23,880	4%
Nonresidential Energy	209,610	17%	153,200	18%	162,400	17%	158,780	17%	168,310	17%	5,910	4%	166,390	17%	176,380	17%	13,980	9%	168,940	17%	179,080	17%	16,680	10%
Residential Energy	257,150	21%	148,280	17%	158,340	17%	164,980	18%	176,180	18%	17,840	11%	187,780	19%	200,520	19%	42,180	27%	195,360	20%	208,620	20%	50,280	32%
Off-road Equipment	34,960	3%	37,930	4%	40,570	4%	47,670	5%	51,300	5%	10,730	26%	58,870	6%	63,400	6%	22,830	56%	62,660	6%	67,490	6%	26,920	66%
Solid Waste/Landfills	52,800	4%	31,560	4%	33,630	4%	34,800	4%	37,090	4%	3,460	10%	39,230	4%	41,810	4%	8,180	24%	40,700	4%	43,380	4%	9,750	29%
Water and Wastewater	8,070	1%	5,170	1%	5,510	1%	5,180	1%	5,550	1%	40	1%	5,170	1%	5,540	1%	30	1%	5,170	1%	5,540	1%	30	1%
Agriculture	220	0%	200	0%	280	0%	130	0%	180	0%	-100	-36%	40	0%	50	0%	-230	-82%	10	0%	10	0%	-270	-96%
Land Use and Sequestration	3,200	0%	-11,850	-1%	-13,060	-1%	-12,900	-1%	-14,160	-1%	-1,100	8%	-12,150	-1%	-13,110	-1%	-50	0%	-11,900	-1%	-12,750	-1%	310	-2%
Total Community Emissions (BAU)	**1,232,730**	100%	**872,300**	100%	**928,810**	100%	**914,530**	100%	**974,070**	100%	**45,260**	5%	**972,240**	100%	**1,035,770**	100%	**106,960**	12%	**991,510**	100%	**1,056,390**	100%	**127,580**	14%
Reductions from State & Regional Actions							**-163,700**		**-170,570**				**-326,630**		**-344,240**				**-345,070**		**-363,680**			
Reductions from GHG Reduction Measures							**-127,640**		**-137,570**				**-497,490**		**-533,020**				**-530,240**		**-568,290**			
Total Community Emissions (with State & Regional Actions and GHG Reduction Measures)							**623,190**		**665,930**				**148,120**		**158,510**				**116,200**		**124,420**			
Service Population (SP)	**NA**	NA	258,595	NA	275,569	NA	285,164	NA	303,904	NA	28,335	10%	321,395	NA	342,545	NA	66,976	24%	333,472	NA	355,425	NA	79,856	29%
$MTCO_2e/SP$	**NA**	NA	3.4	NA	3.4	NA	2.2	NA	2.2	NA	-1.2	-35%	0.5	NA	0.5	NA	-2.9	-86%	0.3	NA	0.4	NA	-3.0	-90%
Trajectory to SB 32 (2030)	**669,420**	40% below 1990 levels					**Does Achieve Target:**		**-3,490**	40% below 1990 levels	**Decrease**		**Does Achieve Target:**		**-8,840**	85% below 1990 levels	**Decrease**		**Does Achieve Target:**		**-42,930**	89% below 1990 levels	**Decrease**	
Trajectory to AB 1279 (2045)	**167,350**	85% below 1990 levels																						
Stationary Sources (informational)	28,440		12,400		68,910		12,400		72,120				12,400		75,980				12,400		77,290			

Notes: Emissions may not total to 100 percent due to rounding. Based on GWPs in the IPCC Sixth Assessment Report (AR6).

BAU = Business as usual

The emissions inventory and forecast is based on activity data for the City of Santa Rosa and external planning area (EPA). This emissions inventory methodology identifies GHG emissions produced within a jurisdiction and captures direct and indirect emissions generated by land uses in a community. The activity data methodology allows a direct comparison between a community's GHG emissions and that identified by CARB in the SB 32 and AB 1279 inventory and forecast prepared for the scoping plan. Unlike a "consumption-based" GHG emissions inventory, an activity-based emissions inventory does not capture lifecycle emissions associated with consumptions of goods. While a consumption-based emissions inventory approach may document GHG emissions associated with the final demand (regardless of where the were generated), a consumption-based emissions inventory excludes emissions associated with products produced within the jurisdiction but consumed elsewhere. For these reasons, an activity-based emissions inventory was determined to be most applicable for determining significant impacts under CEQA.

Santa Rosa City GHG emissions in 2007 were 1,232,730 MTCO2e, translating to a 1990 GHG emissions level of 1,047,820 MTCO2e (15% below 2007 emissions).

Excludes GHG emissions natural gas use from Permitted Sources within the City.

Santa Rosa + SOI Community Criteria Air Pollutant Emissions Inventory and Forecast

Sources

[1] Source: WTrans; EMFAC2021 Version 1.0.2 Emissions Database (County - Sonoma County[SF])

[2] Sources: Natural Gas Use based on the GHG Reduction Strategy update. CalEEMod User's Guide for natural gas criteria air pollutant emission rates. Excludes criteria air pollutant emissions natural gas use from Permitted Sources within the Planning Area.

[3] Source: OFFROAD 2021.

[4] Source: CalEEMod 2022 User's Guide

EXISTING (2019)

Phase	Existing Criteria Air Pollutant Emissions (lbs/day)				Existing Criteria Air Pollutant Emissions (tons/year)			
	VOC	NO_X	PM_{10}	$PM_{2.5}$	VOC	NO_X	PM_{10}	$PM_{2.5}$
Transportation[1]	263	2,168	128	41	46	376	22	7
Energy[2]	61	1,143	85	85	11	209	16	16
Offroad Equipment[3]	783	947	52	43	143	173	9	8
Consumer Products[4]	2,899				529			
Total	**4,006**	**4,259**	**265**	**169**	**729**	**758**	**47**	**30**

EXISTING LAND USES (2050 Emission Rates)

Phase	Existing (2050) Criteria Air Pollutant Emissions (lbs/day)				Existing (2050) Criteria Air Pollutant Emissions (tons/year)			
	VOC	NO_X	PM_{10}	$PM_{2.5}$	VOC	NO_X	PM_{10}	$PM_{2.5}$
Transportation[1]	32	244	109	34	6	42	19	6
Energy[2]	61	1,143	85	85	11	209	16	16
Offroad Equipment[3]	783	947	52	43	143	173	9	8
Consumer Products[4]	2,899				529			
Total	**3,775**	**2,335**	**246**	**162**	**689**	**424**	**44**	**29**

Year 2050

Phase	Project (2050) Criteria Air Pollutant Emissions(lbs/day)				Project (2050) Criteria Air Pollutant Emissions (tons/year)			
	VOC	NO_X	PM_{10}	$PM_{2.5}$	VOC	NO_X	PM_{10}	$PM_{2.5}$
Transportation[1]	39	300	134	42	7	52	23	7
Energy[2]	67	1,260	94	94	12	230	17	17
Offroad Equipment[3]	974	992	53	44	178	181	10	8
Consumer Products[4]	4,081				745			
Total	**5,161**	**2,551**	**281**	**179**	**942**	**463**	**50**	**32**

Santa Rosa + SOI Community Criteria Air Pollutant Emissions Inventory and Forecast

Net Change (No Project)

Phase	Net Change (2050-2050 No Project) Criteria Air Pollutant Emissions (lbs/day)				Net Change (2050-2050 No Project) Criteria Air Pollutant Emissions (tons/year)			
	VOC	NO_X	PM_{10}	$PM_{2.5}$	VOC	NO_X	PM_{10}	$PM_{2.5}$
Transportation[1]	7	56	25	8	1	10	4	1
Energy[2]	6	116	9	9	1	21	2	2
Offroad Equipment[3]	192	44	1	0	35	8	0	0
Consumer Products[4]	1,182				216			
Total	**1,387**	**217**	**35**	**17**	**253**	**39**	**6**	**3**
BAAQMD THRESHOLD	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Exceeds Threshold	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

NET CHANGE (from Existing)

Phase	Net Change (2050-Existing) Criteria Air Pollutant Emissions(lbs/day)				Net Change (2050-Existing) Criteria Air Pollutant Emissions (tons/year)			
	VOC	NO_X	PM_{10}	$PM_{2.5}$	VOC	NO_X	PM_{10}	$PM_{2.5}$
Transportation[1]	-224	-1,867	6	1	-39	-324	1	0
Energy[2]	6	116	9	9	1	21	2	2
Offroad Equipment[3]	192	44	1	0	35	8	0	0
Consumer Products[4]	1,182	0	0	0	216	0	0	0
Total	**1,156**	**-1,707**	**16**	**10**	**213**	**-295**	**3**	**2**
BAAQMD THRESHOLD	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Exceeds Threshold	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**

Criteria Air Pollutants from Natural Gas

Rate	lbs/MMBTU					
Natural Gas	ROG	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Residential	0.005	0.092	0.039	0.001	0.007	0.007
Non-Residential	0.005	0.098	0.082	0.001	0.007	0.007
Sources CalEEMod Version 2022.1, 2022, Appendix C. https://www.caleemod.com/documents/handbook/appendices/appendix_c.pdf						

			With State Actions	
Santa Rosa	City 2019	Planning Area 2019	City 2050	Planning Area 2050
		Therms/Year		
Residential	26,568,570	28,371,401	29,445,960	31,665,210
Nonresidential	15,051,190	15,954,672	16,212,640	17,186,490
Total	**41,619,760**	**44,326,074**	**45,658,600**	**48,851,700**

Natural Gas	Planning Area tons/year					
	ROG	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Residential	7	131	55	1	10	10
Nonresidential	4	78	65	1	6	6
TOTAL	**11**	**209**	**121**	**2**	**16**	**16**

Natural Gas	2050 Planning Area tons/year					
	ROG	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Residential	8	146	62	2	11	11
Nonresidential	4	84	70	1	6	6
TOTAL	**12**	**230**	**132**	**2**	**17**	**17**

City limits + External Planning Area

Fuel type	Existing baseline year 2019	Project year 2050	Net change from existing baseline
Gasoline			
VMT	1,093,443,760	78,870,070	-1,014,573,690
Gallons	50,236,587	2,419,159	-47,817,428
Miles per gallon	21.77	32.6	10.84
Diesel			
VMT	111,134,150	4,557,910	-106,576,240
Gallons	11,490,536	493,229	-10,997,307
Miles per gallon	9.67	9.24	-0.43
Compressed natural gas			
VMT	1,713,800	39,610	-1,674,190
Gallons	326,690	6,623	-320,067
Miles per gallon	5.25	5.98	0.73
Electricity			
VMT	12,792,080	931,669,180	918,877,100
kWh	4,674,096	528,941,104	524,267,008
Miles per kWh	2.74	1.76	-0.98
Hydrogen			
VMT	0	75,221,400	75,221,400
kg	-	857,847	-
Miles per kg	0	87.69	87.69
Total VMT	**1,219,083,790**	**1,090,358,170**	**-128,725,620**

Area Sources - Residential Consumer Product Use[a]

Emissions = EF x Building Area		
EF =	2.14E-05	lbs/sqft/day
EF South Coast AQMD =	1.98E-05	lbs/sqft/day

Sources/Notes:

a. California Emissions Estimator Model, Version 2022, Users Guide. Appendix DC, Section 5.2.2, Consumer Products Screen.

AVERAGE HOUSING SQFT ASSUMPTIONS

Year Structure was Built	Percent of Housing Stock [a]	Average Square Feet of New Single Family Homes[b]	Average Square Feet (Weighted)
2020 or Later	0.5%	2,448	12
2010 to 2019	4.6%	2,524	116
2000 to 2009	12.5%	2,404	300
1990 to 1999	13.2%	2,116	279
1980 to 1989	17.9%	1,819	326
1979 or earlier	51.4%	1,699	873
	100%		1,907

Sources/Notes: https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/

a. United States Census Bureau, Selected Housing Characteristics, Santa Rosa, 2021. Table DP04. American Community Survey 5-Year Estimates, Year structure built.
https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2019/

b. United States Census Bureau, Characteristics of New Housing, Characteristics of New Single-Family Houses Completed, Median and Average Square Feet by Location. https://www.census.gov/construction/chars/completed.html

	2019 City	2019 Planning Area	2050 City	2050 Planning Area
	TOTAL	TOTAL	TOTAL	TOTAL
Housing Units	71,033	75,853	93,592	99,943
Residential SQFT	135,476,195	144,669,038	190,689,347	203,629,313
lbs VOC per day	2,899	3,096	4,081	4,358
tons VOC/year	529	565	745	795

Notes:

[1] New housing units constructed post-2020 assumed to be 2,448 square feet (based on Source 2).

[2] Daily emissions converted to annual emissions by multiplying by 365 days/year.

Area Sources

Source: OFFROAD2021. https://arb.ca.gov/emfac/emissions-inventory/2f6c8fa1b8ec8bd9f8a4f23b3d84c74a77f77161

OFFROAD2021 Estimate based on:

Agricultural Equipment	Based on agricultural acreage within Sonoma County and Santa Rosa
Construction Equipment	Based on housing permits in Sonoma County and Santa Rosa
Light Commercial and Industrial Equipment	Based on employment in Sonoma County and Santa Rosa
Lawn & Garden	Based on housing units in Sonoma County and Santa Rosa

Sources

Farmland Acreage in Planning Area (City + SOI + UGB)

Source: California Department of Convervation. 2018. Farmland Mapping and Monitoring Program GIS data.

Existing Farmland - Santa Rosa + SOI + UGB	2,962	excludes grazing land (see Chapter 4.2)
Farmland Acreage at Buildout at 2050	118	4%
Percent Reduction	-96.02%	

Construction (Housing Permits)

Source: Housing and Urban Development (HUD). 2022, Accessed August 21, 2023. SOCDS Building Permits Database. https://socds.huduser.gov/permits/

Employment

Source. U.S. Census Bureau. Longitudinal Employer-Household Dynamics. 2019. http://lehd.ces.census.gov/

Lawn & Garden (Housing Units)

Source. U.S. Census Bureau. Data Profiles. 2019. https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/

2019 Existing (Planning Area)		ROG Exhaust	NO_x Exhaust	CO Exhaust	SO_2 Exhaust	PM_{10} Exhaust	$PM_{2.5}$ Exhaust*
		Tons/year					
Agricultural		1	7	7	0.0	0.5	0.4
Construction Equipment		16	95	300	0.1	6	6
Lawn & Garden		84	11	974	0.0	1	1
Light Commercial / Industrial Equipment		41	59	1,874	0.1	2	1
TOTAL		143	173	3,155	0.3	9	8

2050 (Planning Area)	Forecast Adjusted for:	ROG Exhaust	NO_x Exhaust	CO Exhaust	SO2 Exhaust	PM10 Exhaust	PM2.5 Exhaust*
		Tons/year					
Agricultural	Based on a reduction in Agricultural land in the County	0.06	0.29	0.30	0.00	0.02	0.02
Construction Equipment	Similar to historic	16	95	300	0.1	6	6
Lawn & Garden	Proportional to housing growth	112	15	1,304	0.1	1	1
Light Commercial / Industrial Equipment	Proportional to employment growth	49	70	2,234	0.1	2	1
TOTAL		178	181	3,839	0.3	10	8

Sonoma County OFFROAD2021

Source: https://arb.ca.gov/emfac/emissions-inventory/6b69efcdedeccb2c38d2459edb8f818353d2ec60
Construction includes: Over 25 horsepower, self-propelled, diesel equipment only subjected to In-Use Regulation; AND Under 25 horsepower equipment not subject to the In-Use Regulation

Model Output: OFFROAD2021 (v1.0.4) Emissions Inventory
Region Type: Sub-Area
Region: Sonoma (SF)
Calendar Year: 2019, 2050
Scenario: All Adopted Rules - Exhaust
Vehicle Classification: OFFROAD2021 Equipment Types
Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

Agriculture

Region	Calendar Year	Vehicle Category	Model Year	Horsepower Bin	Fuel	Fuel Consumption (g/yr)	ROG_tpd	NOx_tpd	CO_tpd	SOx_tpd	PM10_tpd	PM2.5_tpd
Sonoma (SF)	2019	Agricultural - Agricultural Tractors	Aggregate	Aggregate	Gasoline	253	0.000	0.000	0.001	0.000	0.000	0.000
Sonoma (SF)	2019	Agricultural - Agricultural Tractors	Aggregate	Aggregate	Diesel	3,424,193	0.152	0.881	0.666	0.001	0.056	0.051
Sonoma (SF)	2019	Agricultural - ATVs	Aggregate	Aggregate	Gasoline	113,274	0.030	0.015	0.306	0.000	0.001	0.001
Sonoma (SF)	2019	Agricultural - ATVs	Aggregate	Aggregate	Diesel	56,870	0.002	0.012	0.012	0.000	0.001	0.001
Sonoma (SF)	2019	Agricultural - ATVs	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Agricultural - Bale Wagons (Self Propelled)	Aggregate	Aggregate	Diesel	6,916	0.000	0.002	0.001	0.000	0.000	0.000
Sonoma (SF)	2019	Agricultural - Balers (Self Propelled)	Aggregate	Aggregate	Diesel	155	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Agricultural - Combine Harvesters	Aggregate	Aggregate	Diesel	88,782	0.002	0.019	0.013	0.000	0.001	0.001
Sonoma (SF)	2019	Agricultural - Construction Equipment	Aggregate	Aggregate	Diesel	78,571	0.002	0.022	0.014	0.000	0.001	0.001
Sonoma (SF)	2019	Agricultural - Cotton Pickers	Aggregate	Aggregate	Diesel	1,607	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Agricultural - Forage & Silage Harvesters	Aggregate	Aggregate	Diesel	24,737	0.001	0.006	0.004	0.000	0.000	0.000
Sonoma (SF)	2019	Agricultural - Forklifts	Aggregate	Aggregate	Diesel	66,536	0.003	0.018	0.014	0.000	0.001	0.001
Sonoma (SF)	2019	Agricultural - Hay Squeeze/Stack Retriever	Aggregate	Aggregate	Diesel	7,818	0.000	0.002	0.001	0.000	0.000	0.000
Sonoma (SF)	2019	Agricultural - Nut Harvester	Aggregate	Aggregate	Diesel	123,172	0.005	0.034	0.024	0.000	0.002	0.002
Sonoma (SF)	2019	Agricultural - Other Harvesters	Aggregate	Aggregate	Diesel	74,886	0.002	0.019	0.013	0.000	0.001	0.001
Sonoma (SF)	2019	Agricultural - Sprayers/Spray Rigs	Aggregate	Aggregate	Diesel	242,880	0.009	0.070	0.047	0.000	0.004	0.004
Sonoma (SF)	2019	Agricultural - Swathers/Windrowers/Hay Conditioners	Aggregate	Aggregate	Diesel	32,659	0.001	0.008	0.006	0.000	0.001	0.000
TOTAL AGRICULTURAL OFFROAD (tons/yr)						4,343,309	0.211	1.108	1.121	0.001	0.068	0.063
ESTIMATED Santa Rosa(tons/year)							1.407	7.402	7.492	0.008	0.457	0.421
ESTIMATED Santa Rosa (lbs/day)							7.7	40.6	41.1	0.0	2.5	2.3

AGRICULTURAL ACREAGE (excluding grading land)	**2019**
Farmland Acreage in Sonoma County	161,801
Farmland Acreage in Santa Rosa	2,962
	2%

Construction and Mining

Region	Calendar Year	Vehicle Category	Model Year	Horsepower Bin	Fuel	Fuel Consumption (g/yr)	ROG_tpd	NOx_tpd	CO_tpd	SOx_tpd	PM10_tpd	PM2.5_tpd
Sonoma (SF)	2019	Construction and Mining - Bore/Drill Rigs	Aggregate	Aggregate	Diesel	24,002	0.000	0.003	0.002	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Cranes	Aggregate	Aggregate	Diesel	57,120	0.001	0.016	0.009	0.000	0.001	0.001
Sonoma (SF)	2019	Construction and Mining - Crawler Tractors	Aggregate	Aggregate	Diesel	141,175	0.003	0.038	0.020	0.000	0.002	0.002
Sonoma (SF)	2019	Construction and Mining - Excavators	Aggregate	Aggregate	Diesel	254,022	0.003	0.034	0.028	0.000	0.001	0.001
Sonoma (SF)	2019	Construction and Mining - Graders	Aggregate	Aggregate	Diesel	95,563	0.003	0.028	0.012	0.000	0.001	0.001
Sonoma (SF)	2019	Construction and Mining - Misc - Asphalt Pavers	Aggregate	Aggregate	Gasoline	2,669	0.000	0.000	0.017	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Bore/Drill Rigs	Aggregate	Aggregate	Gasoline	1,710	0.000	0.000	0.005	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Bore/Drill Rigs	Aggregate	Aggregate	Diesel	10	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Cement And Mortar Mixers	Aggregate	Aggregate	Gasoline	11,242	0.006	0.003	0.178	0.000	0.002	0.001
Sonoma (SF)	2019	Construction and Mining - Misc - Cement And Mortar Mixers	Aggregate	Aggregate	Diesel	15	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Concrete/Industrial Saws	Aggregate	Aggregate	Gasoline	13,416	0.005	0.003	0.154	0.000	0.002	0.001
Sonoma (SF)	2019	Construction and Mining - Misc - Concrete/Industrial Saws	Aggregate	Aggregate	Diesel	575	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Cranes	Aggregate	Aggregate	Gasoline	1,391	0.000	0.000	0.002	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Crushing/Proc. Equipment	Aggregate	Aggregate	Gasoline	68	0.000	0.000	0.001	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Dumpers/Tenders	Aggregate	Aggregate	Gasoline	1,153	0.001	0.000	0.017	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Dumpers/Tenders	Aggregate	Aggregate	Diesel	1	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Excavators	Aggregate	Aggregate	Diesel	8	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Other	Aggregate	Aggregate	Gasoline	2,132	0.000	0.000	0.002	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Other	Aggregate	Aggregate	Diesel	31	0.000	0.001	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Pavers	Aggregate	Aggregate	Diesel	2	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Paving Equipment	Aggregate	Aggregate	Gasoline	20,186	0.010	0.007	0.298	0.000	0.003	0.002
Sonoma (SF)	2019	Construction and Mining - Misc - Paving Equipment	Aggregate	Aggregate	Diesel	4	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Plate Compactors	Aggregate	Aggregate	Gasoline	7,387	0.004	0.003	0.117	0.000	0.001	0.001
Sonoma (SF)	2019	Construction and Mining - Misc - Plate Compactors	Aggregate	Aggregate	Diesel	11	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Rollers	Aggregate	Aggregate	Gasoline	9,210	0.002	0.002	0.075	0.000	0.001	0.001
Sonoma (SF)	2019	Construction and Mining - Misc - Rollers	Aggregate	Aggregate	Diesel	65	0.000	0.001	0.001	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Rough Terrain Forklifts	Aggregate	Aggregate	Gasoline	9,892	0.000	0.001	0.013	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Rubber Tired Loaders	Aggregate	Aggregate	Gasoline	5,220	0.000	0.001	0.008	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Rubber Tired Loaders	Aggregate	Aggregate	Diesel	1	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Signal Boards	Aggregate	Aggregate	Gasoline	209	0.000	0.000	0.003	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Signal Boards	Aggregate	Aggregate	Diesel	424	0.000	0.003	0.002	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Skid Steer Loaders	Aggregate	Aggregate	Gasoline	19,711	0.003	0.002	0.108	0.000	0.001	0.001
Sonoma (SF)	2019	Construction and Mining - Misc - Skid Steer Loaders	Aggregate	Aggregate	Diesel	447	0.002	0.009	0.005	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Surfacing Equipment	Aggregate	Aggregate	Gasoline	8,976	0.005	0.004	0.141	0.000	0.002	0.001
Sonoma (SF)	2019	Construction and Mining - Misc - Tampers/Rammers	Aggregate	Aggregate	Gasoline	1,147	0.000	0.000	0.019	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Tractors/Loaders/Backhoes	Aggregate	Aggregate	Gasoline	3,351	0.000	0.000	0.005	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Tractors/Loaders/Backhoes	Aggregate	Aggregate	Diesel	40	0.000	0.001	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Misc - Trenchers	Aggregate	Aggregate	Gasoline	16,826	0.004	0.003	0.136	0.000	0.001	0.001
Sonoma (SF)	2019	Construction and Mining - Misc - Trenchers	Aggregate	Aggregate	Diesel	55	0.000	0.001	0.001	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Off-Highway Tractors	Aggregate	Aggregate	Diesel	53,705	0.001	0.009	0.008	0.000	0.001	0.000
Sonoma (SF)	2019	Construction and Mining - Off-Highway Trucks	Aggregate	Aggregate	Diesel	322,176	0.005	0.061	0.031	0.000	0.002	0.002
Sonoma (SF)	2019	Construction and Mining - Other	Aggregate	Aggregate	Diesel	71,910	0.001	0.015	0.009	0.000	0.001	0.001
Sonoma (SF)	2019	Construction and Mining - Pavers	Aggregate	Aggregate	Diesel	16,938	0.000	0.003	0.003	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Paving Equipment	Aggregate	Aggregate	Diesel	9,854	0.000	0.002	0.001	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Rollers	Aggregate	Aggregate	Diesel	43,916	0.001	0.009	0.008	0.000	0.001	0.001
Sonoma (SF)	2019	Construction and Mining - Rough Terrain Forklifts	Aggregate	Aggregate	Diesel	47,675	0.001	0.007	0.009	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Rubber Tired Dozers	Aggregate	Aggregate	Diesel	28,183	0.001	0.010	0.007	0.000	0.001	0.000
Sonoma (SF)	2019	Construction and Mining - Rubber Tired Loaders	Aggregate	Aggregate	Diesel	387,277	0.008	0.084	0.048	0.000	0.004	0.003
Sonoma (SF)	2019	Construction and Mining - Scrapers	Aggregate	Aggregate	Diesel	252,238	0.005	0.062	0.037	0.000	0.003	0.002
Sonoma (SF)	2019	Construction and Mining - Skid Steer Loaders	Aggregate	Aggregate	Diesel	46,181	0.001	0.007	0.009	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Surfacing Equipment	Aggregate	Aggregate	Diesel	5,300	0.000	0.001	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Construction and Mining - Tractors/Loaders/Backhoes	Aggregate	Aggregate	Diesel	352,880	0.007	0.071	0.065	0.000	0.004	0.004
Sonoma (SF)	2019	Construction and Mining - Trenchers	Aggregate	Aggregate	Diesel	14,584	0.000	0.004	0.003	0.000	0.000	0.000
TOTAL CONSTRUCTION OFFROAD (tons/yr)						2,362,282	0.089	0.515	1.619	0.001	0.035	0.030
ESTIMATED Santa Rosa (tons/year)							16.4	95.4	300.1	0.1	6.4	5.5
ESTIMATED Santa Rosa (lbs/year)							90	523	1,644	1	35	30

TOTAL UNITS: https://socds.huduser.gov/permits/	2018	2019	2020	2021	2022	**Average**
Housing Permits in Sonoma County	3,297	2,429	1,395	2,618	2,264	2,401
Housing Permits in Santa Rosa (City)	1,701	1,190	628	1,451	1,197	1,233
Percent Santa Rosa	52%	49%	45%	1	53%	51%

Industrial and Light Commercial

Region	Calendar Year	Vehicle Category	Model Year	Horsepower Bin	Fuel	Fuel Consumption (g/yr)	ROG_tpd	NOx_tpd	CO_tpd	SOx_tpd	PM10_tpd	PM2.5_tpd
Sonoma (SF)	2019	Industrial - Aerial Lifts	Aggregate	Aggregate	Diesel	35,034	0.000	0.005	0.006	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Forklifts	Aggregate	Aggregate	Diesel	147,505	0.004	0.038	0.031	0.000	0.003	0.002
Sonoma (SF)	2019	Industrial - Misc - Aerial Lifts	Aggregate	Aggregate	Gasoline	20,310	0.002	0.002	0.063	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Misc - Aerial Lifts	Aggregate	Aggregate	Diesel	31	0.000	0.001	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Misc - Aerial Lifts	Aggregate	Aggregate	Electric	343	0.000	0.000	0.006	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Misc - Forklifts	Aggregate	Aggregate	Gasoline	637,512	0.014	0.065	1.604	0.000	0.001	0.001
Sonoma (SF)	2019	Industrial - Misc - Forklifts	Aggregate	Aggregate	Electric	38	0.000	0.000	0.001	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Misc - Forklifts	Aggregate	Aggregate	Nat Gas	1,259,925	0.000	0.100	0.923	0.000	0.002	0.000
Sonoma (SF)	2019	Industrial - Misc - Other General Industrial Equipment	Aggregate	Aggregate	Gasoline	11,060	0.001	0.001	0.060	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Misc - Other General Industrial Equipment	Aggregate	Aggregate	Diesel	24	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Misc - Other Material Handling Equipment	Aggregate	Aggregate	Gasoline	4,796	0.000	0.001	0.006	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Misc - Sweepers/Scrubbers	Aggregate	Aggregate	Gasoline	36,246	0.001	0.003	0.086	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Misc - Sweepers/Scrubbers	Aggregate	Aggregate	Diesel	6	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Industrial - Other General Industrial Equipment	Aggregate	Aggregate	Diesel	71,241	0.002	0.014	0.013	0.000	0.001	0.001
Sonoma (SF)	2019	Industrial - Other Material Handling Equipment	Aggregate	Aggregate	Diesel	41,769	0.001	0.008	0.006	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Air Compressors	Aggregate	Aggregate	Gasoline	386,193	0.048	0.030	2.628	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Air Compressors	Aggregate	Aggregate	Diesel	13,145	0.001	0.003	0.003	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Air Compressors	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Gas Compressors	Aggregate	Aggregate	Nat Gas	165,903	0.000	0.009	0.111	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Gasoline	622,997	0.136	0.054	3.843	0.000	0.001	0.001
Sonoma (SF)	2019	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Diesel	59,801	0.002	0.014	0.011	0.000	0.001	0.001
Sonoma (SF)	2019	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Nat Gas	5,336	0.000	0.000	0.003	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Pressure Washers	Aggregate	Aggregate	Gasoline	260,961	0.034	0.015	1.913	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Pressure Washers	Aggregate	Aggregate	Diesel	316	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Pressure Washers	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Pumps	Aggregate	Aggregate	Gasoline	89,271	0.011	0.006	0.393	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Pumps	Aggregate	Aggregate	Diesel	33,119	0.001	0.008	0.007	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Pumps	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Welders	Aggregate	Aggregate	Gasoline	177,329	0.024	0.012	1.141	0.000	0.000	0.000
Sonoma (SF)	2019	Light Commercial - Misc - Welders	Aggregate	Aggregate	Diesel	67,635	0.003	0.016	0.016	0.000	0.001	0.001
Sonoma (SF)	2019	Light Commercial - Misc - Welders	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL LIGHT COMMERCIAL + INDUSTRIAL OFFROAD (tons/yr)						4,147,847	0.285	0.404	12.873	0.001	0.011	0.008
ESTIMATED Santa Rosa (tons/year)							41.471	58.873	1,873.785	0.102	1.565	1.194
ESTIMATED Santa Rosa (lbs/year)							227	323	10,267	1	9	7

EMPLOYMENT		**2019**
Employment in Sonoma County		183,552
Employment in Santa Rosa Planning Area		73,199
Percent Santa Rosa		40%

Lawn and Garden

Region	Calendar Year	Vehicle Category	Model Year	Horsepower Bin	Fuel	Fuel Consumption (g/yr)	ROG_tpd	NOx_tpd	CO_tpd	SOx_tpd	PM10_tpd	PM2.5_tpd
Sonoma (SF)	2019	Lawn and Garden - Misc - Chainsaws	Aggregate	Aggregate	Gasoline	95,647	0.110	0.004	0.323	0.000	0.001	0.001
Sonoma (SF)	2019	Lawn and Garden - Misc - Chainsaws	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Chainsaws Preempt	Aggregate	Aggregate	Gasoline	56,176	0.095	0.003	0.174	0.000	0.001	0.001
Sonoma (SF)	2019	Lawn and Garden - Misc - Chainsaws Preempt	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Chippers/Stump Grinders	Aggregate	Aggregate	Gasoline	1,016	0.000	0.000	0.007	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Chippers/Stump Grinders	Aggregate	Aggregate	Diesel	61	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Chippers/Stump Grinders	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Lawn Mowers	Aggregate	Aggregate	Gasoline	236,986	0.037	0.019	1.468	0.000	0.001	0.001
Sonoma (SF)	2019	Lawn and Garden - Misc - Lawn Mowers	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Leaf Blowers/Vacuums	Aggregate	Aggregate	Gasoline	250,438	0.183	0.007	0.924	0.000	0.003	0.002
Sonoma (SF)	2019	Lawn and Garden - Misc - Leaf Blowers/Vacuums	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Other	Aggregate	Aggregate	Gasoline	4,857	0.001	0.000	0.033	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Other	Aggregate	Aggregate	Diesel	31	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Rear Engine Riding Mowers	Aggregate	Aggregate	Gasoline	449,687	0.073	0.035	3.319	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Rear Engine Riding Mowers	Aggregate	Aggregate	Diesel	24,496	0.001	0.006	0.003	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Rear Engine Riding Mowers	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Snowblowers	Aggregate	Aggregate	Gasoline	2,028	0.000	0.000	0.016	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Snowblowers	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Tillers	Aggregate	Aggregate	Gasoline	4,509	0.001	0.000	0.027	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Tillers	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Trimmers/Edgers/Brush Cutters	Aggregate	Aggregate	Gasoline	190,067	0.118	0.007	0.725	0.000	0.001	0.001
Sonoma (SF)	2019	Lawn and Garden - Misc - Trimmers/Edgers/Brush Cutters	Aggregate	Aggregate	Electric	0	0.000	0.000	0.000	0.000	0.000	0.000
Sonoma (SF)	2019	Lawn and Garden - Misc - Wood Splitters	Aggregate	Aggregate	Gasoline	42,140	0.008	0.003	0.287	0.000	0.000	0.000
TOTAL LAWN & GARDEN (tons/yr)						1,358,140	0.627	0.084	7.307	0.000	0.008	0.006
ESTIMATED Santa Rosa (tons/year)							83.536	11.244	974.024	0.047	1.026	0.775
ESTIMATED Sonoma County (lbs/day)							458	62	5,337	0	6	4

HOUSING UNITS			**2019**
Housing Units in Sonoma County (2019)			207,713
Housing Units in Santa Rosa Planning Area (2019)			75,853
			37%

Santa Rosa VMT

Source: WTrans 2023.

Planning Area (City + SOI)	Daily VMT			Total Daily VMT	Total with RTAC	Residents	Jobs	Service Population	VMT/SP	VMT/SP w RTAC
	IX	XI	II							
Existing - TOTAL	875,500	876,334	1,354,060	3,105,894	2,229,977	197,976	77,593	275,569	11.3	8.1
2050	1,159,747	1,161,963	1,584,823	3,906,533	2,745,678	263,742	91,683	355,425	11.0	7.7

Notes: Total may not add to 100% due to rounding.

IX = Internal-External

XI = External- Internal

II = Internal-Internal

Modeling of vehicle miles traveled (VMT) is provided by WTrans is based on the SCTA Model. VMT from passenger vehicles and trucks that have an origin or destination in the City or SOI using a transportation origin-destination methodology. Accounting of VMT is based on the recommendations of CARB's Regional Targets Advisory Committee (RTAC) created under Senate Bill 375 (SB 375). For accounting purposes, there are three types of trips:

- Vehicle trips that originated and terminated within the Planning Area (Internal-Internal, I-I). Using the accounting rules established by RTAC, 100 percent of the length of these
- Vehicle trips that either originated or terminated (but not both) within the Planning Area (Internal-External or External-Internal, I-X and X-I). Using the accounting rules
- Vehicle trips that neither originated nor terminated within the Planning Area. These trips are commonly called pass-through trips (External-External, X-X). Using the accounting

Santa Rosa — TRANSPORTATION SECTOR

Source: EMFAC2021 V. 1.0.2. , Web Database - Emissions Rates. Contra Costa County. Based on the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) Global Warming Potentials (GWPs)

Note: MTons = metric tons; CO_2e = carbon dioxide-equivalent.

Criteria Air Pollutant Emissions

	lbs/day					
	ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Existing	263	2,168	7,180	21	128	41
Existing in year 2050	32	244	2,324	12	109	34
2050	39	300	2,861	15	134	42
Change from Existing Conditions (2019-2050)	-224	-1,867	-4,318	-6	6	1
Change from Existing Land Uses (2050 Emission Rates)	-7	-56	-537	-3	-25	-8

	Tons/year					
	ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Existing	46	376	1,246	4	22	7
Existing in year 2050	6	42	403	2	19	6
2050	7	52	496	3	23	7
Change from Existing Conditions (2019-2050)	-39	-324	-749	-1	1	0
Change from Existing Land Uses (2050 Emission Rates)	-1	-10	-93	0	-4	-1

lbs to Tons 2000

Daily vehicles miles traveled (VMT) multiplied by 347 days/year to account for reduced traffic on weekends and holidays. This assumption is consistent with the California Air Resources Board's (CARB) methodology within the 2008 Climate Change Scoping Plan Measure Documentation Supplement.

Year 2019 Existing: Criteria Air Pollutants

Source: EMFAC2021 (v1.0.2) Emission Rates, Sonoma County (SF), Average Speed, Average Fleet

Daily VMT	**2,229,977**			**lbs/day**					
Vehicle Type	**Fuel Type**	**Percent of VMT**	**Adjusted Percent VMT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
All Other Buses	Diesel	0.08%	0.08%	1.85	16.82	4.56	0.05	0.24	0.08
All Other Buses	Natural Gas	0.00%	0.00%	0.00	0.01	0.07	0.00	0.00	0.00
LDA	Gasoline	43.61%	43.61%	45.56	205.12	2,590.59	6.33	36.25	10.97
LDA	Diesel	0.29%	0.29%	0.62	6.33	6.33	0.03	0.24	0.07
LDA	Electricity	1.04%	1.04%	0.00	0.00	0.00	0.00	0.63	0.18
LDA	Plug-in Hybrid	0.69%	0.69%	0.05	0.13	8.08	0.05	0.41	0.12
LDT1	Gasoline	5.76%	5.76%	17.57	76.78	741.56	0.98	5.28	1.62
LDT1	Diesel	0.00%	0.00%	0.06	0.34	0.34	0.00	0.00	0.00
LDT1	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.00	0.00
LDT1	Plug-in Hybrid	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
LDT2	Gasoline	20.82%	20.82%	24.31	152.64	1,375.79	3.81	18.65	5.71
LDT2	Diesel	0.09%	0.09%	0.09	0.49	0.73	0.01	0.08	0.02
LDT2	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
LDT2	Plug-in Hybrid	0.03%	0.03%	0.00	0.01	0.34	0.00	0.02	0.01
LHD1	Gasoline	2.83%	2.83%	11.52	47.73	251.52	1.32	11.94	4.07
LHD1	Diesel	2.87%	2.87%	34.95	421.13	105.50	0.86	12.69	4.27
LHD2	Gasoline	0.49%	0.49%	1.04	5.01	27.46	0.25	2.39	0.82
LHD2	Diesel	1.01%	1.01%	9.85	97.24	26.46	0.37	5.14	1.74
MCY	Gasoline	0.53%	0.53%	41.93	19.72	469.15	0.05	0.42	0.14
MDV	Gasoline	14.56%	14.56%	26.95	158.27	1,200.54	3.22	13.25	4.07
MDV	Diesel	0.37%	0.37%	0.29	2.07	4.15	0.08	0.33	0.10
MDV	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
MDV	Plug-in Hybrid	0.05%	0.05%	0.00	0.01	0.63	0.00	0.03	0.01
MH	Gasoline	0.11%	0.11%	0.81	3.69	22.37	0.10	0.31	0.10
MH	Diesel	0.05%	0.05%	0.33	11.92	1.14	0.02	0.15	0.05
Motor Coach	Diesel	0.04%	0.04%	0.37	9.08	1.30	0.03	0.19	0.06
OBUS	Gasoline	0.09%	0.09%	0.48	3.57	10.97	0.08	0.26	0.09
PTO	Diesel	0.13%	0.13%	2.99	43.02	11.72	0.13	0.00	0.00
SBUS	Gasoline	0.02%	0.02%	0.51	0.91	11.22	0.01	0.06	0.02
SBUS	Diesel	0.09%	0.09%	0.30	19.73	0.86	0.05	0.26	0.09
SBUS	Natural Gas	0.01%	0.01%	0.02	0.25	4.77	0.00	0.02	0.01
T6 CAIRP Class 4	Diesel	0.00%	0.00%	0.00	0.08	0.01	0.00	0.00	0.00
T6 CAIRP Class 5	Diesel	0.00%	0.00%	0.00	0.09	0.01	0.00	0.00	0.00
T6 CAIRP Class 6	Diesel	0.00%	0.00%	0.01	0.29	0.04	0.00	0.01	0.00
T6 CAIRP Class 7	Diesel	0.02%	0.02%	0.07	1.96	0.25	0.01	0.05	0.02
T6 Instate Delivery Class 4	Diesel	0.08%	0.08%	1.88	24.09	4.95	0.05	0.24	0.08
T6 Instate Delivery Class 4	Natural Gas	0.00%	0.00%	0.00	0.00	0.04	0.00	0.00	0.00
T6 Instate Delivery Class 5	Diesel	0.04%	0.04%	0.77	9.95	2.03	0.03	0.13	0.04
T6 Instate Delivery Class 5	Natural Gas	0.00%	0.00%	0.00	0.00	0.02	0.00	0.00	0.00
T6 Instate Delivery Class 6	Diesel	0.14%	0.14%	2.29	31.38	6.03	0.08	0.40	0.13
T6 Instate Delivery Class 6	Natural Gas	0.00%	0.00%	0.00	0.01	0.12	0.00	0.00	0.00
T6 Instate Delivery Class 7	Diesel	0.06%	0.06%	0.97	12.54	2.56	0.03	0.17	0.06
T6 Instate Delivery Class 7	Natural Gas	0.00%	0.00%	0.00	0.00	0.07	0.00	0.00	0.00
T6 Instate Other Class 4	Diesel	0.21%	0.21%	4.48	68.22	12.74	0.11	0.58	0.19
T6 Instate Other Class 4	Natural Gas	0.00%	0.00%	0.00	0.00	0.03	0.00	0.00	0.00
T6 Instate Other Class 5	Diesel	0.62%	0.62%	3.50	64.65	10.93	0.33	1.74	0.57
T6 Instate Other Class 5	Natural Gas	0.00%	0.00%	0.00	0.01	0.18	0.00	0.00	0.00
T6 Instate Other Class 6	Diesel	0.37%	0.37%	4.20	65.72	12.25	0.20	1.05	0.34
T6 Instate Other Class 6	Natural Gas	0.00%	0.00%	0.00	0.01	0.13	0.00	0.00	0.00
T6 Instate Other Class 7	Diesel	0.30%	0.30%	3.36	50.00	9.19	0.16	0.83	0.27
T6 Instate Other Class 7	Natural Gas	0.01%	0.01%	0.00	0.04	0.79	0.00	0.02	0.01
T6 Instate Tractor Class 6	Diesel	0.00%	0.00%	0.05	0.91	0.15	0.00	0.01	0.00
T6 Instate Tractor Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Instate Tractor Class 7	Diesel	0.11%	0.11%	0.67	15.57	2.02	0.06	0.32	0.10
T6 Instate Tractor Class 7	Natural Gas	0.00%	0.00%	0.00	0.02	0.28	0.00	0.01	0.00
T6 OOS Class 4	Diesel	0.00%	0.00%	0.00	0.05	0.01	0.00	0.00	0.00
T6 OOS Class 5	Diesel	0.00%	0.00%	0.00	0.05	0.01	0.00	0.00	0.00

Year 2019 Existing: Criteria Air Pollutants

Source: EMFAC2021 (v1.0.2) Emission Rates, Sonoma County (SF), Average Speed, Average Fleet

Daily VMT	**2,229,977**			**lbs/day**					
Vehicle Type	**Fuel Type**	**Percent of VMT**	**Adjusted Percent VMT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
T6 OOS Class 6	Diesel	0.00%	0.00%	0.01	0.18	0.03	0.00	0.00	0.00
T6 OOS Class 7	Diesel	0.01%	0.01%	0.06	1.44	0.19	0.01	0.03	0.01
T6 Public Class 4	Diesel	0.01%	0.01%	0.05	3.79	0.11	0.01	0.03	0.01
T6 Public Class 4	Natural Gas	0.00%	0.00%	0.00	0.00	0.01	0.00	0.00	0.00
T6 Public Class 5	Diesel	0.03%	0.03%	0.08	5.76	0.23	0.02	0.07	0.02
T6 Public Class 5	Natural Gas	0.00%	0.00%	0.00	0.01	0.11	0.00	0.00	0.00
T6 Public Class 6	Diesel	0.02%	0.02%	0.10	6.94	0.23	0.01	0.05	0.02
T6 Public Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.07	0.00	0.00	0.00
T6 Public Class 7	Diesel	0.04%	0.04%	0.36	22.31	0.76	0.03	0.13	0.04
T6 Public Class 7	Natural Gas	0.00%	0.00%	0.00	0.00	0.02	0.00	0.00	0.00
T6 Utility Class 5	Diesel	0.00%	0.00%	0.01	0.29	0.02	0.00	0.01	0.00
T6 Utility Class 5	Natural Gas	0.00%	0.00%	0.00	0.00	0.01	0.00	0.00	0.00
T6 Utility Class 6	Diesel	0.00%	0.00%	0.00	0.09	0.01	0.00	0.00	0.00
T6 Utility Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 7	Diesel	0.00%	0.00%	0.00	0.11	0.01	0.00	0.00	0.00
T6 Utility Class 7	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6TS	Gasoline	0.33%	0.33%	3.02	14.17	68.45	0.30	0.93	0.31
T7 CAIRP Class 8	Diesel	0.22%	0.22%	0.97	39.55	3.57	0.17	1.25	0.40
T7 CAIRP Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.09	0.00	0.00	0.00
T7 NNOOS Class 8	Diesel	0.27%	0.27%	1.90	50.56	7.50	0.20	1.50	0.48
T7 NOOS Class 8	Diesel	0.10%	0.10%	0.49	17.88	1.79	0.07	0.54	0.17
T7 Other Port Class 8	Diesel	0.02%	0.02%	0.11	4.04	0.34	0.01	0.12	0.04
T7 POAK Class 8	Diesel	0.07%	0.07%	0.50	16.80	1.58	0.06	0.45	0.14
T7 POAK Class 8	Natural Gas	0.00%	0.00%	0.00	0.01	0.08	0.00	0.00	0.00
T7 Public Class 8	Diesel	0.12%	0.12%	0.96	74.68	2.95	0.11	0.90	0.30
T7 Public Class 8	Natural Gas	0.00%	0.00%	0.00	0.02	0.23	0.00	0.00	0.00
T7 Single Concrete/Transit Mix Class 8	Diesel	0.03%	0.03%	0.58	14.58	1.84	0.02	0.20	0.06
T7 Single Concrete/Transit Mix Class 8	Natural Gas	0.00%	0.00%	0.00	0.02	0.34	0.00	0.01	0.00
T7 Single Dump Class 8	Diesel	0.28%	0.28%	2.53	59.29	9.49	0.23	1.71	0.55
T7 Single Dump Class 8	Natural Gas	0.02%	0.02%	0.01	0.29	5.34	0.00	0.09	0.03
T7 Single Other Class 8	Diesel	0.28%	0.28%	4.07	86.00	15.17	0.23	1.76	0.57
T7 Single Other Class 8	Natural Gas	0.02%	0.02%	0.01	0.29	5.38	0.00	0.09	0.03
T7 SWCV Class 8	Diesel	0.09%	0.09%	0.07	42.51	0.19	0.18	1.11	0.37
T7 SWCV Class 8	Natural Gas	0.04%	0.04%	0.30	4.94	30.07	0.00	0.50	0.17
T7 Tractor Class 8	Diesel	0.17%	0.17%	1.24	40.78	4.49	0.13	1.02	0.33
T7 Tractor Class 8	Natural Gas	0.01%	0.01%	0.01	0.39	6.79	0.00	0.08	0.03
T7 Utility Class 8	Diesel	0.00%	0.00%	0.01	0.45	0.04	0.00	0.02	0.01
T7IS	Gasoline	0.00%	0.00%	0.30	1.06	8.05	0.00	0.01	0.00
UBUS	Gasoline	0.04%	0.04%	0.02	0.19	0.93	0.02	0.20	0.07
UBUS	Diesel	0.04%	0.04%	0.16	6.72	0.40	0.02	0.28	0.09
UBUS	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
UBUS	Natural Gas	0.06%	0.06%	0.30	3.86	59.61	0.00	0.43	0.14
	Total	100%	100%	262.98	2167.69	7179.51	20.75	128.35	40.62

Source: EMFAC2021 (v1.0.2) Emission Rates
Region Type: Sub-Area
Region: Sonoma (SF)
Calendar Year: 2019, 2050
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HOTSOAK and RUNLOSS, g/vehicle/day for IDLEX, RESTLOSS and DIURN

			g/mile																		
Vehicle Category	Fuel	Population	ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	VMT Total	% of VMT
All Other Buses	Diesel	127	4.53E-01	4.13E+00	1.12E+00	1.16E-02	1.86E-01	1.20E-02	4.61E-02	5.81E-02	1.78E-01	3.00E-03	1.61E-02	1.91E-02	1.22E+03	2.11E-02	1.92E-01	7,638	0.08%
All Other Buses	Natural Gas	1	1.04E-02	3.01E-01	3.09E+00	0.00E+00	5.82E-04	1.20E-02	4.61E-02	5.81E-02	5.35E-04	3.00E-03	1.61E-02	1.91E-02	1.03E+03	7.29E-01	2.10E-01	45	0.00%
LDA	Gasoline	117,764	2.12E-02	9.57E-02	1.21E+00	2.95E-03	1.56E-03	8.00E-03	8.91E-03	1.69E-02	1.43E-03	2.00E-03	3.12E-03	5.12E-03	2.98E+02	4.91E-03	7.95E-03	4,017,074	43.61%
LDA	Diesel	909	4.38E-02	4.43E-01	4.44E-01	2.34E-03	2.81E-02	8.00E-03	8.94E-03	1.69E-02	2.69E-02	2.00E-03	3.13E-03	5.13E-03	2.47E+02	2.03E-03	3.89E-02	26,748	0.29%
LDA	Electricity	2,892	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	4.36E-03	1.24E-02	0.00E+00	2.00E-03	1.53E-03	3.53E-03	0.00E+00	0.00E+00	0.00E+00	95,701	1.04%
LDA	Plug-in Hybrid	1,473	1.60E-03	3.74E-03	2.39E-01	1.52E-03	9.31E-04	8.00E-03	4.11E-03	1.21E-02	8.56E-04	2.00E-03	1.44E-03	3.44E-03	1.54E+02	5.05E-04	6.77E-04	63,361	0.69%
LDT1	Gasoline	18,391	6.21E-02	2.71E-01	2.62E+00	3.47E-03	2.92E-03	8.00E-03	1.06E-02	1.86E-02	2.68E-03	2.00E-03	3.73E-03	5.73E-03	3.50E+02	1.30E-02	1.72E-02	530,606	5.76%
LDT1	Diesel	30	3.07E-01	1.63E+00	1.63E+00	3.99E-03	2.56E-01	8.00E-03	1.22E-02	2.02E-02	2.45E-01	2.00E-03	4.27E-03	6.27E-03	4.21E+02	1.43E-02	6.63E-02	389	0.00%
LDT1	Electricity	27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	4.39E-03	1.24E-02	0.00E+00	2.00E-03	1.54E-03	3.54E-03	0.00E+00	0.00E+00	0.00E+00	744	0.01%
LDT1	Plug-in Hybrid	0	1.60E-03	3.76E-03	2.40E-01	1.53E-03	1.10E-03	8.00E-03	4.11E-03	1.21E-02	1.01E-03	2.00E-03	1.44E-03	3.44E-03	1.55E+02	5.07E-04	6.80E-04	8	0.00%
LDT2	Gasoline	56,917	2.38E-02	1.49E-01	1.34E+00	3.73E-03	1.65E-03	8.00E-03	1.02E-02	1.82E-02	1.51E-03	2.00E-03	3.58E-03	5.58E-03	3.77E+02	5.33E-03	1.01E-02	1,917,479	20.82%
LDT2	Diesel	214	2.13E-02	1.15E-01	1.73E-01	3.21E-03	1.06E-02	8.00E-03	9.93E-03	1.79E-02	1.02E-02	2.00E-03	3.47E-03	5.47E-03	3.39E+02	9.89E-04	5.33E-02	7,930	0.09%
LDT2	Electricity	11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	4.36E-03	1.24E-02	0.00E+00	2.00E-03	1.53E-03	3.53E-03	0.00E+00	0.00E+00	0.00E+00	353	0.00%
LDT2	Plug-in Hybrid	60	1.57E-03	3.69E-03	2.36E-01	1.50E-03	1.06E-03	8.00E-03	4.10E-03	1.21E-02	9.79E-04	2.00E-03	1.44E-03	3.44E-03	1.52E+02	4.99E-04	6.73E-04	2,741	0.03%
LHD1	Gasoline	7,577	8.29E-02	3.44E-01	1.81E+00	9.51E-03	2.36E-03	8.00E-03	7.80E-02	8.60E-02	2.17E-03	2.00E-03	2.73E-02	2.93E-02	9.61E+02	1.59E-02	1.87E-02	260,246	2.83%
LHD1	Diesel	7,320	2.48E-01	2.99E+00	7.48E-01	6.12E-03	5.63E-02	1.20E-02	7.80E-02	9.00E-02	5.38E-02	3.00E-03	2.73E-02	3.03E-02	6.46E+02	1.15E-02	1.02E-01	264,250	2.87%
LHD2	Gasoline	1,154	4.31E-02	2.07E-01	1.14E+00	1.02E-02	1.67E-03	8.00E-03	9.10E-02	9.90E-02	1.53E-03	2.00E-03	3.19E-02	3.39E-02	1.03E+03	8.88E-03	1.23E-02	45,242	0.49%
LHD2	Diesel	2,359	1.98E-01	1.95E+00	5.31E-01	7.51E-03	4.29E-02	1.20E-02	9.10E-02	1.03E-01	4.11E-02	3.00E-03	3.19E-02	3.49E-02	7.93E+02	9.18E-03	1.25E-01	93,418	1.01%
MCY	Gasoline	9,109	1.60E+00	7.52E-01	1.79E+01	1.92E-03	2.06E-03	4.00E-03	1.20E-02	1.60E-02	1.94E-03	1.00E-03	4.20E-03	5.20E-03	1.94E+02	2.24E-01	4.74E-02	49,114	0.53%
MDV	Gasoline	41,343	3.76E-02	2.21E-01	1.68E+00	4.50E-03	1.72E-03	8.00E-03	1.05E-02	1.85E-02	1.58E-03	2.00E-03	3.68E-03	5.68E-03	4.55E+02	7.83E-03	1.37E-02	1,341,578	14.56%
MDV	Diesel	888	1.59E-02	1.13E-01	2.26E-01	4.09E-03	8.37E-03	8.00E-03	9.87E-03	1.79E-02	8.01E-03	2.00E-03	3.45E-03	5.45E-03	4.32E+02	7.38E-04	6.80E-02	34,445	0.37%
MDV	Electricity	2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	4.42E-03	1.24E-02	0.00E+00	2.00E-03	1.55E-03	3.55E-03	0.00E+00	0.00E+00	0.00E+00	37	0.00%
MDV	Plug-in Hybrid	109	1.60E-03	3.74E-03	2.39E-01	1.52E-03	1.10E-03	8.00E-03	4.11E-03	1.21E-02	1.01E-03	2.00E-03	1.44E-03	3.44E-03	1.54E+02	5.08E-04	6.85E-04	4,954	0.05%
MH	Gasoline	1,218	1.52E-01	6.91E-01	4.18E+00	1.93E-02	2.48E-03	1.20E-02	4.50E-02	5.70E-02	2.29E-03	3.00E-03	1.58E-02	1.88E-02	1.95E+03	2.93E-02	3.70E-02	10,024	0.11%
MH	Diesel	468	1.38E-01	4.99E+00	4.77E-01	1.02E-02	1.41E-01	1.60E-02	4.48E-02	6.08E-02	1.35E-01	4.00E-03	1.57E-02	1.97E-02	1.08E+03	6.40E-03	1.70E-01	4,477	0.05%
Motor Coach	Diesel	29	1.77E-01	4.35E+00	6.23E-01	1.66E-02	1.08E-01	1.20E-02	7.91E-02	9.11E-02	1.03E-01	3.00E-03	2.77E-02	3.07E-02	1.76E+03	8.24E-03	2.77E-01	3,917	0.04%
OBUS	Gasoline	180	1.04E-01	7.68E-01	2.36E+00	1.80E-02	1.08E-03	1.20E-02	4.48E-02	5.68E-02	9.92E-04	3.00E-03	1.57E-02	1.87E-02	1.82E+03	2.09E-02	3.33E-02	8,724	0.09%
PTO	Diesel	0	4.85E-01	6.98E+00	1.90E+00	2.06E-02	2.09E-01	0.00E+00	0.00E+00	0.00E+00	2.00E-01	0.00E+00	0.00E+00	0.00E+00	2.18E+03	2.25E-02	3.43E-01	11,556	0.13%
SBUS	Gasoline	51	4.17E-01	7.42E-01	9.15E+00	8.28E-03	3.04E-03	8.00E-03	4.49E-02	5.29E-02	2.83E-03	2.00E-03	1.57E-02	1.77E-02	8.37E+02	6.27E-02	3.44E-02	2,298	0.02%
SBUS	Diesel	352	6.47E-02	4.31E+00	1.88E-01	1.13E-02	2.32E-02	1.20E-02	4.49E-02	5.69E-02	2.22E-02	3.00E-03	1.57E-02	1.87E-02	1.19E+03	3.00E-03	1.87E-01	8,569	0.09%
SBUS	Natural Gas	25	5.39E-02	6.91E-01	1.32E+01	0.00E+00	3.67E-03	1.20E-02	4.49E-02	5.69E-02	3.38E-03	3.00E-03	1.57E-02	1.87E-02	1.29E+03	3.77E+00	2.63E-01	676	0.01%
T6 CAIRP Class 4	Diesel	1	8.78E-02	2.18E+00	3.12E-01	1.08E-02	7.44E-02	1.20E-02	4.23E-02	5.43E-02	7.12E-02	3.00E-03	1.48E-02	1.78E-02	1.14E+03	4.08E-03	1.79E-01	72	0.00%
T6 CAIRP Class 5	Diesel	1	5.99E-02	1.64E+00	2.28E-01	1.07E-02	5.44E-02	1.20E-02	4.23E-02	5.43E-02	5.21E-02	3.00E-03	1.48E-02	1.78E-02	1.13E+03	2.78E-03	1.78E-01	98	0.00%
T6 CAIRP Class 6	Diesel	4	8.56E-02	2.15E+00	3.18E-01	1.06E-02	7.67E-02	1.20E-02	4.23E-02	5.43E-02	7.34E-02	3.00E-03	1.48E-02	1.78E-02	1.12E+03	3.97E-03	1.76E-01	257	0.00%
T6 CAIRP Class 7	Diesel	8	8.48E-02	2.28E+00	2.89E-01	9.99E-03	6.94E-02	1.20E-02	4.23E-02	5.43E-02	6.64E-02	3.00E-03	1.48E-02	1.78E-02	1.06E+03	3.94E-03	1.66E-01	1,612	0.02%
T6 Instate Delivery Class 4	Diesel	229	4.71E-01	6.04E+00	1.24E+00	1.19E-02	1.89E-01	1.20E-02	4.76E-02	5.96E-02	1.81E-01	3.00E-03	1.66E-02	1.96E-02	1.25E+03	2.19E-02	1.97E-01	7,475	0.08%
T6 Instate Delivery Class 4	Natural Gas	1	1.04E-02	3.01E-01	3.25E+00	0.00E+00	6.39E-04	1.20E-02	4.76E-02	5.96E-02	5.87E-04	3.00E-03	1.66E-02	1.96E-02	1.11E+03	7.27E-01	2.26E-01	24	0.00%
T6 Instate Delivery Class 5	Diesel	122	3.48E-01	4.51E+00	9.20E-01	1.17E-02	1.39E-01	1.20E-02	4.76E-02	5.96E-02	1.33E-01	3.00E-03	1.66E-02	1.96E-02	1.24E+03	1.62E-02	1.95E-01	4,132	0.04%
T6 Instate Delivery Class 5	Natural Gas	0	1.05E-02	2.88E-01	3.28E+00	0.00E+00	7.12E-04	1.20E-02	4.76E-02	5.96E-02	6.54E-04	3.00E-03	1.66E-02	1.96E-02	1.11E+03	7.35E-01	2.26E-01	14	0.00%
T6 Instate Delivery Class 6	Diesel	380	3.37E-01	4.62E+00	8.87E-01	1.17E-02	1.36E-01	1.20E-02	4.76E-02	5.96E-02	1.30E-01	3.00E-03	1.66E-02	1.96E-02	1.24E+03	1.56E-02	1.95E-01	12,732	0.14%
T6 Instate Delivery Class 6	Natural Gas	2	1.04E-02	2.95E-01	3.26E+00	0.00E+00	6.71E-04	1.20E-02	4.76E-02	5.96E-02	6.17E-04	3.00E-03	1.66E-02	1.96E-02	1.11E+03	7.30E-01	2.27E-01	66	0.00%
T6 Instate Delivery Class 7	Diesel	101	3.33E-01	4.29E+00	8.76E-01	1.17E-02	1.62E-01	1.20E-02	4.76E-02	5.96E-02	1.55E-01	3.00E-03	1.66E-02	1.96E-02	1.23E+03	1.55E-02	1.94E-01	5,481	0.06%
T6 Instate Delivery Class 7	Natural Gas	1	1.11E-02	2.24E-01	3.44E+00	0.00E+00	1.09E-03	1.20E-02	4.76E-02	5.96E-02	9.98E-04	3.00E-03	1.66E-02	1.96E-02	1.08E+03	7.74E-01	2.21E-01	38	0.00%
T6 Instate Other Class 4	Diesel	544	4.41E-01	6.72E+00	1.25E+00	1.12E-02	2.29E-01	1.20E-02	4.49E-02	5.69E-02	2.19E-01	3.00E-03	1.57E-02	1.87E-02	1.18E+03	2.05E-02	1.86E-01	19,024	0.21%
T6 Instate Other Class 4	Natural Gas	0	7.93E-03	2.31E-01	2.83E+00	0.00E+00	4.93E-04	1.20E-02	4.49E-02	5.69E-02	4.54E-04	3.00E-03	1.57E-02	1.87E-02	9.64E+02	5.55E-01	1.97E-01	22	0.00%
T6 Instate Other Class 5	Diesel	1,293	1.15E-01	2.11E+00	3.58E-01	1.09E-02	6.02E-02	1.20E-02	4.49E-02	5.69E-02	5.76E-02	3.00E-03	1.57E-02	1.87E-02	1.16E+03	5.32E-03	1.82E-01	57,273	0.62%
T6 Instate Other Class 5	Natural Gas	3	7.95E-03	2.30E-01	2.83E+00	0.00E+00	5.03E-04	1.20E-02	4.49E-02	5.69E-02	4.62E-04	3.00E-03	1.57E-02	1.87E-02	9.61E+02	5.57E-01	1.96E-01	120	0.00%
T6 Instate Other Class 6	Diesel	855	2.28E-01	3.57E+00	6.66E-01	1.10E-02	1.24E-01	1.20E-02	4.49E-02	5.69E-02	1.18E-01	3.00E-03	1.57E-02	1.87E-02	1.17E+03	1.06E-02	1.83E-01	34,478	0.37%
T6 Instate Other Class 6	Natural Gas	2	8.05E-03	2.22E-01	2.83E+00	0.00E+00	5.51E-04	1.20E-02	4.49E-02	5.69E-02	5.07E-04	3.00E-03	1.57E-02	1.87E-02	9.64E+02	5.63E-01	1.96E-01	87	0.00%
T6 Instate Other Class 7	Diesel	571	2.31E-01	3.43E+00	6.30E-01	1.10E-02	1.31E-01	1.20E-02	4.49E-02	5.69E-02	1.25E-01	3.00E-03	1.57E-02	1.87E-02	1.16E+03	1.07E-02	1.82E-01	27,308	0.30%
T6 Instate Other Class 7	Natural Gas	8	8.96E-03	1.43E-01	2.77E+00	0.00E+00	1.04E-03	1.20E-02	4.49E-02	5.69E-02	9.52E-04	3.00E-03	1.57E-02	1.87E-02	9.44E+02	6.27E-01	1.92E-01	535	0.01%
T6 Instate Tractor Class 6	Diesel	7	3.33E-01	5.83E+00	9.70E-01	1.05E-02	1.62E-01	1.20E-02	4.49E-02	5.69E-02	1.55E-01	3.00E-03	1.57E-02	1.87E-02	1.11E+03	1.55E-02	1.75E-01	293	0.00%
T6 Instate Tractor Class 6	Natural Gas	0	7.93E-03	2.31E-01	2.83E+00	0.00E+00	4.93E-04	1.20E-02	4.49E-02	5.69E-02	4.54E-04	3.00E-03	1.57E-02	1.87E-02	9.68E+02	5.55E-01	1.97E-01	1	0.00%
T6 Instate Tractor Class 7	Diesel	159	1.21E-01	2.79E+00	3.61E-01	1.01E-02	6.29E-02	1.20E-02	4.49E-02	5.69E-02	6.02E-02	3.00E-03	1.57E-02	1.87E-02	1.06E+03	5.60E-03	1.68E-01	10,470	0.11%
T6 Instate Tractor Class 7	Natural Gas	2	8.73E-03	1.62E-01	2.78E+00	0.00E+00	9.13E-04	1.20E-02	4.49E-02	5.69E-02	8.39E-04	3.00E-03	1.57E-02	1.87E-02	9.48E+02	6.11E-01	1.93E-01	188	0.00%
T6 OOS Class 4	Diesel	1	8.78E-02	2.18E+00	3.12E-01	1.08E-02	7.44E-02	1.20E-02	4.23E-02	5.43E-02	7.12E-02	3.00E-03	1.48E-02	1.78E-02	1.14E+03	4.08E-03	1.79E-01	43	0.00%
T6 OOS Class 5	Diesel	1	5.99E-02	1.64E+00	2.28E-01	1.07E-02	5.44E-02	1.20E-02	4.23E-02	5.43E-02	5.21E-02	3.00E-03	1.48E-02	1.78E-02	1.13E+03	2.78E-03	1.78E-01	59	0.00%
T6 OOS Class 6	Diesel	2	8.56E-02	2.15E+00	3.18E-01	1.06E-02	7.67E-02	1.20E-02	4.23E-02	5.43E-02	7.34E-02	3.00E-03	1.48E-02	1.78E-02	1.12E+03	3.97E-03	1.76E-01	154	0.00%
T6 OOS Class 7	Diesel	5	9.39E-02	2.40E+00	3.19E-01	9.98E-03	7.66E-02	1.20E-02	4.23E-02	5.43E-02	7.33E-02	3.00E-03	1.48E-02	1.78E-02	1.05E+03	4.36E-03	1.66E-01	1,123	0.01%
T6 Public Class 4	Diesel	26	1.08E-01	8.23E+00	2.49E-01	1.21E-02	4.93E-02	1.20E-02	4.62E-02	5.82E-02	4.72E-02	3.00E-03	1.62E-02	1.92E-02	1.28E+03	5.01E-03	2.01E-01	863	0.01%

Source: EMFAC2021 (v1.0.2) Emission Rates
Region Type: Sub-Area
Region: Sonoma (SF)
Calendar Year: 2019, 2050
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HOTSOAK and RUNLOSS, g/vehicle/day for IDLEX, RESTLOSS and DIURN

			g/mile																	
Vehicle Category	Fuel	Population	ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	VMT Total	% of VMT
T6 Public Class 4	Natural Gas	0	1.10E-02	3.18E-01	3.03E+00	0.00E+00	5.68E-04	1.20E-02	4.62E-02	5.82E-02	5.23E-04	3.00E-03	1.62E-02	1.92E-02	1.06E+03	7.72E-01	2.15E-01	5	0.00%
T6 Public Class 5	Diesel	64	6.45E-02	4.50E+00	1.78E-01	1.18E-02	2.36E-02	1.20E-02	4.62E-02	5.82E-02	2.25E-02	3.00E-03	1.62E-02	1.92E-02	1.25E+03	3.00E-03	1.97E-01	2,399	0.03%
T6 Public Class 5	Natural Gas	2	1.18E-02	1.86E-01	3.08E+00	0.00E+00	1.19E-03	1.20E-02	4.62E-02	5.82E-02	1.10E-03	3.00E-03	1.62E-02	1.92E-02	1.05E+03	8.29E-01	2.13E-01	68	0.00%
T6 Public Class 6	Diesel	45	1.32E-01	8.84E+00	2.90E-01	1.23E-02	6.06E-02	1.20E-02	4.62E-02	5.82E-02	5.80E-02	3.00E-03	1.62E-02	1.92E-02	1.30E+03	6.12E-03	2.04E-01	1,472	0.02%
T6 Public Class 6	Natural Gas	1	1.22E-02	1.34E-01	3.09E+00	0.00E+00	1.44E-03	1.20E-02	4.62E-02	5.82E-02	1.32E-03	3.00E-03	1.62E-02	1.92E-02	1.05E+03	8.52E-01	2.14E-01	41	0.00%
T6 Public Class 7	Diesel	106	1.68E-01	1.03E+01	3.50E-01	1.26E-02	8.07E-02	1.20E-02	4.62E-02	5.82E-02	7.72E-02	3.00E-03	1.62E-02	1.92E-02	1.33E+03	7.79E-03	2.09E-01	4,050	0.04%
T6 Public Class 7	Natural Gas	0	1.10E-02	3.18E-01	3.03E+00	0.00E+00	5.68E-04	1.20E-02	4.62E-02	5.82E-02	5.23E-04	3.00E-03	1.62E-02	1.92E-02	1.02E+03	7.72E-01	2.09E-01	12	0.00%
T6 Utility Class 5	Diesel	10	2.45E-02	1.27E+00	9.54E-02	1.08E-02	6.14E-03	1.20E-02	4.55E-02	5.75E-02	5.88E-03	3.00E-03	1.59E-02	1.89E-02	1.14E+03	1.14E-03	1.79E-01	424	0.00%
T6 Utility Class 5	Natural Gas	0	9.34E-03	2.70E-01	2.89E+00	0.00E+00	5.18E-04	1.20E-02	4.55E-02	5.75E-02	4.76E-04	3.00E-03	1.59E-02	1.89E-02	1.01E+03	6.54E-01	2.06E-01	6	0.00%
T6 Utility Class 6	Diesel	2	3.71E-02	2.09E+00	1.24E-01	1.10E-02	1.08E-02	1.20E-02	4.55E-02	5.75E-02	1.03E-02	3.00E-03	1.59E-02	1.89E-02	1.17E+03	1.72E-03	1.83E-01	81	0.00%
T6 Utility Class 6	Natural Gas	0	9.34E-03	2.70E-01	2.89E+00	0.00E+00	5.18E-04	1.20E-02	4.55E-02	5.75E-02	4.76E-04	3.00E-03	1.59E-02	1.89E-02	9.95E+02	6.54E-01	2.03E-01	1	0.00%
T6 Utility Class 7	Diesel	2	2.80E-02	1.92E+00	1.00E-01	1.10E-02	1.03E-02	1.20E-02	4.55E-02	5.75E-02	9.87E-03	3.00E-03	1.59E-02	1.89E-02	1.17E+03	1.30E-03	1.83E-01	111	0.00%
T6 Utility Class 7	Natural Gas	0	9.34E-03	2.70E-01	2.89E+00	0.00E+00	5.18E-04	1.20E-02	4.55E-02	5.75E-02	4.76E-04	3.00E-03	1.59E-02	1.89E-02	1.00E+03	6.54E-01	2.04E-01	2	0.00%
T6TS	Gasoline	661	1.84E-01	8.66E-01	4.19E+00	1.84E-02	1.98E-03	1.20E-02	4.50E-02	5.70E-02	1.83E-03	3.00E-03	1.58E-02	1.88E-02	1.85E+03	3.28E-02	3.78E-02	30,641	0.33%
T7 CAIRP Class 8	Diesel	96	8.81E-02	3.59E+00	3.24E-01	1.51E-02	6.62E-02	3.60E-02	7.73E-02	1.13E-01	6.33E-02	9.00E-03	2.71E-02	3.61E-02	1.60E+03	4.09E-03	2.52E-01	20,659	0.22%
T7 CAIRP Class 8	Natural Gas	0	1.32E-02	2.63E-01	4.60E+00	0.00E+00	1.74E-03	3.60E-02	7.41E-02	1.10E-01	1.60E-03	9.00E-03	2.59E-02	3.49E-02	1.18E+03	9.23E-01	2.41E-01	35	0.00%
T7 NNOOS Class 8	Diesel	89	1.45E-01	3.86E+00	5.72E-01	1.52E-02	1.09E-01	3.60E-02	7.82E-02	1.14E-01	1.05E-01	9.00E-03	2.74E-02	3.64E-02	1.61E+03	6.74E-03	2.54E-01	24,571	0.27%
T7 NOOS Class 8	Diesel	36	1.03E-01	3.75E+00	3.75E-01	1.51E-02	7.38E-02	3.60E-02	7.75E-02	1.13E-01	7.06E-02	9.00E-03	2.71E-02	3.61E-02	1.60E+03	4.78E-03	2.52E-01	8,928	0.10%
T7 Other Port Class 8	Diesel	10	1.19E-01	4.48E+00	3.80E-01	1.63E-02	3.11E-02	3.60E-02	9.40E-02	1.30E-01	2.98E-02	9.00E-03	3.29E-02	4.19E-02	1.72E+03	5.53E-03	2.71E-01	1,689	0.02%
T7 POAK Class 8	Diesel	65	1.47E-01	4.98E+00	4.69E-01	1.63E-02	4.14E-02	3.60E-02	9.60E-02	1.32E-01	3.96E-02	9.00E-03	3.36E-02	4.26E-02	1.73E+03	6.85E-03	2.72E-01	6,317	0.07%
T7 POAK Class 8	Natural Gas	0	1.70E-02	7.07E-01	1.10E+01	0.00E+00	1.36E-03	3.60E-02	8.52E-02	1.21E-01	1.25E-03	9.00E-03	2.98E-02	3.88E-02	1.49E+03	1.19E+00	3.04E-01	14	0.00%
T7 Public Class 8	Diesel	268	1.67E-01	1.31E+01	5.15E-01	1.87E-02	7.84E-02	3.60E-02	1.22E-01	1.58E-01	7.50E-02	9.00E-03	4.27E-02	5.17E-02	1.98E+03	7.76E-03	3.11E-01	10,717	0.12%
T7 Public Class 8	Natural Gas	1	2.66E-02	8.79E-01	1.13E+01	0.00E+00	2.25E-03	3.60E-02	1.05E-01	1.41E-01	2.07E-03	9.00E-03	3.66E-02	4.56E-02	1.69E+03	1.86E+00	3.44E-01	38	0.00%
T7 Single Concrete/Transit	Diesel	56	3.91E-01	9.77E+00	1.24E+00	1.63E-02	2.08E-01	3.60E-02	9.56E-02	1.32E-01	1.99E-01	9.00E-03	3.35E-02	4.25E-02	1.72E+03	1.82E-02	2.71E-01	2,795	0.03%
T7 Single Concrete/Transit	Natural Gas	1	1.52E-02	2.36E-01	5.04E+00	0.00E+00	2.09E-03	3.60E-02	8.04E-02	1.16E-01	1.93E-03	9.00E-03	2.81E-02	3.71E-02	1.27E+03	1.06E+00	2.60E-01	127	0.00%
T7 Single Dump Class 8	Diesel	418	1.82E-01	4.26E+00	6.81E-01	1.62E-02	1.20E-01	3.60E-02	8.66E-02	1.23E-01	1.15E-01	9.00E-03	3.03E-02	3.93E-02	1.72E+03	8.44E-03	2.70E-01	26,094	0.28%
T7 Single Dump Class 8	Natural Gas	18	1.52E-02	3.71E-01	6.75E+00	0.00E+00	1.81E-03	3.60E-02	8.16E-02	1.18E-01	1.66E-03	9.00E-03	2.85E-02	3.75E-02	1.29E+03	1.06E+00	2.62E-01	1,482	0.02%
T7 Single Other Class 8	Diesel	467	2.91E-01	6.14E+00	1.08E+00	1.61E-02	1.86E-01	3.60E-02	8.97E-02	1.26E-01	1.78E-01	9.00E-03	3.14E-02	4.04E-02	1.70E+03	1.35E-02	2.68E-01	26,242	0.28%
T7 Single Other Class 8	Natural Gas	18	1.52E-02	3.77E-01	6.92E+00	0.00E+00	1.79E-03	3.60E-02	8.19E-02	1.18E-01	1.64E-03	9.00E-03	2.87E-02	3.77E-02	1.30E+03	1.06E+00	2.65E-01	1,457	0.02%
T7 SWCV Class 8	Diesel	131	1.51E-02	9.39E+00	4.14E-02	3.90E-02	1.52E-02	3.60E-02	2.10E-01	2.46E-01	1.46E-02	9.00E-03	7.35E-02	8.25E-02	4.13E+03	6.99E-04	6.50E-01	8,483	0.09%
T7 SWCV Class 8	Natural Gas	59	1.48E-01	2.43E+00	1.48E+01	0.00E+00	5.35E-03	3.60E-02	2.10E-01	2.46E-01	4.92E-03	9.00E-03	7.35E-02	8.25E-02	1.65E+03	2.70E+00	3.37E-01	3,810	0.04%
T7 Tractor Class 8	Diesel	173	1.48E-01	4.87E+00	5.36E-01	1.51E-02	8.65E-02	3.60E-02	8.53E-02	1.21E-01	8.27E-02	9.00E-03	2.99E-02	3.89E-02	1.60E+03	6.87E-03	2.51E-01	15,687	0.17%
T7 Tractor Class 8	Natural Gas	12	1.42E-02	5.64E-01	9.73E+00	0.00E+00	1.24E-03	3.60E-02	7.85E-02	1.14E-01	1.14E-03	9.00E-03	2.75E-02	3.65E-02	1.22E+03	9.96E-01	2.49E-01	1,308	0.01%
T7 Utility Class 8	Diesel	7	4.10E-02	2.47E+00	1.98E-01	1.68E-02	1.14E-02	3.60E-02	9.84E-02	1.34E-01	1.09E-02	9.00E-03	3.44E-02	4.34E-02	1.78E+03	1.90E-03	2.80E-01	340	0.00%
T7IS	Gasoline	4	6.38E+00	2.26E+01	1.72E+02	2.77E-02	1.05E-02	2.00E-02	1.18E-01	1.38E-01	9.85E-03	5.00E-03	4.13E-02	4.63E-02	2.80E+03	8.44E-01	4.96E-01	88	0.00%
UBUS	Gasoline	48	9.42E-03	1.00E-01	4.85E-01	1.24E-02	6.71E-04	9.15E-03	9.65E-02	1.06E-01	6.17E-04	2.29E-03	3.38E-02	3.61E-02	1.25E+03	3.05E-03	1.04E-02	3,580	0.04%
UBUS	Diesel	43	8.13E-02	3.32E+00	2.00E-01	1.18E-02	8.09E-03	2.97E-02	1.10E-01	1.40E-01	7.74E-03	7.42E-03	3.85E-02	4.59E-02	1.25E+03	3.78E-03	1.97E-01	3,794	0.04%
UBUS	Electricity	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	5.50E-02	6.70E-02	0.00E+00	3.00E-03	1.93E-02	2.23E-02	0.00E+00	0.00E+00	0.00E+00	27	0.00%
UBUS	Natural Gas	44	9.95E-02	1.28E+00	1.98E+01	0.00E+00	8.87E-04	3.31E-02	1.10E-01	1.43E-01	8.49E-04	8.29E-03	3.85E-02	4.68E-02	1.50E+03	1.56E+00	3.06E-01	5,638	0.06%
																		9,211,616	

lbs/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
9.99E-04	9.10E-03	2.46E-03	2.55E-05	2.65E-05	1.02E-04	4.11E-04	1.28E-04	6.61E-06	3.56E-05	3.93E-04	4.22E-05	2.69E+00	4.64E-05	4.24E-04	
2.30E-05	6.64E-04	6.82E-03	0.00E+00	2.65E-05	1.02E-04	1.28E-06	1.28E-04	6.61E-06	3.56E-05	1.18E-06	4.22E-05	2.28E+00	1.61E-03	4.64E-04	
4.68E-05	2.11E-04	2.66E-03	6.51E-06	1.76E-05	1.96E-05	3.43E-06	3.73E-05	4.41E-06	6.87E-06	3.16E-06	1.13E-05	6.58E-01	1.08E-05	1.75E-05	
9.65E-05	9.77E-04	9.78E-04	5.15E-06	1.76E-05	1.97E-05	6.19E-05	3.73E-05	4.41E-06	6.90E-06	5.92E-05	1.13E-05	5.44E-01	4.48E-06	8.57E-05	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E-05	9.62E-06	0.00E+00	2.73E-05	4.41E-06	3.37E-06	0.00E+00	7.78E-06	0.00E+00	0.00E+00	0.00E+00	
3.53E-06	8.25E-06	5.27E-04	3.36E-06	1.76E-05	9.07E-06	2.05E-06	2.67E-05	4.41E-06	3.17E-06	1.89E-06	7.58E-06	3.39E-01	1.11E-06	1.49E-06	
1.37E-04	5.98E-04	5.77E-03	7.64E-06	1.76E-05	2.35E-05	6.43E-06	4.11E-05	4.41E-06	8.22E-06	5.92E-06	1.26E-05	7.72E-01	2.88E-05	3.79E-05	
6.76E-04	3.60E-03	3.60E-03	8.79E-06	1.76E-05	2.69E-05	5.65E-04	4.46E-05	4.41E-06	9.42E-06	5.40E-04	1.38E-05	9.28E-01	3.14E-05	1.46E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E-05	9.69E-06	0.00E+00	2.73E-05	4.41E-06	3.39E-06	0.00E+00	7.80E-06	0.00E+00	0.00E+00	0.00E+00	
3.54E-06	8.28E-06	5.29E-04	3.37E-06	1.76E-05	9.06E-06	2.42E-06	2.67E-05	4.41E-06	3.17E-06	2.22E-06	7.58E-06	3.41E-01	1.12E-06	1.50E-06	
5.24E-05	3.29E-04	2.96E-03	8.21E-06	1.76E-05	2.25E-05	3.63E-06	4.02E-05	4.41E-06	7.89E-06	3.34E-06	1.23E-05	8.30E-01	1.18E-05	2.23E-05	
4.70E-05	2.54E-04	3.81E-04	7.07E-06	1.76E-05	2.19E-05	2.35E-05	3.95E-05	4.41E-06	7.66E-06	2.24E-05	1.21E-05	7.47E-01	2.18E-06	1.18E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E-05	9.62E-06	0.00E+00	2.73E-05	4.41E-06	3.37E-06	0.00E+00	7.78E-06	0.00E+00	0.00E+00	0.00E+00	
3.47E-06	8.12E-06	5.20E-04	3.31E-06	1.76E-05	9.05E-06	2.35E-06	2.67E-05	4.41E-06	3.17E-06	2.16E-06	7.58E-06	3.34E-01	1.10E-06	1.48E-06	
1.83E-04	7.58E-04	3.99E-03	2.10E-05	1.76E-05	1.72E-04	5.21E-06	1.90E-04	4.41E-06	6.02E-05	4.79E-06	6.46E-05	2.12E+00	3.52E-05	4.12E-05	
5.46E-04	6.58E-03	1.65E-03	1.35E-05	2.65E-05	1.72E-04	1.24E-04	1.98E-04	6.61E-06	6.02E-05	1.19E-04	6.68E-05	1.42E+00	2.54E-05	2.24E-04	
9.50E-05	4.57E-04	2.51E-03	2.24E-05	1.76E-05	2.01E-04	3.67E-06	2.18E-04	4.41E-06	7.02E-05	3.38E-06	7.46E-05	2.26E+00	1.96E-05	2.72E-05	
4.36E-04	4.30E-03	1.17E-03	1.66E-05	2.65E-05	2.01E-04	9.47E-05	2.27E-04	6.61E-06	7.02E-05	9.06E-05	7.68E-05	1.75E+00	2.02E-05	2.75E-04	
3.53E-03	1.66E-03	3.95E-02	4.23E-06	8.82E-06	2.65E-05	4.54E-06	3.53E-05	2.20E-06	9.26E-06	4.28E-06	1.15E-05	4.28E-01	4.94E-04	1.04E-04	
8.30E-05	4.87E-04	3.70E-03	9.92E-06	1.76E-05	2.32E-05	3.79E-06	4.08E-05	4.41E-06	8.11E-06	3.49E-06	1.25E-05	1.00E+00	1.73E-05	3.02E-05	
3.50E-05	2.49E-04	4.97E-04	9.01E-06	1.76E-05	2.18E-05	1.85E-05	3.94E-05	4.41E-06	7.62E-06	1.77E-05	1.20E-05	9.52E-01	1.63E-06	1.50E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E-05	9.75E-06	0.00E+00	2.74E-05	4.41E-06	3.41E-06	0.00E+00	7.82E-06	0.00E+00	0.00E+00	0.00E+00	
3.53E-06	8.25E-06	5.28E-04	3.36E-06	1.76E-05	9.05E-06	2.42E-06	2.67E-05	4.41E-06	3.17E-06	2.23E-06	7.58E-06	3.40E-01	1.12E-06	1.51E-06	
3.36E-04	1.52E-03	9.22E-03	4.25E-05	2.65E-05	9.92E-05	5.47E-06	1.26E-04	6.61E-06	3.47E-05	5.05E-06	4.13E-05	4.30E+00	6.47E-05	8.16E-05	
3.04E-04	1.10E-02	1.05E-03	2.25E-05	3.53E-05	9.87E-05	3.11E-04	1.34E-04	8.82E-06	3.46E-05	2.98E-04	4.34E-05	2.38E+00	1.41E-05	3.75E-04	
3.91E-04	9.58E-03	1.37E-03	3.67E-05	2.65E-05	1.74E-04	2.38E-04	2.01E-04	6.61E-06	6.10E-05	2.27E-04	6.76E-05	3.88E+00	1.82E-05	6.10E-04	
2.29E-04	1.69E-03	5.19E-03	3.96E-05	2.65E-05	9.88E-05	2.38E-06	1.25E-04	6.61E-06	3.46E-05	2.19E-06	4.12E-05	4.00E+00	4.61E-05	7.35E-05	
1.07E-03	1.54E-02	4.19E-03	4.54E-05	0.00E+00	0.00E+00	4.60E-04	0.00E+00	0.00E+00	0.00E+00	4.40E-04	0.00E+00	4.80E+00	4.97E-05	7.56E-04	
9.20E-04	1.64E-03	2.02E-02	1.83E-05	1.76E-05	9.90E-05	6.69E-06	1.17E-04	4.41E-06	3.47E-05	6.24E-06	3.91E-05	1.85E+00	1.38E-04	7.59E-05	
1.43E-04	9.51E-03	4.16E-04	2.48E-05	2.65E-05	9.90E-05	5.12E-05	1.25E-04	6.61E-06	3.47E-05	4.90E-05	4.13E-05	2.62E+00	6.62E-06	4.13E-04	
1.19E-04	1.52E-03	2.92E-02	0.00E+00	2.65E-05	9.90E-05	8.10E-06	1.25E-04	6.61E-06	3.47E-05	7.45E-06	4.13E-05	2.85E+00	8.31E-03	5.81E-04	
1.94E-04	4.81E-03	6.87E-04	2.38E-05	2.65E-05	9.33E-05	1.64E-04	1.20E-04	6.61E-06	3.26E-05	1.57E-04	3.93E-05	2.51E+00	9.00E-06	3.96E-04	
1.32E-04	3.62E-03	5.03E-04	2.37E-05	2.65E-05	9.33E-05	1.20E-04	1.20E-04	6.61E-06	3.26E-05	1.15E-04	3.93E-05	2.50E+00	6.14E-06	3.94E-04	
1.89E-04	4.73E-03	7.01E-04	2.34E-05	2.65E-05	9.33E-05	1.69E-04	1.20E-04	6.61E-06	3.26E-05	1.62E-04	3.93E-05	2.47E+00	8.76E-06	3.89E-04	
1.87E-04	5.03E-03	6.38E-04	2.20E-05	2.65E-05	9.33E-05	1.53E-04	1.20E-04	6.61E-06	3.26E-05	1.46E-04	3.93E-05	2.33E+00	8.68E-06	3.66E-04	
1.04E-03	1.33E-02	2.74E-03	2.61E-05	2.65E-05	1.05E-04	4.17E-04	1.31E-04	6.61E-06	3.67E-05	3.99E-04	4.33E-05	2.76E+00	4.82E-05	4.35E-04	
2.29E-05	6.63E-04	7.16E-03	0.00E+00	2.65E-05	1.05E-04	1.41E-06	1.31E-04	6.61E-06	3.67E-05	1.29E-06	4.33E-05	2.45E+00	1.60E-03	4.99E-04	
7.68E-04	9.94E-03	2.03E-03	2.59E-05	2.65E-05	1.05E-04	3.07E-04	1.31E-04	6.61E-06	3.67E-05	2.94E-04	4.33E-05	2.74E+00	3.57E-05	4.31E-04	
2.31E-05	6.35E-04	7.22E-03	0.00E+00	2.65E-05	1.05E-04	1.57E-06	1.31E-04	6.61E-06	3.67E-05	1.44E-06	4.33E-05	2.45E+00	1.62E-03	4.99E-04	
7.43E-04	1.02E-02	1.95E-03	2.59E-05	2.65E-05	1.05E-04	3.00E-04	1.31E-04	6.61E-06	3.67E-05	2.87E-04	4.33E-05	2.74E+00	3.45E-05	4.31E-04	
2.30E-05	6.50E-04	7.19E-03	0.00E+00	2.65E-05	1.05E-04	1.48E-06	1.31E-04	6.61E-06	3.67E-05	1.36E-06	4.33E-05	2.45E+00	1.61E-03	4.99E-04	
7.34E-04	9.45E-03	1.93E-03	2.57E-05	2.65E-05	1.05E-04	3.58E-04	1.31E-04	6.61E-06	3.67E-05	3.42E-04	4.33E-05	2.72E+00	3.41E-05	4.28E-04	
2.44E-05	4.94E-04	7.59E-03	0.00E+00	2.65E-05	1.05E-04	2.39E-06	1.31E-04	6.61E-06	3.67E-05	2.20E-06	4.33E-05	2.39E+00	1.71E-03	4.87E-04	
9.72E-04	1.48E-02	2.77E-03	2.46E-05	2.65E-05	9.89E-05	5.04E-04	1.25E-04	6.61E-06	3.46E-05	4.82E-04	4.12E-05	2.60E+00	4.51E-05	4.10E-04	
1.75E-05	5.10E-04	6.25E-03	0.00E+00	2.65E-05	9.89E-05	1.09E-06	1.25E-04	6.61E-06	3.46E-05	1.00E-06	4.12E-05	2.13E+00	1.22E-03	4.33E-04	
2.53E-04	4.66E-03	7.88E-04	2.41E-05	2.65E-05	9.89E-05	1.33E-04	1.25E-04	6.61E-06	3.46E-05	1.27E-04	4.12E-05	2.55E+00	1.17E-05	4.01E-04	
1.75E-05	5.06E-04	6.25E-03	0.00E+00	2.65E-05	9.89E-05	1.11E-06	1.25E-04	6.61E-06	3.46E-05	1.02E-06	4.12E-05	2.12E+00	1.23E-03	4.32E-04	
5.03E-04	7.87E-03	1.47E-03	2.43E-05	2.65E-05	9.89E-05	2.72E-04	1.25E-04	6.61E-06	3.46E-05	2.61E-04	4.12E-05	2.57E+00	2.33E-05	4.04E-04	
1.77E-05	4.88E-04	6.23E-03	0.00E+00	2.65E-05	9.89E-05	1.22E-06	1.25E-04	6.61E-06	3.46E-05	1.12E-06	4.12E-05	2.12E+00	1.24E-03	4.33E-04	
5.09E-04	7.56E-03	1.39E-03	2.42E-05	2.65E-05	9.89E-05	2.89E-04	1.25E-04	6.61E-06	3.46E-05	2.76E-04	4.12E-05	2.56E+00	2.36E-05	4.02E-04	
1.98E-05	3.14E-04	6.11E-03	0.00E+00	2.65E-05	9.89E-05	2.28E-06	1.25E-04	6.61E-06	3.46E-05	2.10E-06	4.12E-05	2.08E+00	1.38E-03	4.24E-04	
7.34E-04	1.29E-02	2.14E-03	2.32E-05	2.65E-05	9.89E-05	3.58E-04	1.25E-04	6.61E-06	3.46E-05	3.42E-04	4.12E-05	2.45E+00	3.41E-05	3.86E-04	
1.75E-05	5.10E-04	6.25E-03	0.00E+00	2.65E-05	9.89E-05	1.09E-06	1.25E-04	6.61E-06	3.46E-05	1.00E-06	4.12E-05	2.13E+00	1.22E-03	4.35E-04	
2.66E-04	6.14E-03	7.97E-04	2.22E-05	2.65E-05	9.89E-05	1.39E-04	1.25E-04	6.61E-06	3.46E-05	1.33E-04	4.12E-05	2.35E+00	1.23E-05	3.69E-04	
1.92E-05	3.58E-04	6.14E-03	0.00E+00	2.65E-05	9.89E-05	2.01E-06	1.25E-04	6.61E-06	3.46E-05	1.85E-06	4.12E-05	2.09E+00	1.35E-03	4.26E-04	
1.94E-04	4.81E-03	6.87E-04	2.38E-05	2.65E-05	9.33E-05	1.64E-04	1.20E-04	6.61E-06	3.26E-05	1.57E-04	3.93E-05	2.51E+00	9.00E-06	3.96E-04	
1.32E-04	3.62E-03	5.03E-04	2.37E-05	2.65E-05	9.33E-05	1.20E-04	1.20E-04	6.61E-06	3.26E-05	1.15E-04	3.93E-05	2.50E+00	6.14E-06	3.94E-04	
1.89E-04	4.73E-03	7.01E-04	2.34E-05	2.65E-05	9.33E-05	1.69E-04	1.20E-04	6.61E-06	3.26E-05	1.62E-04	3.93E-05	2.47E+00	8.76E-06	3.89E-04	
2.07E-04	5.29E-03	7.04E-04	2.20E-05	2.65E-05	9.33E-05	1.69E-04	1.20E-04	6.61E-06	3.26E-05	1.62E-04	3.93E-05	2.33E+00	9.61E-06	3.66E-04	
2.38E-04	1.81E-02	5.49E-04	2.66E-05	2.65E-05	1.02E-04	1.09E-04	1.28E-04	6.61E-06	3.56E-05	1.04E-04	4.22E-05	2.81E+00	1.10E-05	4.43E-04	

1.00E-06

lbs/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
2.43E-05	7.00E-04	6.68E-03	0.00E+00	2.65E-05	1.02E-04	1.25E-06	1.28E-04	6.61E-06	3.56E-05	1.15E-06	4.22E-05	2.33E+00	1.70E-03	4.74E-04	
1.42E-04	9.92E-03	3.93E-04	2.61E-05	2.65E-05	1.02E-04	5.19E-05	1.28E-04	6.61E-06	3.56E-05	4.97E-05	4.22E-05	2.76E+00	6.60E-06	4.34E-04	
2.61E-05	4.09E-04	6.79E-03	0.00E+00	2.65E-05	1.02E-04	2.63E-06	1.28E-04	6.61E-06	3.56E-05	2.42E-06	4.22E-05	2.31E+00	1.83E-03	4.71E-04	
2.91E-04	1.95E-02	6.39E-04	2.71E-05	2.65E-05	1.02E-04	1.34E-04	1.28E-04	6.61E-06	3.56E-05	1.28E-04	4.22E-05	2.86E+00	1.35E-05	4.50E-04	
2.68E-05	2.94E-04	6.81E-03	0.00E+00	2.65E-05	1.02E-04	3.17E-06	1.28E-04	6.61E-06	3.56E-05	2.92E-06	4.22E-05	2.32E+00	1.88E-03	4.72E-04	
3.70E-04	2.28E-02	7.72E-04	2.77E-05	2.65E-05	1.02E-04	1.78E-04	1.28E-04	6.61E-06	3.56E-05	1.70E-04	4.22E-05	2.92E+00	1.72E-05	4.60E-04	
2.43E-05	7.00E-04	6.68E-03	0.00E+00	2.65E-05	1.02E-04	1.25E-06	1.28E-04	6.61E-06	3.56E-05	1.15E-06	4.22E-05	2.26E+00	1.70E-03	4.61E-04	
5.40E-05	2.81E-03	2.10E-04	2.38E-05	2.65E-05	1.00E-04	1.35E-05	1.27E-04	6.61E-06	3.51E-05	1.30E-05	4.17E-05	2.51E+00	2.51E-06	3.95E-04	
2.06E-05	5.96E-04	6.38E-03	0.00E+00	2.65E-05	1.00E-04	1.14E-06	1.27E-04	6.61E-06	3.51E-05	1.05E-06	4.17E-05	2.23E+00	1.44E-03	4.54E-04	
8.18E-05	4.60E-03	2.73E-04	2.43E-05	2.65E-05	1.00E-04	2.37E-05	1.27E-04	6.61E-06	3.51E-05	2.27E-05	4.17E-05	2.57E+00	3.80E-06	4.04E-04	
2.06E-05	5.96E-04	6.38E-03	0.00E+00	2.65E-05	1.00E-04	1.14E-06	1.27E-04	6.61E-06	3.51E-05	1.05E-06	4.17E-05	2.19E+00	1.44E-03	4.47E-04	
6.17E-05	4.24E-03	2.21E-04	2.43E-05	2.65E-05	1.00E-04	2.27E-05	1.27E-04	6.61E-06	3.51E-05	2.17E-05	4.17E-05	2.57E+00	2.86E-06	4.04E-04	
2.06E-05	5.96E-04	6.38E-03	0.00E+00	2.65E-05	1.00E-04	1.14E-06	1.27E-04	6.61E-06	3.51E-05	1.05E-06	4.17E-05	2.21E+00	1.44E-03	4.50E-04	
4.07E-04	1.91E-03	9.23E-03	4.05E-05	2.65E-05	9.92E-05	4.36E-06	1.26E-04	6.61E-06	3.47E-05	4.03E-06	4.13E-05	4.09E+00	7.23E-05	8.33E-05	
1.94E-04	7.91E-03	7.14E-04	3.34E-05	7.94E-05	1.70E-04	1.46E-04	2.50E-04	1.98E-05	5.97E-05	1.40E-04	7.95E-05	3.53E+00	9.02E-06	5.56E-04	
2.91E-05	5.79E-04	1.01E-02	0.00E+00	7.94E-05	1.63E-04	3.83E-06	2.43E-04	1.98E-05	5.72E-05	3.52E-06	7.70E-05	2.60E+00	2.04E-03	5.31E-04	
3.20E-04	8.50E-03	1.26E-03	3.36E-05	7.94E-05	1.72E-04	2.41E-04	2.52E-04	1.98E-05	6.03E-05	2.31E-04	8.02E-05	3.55E+00	1.49E-05	5.59E-04	
2.27E-04	8.27E-03	8.27E-04	3.34E-05	7.94E-05	1.71E-04	1.63E-04	2.50E-04	1.98E-05	5.98E-05	1.56E-04	7.96E-05	3.53E+00	1.05E-05	5.56E-04	
2.63E-04	9.87E-03	8.38E-04	3.59E-05	7.94E-05	2.07E-04	6.86E-05	2.87E-04	1.98E-05	7.26E-05	6.56E-05	9.24E-05	3.80E+00	1.22E-05	5.98E-04	
3.25E-04	1.10E-02	1.03E-03	3.60E-05	7.94E-05	2.12E-04	9.13E-05	2.91E-04	1.98E-05	7.41E-05	8.73E-05	9.40E-05	3.80E+00	1.51E-05	5.99E-04	
3.74E-05	1.56E-03	2.43E-02	0.00E+00	7.94E-05	1.88E-04	2.99E-06	2.67E-04	1.98E-05	6.58E-05	2.75E-06	8.56E-05	3.29E+00	2.62E-03	6.71E-04	
3.68E-04	2.88E-02	1.14E-03	4.12E-05	7.94E-05	2.69E-04	1.73E-04	3.48E-04	1.98E-05	9.42E-05	1.65E-04	1.14E-04	4.36E+00	1.71E-05	6.86E-04	
5.86E-05	1.94E-03	2.49E-02	0.00E+00	7.94E-05	2.31E-04	4.96E-06	3.10E-04	1.98E-05	8.08E-05	4.56E-06	1.01E-04	3.72E+00	4.10E-03	7.59E-04	
8.61E-04	2.15E-02	2.73E-03	3.60E-05	7.94E-05	2.11E-04	4.59E-04	2.90E-04	1.98E-05	7.38E-05	4.39E-04	9.36E-05	3.80E+00	4.00E-05	5.98E-04	
3.35E-05	5.20E-04	1.11E-02	0.00E+00	7.94E-05	1.77E-04	4.62E-06	2.57E-04	1.98E-05	6.20E-05	4.24E-06	8.18E-05	2.81E+00	2.35E-03	5.72E-04	
4.00E-04	9.39E-03	1.50E-03	3.58E-05	7.94E-05	1.91E-04	2.64E-04	2.70E-04	1.98E-05	6.69E-05	2.53E-04	8.67E-05	3.79E+00	1.86E-05	5.96E-04	
3.34E-05	8.19E-04	1.49E-02	0.00E+00	7.94E-05	1.80E-04	3.99E-06	2.59E-04	1.98E-05	6.29E-05	3.67E-06	8.28E-05	2.83E+00	2.34E-03	5.78E-04	
6.41E-04	1.35E-02	2.39E-03	3.56E-05	7.94E-05	1.98E-04	4.10E-04	2.77E-04	1.98E-05	6.92E-05	3.93E-04	8.90E-05	3.76E+00	2.98E-05	5.92E-04	
3.34E-05	8.32E-04	1.53E-02	0.00E+00	7.94E-05	1.81E-04	3.94E-06	2.60E-04	1.98E-05	6.32E-05	3.62E-06	8.31E-05	2.87E+00	2.34E-03	5.84E-04	
3.32E-05	2.07E-02	9.13E-05	8.61E-05	7.94E-05	4.63E-04	3.35E-05	5.42E-04	1.98E-05	1.62E-04	3.21E-05	1.82E-04	9.10E+00	1.54E-06	1.43E-03	
3.27E-04	5.36E-03	3.26E-02	0.00E+00	7.94E-05	4.63E-04	1.18E-05	5.42E-04	1.98E-05	1.62E-04	1.08E-05	1.82E-04	3.64E+00	5.94E-03	7.43E-04	
3.26E-04	1.07E-02	1.18E-03	3.33E-05	7.94E-05	1.88E-04	1.91E-04	2.67E-04	1.98E-05	6.58E-05	1.82E-04	8.57E-05	3.52E+00	1.51E-05	5.54E-04	
3.14E-05	1.24E-03	2.14E-02	0.00E+00	7.94E-05	1.73E-04	2.74E-06	2.52E-04	1.98E-05	6.05E-05	2.52E-06	8.04E-05	2.69E+00	2.20E-03	5.49E-04	
9.04E-05	5.45E-03	4.37E-04	3.71E-05	7.94E-05	2.17E-04	2.51E-05	2.96E-04	1.98E-05	7.59E-05	2.40E-05	9.58E-05	3.92E+00	4.20E-06	6.17E-04	
1.41E-02	4.97E-02	3.78E-01	6.11E-05	4.41E-05	2.60E-04	2.32E-05	3.04E-04	1.10E-05	9.11E-05	2.17E-05	1.02E-04	6.18E+00	1.86E-03	1.09E-03	
2.08E-05	2.21E-04	1.07E-03	2.72E-05	2.02E-05	2.13E-04	1.48E-06	2.33E-04	5.04E-06	7.44E-05	1.36E-06	7.95E-05	2.75E+00	6.72E-06	2.28E-05	
1.79E-04	7.31E-03	4.40E-04	2.61E-05	6.54E-05	2.43E-04	1.78E-05	3.08E-04	1.64E-05	8.49E-05	1.71E-05	1.01E-04	2.76E+00	8.33E-06	4.34E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.65E-05	1.21E-04	0.00E+00	1.48E-04	6.61E-06	4.24E-05	0.00E+00	4.91E-05	0.00E+00	0.00E+00	0.00E+00	
2.19E-04	2.83E-03	4.37E-02	0.00E+00	7.31E-05	2.43E-04	1.96E-06	3.16E-04	1.83E-05	8.49E-05	1.87E-06	1.03E-04	3.31E+00	3.45E-03	6.75E-04	

1.00E-06

MTens/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
4.53E-07	4.13E-06	1.12E-06	1.16E-08	1.20E-08	4.61E-08	1.86E-07	5.81E-08	3.00E-09	1.61E-08	1.78E-07	1.91E-08	1.22E-03	2.11E-08	1.92E-07	
1.04E-08	3.01E-07	3.09E-06	0.00E+00	1.20E-08	4.61E-08	5.82E-10	5.81E-08	3.00E-09	1.61E-08	5.35E-10	1.91E-08	1.03E-03	7.29E-07	2.10E-07	
2.12E-08	9.57E-08	1.21E-06	2.95E-09	8.00E-09	8.91E-09	1.56E-09	1.69E-08	2.00E-09	3.12E-09	1.43E-09	5.12E-09	2.98E-04	4.91E-09	7.95E-09	
4.38E-08	4.43E-07	4.44E-07	2.34E-09	8.00E-09	8.94E-09	2.81E-08	1.69E-08	2.00E-09	3.13E-09	2.69E-08	5.13E-09	2.47E-04	2.03E-09	3.89E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	4.36E-09	0.00E+00	1.24E-08	2.00E-09	1.53E-09	0.00E+00	3.53E-09	0.00E+00	0.00E+00	0.00E+00	
1.60E-09	3.74E-09	2.39E-07	1.52E-09	8.00E-09	4.11E-09	9.31E-10	1.21E-08	2.00E-09	1.44E-09	8.56E-10	3.44E-09	1.54E-04	5.05E-10	6.77E-10	
6.21E-08	2.71E-07	2.62E-06	3.47E-09	8.00E-09	1.06E-08	2.92E-09	1.86E-08	2.00E-09	3.73E-09	2.68E-09	5.73E-09	3.50E-04	1.30E-08	1.72E-08	
3.07E-07	1.63E-06	1.63E-06	3.99E-09	8.00E-09	1.22E-08	2.56E-07	2.02E-08	2.00E-09	4.27E-09	2.45E-07	6.27E-09	4.21E-04	1.43E-08	6.63E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	4.39E-09	0.00E+00	1.24E-08	2.00E-09	1.54E-09	0.00E+00	3.54E-09	0.00E+00	0.00E+00	0.00E+00	
1.60E-09	3.76E-09	2.40E-07	1.53E-09	8.00E-09	4.11E-09	1.10E-09	1.21E-08	2.00E-09	1.44E-09	1.01E-09	3.44E-09	1.55E-04	5.07E-10	6.80E-10	
2.38E-08	1.49E-07	1.34E-06	3.73E-09	8.00E-09	1.02E-08	1.65E-09	1.82E-08	2.00E-09	3.58E-09	1.51E-09	5.58E-09	3.77E-04	5.33E-09	1.01E-08	
2.13E-08	1.15E-07	1.73E-07	3.21E-09	8.00E-09	9.93E-09	1.06E-08	1.79E-08	2.00E-09	3.47E-09	1.02E-08	5.47E-09	3.39E-04	9.89E-10	5.33E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	4.36E-09	0.00E+00	1.24E-08	2.00E-09	1.53E-09	0.00E+00	3.53E-09	0.00E+00	0.00E+00	0.00E+00	
1.57E-09	3.69E-09	2.36E-07	1.50E-09	8.00E-09	4.10E-09	1.06E-09	1.21E-08	2.00E-09	1.44E-09	9.79E-10	3.44E-09	1.52E-04	4.99E-10	6.73E-10	
8.29E-08	3.44E-07	1.81E-06	9.51E-09	8.00E-09	7.80E-08	2.36E-09	8.60E-08	2.00E-09	2.73E-08	2.17E-09	2.93E-08	9.61E-04	1.59E-08	1.87E-08	
2.48E-07	2.99E-06	7.48E-07	6.12E-09	1.20E-08	7.80E-08	5.63E-08	9.00E-08	3.00E-09	2.73E-08	5.38E-08	3.03E-08	6.46E-04	1.15E-08	1.02E-07	
4.31E-08	2.07E-07	1.14E-06	1.02E-08	8.00E-09	9.10E-08	1.67E-09	9.90E-08	2.00E-09	3.19E-08	1.53E-09	3.39E-08	1.03E-03	8.88E-09	1.23E-08	
1.98E-07	1.95E-06	5.31E-07	7.51E-09	1.20E-08	9.10E-08	4.29E-08	1.03E-07	3.00E-09	3.19E-08	4.11E-08	3.49E-08	7.93E-04	9.18E-09	1.25E-07	
1.60E-06	7.52E-07	1.79E-05	1.92E-09	4.00E-09	1.20E-08	2.06E-09	1.60E-08	1.00E-09	4.20E-09	1.94E-09	5.20E-09	1.94E-04	2.24E-07	4.74E-08	
3.76E-08	2.21E-07	1.68E-06	4.50E-09	8.00E-09	1.05E-08	1.72E-09	1.85E-08	2.00E-09	3.68E-09	1.58E-09	5.68E-09	4.55E-04	7.83E-09	1.37E-08	
1.59E-08	1.13E-07	2.26E-07	4.09E-09	8.00E-09	9.87E-09	8.37E-09	1.79E-08	2.00E-09	3.45E-09	8.01E-09	5.45E-09	4.32E-04	7.38E-10	6.80E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	4.42E-09	0.00E+00	1.24E-08	2.00E-09	1.55E-09	0.00E+00	3.55E-09	0.00E+00	0.00E+00	0.00E+00	
1.60E-09	3.74E-09	2.39E-07	1.52E-09	8.00E-09	4.11E-09	1.10E-09	1.21E-08	2.00E-09	1.44E-09	1.01E-09	3.44E-09	1.54E-04	5.08E-10	6.85E-10	
1.52E-07	6.91E-07	4.18E-06	1.93E-08	1.20E-08	4.50E-08	2.48E-09	5.70E-08	3.00E-09	1.58E-08	2.29E-09	1.88E-08	1.95E-03	2.93E-08	3.70E-08	
1.38E-07	4.99E-06	4.77E-07	1.02E-08	1.60E-08	4.48E-08	1.41E-07	6.08E-08	4.00E-09	1.57E-08	1.35E-07	1.97E-08	1.08E-03	6.40E-09	1.70E-07	
1.77E-07	4.35E-06	6.23E-07	1.66E-08	1.20E-08	7.91E-08	1.08E-07	9.11E-08	3.00E-09	2.77E-08	1.03E-07	3.07E-08	1.76E-03	8.24E-09	2.77E-07	
1.04E-07	7.68E-07	2.36E-06	1.80E-08	1.20E-08	4.48E-08	1.08E-09	5.68E-08	3.00E-09	1.57E-08	9.92E-10	1.87E-08	1.82E-03	2.09E-08	3.33E-08	
4.85E-07	6.98E-06	1.90E-06	2.06E-08	0.00E+00	0.00E+00	2.09E-07	0.00E+00	0.00E+00	0.00E+00	2.00E-07	0.00E+00	2.18E-03	2.25E-08	3.43E-07	
4.17E-07	7.42E-07	9.15E-06	8.28E-09	8.00E-09	4.49E-08	3.04E-09	5.29E-08	2.00E-09	1.57E-08	2.83E-09	1.77E-08	8.37E-04	6.27E-08	3.44E-08	
6.47E-08	4.31E-06	1.88E-07	1.13E-08	1.20E-08	4.49E-08	2.32E-08	5.69E-08	3.00E-09	1.57E-08	2.22E-08	1.87E-08	1.19E-03	3.00E-09	1.87E-07	
5.39E-08	6.91E-07	1.32E-05	0.00E+00	1.20E-08	4.49E-08	3.67E-09	5.69E-08	3.00E-09	1.57E-08	3.38E-09	1.87E-08	1.29E-03	3.77E-06	2.63E-07	
8.78E-08	2.18E-06	3.12E-07	1.08E-08	1.20E-08	4.23E-08	7.44E-08	5.43E-08	3.00E-09	1.48E-08	7.12E-08	1.78E-08	1.14E-03	4.08E-09	1.79E-07	
5.99E-08	1.64E-06	2.28E-07	1.07E-08	1.20E-08	4.23E-08	5.44E-08	5.43E-08	3.00E-09	1.48E-08	5.21E-08	1.78E-08	1.13E-03	2.78E-09	1.78E-07	
8.56E-08	2.15E-06	3.18E-07	1.06E-08	1.20E-08	4.23E-08	7.67E-08	5.43E-08	3.00E-09	1.48E-08	7.34E-08	1.78E-08	1.12E-03	3.97E-09	1.76E-07	
8.48E-08	2.28E-06	2.89E-07	9.99E-09	1.20E-08	4.23E-08	6.94E-08	5.43E-08	3.00E-09	1.48E-08	6.64E-08	1.78E-08	1.06E-03	3.94E-09	1.66E-07	
4.71E-07	6.04E-06	1.24E-06	1.19E-08	1.20E-08	4.76E-08	1.89E-07	5.96E-08	3.00E-09	1.66E-08	1.81E-07	1.96E-08	1.25E-03	2.19E-08	1.97E-07	
1.04E-08	3.01E-07	3.25E-06	0.00E+00	1.20E-08	4.76E-08	6.39E-10	5.96E-08	3.00E-09	1.66E-08	5.87E-10	1.96E-08	1.11E-03	7.27E-07	2.26E-07	
3.48E-07	4.51E-06	9.20E-07	1.17E-08	1.20E-08	4.76E-08	1.39E-07	5.96E-08	3.00E-09	1.66E-08	1.33E-07	1.96E-08	1.24E-03	1.62E-08	1.95E-07	
1.05E-08	2.88E-07	3.28E-06	0.00E+00	1.20E-08	4.76E-08	7.12E-10	5.96E-08	3.00E-09	1.66E-08	6.54E-10	1.96E-08	1.11E-03	7.35E-07	2.26E-07	
3.37E-07	4.62E-06	8.87E-07	1.17E-08	1.20E-08	4.76E-08	1.36E-07	5.96E-08	3.00E-09	1.66E-08	1.30E-07	1.96E-08	1.24E-03	1.56E-08	1.95E-07	
1.04E-08	2.95E-07	3.26E-06	0.00E+00	1.20E-08	4.76E-08	6.71E-10	5.96E-08	3.00E-09	1.66E-08	6.17E-10	1.96E-08	1.11E-03	7.30E-07	2.27E-07	
3.33E-07	4.29E-06	8.76E-07	1.17E-08	1.20E-08	4.76E-08	1.62E-07	5.96E-08	3.00E-09	1.66E-08	1.55E-07	1.96E-08	1.23E-03	1.55E-08	1.94E-07	
1.11E-08	2.24E-07	3.44E-06	0.00E+00	1.20E-08	4.76E-08	1.09E-09	5.96E-08	3.00E-09	1.66E-08	9.98E-10	1.96E-08	1.08E-03	7.74E-07	2.21E-07	
4.41E-07	6.72E-06	1.25E-06	1.12E-08	1.20E-08	4.49E-08	2.29E-07	5.69E-08	3.00E-09	1.57E-08	2.19E-07	1.87E-08	1.18E-03	2.05E-08	1.86E-07	
7.93E-09	2.31E-07	2.83E-06	0.00E+00	1.20E-08	4.49E-08	4.93E-10	5.69E-08	3.00E-09	1.57E-08	4.54E-10	1.87E-08	9.64E-04	5.55E-07	1.97E-07	
1.15E-07	2.11E-06	3.58E-07	1.09E-08	1.20E-08	4.49E-08	6.02E-08	5.69E-08	3.00E-09	1.57E-08	5.76E-08	1.87E-08	1.16E-03	5.32E-09	1.82E-07	
7.95E-09	2.30E-07	2.83E-06	0.00E+00	1.20E-08	4.49E-08	5.03E-10	5.69E-08	3.00E-09	1.57E-08	4.62E-10	1.87E-08	9.61E-04	5.57E-07	1.96E-07	
2.28E-07	3.57E-06	6.66E-07	1.10E-08	1.20E-08	4.49E-08	1.24E-07	5.69E-08	3.00E-09	1.57E-08	1.18E-07	1.87E-08	1.17E-03	1.06E-08	1.83E-07	
8.05E-09	2.22E-07	2.83E-06	0.00E+00	1.20E-08	4.49E-08	5.51E-10	5.69E-08	3.00E-09	1.57E-08	5.07E-10	1.87E-08	9.64E-04	5.63E-07	1.96E-07	
2.31E-07	3.43E-06	6.30E-07	1.10E-08	1.20E-08	4.49E-08	1.31E-07	5.69E-08	3.00E-09	1.57E-08	1.25E-07	1.87E-08	1.16E-03	1.07E-08	1.82E-07	
8.96E-09	1.43E-07	2.77E-06	0.00E+00	1.20E-08	4.49E-08	1.04E-09	5.69E-08	3.00E-09	1.57E-08	9.52E-10	1.87E-08	9.44E-04	6.27E-07	1.92E-07	
3.33E-07	5.83E-06	9.70E-07	1.05E-08	1.20E-08	4.49E-08	1.62E-07	5.69E-08	3.00E-09	1.57E-08	1.55E-07	1.87E-08	1.11E-03	1.55E-08	1.75E-07	
7.93E-09	2.31E-07	2.83E-06	0.00E+00	1.20E-08	4.49E-08	4.93E-10	5.69E-08	3.00E-09	1.57E-08	4.54E-10	1.87E-08	9.68E-04	5.55E-07	1.97E-07	
1.21E-07	2.79E-06	3.61E-07	1.01E-08	1.20E-08	4.49E-08	6.29E-08	5.69E-08	3.00E-09	1.57E-08	6.02E-08	1.87E-08	1.06E-03	5.60E-09	1.68E-07	
8.73E-09	1.62E-07	2.78E-06	0.00E+00	1.20E-08	4.49E-08	9.13E-10	5.69E-08	3.00E-09	1.57E-08	8.39E-10	1.87E-08	9.48E-04	6.11E-07	1.93E-07	
8.78E-08	2.18E-06	3.12E-07	1.08E-08	1.20E-08	4.23E-08	7.44E-08	5.43E-08	3.00E-09	1.48E-08	7.12E-08	1.78E-08	1.14E-03	4.08E-09	1.79E-07	
5.99E-08	1.64E-06	2.28E-07	1.07E-08	1.20E-08	4.23E-08	5.44E-08	5.43E-08	3.00E-09	1.48E-08	5.21E-08	1.78E-08	1.13E-03	2.78E-09	1.78E-07	
8.56E-08	2.15E-06	3.18E-07	1.06E-08	1.20E-08	4.23E-08	7.67E-08	5.43E-08	3.00E-09	1.48E-08	7.34E-08	1.78E-08	1.12E-03	3.97E-09	1.76E-07	
9.39E-08	2.40E-06	3.19E-07	9.98E-09	1.20E-08	4.23E-08	7.66E-08	5.43E-08	3.00E-09	1.48E-08	7.33E-08	1.78E-08	1.05E-03	4.36E-09	1.66E-07	
1.08E-07	8.23E-06	2.49E-07	1.21E-08	1.20E-08	4.62E-08	4.93E-08	5.82E-08	3.00E-09	1.62E-08	4.72E-08	1.92E-08	1.28E-03	5.01E-09	2.01E-07	

MTens/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
1.10E-08	3.18E-07	3.03E-06	0.00E+00	1.20E-08	4.62E-08	5.68E-10	5.82E-08	3.00E-09	1.62E-08	5.23E-10	1.92E-08	1.06E-03	7.72E-07	2.15E-07	
6.45E-08	4.50E-06	1.78E-07	1.18E-08	1.20E-08	4.62E-08	2.36E-08	5.82E-08	3.00E-09	1.62E-08	2.25E-08	1.92E-08	1.25E-03	3.00E-09	1.97E-07	
1.18E-08	1.86E-07	3.08E-06	0.00E+00	1.20E-08	4.62E-08	1.19E-09	5.82E-08	3.00E-09	1.62E-08	1.10E-09	1.92E-08	1.05E-03	8.29E-07	2.13E-07	
1.32E-07	8.84E-06	2.90E-07	1.23E-08	1.20E-08	4.62E-08	6.06E-08	5.82E-08	3.00E-09	1.62E-08	5.80E-08	1.92E-08	1.30E-03	6.12E-09	2.04E-07	
1.22E-08	1.34E-07	3.09E-06	0.00E+00	1.20E-08	4.62E-08	1.44E-09	5.82E-08	3.00E-09	1.62E-08	1.32E-09	1.92E-08	1.05E-03	8.52E-07	2.14E-07	
1.68E-07	1.03E-05	3.50E-07	1.26E-08	1.20E-08	4.62E-08	8.07E-08	5.82E-08	3.00E-09	1.62E-08	7.72E-08	1.92E-08	1.33E-03	7.79E-09	2.09E-07	
1.10E-08	3.18E-07	3.03E-06	0.00E+00	1.20E-08	4.62E-08	5.68E-10	5.82E-08	3.00E-09	1.62E-08	5.23E-10	1.92E-08	1.02E-03	7.72E-07	2.09E-07	
2.45E-08	1.27E-06	9.54E-08	1.08E-08	1.20E-08	4.55E-08	6.14E-09	5.75E-08	3.00E-09	1.59E-08	5.88E-09	1.89E-08	1.14E-03	1.14E-09	1.79E-07	
9.34E-09	2.70E-07	2.89E-06	0.00E+00	1.20E-08	4.55E-08	5.18E-10	5.75E-08	3.00E-09	1.59E-08	4.76E-10	1.89E-08	1.01E-03	6.54E-07	2.06E-07	
3.71E-08	2.09E-06	1.24E-07	1.10E-08	1.20E-08	4.55E-08	1.08E-08	5.75E-08	3.00E-09	1.59E-08	1.03E-08	1.89E-08	1.17E-03	1.72E-09	1.83E-07	
9.34E-09	2.70E-07	2.89E-06	0.00E+00	1.20E-08	4.55E-08	5.18E-10	5.75E-08	3.00E-09	1.59E-08	4.76E-10	1.89E-08	9.95E-04	6.54E-07	2.03E-07	
2.80E-08	1.92E-06	1.00E-07	1.10E-08	1.20E-08	4.55E-08	1.03E-08	5.75E-08	3.00E-09	1.59E-08	9.87E-09	1.89E-08	1.17E-03	1.30E-09	1.83E-07	
9.34E-09	2.70E-07	2.89E-06	0.00E+00	1.20E-08	4.55E-08	5.18E-10	5.75E-08	3.00E-09	1.59E-08	4.76E-10	1.89E-08	1.00E-03	6.54E-07	2.04E-07	
1.84E-07	8.66E-07	4.19E-06	1.84E-08	1.20E-08	4.50E-08	1.98E-09	5.70E-08	3.00E-09	1.58E-08	1.83E-09	1.88E-08	1.85E-03	3.28E-08	3.78E-08	
8.81E-08	3.59E-06	3.24E-07	1.51E-08	3.60E-08	7.73E-08	6.62E-08	1.13E-07	9.00E-09	2.71E-08	6.33E-08	3.61E-08	1.60E-03	4.09E-09	2.52E-07	
1.32E-08	2.63E-07	4.60E-06	0.00E+00	3.60E-08	7.41E-08	1.74E-09	1.10E-07	9.00E-09	2.59E-08	1.60E-09	3.49E-08	1.18E-03	9.23E-07	2.41E-07	
1.45E-07	3.86E-06	5.72E-07	1.52E-08	3.60E-08	7.82E-08	1.09E-07	1.14E-07	9.00E-09	2.74E-08	1.05E-07	3.64E-08	1.61E-03	6.74E-09	2.54E-07	
1.03E-07	3.75E-06	3.75E-07	1.51E-08	3.60E-08	7.75E-08	7.38E-08	1.13E-07	9.00E-09	2.71E-08	7.06E-08	3.61E-08	1.60E-03	4.78E-09	2.52E-07	
1.19E-07	4.48E-06	3.80E-07	1.63E-08	3.60E-08	9.40E-08	3.11E-08	1.30E-07	9.00E-09	3.29E-08	2.98E-08	4.19E-08	1.72E-03	5.53E-09	2.71E-07	
1.47E-07	4.98E-06	4.69E-07	1.63E-08	3.60E-08	9.60E-08	4.14E-08	1.32E-07	9.00E-09	3.36E-08	3.96E-08	4.26E-08	1.73E-03	6.85E-09	2.72E-07	
1.70E-08	7.07E-07	1.10E-05	0.00E+00	3.60E-08	8.52E-08	1.36E-09	1.21E-07	9.00E-09	2.98E-08	1.25E-09	3.88E-08	1.49E-03	1.19E-06	3.04E-07	
1.67E-07	1.31E-05	5.15E-07	1.87E-08	3.60E-08	1.22E-07	7.84E-08	1.58E-07	9.00E-09	4.27E-08	7.50E-08	5.17E-08	1.98E-03	7.76E-09	3.11E-07	
2.66E-08	8.79E-07	1.13E-05	0.00E+00	3.60E-08	1.05E-07	2.25E-09	1.41E-07	9.00E-09	3.66E-08	2.07E-09	4.56E-08	1.69E-03	1.86E-06	3.44E-07	
3.91E-07	9.77E-06	1.24E-06	1.63E-08	3.60E-08	9.56E-08	2.08E-07	1.32E-07	9.00E-09	3.35E-08	1.99E-07	4.25E-08	1.72E-03	1.82E-08	2.71E-07	
1.52E-08	2.36E-07	5.04E-06	0.00E+00	3.60E-08	8.04E-08	2.09E-09	1.16E-07	9.00E-09	2.81E-08	1.93E-09	3.71E-08	1.27E-03	1.06E-06	2.60E-07	
1.82E-07	4.26E-06	6.81E-07	1.62E-08	3.60E-08	8.66E-08	1.20E-07	1.23E-07	9.00E-09	3.03E-08	1.15E-07	3.93E-08	1.72E-03	8.44E-09	2.70E-07	
1.52E-08	3.71E-07	6.75E-06	0.00E+00	3.60E-08	8.16E-08	1.81E-09	1.18E-07	9.00E-09	2.85E-08	1.66E-09	3.75E-08	1.29E-03	1.06E-06	2.62E-07	
2.91E-07	6.14E-06	1.08E-06	1.61E-08	3.60E-08	8.97E-08	1.86E-07	1.26E-07	9.00E-09	3.14E-08	1.78E-07	4.04E-08	1.70E-03	1.35E-08	2.68E-07	
1.52E-08	3.77E-07	6.92E-06	0.00E+00	3.60E-08	8.19E-08	1.79E-09	1.18E-07	9.00E-09	2.87E-08	1.64E-09	3.77E-08	1.30E-03	1.06E-06	2.65E-07	
1.51E-08	9.39E-06	4.14E-08	3.90E-08	3.60E-08	2.10E-07	1.52E-08	2.46E-07	9.00E-09	7.35E-08	1.46E-08	8.25E-08	4.13E-03	6.99E-10	6.50E-07	
1.48E-07	2.43E-06	1.48E-05	0.00E+00	3.60E-08	2.10E-07	5.35E-09	2.46E-07	9.00E-09	7.35E-08	4.92E-09	8.25E-08	1.65E-03	2.70E-06	3.37E-07	
1.48E-07	4.87E-06	5.36E-07	1.51E-08	3.60E-08	8.53E-08	8.65E-08	1.21E-07	9.00E-09	2.99E-08	8.27E-08	3.89E-08	1.60E-03	6.87E-09	2.51E-07	
1.42E-08	5.64E-07	9.73E-06	0.00E+00	3.60E-08	7.85E-08	1.24E-09	1.14E-07	9.00E-09	2.75E-08	1.14E-09	3.65E-08	1.22E-03	9.96E-07	2.49E-07	
4.10E-08	2.47E-06	1.98E-07	1.68E-08	3.60E-08	9.84E-08	1.14E-08	1.34E-07	9.00E-09	3.44E-08	1.09E-08	4.34E-08	1.78E-03	1.90E-09	2.80E-07	
6.38E-06	2.26E-05	1.72E-04	2.77E-08	2.00E-08	1.18E-07	1.05E-08	1.38E-07	5.00E-09	4.13E-08	9.85E-09	4.63E-08	2.80E-03	8.44E-07	4.96E-07	
9.42E-09	1.00E-07	4.85E-07	1.24E-08	9.15E-09	9.65E-08	6.71E-10	1.06E-07	2.29E-09	3.38E-08	6.17E-10	3.61E-08	1.25E-03	3.05E-09	1.04E-08	
8.13E-08	3.32E-06	2.00E-07	1.18E-08	2.97E-08	1.10E-07	8.09E-09	1.40E-07	7.42E-09	3.85E-08	7.74E-09	4.59E-08	1.25E-03	3.78E-09	1.97E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	5.50E-08	0.00E+00	6.70E-08	3.00E-09	1.93E-08	0.00E+00	2.23E-08	0.00E+00	0.00E+00	0.00E+00	
9.95E-08	1.28E-06	1.98E-05	0.00E+00	3.31E-08	1.10E-07	8.87E-10	1.43E-07	8.29E-09	3.85E-08	8.49E-10	4.68E-08	1.50E-03	1.56E-06	3.06E-07	

Existing in Year 2050: Criteria Air Pollutants

Source: EMFAC2021 (v1.0.2) Emission Rates, Sonoma County (SF), Average Speed, Average Fleet

Daily VMT	**2,229,977**	**lbs/day**

Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent VMT	ROG	NOx	CO	SOx	PM10	PM2.5
All Other Buses	Diesel	0.07%	0.07%	0.05	2.12	0.33	0.04	0.21	0.07
All Other Buses	Natural Gas	0.00%	0.00%	0.00	0.01	0.24	0.00	0.00	0.00
LDA	Gasoline	45.41%	45.41%	6.57	46.35	1,102.49	4.85	37.83	11.45
LDA	Diesel	0.03%	0.03%	0.01	0.01	0.19	0.00	0.02	0.01
LDA	Electricity	6.79%	6.79%	0.00	0.00	0.00	0.00	4.14	1.18
LDA	Plug-in Hybrid	2.18%	2.18%	0.13	0.30	19.42	0.12	1.31	0.37
LDT1	Gasoline	2.31%	2.31%	0.35	2.45	58.10	0.29	2.10	0.64
LDT1	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
LDT1	Electricity	0.08%	0.08%	0.00	0.00	0.00	0.00	0.05	0.01
LDT1	Plug-in Hybrid	0.06%	0.06%	0.00	0.01	0.51	0.00	0.03	0.01
LDT2	Gasoline	19.80%	19.80%	3.91	22.34	553.02	2.55	17.93	5.50
LDT2	Diesel	0.08%	0.08%	0.05	0.11	0.53	0.01	0.07	0.02
LDT2	Electricity	0.63%	0.63%	0.00	0.00	0.00	0.00	0.39	0.11
LDT2	Plug-in Hybrid	0.55%	0.55%	0.03	0.08	4.92	0.03	0.33	0.09
LHD1	Gasoline	0.85%	0.85%	0.16	0.70	25.01	0.31	3.61	1.23
LHD1	Diesel	0.58%	0.58%	2.55	7.70	6.62	0.17	2.58	0.87
LHD1	Electricity	1.30%	1.30%	0.00	0.00	0.00	0.00	3.00	1.00
LHD2	Gasoline	0.10%	0.10%	0.02	0.11	3.13	0.04	0.51	0.17
LHD2	Diesel	0.29%	0.29%	1.66	6.15	4.40	0.10	1.48	0.50
LHD2	Electricity	0.32%	0.32%	0.00	0.00	0.00	0.00	0.83	0.28
MCY	Gasoline	0.32%	0.32%	12.44	7.52	160.70	0.03	0.25	0.08
MDV	Gasoline	11.46%	11.46%	2.33	13.35	329.21	1.79	10.46	3.21
MDV	Diesel	0.13%	0.13%	0.03	0.07	0.95	0.02	0.12	0.04
MDV	Electricity	0.58%	0.58%	0.00	0.00	0.00	0.00	0.35	0.10
MDV	Plug-in Hybrid	0.35%	0.35%	0.02	0.05	3.14	0.02	0.21	0.06
MH	Gasoline	0.03%	0.03%	0.01	0.38	0.25	0.03	0.10	0.03
MH	Diesel	0.02%	0.02%	0.09	2.65	0.26	0.01	0.06	0.02
Motor Coach	Diesel	0.05%	0.05%	0.03	2.23	0.09	0.04	0.23	0.08
OBUS	Gasoline	0.01%	0.01%	0.00	0.15	0.10	0.01	0.03	0.01
OBUS	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.02	0.01
PTO	Diesel	0.08%	0.08%	0.06	9.80	0.69	0.06	0.00	0.00
PTO	Electricity	0.09%	0.09%	0.00	0.00	0.00	0.00	0.00	0.00
SBUS	Gasoline	0.01%	0.01%	0.00	0.03	0.08	0.00	0.02	0.01
SBUS	Diesel	0.04%	0.04%	0.01	0.51	0.10	0.02	0.11	0.04
SBUS	Electricity	0.06%	0.06%	0.00	0.00	0.00	0.00	0.11	0.03
SBUS	Natural Gas	0.00%	0.00%	0.00	0.03	0.90	0.00	0.01	0.00
T6 CAIRP Class 4	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 CAIRP Class 4	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 CAIRP Class 5	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 CAIRP Class 5	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 CAIRP Class 6	Diesel	0.00%	0.00%	0.00	0.01	0.00	0.00	0.00	0.00
T6 CAIRP Class 6	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 CAIRP Class 7	Diesel	0.02%	0.02%	0.00	0.16	0.02	0.01	0.05	0.01
T6 CAIRP Class 7	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.01	0.00
T6 Instate Delivery Class 4	Diesel	0.05%	0.05%	0.01	0.77	0.12	0.02	0.13	0.04
T6 Instate Delivery Class 4	Electricity	0.06%	0.06%	0.00	0.00	0.00	0.00	0.10	0.03
T6 Instate Delivery Class 4	Natural Gas	0.00%	0.00%	0.00	0.00	0.12	0.00	0.00	0.00
T6 Instate Delivery Class 5	Diesel	0.03%	0.03%	0.01	0.42	0.06	0.01	0.07	0.02
T6 Instate Delivery Class 5	Electricity	0.03%	0.03%	0.00	0.00	0.00	0.00	0.06	0.02
T6 Instate Delivery Class 5	Natural Gas	0.00%	0.00%	0.00	0.00	0.06	0.00	0.00	0.00
T6 Instate Delivery Class 6	Diesel	0.08%	0.08%	0.02	1.32	0.20	0.04	0.23	0.07
T6 Instate Delivery Class 6	Electricity	0.10%	0.10%	0.00	0.00	0.00	0.00	0.17	0.05
T6 Instate Delivery Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.20	0.00	0.00	0.00
T6 Instate Delivery Class 7	Diesel	0.04%	0.04%	0.02	1.30	0.15	0.02	0.13	0.04
T6 Instate Delivery Class 7	Electricity	0.03%	0.03%	0.00	0.00	0.00	0.00	0.06	0.02
T6 Instate Delivery Class 7	Natural Gas	0.00%	0.00%	0.00	0.00	0.15	0.00	0.00	0.00
T6 Instate Other Class 4	Diesel	0.11%	0.11%	0.03	1.45	0.23	0.05	0.31	0.10
T6 Instate Other Class 4	Electricity	0.15%	0.15%	0.00	0.00	0.00	0.00	0.25	0.08
T6 Instate Other Class 4	Natural Gas	0.00%	0.00%	0.00	0.00	0.21	0.00	0.00	0.00

Existing in Year 2050: Criteria Air Pollutants

Source: EMFAC2021 (v1.0.2) Emission Rates, Sonoma County (SF), Average Speed, Average Fleet

Daily VMT	2,229,977	lbs/day

Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent VMT	ROG	NOx	CO	SOx	PM10	PM2.5
T6 Instate Other Class 5	Diesel	0.34%	0.34%	0.09	4.34	0.70	0.16	0.95	0.31
T6 Instate Other Class 5	Electricity	0.45%	0.45%	0.00	0.00	0.00	0.00	0.76	0.24
T6 Instate Other Class 5	Natural Gas	0.00%	0.00%	0.00	0.01	0.62	0.00	0.01	0.00
T6 Instate Other Class 6	Diesel	0.20%	0.20%	0.05	2.65	0.42	0.10	0.57	0.19
T6 Instate Other Class 6	Electricity	0.27%	0.27%	0.00	0.00	0.00	0.00	0.46	0.14
T6 Instate Other Class 6	Natural Gas	0.00%	0.00%	0.00	0.01	0.37	0.00	0.01	0.00
T6 Instate Other Class 7	Diesel	0.21%	0.21%	0.07	4.18	0.53	0.10	0.59	0.19
T6 Instate Other Class 7	Electricity	0.17%	0.17%	0.00	0.00	0.00	0.00	0.29	0.09
T6 Instate Other Class 7	Natural Gas	0.00%	0.00%	0.00	0.02	0.56	0.00	0.01	0.00
T6 Instate Tractor Class 6	Diesel	0.00%	0.00%	0.00	0.02	0.00	0.00	0.00	0.00
T6 Instate Tractor Class 6	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Instate Tractor Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Instate Tractor Class 7	Diesel	0.12%	0.12%	0.04	2.34	0.29	0.05	0.33	0.11
T6 Instate Tractor Class 7	Electricity	0.03%	0.03%	0.00	0.00	0.00	0.00	0.05	0.02
T6 Instate Tractor Class 7	Natural Gas	0.00%	0.00%	0.00	0.01	0.31	0.00	0.01	0.00
T6 OOS Class 4	Diesel	0.00%	0.00%	0.00	0.01	0.00	0.00	0.00	0.00
T6 OOS Class 5	Diesel	0.00%	0.00%	0.00	0.01	0.00	0.00	0.00	0.00
T6 OOS Class 6	Diesel	0.00%	0.00%	0.00	0.02	0.00	0.00	0.01	0.00
T6 OOS Class 7	Diesel	0.02%	0.02%	0.00	0.18	0.02	0.01	0.04	0.01
T6 Public Class 4	Diesel	0.00%	0.00%	0.00	0.08	0.01	0.00	0.01	0.00
T6 Public Class 4	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.01	0.00
T6 Public Class 4	Natural Gas	0.00%	0.00%	0.00	0.00	0.04	0.00	0.00	0.00
T6 Public Class 5	Diesel	0.01%	0.01%	0.01	0.23	0.03	0.01	0.03	0.01
T6 Public Class 5	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.02	0.01
T6 Public Class 5	Natural Gas	0.00%	0.00%	0.00	0.00	0.12	0.00	0.00	0.00
T6 Public Class 6	Diesel	0.01%	0.01%	0.00	0.12	0.02	0.00	0.02	0.01
T6 Public Class 6	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.01	0.00
T6 Public Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.08	0.00	0.00	0.00
T6 Public Class 7	Diesel	0.02%	0.02%	0.01	0.36	0.05	0.01	0.06	0.02
T6 Public Class 7	Electricity	0.02%	0.02%	0.00	0.00	0.00	0.00	0.03	0.01
T6 Public Class 7	Natural Gas	0.00%	0.00%	0.00	0.00	0.22	0.00	0.00	0.00
T6 Utility Class 5	Diesel	0.00%	0.00%	0.00	0.02	0.00	0.00	0.00	0.00
T6 Utility Class 5	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 5	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 6	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 6	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 7	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 7	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 7	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6TS	Gasoline	0.06%	0.06%	0.03	0.21	0.50	0.05	0.18	0.06
T6TS	Electricity	0.08%	0.08%	0.00	0.00	0.00	0.00	0.14	0.04
T7 CAIRP Class 8	Diesel	0.26%	0.26%	0.15	15.79	0.51	0.16	1.53	0.49
T7 CAIRP Class 8	Electricity	0.07%	0.07%	0.00	0.00	0.00	0.00	0.28	0.09
T7 CAIRP Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.07	0.00	0.00	0.00
T7 NNOOS Class 8	Diesel	0.40%	0.40%	0.22	26.56	0.75	0.23	2.34	0.75
T7 NOOS Class 8	Diesel	0.15%	0.15%	0.08	9.93	0.28	0.08	0.85	0.27
T7 Other Port Class 8	Diesel	0.03%	0.03%	0.01	1.68	0.09	0.02	0.18	0.06
T7 Other Port Class 8	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.03	0.01
T7 POAK Class 8	Diesel	0.10%	0.10%	0.05	6.63	0.33	0.07	0.67	0.22
T7 POAK Class 8	Electricity	0.02%	0.02%	0.00	0.00	0.00	0.00	0.10	0.03
T7 POAK Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.06	0.00	0.00	0.00
T7 Public Class 8	Diesel	0.06%	0.06%	0.07	4.69	0.41	0.04	0.42	0.14
T7 Public Class 8	Electricity	0.05%	0.05%	0.00	0.00	0.00	0.00	0.21	0.07
T7 Public Class 8	Natural Gas	0.00%	0.00%	0.00	0.01	0.20	0.00	0.00	0.00
T7 Single Concrete/Transit Mix Class 8	Diesel	0.01%	0.01%	0.01	0.56	0.03	0.01	0.09	0.03
T7 Single Concrete/Transit Mix Class 8	Electricity	0.02%	0.02%	0.00	0.00	0.00	0.00	0.08	0.03
T7 Single Concrete/Transit Mix Class 8	Natural Gas	0.00%	0.00%	0.00	0.01	0.17	0.00	0.01	0.00
T7 Single Dump Class 8	Diesel	0.16%	0.16%	0.08	7.91	0.39	0.11	0.96	0.31

Existing in Year 2050: Criteria Air Pollutants

Source: EMFAC2021 (v1.0.2) Emission Rates, Sonoma County (SF), Average Speed, Average Fleet

Daily VMT	2,229,977	lbs/day

Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent VMT	ROG	NOx	CO	SOx	PM10	PM2.5
T7 Single Dump Class 8	Electricity	0.17%	0.17%	0.00	0.00	0.00	0.00	0.69	0.21
T7 Single Dump Class 8	Natural Gas	0.01%	0.01%	0.01	0.09	2.05	0.00	0.06	0.02
T7 Single Other Class 8	Diesel	0.21%	0.21%	0.10	10.12	0.51	0.14	1.25	0.40
T7 Single Other Class 8	Electricity	0.24%	0.24%	0.00	0.00	0.00	0.00	0.93	0.28
T7 Single Other Class 8	Natural Gas	0.01%	0.01%	0.01	0.11	2.64	0.00	0.08	0.03
T7 SWCV Class 8	Diesel	0.01%	0.01%	0.01	1.22	0.02	0.01	0.08	0.03
T7 SWCV Class 8	Electricity	0.05%	0.05%	0.00	0.00	0.00	0.00	0.38	0.12
T7 SWCV Class 8	Natural Gas	0.06%	0.06%	0.01	0.44	28.43	0.00	0.73	0.25
T7 Tractor Class 8	Diesel	0.21%	0.21%	0.11	12.38	0.50	0.13	1.28	0.41
T7 Tractor Class 8	Electricity	0.05%	0.05%	0.00	0.00	0.00	0.00	0.18	0.06
T7 Tractor Class 8	Natural Gas	0.02%	0.02%	0.01	0.15	3.41	0.00	0.11	0.04
T7 Utility Class 8	Diesel	0.00%	0.00%	0.00	0.10	0.01	0.00	0.01	0.00
T7 Utility Class 8	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.01	0.00
T7IS	Gasoline	0.00%	0.00%	0.00	0.03	0.31	0.00	0.00	0.00
T7IS	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
UBUS	Gasoline	0.03%	0.03%	0.00	0.02	0.81	0.01	0.14	0.05
UBUS	Electricity	0.12%	0.12%	0.00	0.00	0.00	0.00	0.49	0.16
	Total	100%	100%	31.89	243.93	2323.80	12.18	108.93	33.78

Buildout Year 2050: Criteria Air Pollutants

Source: EMFAC2021 (v1.0.2) Emission Rates, Sonoma County (SF), Average Speed, Average Fleet

Daily VMT	2,745,678	lbs/day						

Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent VMT	ROG	NOx	CO	SOx	PM10	PM2.5
All Other Buses	Diesel	0.07%	0.07%	0.06	2.61	0.41	0.04	0.26	0.09
All Other Buses	Natural Gas	0.00%	0.00%	0.00	0.01	0.30	0.00	0.01	0.00
LDA	Gasoline	45.41%	45.41%	8.09	57.07	1,357.45	5.98	46.57	14.10
LDA	Diesel	0.03%	0.03%	0.01	0.02	0.24	0.00	0.03	0.01
LDA	Electricity	6.79%	6.79%	0.00	0.00	0.00	0.00	5.10	1.46
LDA	Plug-in Hybrid	2.18%	2.18%	0.16	0.37	23.91	0.15	1.61	0.46
LDT1	Gasoline	2.31%	2.31%	0.43	3.02	71.54	0.35	2.58	0.79
LDT1	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
LDT1	Electricity	0.08%	0.08%	0.00	0.00	0.00	0.00	0.06	0.02
LDT1	Plug-in Hybrid	0.06%	0.06%	0.00	0.01	0.63	0.00	0.04	0.01
LDT2	Gasoline	19.80%	19.80%	4.81	27.51	680.91	3.14	22.08	6.77
LDT2	Diesel	0.08%	0.08%	0.06	0.14	0.65	0.01	0.09	0.03
LDT2	Electricity	0.63%	0.63%	0.00	0.00	0.00	0.00	0.47	0.14
LDT2	Plug-in Hybrid	0.55%	0.55%	0.04	0.09	6.06	0.04	0.41	0.12
LHD1	Gasoline	0.85%	0.85%	0.20	0.87	30.80	0.38	4.44	1.51
LHD1	Diesel	0.58%	0.58%	3.14	9.48	8.15	0.20	3.18	1.07
LHD1	Electricity	1.30%	1.30%	0.00	0.00	0.00	0.00	3.69	1.23
LHD2	Gasoline	0.10%	0.10%	0.02	0.13	3.86	0.05	0.63	0.21
LHD2	Diesel	0.29%	0.29%	2.04	7.57	5.41	0.12	1.82	0.62
LHD2	Electricity	0.32%	0.32%	0.00	0.00	0.00	0.00	1.02	0.34
MCY	Gasoline	0.32%	0.32%	15.31	9.26	197.86	0.04	0.31	0.10
MDV	Gasoline	11.46%	11.46%	2.87	16.43	405.35	2.20	12.88	3.95
MDV	Diesel	0.13%	0.13%	0.04	0.08	1.18	0.02	0.14	0.04
MDV	Electricity	0.58%	0.58%	0.00	0.00	0.00	0.00	0.43	0.12
MDV	Plug-in Hybrid	0.35%	0.35%	0.03	0.06	3.86	0.02	0.26	0.07
MH	Gasoline	0.03%	0.03%	0.02	0.47	0.31	0.04	0.12	0.04
MH	Diesel	0.02%	0.02%	0.11	3.26	0.32	0.01	0.08	0.03
Motor Coach	Diesel	0.05%	0.05%	0.03	2.75	0.11	0.04	0.28	0.10
OBUS	Gasoline	0.01%	0.01%	0.00	0.18	0.12	0.01	0.04	0.01
OBUS	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.03	0.01
PTO	Diesel	0.08%	0.08%	0.07	12.07	0.85	0.08	0.00	0.00
PTO	Electricity	0.09%	0.09%	0.00	0.00	0.00	0.00	0.00	0.00
SBUS	Gasoline	0.01%	0.01%	0.00	0.04	0.09	0.00	0.03	0.01
SBUS	Diesel	0.04%	0.04%	0.01	0.63	0.12	0.02	0.14	0.05
SBUS	Electricity	0.06%	0.06%	0.00	0.00	0.00	0.00	0.13	0.04
SBUS	Natural Gas	0.00%	0.00%	0.01	0.03	1.11	0.00	0.01	0.00
T6 CAIRP Class 4	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 CAIRP Class 4	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 CAIRP Class 5	Diesel	0.00%	0.00%	0.00	0.01	0.00	0.00	0.00	0.00
T6 CAIRP Class 5	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 CAIRP Class 6	Diesel	0.00%	0.00%	0.00	0.02	0.00	0.00	0.00	0.00
T6 CAIRP Class 6	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 CAIRP Class 7	Diesel	0.02%	0.02%	0.01	0.20	0.03	0.01	0.06	0.02
T6 CAIRP Class 7	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.01	0.00
T6 Instate Delivery Class 4	Diesel	0.05%	0.05%	0.02	0.94	0.14	0.03	0.16	0.05
T6 Instate Delivery Class 4	Electricity	0.06%	0.06%	0.00	0.00	0.00	0.00	0.12	0.04
T6 Instate Delivery Class 4	Natural Gas	0.00%	0.00%	0.00	0.00	0.15	0.00	0.00	0.00
T6 Instate Delivery Class 5	Diesel	0.03%	0.03%	0.01	0.52	0.08	0.01	0.09	0.03
T6 Instate Delivery Class 5	Electricity	0.03%	0.03%	0.00	0.00	0.00	0.00	0.07	0.02
T6 Instate Delivery Class 5	Natural Gas	0.00%	0.00%	0.00	0.00	0.08	0.00	0.00	0.00
T6 Instate Delivery Class 6	Diesel	0.08%	0.08%	0.03	1.62	0.25	0.05	0.28	0.09
T6 Instate Delivery Class 6	Electricity	0.10%	0.10%	0.00	0.00	0.00	0.00	0.21	0.07
T6 Instate Delivery Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.25	0.00	0.00	0.00
T6 Instate Delivery Class 7	Diesel	0.04%	0.04%	0.02	1.60	0.19	0.03	0.16	0.05

Buildout Year 2050: Criteria Air Pollutants

Source: EMFAC2021 (v1.0.2) Emission Rates, Sonoma County (SF), Average Speed, Average Fleet

Daily VMT	2,745,678	lbs/day						
Vehicle Type	**Fuel Type**	**Percent of VMT**	**Adjusted Percent VMT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
T6 Instate Delivery Class 7	Electricity	0.03%	0.03%	0.00	0.00	0.00	0.00	0.07	0.02
T6 Instate Delivery Class 7	Natural Gas	0.00%	0.00%	0.00	0.01	0.19	0.00	0.00	0.00
T6 Instate Other Class 4	Diesel	0.11%	0.11%	0.04	1.78	0.29	0.06	0.39	0.13
T6 Instate Other Class 4	Electricity	0.15%	0.15%	0.00	0.00	0.00	0.00	0.31	0.10
T6 Instate Other Class 4	Natural Gas	0.00%	0.00%	0.00	0.00	0.26	0.00	0.01	0.00
T6 Instate Other Class 5	Diesel	0.34%	0.34%	0.11	5.34	0.86	0.19	1.16	0.38
T6 Instate Other Class 5	Electricity	0.45%	0.45%	0.00	0.00	0.00	0.00	0.94	0.30
T6 Instate Other Class 5	Natural Gas	0.00%	0.00%	0.00	0.01	0.76	0.00	0.02	0.01
T6 Instate Other Class 6	Diesel	0.20%	0.20%	0.07	3.26	0.52	0.12	0.70	0.23
T6 Instate Other Class 6	Electricity	0.27%	0.27%	0.00	0.00	0.00	0.00	0.56	0.18
T6 Instate Other Class 6	Natural Gas	0.00%	0.00%	0.00	0.01	0.46	0.00	0.01	0.00
T6 Instate Other Class 7	Diesel	0.21%	0.21%	0.09	5.15	0.65	0.12	0.72	0.24
T6 Instate Other Class 7	Electricity	0.17%	0.17%	0.00	0.00	0.00	0.00	0.35	0.11
T6 Instate Other Class 7	Natural Gas	0.00%	0.00%	0.00	0.02	0.69	0.00	0.01	0.00
T6 Instate Tractor Class 6	Diesel	0.00%	0.00%	0.00	0.03	0.00	0.00	0.01	0.00
T6 Instate Tractor Class 6	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Instate Tractor Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Instate Tractor Class 7	Diesel	0.12%	0.12%	0.05	2.88	0.36	0.06	0.40	0.13
T6 Instate Tractor Class 7	Electricity	0.03%	0.03%	0.00	0.00	0.00	0.00	0.06	0.02
T6 Instate Tractor Class 7	Natural Gas	0.00%	0.00%	0.00	0.01	0.38	0.00	0.01	0.00
T6 OOS Class 4	Diesel	0.00%	0.00%	0.00	0.01	0.00	0.00	0.00	0.00
T6 OOS Class 5	Diesel	0.00%	0.00%	0.00	0.01	0.00	0.00	0.00	0.00
T6 OOS Class 6	Diesel	0.00%	0.00%	0.00	0.03	0.00	0.00	0.01	0.00
T6 OOS Class 7	Diesel	0.02%	0.02%	0.01	0.22	0.03	0.01	0.05	0.02
T6 Public Class 4	Diesel	0.00%	0.00%	0.00	0.10	0.01	0.00	0.01	0.00
T6 Public Class 4	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.01	0.00
T6 Public Class 4	Natural Gas	0.00%	0.00%	0.00	0.00	0.05	0.00	0.00	0.00
T6 Public Class 5	Diesel	0.01%	0.01%	0.01	0.28	0.04	0.01	0.04	0.01
T6 Public Class 5	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.03	0.01
T6 Public Class 5	Natural Gas	0.00%	0.00%	0.00	0.00	0.15	0.00	0.00	0.00
T6 Public Class 6	Diesel	0.01%	0.01%	0.00	0.14	0.02	0.00	0.02	0.01
T6 Public Class 6	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.02	0.01
T6 Public Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.09	0.00	0.00	0.00
T6 Public Class 7	Diesel	0.02%	0.02%	0.01	0.45	0.06	0.01	0.07	0.02
T6 Public Class 7	Electricity	0.02%	0.02%	0.00	0.00	0.00	0.00	0.04	0.01
T6 Public Class 7	Natural Gas	0.00%	0.00%	0.00	0.01	0.27	0.00	0.01	0.00
T6 Utility Class 5	Diesel	0.00%	0.00%	0.00	0.02	0.00	0.00	0.01	0.00
T6 Utility Class 5	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.01	0.00
T6 Utility Class 5	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 6	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 6	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 7	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 7	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6 Utility Class 7	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
T6TS	Gasoline	0.06%	0.06%	0.04	0.26	0.62	0.06	0.22	0.07
T6TS	Electricity	0.08%	0.08%	0.00	0.00	0.00	0.00	0.17	0.06
T7 CAIRP Class 8	Diesel	0.26%	0.26%	0.18	19.44	0.62	0.19	1.89	0.60
T7 CAIRP Class 8	Electricity	0.07%	0.07%	0.00	0.00	0.00	0.00	0.35	0.11
T7 CAIRP Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.08	0.00	0.00	0.00
T7 NNOOS Class 8	Diesel	0.40%	0.40%	0.27	32.70	0.92	0.28	2.88	0.92
T7 NOOS Class 8	Diesel	0.15%	0.15%	0.10	12.23	0.35	0.10	1.05	0.33
T7 Other Port Class 8	Diesel	0.03%	0.03%	0.02	2.07	0.11	0.02	0.22	0.07
T7 Other Port Class 8	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00	0.03	0.01
T7 POAK Class 8	Diesel	0.10%	0.10%	0.07	8.16	0.41	0.08	0.83	0.27
T7 POAK Class 8	Electricity	0.02%	0.02%	0.00	0.00	0.00	0.00	0.12	0.04
T7 POAK Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.07	0.00	0.00	0.00

Buildout Year 2050: Criteria Air Pollutants

Source: EMFAC2021 (v1.0.2) Emission Rates, Sonoma County (SF), Average Speed, Average Fleet

Daily VMT	2,745,678	lbs/day							
Vehicle Type	**Fuel Type**	**Percent of VMT**	**Adjusted Percent VMT**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
T7 Public Class 8	Diesel	0.06%	0.06%	0.09	5.78	0.51	0.05	0.51	0.17
T7 Public Class 8	Electricity	0.05%	0.05%	0.00	0.00	0.00	0.00	0.26	0.08
T7 Public Class 8	Natural Gas	0.00%	0.00%	0.00	0.01	0.24	0.00	0.00	0.00
T7 Single Concrete/Transit Mix Class 8	Diesel	0.01%	0.01%	0.01	0.69	0.04	0.01	0.11	0.03
T7 Single Concrete/Transit Mix Class 8	Electricity	0.02%	0.02%	0.00	0.00	0.00	0.00	0.10	0.03
T7 Single Concrete/Transit Mix Class 8	Natural Gas	0.00%	0.00%	0.00	0.01	0.21	0.00	0.01	0.00
T7 Single Dump Class 8	Diesel	0.16%	0.16%	0.09	9.74	0.49	0.13	1.18	0.38
T7 Single Dump Class 8	Electricity	0.17%	0.17%	0.00	0.00	0.00	0.00	0.85	0.26
T7 Single Dump Class 8	Natural Gas	0.01%	0.01%	0.01	0.11	2.53	0.00	0.07	0.02
T7 Single Other Class 8	Diesel	0.21%	0.21%	0.12	12.46	0.62	0.17	1.54	0.50
T7 Single Other Class 8	Electricity	0.24%	0.24%	0.00	0.00	0.00	0.00	1.15	0.35
T7 Single Other Class 8	Natural Gas	0.01%	0.01%	0.01	0.14	3.25	0.00	0.10	0.03
T7 SWCV Class 8	Diesel	0.01%	0.01%	0.01	1.51	0.02	0.02	0.10	0.03
T7 SWCV Class 8	Electricity	0.05%	0.05%	0.00	0.00	0.00	0.00	0.47	0.15
T7 SWCV Class 8	Natural Gas	0.06%	0.06%	0.01	0.54	35.01	0.00	0.90	0.30
T7 Tractor Class 8	Diesel	0.21%	0.21%	0.13	15.24	0.61	0.15	1.58	0.51
T7 Tractor Class 8	Electricity	0.05%	0.05%	0.00	0.00	0.00	0.00	0.23	0.07
T7 Tractor Class 8	Natural Gas	0.02%	0.02%	0.02	0.19	4.20	0.00	0.14	0.04
T7 Utility Class 8	Diesel	0.00%	0.00%	0.00	0.12	0.01	0.00	0.02	0.00
T7 Utility Class 8	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.01	0.00
T7IS	Gasoline	0.00%	0.00%	0.01	0.03	0.38	0.00	0.00	0.00
T7IS	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
UBUS	Gasoline	0.03%	0.03%	0.01	0.03	1.00	0.01	0.17	0.06
UBUS	Electricity	0.12%	0.12%	0.00	0.00	0.00	0.00	0.61	0.19
	Total	100%	100%	39.26	300.34	2,861.20	14.99	134.12	41.60

Source: EMFAC2021 (v1.0.2) Emission Rates
Region Type: Sub-Area
Region: Sonoma (SF)
Calendar Year: 2019, 2050
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HOTSOAK and RUNLOSS, g/vehicle/day for IDLEX, RESTLOSS and DIURN

g/mile

2.20E-03

Vehicle Category	Fuel	Population	ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM 2.5 Total	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	VMT Total	% of VMT
All Other Buses	Diesel	141	1.42E-02	5.77E-01	8.97E-02	9.66E-03	4.09E-03	1.20E-02	4.61E-02	5.81E-02	3.92E-03	3.00E-03	1.61E-02	1.91E-02	1.02E+03	6.61E-04	1.61E-01	6,948	0.075%
All Other Buses	Natural Gas	3	1.21E-02	8.08E-02	3.42E+00	0.00E+00	1.72E-03	1.20E-02	4.61E-02	5.81E-02	1.58E-03	3.00E-03	1.61E-02	1.91E-02	9.00E+02	8.50E-01	1.84E-01	134	0.001%
LDA	Gasoline	117,964	2.94E-03	2.08E-02	4.94E-01	2.17E-03	4.95E-04	8.00E-03	8.95E-03	1.69E-02	4.55E-04	2.00E-03	3.13E-03	5.13E-03	2.20E+02	1.01E-03	3.31E-03	4,214,897	45.407%
LDA	Diesel	80	4.62E-03	1.13E-02	1.45E-01	1.71E-03	1.02E-03	8.00E-03	8.97E-03	1.70E-02	9.80E-04	2.00E-03	3.14E-03	5.14E-03	1.81E+02	2.15E-04	2.85E-02	2,496	0.027%
LDA	Electricity	16,451	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	4.40E-03	1.24E-02	0.00E+00	2.00E-03	1.54E-03	3.54E-03	0.00E+00	0.00E+00	0.00E+00	630,456	6.792%
LDA	Plug-in Hybrid	5,574	1.22E-03	2.84E-03	1.82E-01	1.15E-03	2.02E-04	8.00E-03	4.22E-03	1.22E-02	1.86E-04	2.00E-03	1.48E-03	3.48E-03	1.17E+02	3.66E-04	4.65E-04	202,011	2.176%
LDT1	Gasoline	6,550	3.11E-03	2.16E-02	5.13E-01	2.52E-03	5.31E-04	8.00E-03	1.05E-02	1.85E-02	4.88E-04	2.00E-03	3.68E-03	5.68E-03	2.54E+02	1.04E-03	3.35E-03	213,969	2.305%
LDT1	Diesel	0	1.31E-02	2.89E-02	1.41E-01	3.19E-03	4.39E-03	8.00E-03	1.04E-02	1.84E-02	4.20E-03	2.00E-03	3.66E-03	5.66E-03	3.36E+02	6.10E-04	5.30E-02	3	0.000%
LDT1	Electricity	202	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	4.40E-03	1.24E-02	0.00E+00	2.00E-03	1.54E-03	3.54E-03	0.00E+00	0.00E+00	0.00E+00	7,795	0.084%
LDT1	Plug-in Hybrid	153	1.22E-03	2.84E-03	1.81E-01	1.15E-03	1.99E-04	8.00E-03	4.22E-03	1.22E-02	1.83E-04	2.00E-03	1.48E-03	3.48E-03	1.17E+02	3.64E-04	4.60E-04	5,358	0.058%
LDT2	Gasoline	53,959	4.01E-03	2.30E-02	5.68E-01	2.62E-03	5.11E-04	8.00E-03	1.04E-02	1.84E-02	4.69E-04	2.00E-03	3.65E-03	5.65E-03	2.65E+02	1.31E-03	3.45E-03	1,838,039	19.801%
LDT2	Diesel	209	1.31E-02	2.97E-02	1.40E-01	2.37E-03	4.39E-03	8.00E-03	1.04E-02	1.84E-02	4.20E-03	2.00E-03	3.65E-03	5.65E-03	2.50E+02	6.10E-04	3.94E-02	7,082	0.076%
LDT2	Electricity	2,168	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	4.40E-03	1.24E-02	0.00E+00	2.00E-03	1.54E-03	3.54E-03	0.00E+00	0.00E+00	0.00E+00	58,659	0.632%
LDT2	Plug-in Hybrid	1,475	1.22E-03	2.84E-03	1.82E-01	1.15E-03	2.02E-04	8.00E-03	4.22E-03	1.22E-02	1.85E-04	2.00E-03	1.48E-03	3.48E-03	1.17E+02	3.64E-04	4.59E-04	51,155	0.551%
LHD1	Gasoline	2,320	3.85E-03	1.68E-02	5.96E-01	7.40E-03	1.25E-03	8.00E-03	7.80E-02	8.60E-02	1.15E-03	2.00E-03	2.73E-02	2.93E-02	7.49E+02	1.16E-03	1.53E-03	79,195	0.853%
LHD1	Diesel	1,692	8.89E-02	2.68E-01	2.31E-01	5.75E-03	1.94E-02	1.20E-02	7.80E-02	9.00E-02	1.86E-02	3.00E-03	2.73E-02	3.03E-02	6.07E+02	4.13E-03	9.57E-02	54,211	0.584%
LHD1	Electricity	2,910	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	3.90E-02	4.70E-02	0.00E+00	2.00E-03	1.37E-02	1.57E-02	0.00E+00	0.00E+00	0.00E+00	120,553	1.299%
LHD2	Gasoline	303	3.55E-03	2.05E-02	6.09E-01	8.36E-03	1.26E-03	8.00E-03	9.10E-02	9.90E-02	1.16E-03	2.00E-03	3.19E-02	3.39E-02	8.46E+02	1.08E-03	2.07E-03	9,726	0.105%
LHD2	Diesel	917	1.16E-01	4.28E-01	3.06E-01	6.79E-03	2.64E-02	1.20E-02	9.10E-02	1.03E-01	2.52E-02	3.00E-03	3.19E-02	3.49E-02	7.16E+02	5.37E-03	1.13E-01	27,127	0.292%
LHD2	Electricity	729	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	4.55E-02	5.35E-02	0.00E+00	2.00E-03	1.59E-02	1.79E-02	0.00E+00	0.00E+00	0.00E+00	29,252	0.315%
MCY	Gasoline	5,748	7.92E-01	4.79E-01	1.02E+01	1.83E-03	2.19E-03	4.00E-03	1.20E-02	1.60E-02	2.05E-03	1.00E-03	4.20E-03	5.20E-03	1.85E+02	1.33E-01	3.60E-02	29,639	0.319%
MDV	Gasoline	31,730	4.14E-03	2.37E-02	5.84E-01	3.17E-03	5.09E-04	8.00E-03	1.06E-02	1.86E-02	4.68E-04	2.00E-03	3.70E-03	5.70E-03	3.21E+02	1.35E-03	3.52E-03	1,063,744	11.460%
MDV	Diesel	372	4.82E-03	1.09E-02	1.53E-01	3.09E-03	1.05E-03	8.00E-03	1.06E-02	1.86E-02	1.00E-03	2.00E-03	3.72E-03	5.72E-03	3.26E+02	2.24E-04	5.14E-02	11,783	0.127%
MDV	Electricity	2,008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	4.40E-03	1.24E-02	0.00E+00	2.00E-03	1.54E-03	3.54E-03	0.00E+00	0.00E+00	0.00E+00	53,419	0.575%
MDV	Plug-in Hybrid	948	1.22E-03	2.84E-03	1.82E-01	1.15E-03	2.03E-04	8.00E-03	4.23E-03	1.22E-02	1.87E-04	2.00E-03	1.48E-03	3.48E-03	1.17E+02	3.64E-04	4.60E-04	32,622	0.351%
MH	Gasoline	306	8.07E-03	2.20E-01	1.45E-01	1.92E-02	1.48E-03	1.20E-02	4.50E-02	5.70E-02	1.36E-03	3.00E-03	1.58E-02	1.88E-02	1.94E+03	2.87E-03	1.81E-02	3,245	0.035%
MH	Diesel	226	8.63E-02	2.50E+00	2.48E-01	1.03E-02	2.11E-02	1.60E-02	4.48E-02	6.08E-02	2.02E-02	4.00E-03	1.57E-02	1.97E-02	1.09E+03	4.01E-03	1.71E-01	1,996	0.022%
Motor Coach	Diesel	37	1.05E-02	9.16E-01	3.57E-02	1.44E-02	2.35E-02	1.20E-02	8.18E-02	9.38E-02	2.25E-02	3.00E-03	2.86E-02	3.16E-02	1.52E+03	4.90E-04	2.40E-01	4,607	0.050%
OBUS	Gasoline	40	6.60E-03	2.48E-01	1.62E-01	1.51E-02	1.27E-03	1.20E-02	4.48E-02	5.68E-02	1.17E-03	3.00E-03	1.57E-02	1.87E-02	1.53E+03	1.75E-03	1.44E-02	1,114	0.012%
OBUS	Electricity	24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.24E-02	3.44E-02	0.00E+00	3.00E-03	7.84E-03	1.08E-02	0.00E+00	0.00E+00	0.00E+00	1,367	0.015%
PTO	Diesel	0	1.42E-02	2.50E+00	1.76E-01	1.64E-02	3.96E-03	0.00E+00	0.00E+00	0.00E+00	3.79E-03	0.00E+00	0.00E+00	0.00E+00	1.73E+03	6.59E-04	2.72E-01	7,405	0.080%
PTO	Electricity	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7,960	0.086%
SBUS	Gasoline	17	7.80E-03	7.44E-02	1.78E-01	6.89E-03	1.28E-03	8.00E-03	4.49E-02	5.29E-02	1.18E-03	2.00E-03	1.57E-02	1.77E-02	6.97E+02	1.82E-03	7.40E-03	811	0.009%
SBUS	Diesel	174	5.72E-03	2.59E-01	4.82E-02	9.64E-03	2.88E-03	1.20E-02	4.49E-02	5.69E-02	2.75E-03	3.00E-03	1.57E-02	1.87E-02	1.02E+03	2.66E-04	1.60E-01	3,759	0.040%
SBUS	Electricity	232	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-02	2.25E-02	3.39E-02	0.00E+00	2.87E-03	7.86E-03	1.07E-02	0.00E+00	0.00E+00	0.00E+00	6,029	0.065%
SBUS	Natural Gas	12	3.43E-02	1.91E-01	6.76E+00	0.00E+00	3.67E-03	1.20E-02	4.49E-02	5.69E-02	3.38E-03	3.00E-03	1.57E-02	1.87E-02	1.07E+03	2.40E+00	2.18E-01	251	0.003%
T6 CAIRP Class 4	Diesel	1	5.31E-03	1.75E-01	2.72E-02	9.57E-03	5.34E-03	1.20E-02	4.23E-02	5.43E-02	5.10E-03	3.00E-03	1.48E-02	1.78E-02	1.01E+03	2.47E-04	1.59E-01	37	0.000%
T6 CAIRP Class 4	Electricity	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.12E-02	3.32E-02	0.00E+00	3.00E-03	7.40E-03	1.04E-02	0.00E+00	0.00E+00	0.00E+00	55	0.001%
T6 CAIRP Class 5	Diesel	1	5.32E-03	1.75E-01	2.72E-02	9.58E-03	5.34E-03	1.20E-02	4.23E-02	5.43E-02	5.11E-03	3.00E-03	1.48E-02	1.78E-02	1.01E+03	2.47E-04	1.59E-01	50	0.001%
T6 CAIRP Class 5	Electricity	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.12E-02	3.32E-02	0.00E+00	3.00E-03	7.40E-03	1.04E-02	0.00E+00	0.00E+00	0.00E+00	76	0.001%
T6 CAIRP Class 6	Diesel	3	5.31E-03	1.77E-01	2.72E-02	9.57E-03	5.37E-03	1.20E-02	4.23E-02	5.43E-02	5.14E-03	3.00E-03	1.48E-02	1.78E-02	1.01E+03	2.47E-04	1.59E-01	131	0.001%
T6 CAIRP Class 6	Electricity	4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.12E-02	3.32E-02	0.00E+00	3.00E-03	7.40E-03	1.04E-02	0.00E+00	0.00E+00	0.00E+00	198	0.002%
T6 CAIRP Class 7	Diesel	8	5.78E-03	1.95E-01	2.96E-02	8.46E-03	5.74E-03	1.20E-02	4.23E-02	5.43E-02	5.49E-03	3.00E-03	1.48E-02	1.78E-02	8.93E+02	2.68E-04	1.41E-01	1,567	0.017%
T6 CAIRP Class 7	Electricity	3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.12E-02	3.32E-02	0.00E+00	3.00E-03	7.40E-03	1.04E-02	0.00E+00	0.00E+00	0.00E+00	499	0.005%
T6 Instate Delivery Class 4	Diesel	128	6.02E-03	3.44E-01	5.26E-02	9.82E-03	1.88E-03	1.20E-02	4.76E-02	5.96E-02	1.80E-03	3.00E-03	1.66E-02	1.96E-02	1.04E+03	2.80E-04	1.63E-01	4,202	0.045%
T6 Instate Delivery Class 4	Electricity	155	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.38E-02	3.58E-02	0.00E+00	3.00E-03	8.32E-03	1.13E-02	0.00E+00	0.00E+00	0.00E+00	5,348	0.058%
T6 Instate Delivery Class 4	Natural Gas	2	1.25E-02	6.00E-02	3.82E+00	0.00E+00	2.02E-03	1.20E-02	4.76E-02	5.96E-02	1.85E-03	3.00E-03	1.66E-02	1.96E-02	1.01E+03	8.73E-01	2.05E-01	59	0.001%
T6 Instate Delivery Class 5	Diesel	71	6.00E-03	3.41E-01	5.25E-02	9.83E-03	1.87E-03	1.20E-02	4.76E-02	5.96E-02	1.79E-03	3.00E-03	1.66E-02	1.96E-02	1.04E+03	2.79E-04	1.63E-01	2,322	0.025%
T6 Instate Delivery Class 5	Electricity	86	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.38E-02	3.58E-02	0.00E+00	3.00E-03	8.32E-03	1.13E-02	0.00E+00	0.00E+00	0.00E+00	2,957	0.032%
T6 Instate Delivery Class 5	Natural Gas	1	1.25E-02	6.00E-02	3.82E+00	0.00E+00	2.02E-03	1.20E-02	4.76E-02	5.96E-02	1.85E-03	3.00E-03	1.66E-02	1.96E-02	1.00E+03	8.73E-01	2.05E-01	32	0.000%
T6 Instate Delivery Class 6	Diesel	218	6.02E-03	3.47E-01	5.26E-02	9.82E-03	1.88E-03	1.20E-02	4.76E-02	5.96E-02	1.80E-03	3.00E-03	1.66E-02	1.96E-02	1.04E+03	2.79E-04	1.63E-01	7,170	0.077%
T6 Instate Delivery Class 6	Electricity	265	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.38E-02	3.58E-02	0.00E+00	3.00E-03	8.32E-03	1.13E-02	0.00E+00	0.00E+00	0.00E+00	9,128	0.098%
T6 Instate Delivery Class 6	Natural Gas	3	1.25E-02	6.00E-02	3.82E+00	0.00E+00	2.02E-03	1.20E-02	4.76E-02	5.96E-02	1.85E-03	3.00E-03	1.66E-02	1.96E-02	1.01E+03	8.73E-01	2.05E-01	100	0.001%
T6 Instate Delivery Class 7	Diesel	81	8.59E-03	6.03E-01	7.09E-02	1.00E-02	2.52E-03	1.20E-02	4.76E-02	5.96E-02	2.41E-03	3.00E-03	1.66E-02	1.96E-02	1.06E+03	3.99E-04	1.67E-01	4,069	0.044%
T6 Instate Delivery Class 7	Electricity	55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.38E-02	3.58E-02	0.00E+00	3.00E-03	8.32E-03	1.13E-02	0.00E+00	0.00E+00	0.00E+00	2,925	0.032%
T6 Instate Delivery Class 7	Natural Gas	2	1.21E-02	1.01E-01	3.73E+00	0.00E+00	1.79E-03	1.20E-02	4.76E-02	5.96E-02	1.64E-03	3.00E-03	1.66E-02	1.96E-02	1.02E+03	8.48E-01	2.09E-01	78	0.001%
T6 Instate Other Class 4	Diesel	271	5.44E-03	2.62E-01	4.19E-02	9.52E-03	3.07E-03	1.20E-02	4.49E-02	5.69E-02	2.94E-03	3.00E-03	1.57E-02	1.87E-02	1.01E+03	2.53E-04	1.58E-01	10,427	0.112%
T6 Instate Other Class 4	Electricity	328	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.24E-02	3.44E-02	0.00E+00	3.00E-03	7.85E-03	1.09E-02	0.00E+00	0.00E+00	0.00E+00	13,829	0.149%
T6 Instate Other Class 4	Natural Gas	4	9.97E-03	5.19E-02	2.67E+00	0.00E+00	1.56E-03	1.20E-02	4.49E-02	5.69E-02	1.43E-03	3.00E-03	1.57E-02	1.87E-02	8.77E+02	6.98E-01	1.79E-01	146	0.002%
T6 Instate Other Class 5	Diesel	815	5.44E-03	2.61E-01	4.19E-02	9.52E-03	3.07E-03	1.20E-02	4.49E-02	5.69E-02	2.93E-03	3.00E-03	1.57E-02	1.87E-02	1.01E+03	2.53E-04	1.58E-01	31,390	0.338%
T6 Instate Other Class 5	Electricity	988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.24E-02	3.44E-02	0.00E+00	3.00E-03	7.85E-03	1.09E-02	0.00E+00	0.00E+00	0.00E+00	41,708	0.449%

Source: EMFAC2021 (v1.0.2) Emission Rates
Region Type: Sub-Area
Region: Sonoma (SF)
Calendar Year: 2019, 2050
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HOTSOAK and RUNLOSS, g/vehicle/day for IDLEX, RESTLOSS and DIURN

g/mile

2.20E-03

Vehicle Category	Fuel	Population	ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM 2.5 Total	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	VMT Total	% of VMT
T6 Instate Other Class 5	Natural Gas	11	9.97E-03	5.20E-02	2.67E+00	0.00E+00	1.56E-03	1.20E-02	4.49E-02	5.69E-02	1.43E-03	3.00E-03	1.57E-02	1.87E-02	8.77E+02	6.97E-01	1.79E-01	438	0.005%
T6 Instate Other Class 6	Diesel	491	5.44E-03	2.64E-01	4.19E-02	9.52E-03	3.09E-03	1.20E-02	4.49E-02	5.69E-02	2.95E-03	3.00E-03	1.57E-02	1.87E-02	1.01E+03	2.53E-04	1.58E-01	18,920	0.204%
T6 Instate Other Class 6	Electricity	596	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.24E-02	3.44E-02	0.00E+00	3.00E-03	7.85E-03	1.09E-02	0.00E+00	0.00E+00	0.00E+00	25,103	0.270%
T6 Instate Other Class 6	Natural Gas	7	9.97E-03	5.20E-02	2.67E+00	0.00E+00	1.56E-03	1.20E-02	4.49E-02	5.69E-02	1.43E-03	3.00E-03	1.57E-02	1.87E-02	8.77E+02	6.97E-01	1.79E-01	264	0.003%
T6 Instate Other Class 7	Diesel	510	6.85E-03	4.06E-01	5.10E-02	9.61E-03	3.80E-03	1.20E-02	4.49E-02	5.69E-02	3.64E-03	3.00E-03	1.57E-02	1.87E-02	1.01E+03	3.18E-04	1.60E-01	19,479	0.210%
T6 Instate Other Class 7	Electricity	321	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.24E-02	3.44E-02	0.00E+00	3.00E-03	7.85E-03	1.09E-02	0.00E+00	0.00E+00	0.00E+00	15,803	0.170%
T6 Instate Other Class 7	Natural Gas	11	9.71E-03	7.53E-02	2.70E+00	0.00E+00	1.42E-03	1.20E-02	4.49E-02	5.69E-02	1.31E-03	3.00E-03	1.57E-02	1.87E-02	8.91E+02	6.79E-01	1.82E-01	392	0.004%
T6 Instate Tractor Class 6	Diesel	4	5.44E-03	2.69E-01	4.17E-02	9.52E-03	3.09E-03	1.20E-02	4.49E-02	5.69E-02	2.96E-03	3.00E-03	1.57E-02	1.87E-02	1.01E+03	2.53E-04	1.58E-01	160	0.002%
T6 Instate Tractor Class 6	Electricity	4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.24E-02	3.44E-02	0.00E+00	3.00E-03	7.85E-03	1.09E-02	0.00E+00	0.00E+00	0.00E+00	216	0.002%
T6 Instate Tractor Class 6	Natural Gas	0	9.96E-03	5.24E-02	2.67E+00	0.00E+00	1.56E-03	1.20E-02	4.49E-02	5.69E-02	1.43E-03	3.00E-03	1.57E-02	1.87E-02	8.78E+02	6.97E-01	1.79E-01	2	0.000%
T6 Instate Tractor Class 7	Diesel	193	6.70E-03	4.08E-01	5.08E-02	8.64E-03	3.77E-03	1.20E-02	4.49E-02	5.69E-02	3.61E-03	3.00E-03	1.57E-02	1.87E-02	9.12E+02	3.11E-04	1.44E-01	10,828	0.117%
T6 Instate Tractor Class 7	Electricity	40	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.24E-02	3.44E-02	0.00E+00	3.00E-03	7.85E-03	1.09E-02	0.00E+00	0.00E+00	0.00E+00	2,614	0.028%
T6 Instate Tractor Class 7	Natural Gas	4	9.74E-03	7.21E-02	2.69E+00	0.00E+00	1.44E-03	1.20E-02	4.49E-02	5.69E-02	1.33E-03	3.00E-03	1.57E-02	1.87E-02	8.70E+02	6.82E-01	1.77E-01	214	0.002%
T6 OOS Class 4	Diesel	1	5.27E-03	2.21E-01	2.70E-02	9.01E-03	5.59E-03	1.20E-02	4.23E-02	5.43E-02	5.34E-03	3.00E-03	1.48E-02	1.78E-02	9.51E+02	2.45E-04	1.50E-01	55	0.001%
T6 OOS Class 5	Diesel	1	5.28E-03	2.23E-01	2.70E-02	9.01E-03	5.60E-03	1.20E-02	4.23E-02	5.43E-02	5.36E-03	3.00E-03	1.48E-02	1.78E-02	9.52E+02	2.45E-04	1.50E-01	76	0.001%
T6 OOS Class 6	Diesel	4	5.25E-03	2.20E-01	2.69E-02	8.99E-03	5.57E-03	1.20E-02	4.23E-02	5.43E-02	5.33E-03	3.00E-03	1.48E-02	1.78E-02	9.50E+02	2.44E-04	1.50E-01	198	0.002%
T6 OOS Class 7	Diesel	5	5.67E-03	2.32E-01	2.90E-02	8.10E-03	5.90E-03	1.20E-02	4.23E-02	5.43E-02	5.65E-03	3.00E-03	1.48E-02	1.78E-02	8.55E+02	2.63E-04	1.35E-01	1,439	0.015%
T6 Public Class 4	Diesel	11	9.86E-03	3.98E-01	5.30E-02	1.02E-02	3.20E-03	1.20E-02	4.62E-02	5.82E-02	3.06E-03	3.00E-03	1.62E-02	1.92E-02	1.08E+03	4.58E-04	1.70E-01	367	0.004%
T6 Public Class 4	Electricity	11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.31E-02	3.51E-02	0.00E+00	3.00E-03	8.08E-03	1.11E-02	0.00E+00	0.00E+00	0.00E+00	408	0.004%
T6 Public Class 4	Natural Gas	1	1.26E-02	6.09E-02	3.06E+00	0.00E+00	1.78E-03	1.20E-02	4.62E-02	5.82E-02	1.64E-03	3.00E-03	1.62E-02	1.92E-02	9.77E+02	8.82E-01	1.99E-01	25	0.000%
T6 Public Class 5	Diesel	31	1.00E-02	4.14E-01	5.37E-02	1.02E-02	3.26E-03	1.20E-02	4.62E-02	5.82E-02	3.12E-03	3.00E-03	1.62E-02	1.92E-02	1.08E+03	4.66E-04	1.70E-01	1,042	0.011%
T6 Public Class 5	Electricity	31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.31E-02	3.51E-02	0.00E+00	3.00E-03	8.08E-03	1.11E-02	0.00E+00	0.00E+00	0.00E+00	1,158	0.012%
T6 Public Class 5	Natural Gas	2	1.26E-02	6.57E-02	3.06E+00	0.00E+00	1.76E-03	1.20E-02	4.62E-02	5.82E-02	1.62E-03	3.00E-03	1.62E-02	1.92E-02	9.80E+02	8.80E-01	2.00E-01	74	0.001%
T6 Public Class 6	Diesel	19	9.07E-03	3.41E-01	5.04E-02	1.02E-02	2.88E-03	1.20E-02	4.62E-02	5.82E-02	2.76E-03	3.00E-03	1.62E-02	1.92E-02	1.08E+03	4.21E-04	1.70E-01	638	0.007%
T6 Public Class 6	Electricity	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.31E-02	3.51E-02	0.00E+00	3.00E-03	8.08E-03	1.11E-02	0.00E+00	0.00E+00	0.00E+00	709	0.008%
T6 Public Class 6	Natural Gas	1	1.26E-02	6.30E-02	3.06E+00	0.00E+00	1.77E-03	1.20E-02	4.62E-02	5.82E-02	1.63E-03	3.00E-03	1.62E-02	1.92E-02	9.82E+02	8.81E-01	2.00E-01	47	0.001%
T6 Public Class 7	Diesel	47	8.91E-03	3.53E-01	4.96E-02	1.01E-02	2.92E-03	1.20E-02	4.62E-02	5.82E-02	2.79E-03	3.00E-03	1.62E-02	1.92E-02	1.06E+03	4.14E-04	1.68E-01	1,943	0.021%
T6 Public Class 7	Electricity	36	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.31E-02	3.51E-02	0.00E+00	3.00E-03	8.08E-03	1.11E-02	0.00E+00	0.00E+00	0.00E+00	1,665	0.018%
T6 Public Class 7	Natural Gas	3	1.26E-02	5.93E-02	3.06E+00	0.00E+00	1.79E-03	1.20E-02	4.62E-02	5.82E-02	1.65E-03	3.00E-03	1.62E-02	1.92E-02	9.77E+02	8.83E-01	1.99E-01	136	0.001%
T6 Utility Class 5	Diesel	4	5.07E-03	1.92E-01	3.54E-02	9.60E-03	2.31E-03	1.20E-02	4.55E-02	5.75E-02	2.21E-03	3.00E-03	1.59E-02	1.89E-02	1.01E+03	2.36E-04	1.60E-01	155	0.002%
T6 Utility Class 5	Electricity	6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.27E-02	3.47E-02	0.00E+00	3.00E-03	7.96E-03	1.10E-02	0.00E+00	0.00E+00	0.00E+00	241	0.003%
T6 Utility Class 5	Natural Gas	0	1.11E-02	5.43E-02	2.75E+00	0.00E+00	1.64E-03	1.20E-02	4.55E-02	5.75E-02	1.50E-03	3.00E-03	1.59E-02	1.89E-02	9.16E+02	7.79E-01	1.87E-01	1	0.000%
T6 Utility Class 6	Diesel	1	5.07E-03	1.88E-01	3.54E-02	9.60E-03	2.30E-03	1.20E-02	4.55E-02	5.75E-02	2.20E-03	3.00E-03	1.59E-02	1.89E-02	1.01E+03	2.36E-04	1.60E-01	29	0.000%
T6 Utility Class 6	Electricity	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.27E-02	3.47E-02	0.00E+00	3.00E-03	7.96E-03	1.10E-02	0.00E+00	0.00E+00	0.00E+00	45	0.000%
T6 Utility Class 6	Natural Gas	0	1.11E-02	5.43E-02	2.75E+00	0.00E+00	1.64E-03	1.20E-02	4.55E-02	5.75E-02	1.50E-03	3.00E-03	1.59E-02	1.89E-02	9.16E+02	7.79E-01	1.87E-01	0	0.000%
T6 Utility Class 7	Diesel	1	5.02E-03	1.83E-01	3.51E-02	9.61E-03	2.28E-03	1.20E-02	4.55E-02	5.75E-02	2.18E-03	3.00E-03	1.59E-02	1.89E-02	1.01E+03	2.33E-04	1.60E-01	40	0.000%
T6 Utility Class 7	Electricity	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.27E-02	3.47E-02	0.00E+00	3.00E-03	7.96E-03	1.10E-02	0.00E+00	0.00E+00	0.00E+00	64	0.001%
T6 Utility Class 7	Natural Gas	0	1.11E-02	5.43E-02	2.75E+00	0.00E+00	1.64E-03	1.20E-02	4.55E-02	5.75E-02	1.50E-03	3.00E-03	1.59E-02	1.89E-02	9.16E+02	7.79E-01	1.87E-01	0	0.000%
T6TS	Gasoline	149	1.05E-02	6.78E-02	1.58E-01	1.52E-02	1.49E-03	1.20E-02	4.50E-02	5.70E-02	1.37E-03	3.00E-03	1.58E-02	1.88E-02	1.54E+03	2.76E-03	6.81E-03	5,984	0.064%
T6TS	Electricity	138	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02	2.25E-02	3.45E-02	0.00E+00	3.00E-03	7.88E-03	1.09E-02	0.00E+00	0.00E+00	0.00E+00	7,760	0.084%
T7 CAIRP Class 8	Diesel	123	1.15E-02	1.21E+00	3.89E-02	1.21E-02	3.00E-02	3.60E-02	8.19E-02	1.18E-01	2.87E-02	9.00E-03	2.87E-02	3.77E-02	1.28E+03	5.34E-04	2.01E-01	24,555	0.265%
T7 CAIRP Class 8	Electricity	34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	4.09E-02	7.69E-02	0.00E+00	9.00E-03	1.43E-02	2.33E-02	0.00E+00	0.00E+00	0.00E+00	6,958	0.075%
T7 CAIRP Class 8	Natural Gas	0	1.34E-02	1.53E-01	2.88E+00	0.00E+00	1.97E-03	3.60E-02	8.19E-02	1.18E-01	1.81E-03	9.00E-03	2.87E-02	3.77E-02	1.02E+03	9.35E-01	2.08E-01	45	0.000%
T7 NNOOS Class 8	Diesel	135	1.12E-02	1.34E+00	3.78E-02	1.16E-02	2.97E-02	3.60E-02	8.19E-02	1.18E-01	2.84E-02	9.00E-03	2.87E-02	3.77E-02	1.22E+03	5.19E-04	1.93E-01	37,469	0.404%
T7 NOOS Class 8	Diesel	58	1.15E-02	1.38E+00	3.90E-02	1.16E-02	3.14E-02	3.60E-02	8.19E-02	1.18E-01	3.01E-02	9.00E-03	2.87E-02	3.77E-02	1.22E+03	5.36E-04	1.93E-01	13,615	0.147%
T7 Other Port Class 8	Diesel	11	1.01E-02	1.24E+00	6.36E-02	1.30E-02	1.65E-02	3.60E-02	9.42E-02	1.30E-01	1.58E-02	9.00E-03	3.30E-02	4.20E-02	1.37E+03	4.67E-04	2.16E-01	2,565	0.028%
T7 Other Port Class 8	Electricity	2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	4.71E-02	8.31E-02	0.00E+00	9.00E-03	1.65E-02	2.55E-02	0.00E+00	0.00E+00	0.00E+00	646	0.007%
T7 POAK Class 8	Diesel	84	1.02E-02	1.28E+00	6.48E-02	1.29E-02	1.71E-02	3.60E-02	9.42E-02	1.30E-01	1.64E-02	9.00E-03	3.30E-02	4.20E-02	1.37E+03	4.75E-04	2.15E-01	9,745	0.105%
T7 POAK Class 8	Electricity	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	4.71E-02	8.31E-02	0.00E+00	9.00E-03	1.65E-02	2.55E-02	0.00E+00	0.00E+00	0.00E+00	2,252	0.024%
T7 POAK Class 8	Natural Gas	0	1.68E-02	1.73E-01	4.98E+00	0.00E+00	2.52E-03	3.60E-02	9.42E-02	1.30E-01	2.32E-03	9.00E-03	3.30E-02	4.20E-02	1.15E+03	1.17E+00	2.35E-01	22	0.000%
T7 Public Class 8	Diesel	138	2.48E-02	1.62E+00	1.42E-01	1.51E-02	8.98E-03	3.60E-02	1.07E-01	1.43E-01	8.59E-03	9.00E-03	3.75E-02	4.65E-02	1.60E+03	1.15E-03	2.51E-01	5,484	0.059%

Source: EMFAC2021 (v1.0.2) Emission Rates
Region Type: Sub-Area
Region: Sonoma (SF)
Calendar Year: 2019, 2050
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HOTSOAK and RUNLOSS, g/vehicle/day for IDLEX, RESTLOSS and DIURN

g/mile

2.20E-03

Vehicle Category	Fuel	Population	ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM 2.5 Total	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	VMT Total	% of VMT
T7 Public Class 8	Electricity	98	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	5.43E-02	9.03E-02	0.00E+00	9.00E-03	1.90E-02	2.80E-02	0.00E+00	0.00E+00	0.00E+00	4,384	0.047%
T7 Public Class 8	Natural Gas	1	2.45E-02	2.92E-01	8.20E+00	0.00E+00	3.25E-03	3.60E-02	1.07E-01	1.43E-01	2.99E-03	9.00E-03	3.73E-02	4.63E-02	1.46E+03	1.71E+00	2.98E-01	45	0.000%
T7 Single Concrete/Transit Mix Cla:	Diesel	20	8.57E-03	7.97E-01	4.34E-02	1.37E-02	1.35E-02	3.60E-02	8.88E-02	1.25E-01	1.29E-02	9.00E-03	3.11E-02	4.01E-02	1.44E+03	3.98E-04	2.27E-01	1,323	0.014%
T7 Single Concrete/Transit Mix Cla:	Electricity	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	4.44E-02	8.04E-02	0.00E+00	9.00E-03	1.55E-02	2.45E-02	0.00E+00	0.00E+00	0.00E+00	1,964	0.021%
T7 Single Concrete/Transit Mix Cla:	Natural Gas	1	1.52E-02	1.64E-01	4.04E+00	0.00E+00	2.26E-03	3.60E-02	8.88E-02	1.25E-01	2.07E-03	9.00E-03	3.11E-02	4.01E-02	1.12E+03	1.07E+00	2.29E-01	81	0.001%
T7 Single Dump Class 8	Diesel	293	9.78E-03	1.02E+00	5.08E-02	1.39E-02	1.68E-02	3.60E-02	8.78E-02	1.24E-01	1.61E-02	9.00E-03	3.07E-02	3.97E-02	1.47E+03	4.54E-04	2.32E-01	14,667	0.158%
T7 Single Dump Class 8	Electricity	271	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	4.44E-02	8.04E-02	0.00E+00	9.00E-03	1.55E-02	2.45E-02	0.00E+00	0.00E+00	0.00E+00	16,204	0.175%
T7 Single Dump Class 8	Natural Gas	18	1.52E-02	1.82E-01	4.27E+00	0.00E+00	2.22E-03	3.60E-02	8.78E-02	1.24E-01	2.04E-03	9.00E-03	3.07E-02	3.97E-02	1.14E+03	1.07E+00	2.32E-01	907	0.010%
T7 Single Other Class 8	Diesel	420	9.68E-03	9.99E-01	4.99E-02	1.38E-02	1.64E-02	3.60E-02	8.78E-02	1.24E-01	1.57E-02	9.00E-03	3.07E-02	3.97E-02	1.46E+03	4.50E-04	2.30E-01	19,127	0.206%
T7 Single Other Class 8	Electricity	407	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	4.44E-02	8.04E-02	0.00E+00	9.00E-03	1.55E-02	2.45E-02	0.00E+00	0.00E+00	0.00E+00	21,923	0.236%
T7 Single Other Class 8	Natural Gas	26	1.52E-02	1.75E-01	4.19E+00	0.00E+00	2.23E-03	3.60E-02	8.77E-02	1.24E-01	2.05E-03	9.00E-03	3.07E-02	3.97E-02	1.14E+03	1.07E+00	2.31E-01	1,190	0.013%
T7 SWCV Class 8	Diesel	10	2.42E-02	3.62E+00	5.78E-02	3.64E-02	1.78E-02	3.60E-02	2.10E-01	2.46E-01	1.70E-02	9.00E-03	7.35E-02	8.25E-02	3.84E+03	1.12E-03	6.05E-01	637	0.007%
T7 SWCV Class 8	Electricity	78	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	1.05E-01	1.41E-01	0.00E+00	9.00E-03	3.68E-02	4.58E-02	0.00E+00	0.00E+00	0.00E+00	5,073	0.055%
T7 SWCV Class 8	Natural Gas	87	3.75E-03	1.48E-01	9.55E+00	0.00E+00	1.15E-03	3.60E-02	2.10E-01	2.46E-01	1.06E-03	9.00E-03	7.35E-02	8.25E-02	1.31E+03	2.46E-01	2.68E-01	5,621	0.061%
T7 Tractor Class 8	Diesel	326	1.02E-02	1.18E+00	4.75E-02	1.20E-02	2.18E-02	3.60E-02	8.62E-02	1.22E-01	2.09E-02	9.00E-03	3.02E-02	3.92E-02	1.26E+03	4.74E-04	1.99E-01	19,826	0.214%
T7 Tractor Class 8	Electricity	67	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	4.33E-02	7.93E-02	0.00E+00	9.00E-03	1.52E-02	2.42E-02	0.00E+00	0.00E+00	0.00E+00	4,389	0.047%
T7 Tractor Class 8	Natural Gas	28	1.46E-02	1.69E-01	3.79E+00	0.00E+00	2.15E-03	3.60E-02	8.62E-02	1.22E-01	1.97E-03	9.00E-03	3.02E-02	3.92E-02	1.07E+03	1.02E+00	2.19E-01	1,702	0.018%
T7 Utility Class 8	Diesel	4	1.13E-02	1.11E+00	1.04E-01	1.46E-02	7.49E-03	3.60E-02	1.01E-01	1.37E-01	7.17E-03	9.00E-03	3.55E-02	4.45E-02	1.54E+03	5.25E-04	2.43E-01	169	0.002%
T7 Utility Class 8	Electricity	3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	5.19E-02	8.79E-02	0.00E+00	9.00E-03	1.82E-02	2.72E-02	0.00E+00	0.00E+00	0.00E+00	145	0.002%
T7IS	Gasoline	0	4.27E-01	2.52E+00	2.89E+01	1.77E-02	1.56E-03	2.00E-02	9.69E-02	1.17E-01	1.43E-03	5.00E-03	3.39E-02	3.89E-02	1.79E+03	9.21E-02	1.05E-01	20	0.000%
T7IS	Electricity	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-02	4.85E-02	6.85E-02	0.00E+00	5.00E-03	1.70E-02	2.20E-02	0.00E+00	0.00E+00	0.00E+00	25	0.000%
UBUS	Gasoline	38	3.23E-03	1.57E-02	5.72E-01	8.40E-03	1.30E-03	8.00E-03	9.10E-02	9.90E-02	1.20E-03	2.00E-03	3.19E-02	3.39E-02	8.50E+02	1.22E-03	2.76E-03	2,670	0.029%
UBUS	Electricity	106	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.98E-02	5.50E-02	8.48E-02	0.00E+00	7.44E-03	1.93E-02	2.67E-02	0.00E+00	0.00E+00	0.00E+00	10,988	0.118%
																		9,282,483	

1.00E-06

lbs/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
3.14E-05	1.27E-03	1.98E-04	2.13E-05	9.03E-06	1.02E-04	9.03E-06	1.28E-04	6.61E-06	3.56E-05	8.64E-06	4.22E-05	2.25E+00	1.46E-06	3.54E-04	
2.68E-05	1.78E-04	7.53E-03	0.00E+00	3.80E-06	1.02E-04	3.80E-06	1.28E-04	6.61E-06	3.56E-05	3.49E-06	4.22E-05	1.98E+00	1.87E-03	4.05E-04	
6.49E-06	4.58E-05	1.09E-03	4.79E-06	1.09E-06	1.97E-05	1.09E-06	3.74E-05	4.41E-06	6.90E-06	1.00E-06	1.13E-05	4.85E-01	2.22E-06	7.29E-06	
1.02E-05	2.49E-05	3.21E-04	3.78E-06	2.26E-06	1.98E-05	2.26E-06	3.74E-05	4.41E-06	6.92E-06	2.16E-06	1.13E-05	3.99E-01	4.73E-07	6.28E-05	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-06	0.00E+00	2.73E-05	4.41E-06	3.39E-06	0.00E+00	7.80E-06	0.00E+00	0.00E+00	0.00E+00	
2.70E-06	6.27E-06	4.00E-04	2.55E-06	4.46E-07	9.31E-06	4.46E-07	2.69E-05	4.41E-06	3.26E-06	4.10E-07	7.67E-06	2.58E-01	8.08E-07	1.03E-06	
6.86E-06	4.77E-05	1.13E-03	5.54E-06	1.17E-06	2.32E-05	1.17E-06	4.08E-05	4.41E-06	8.11E-06	1.08E-06	1.25E-05	5.61E-01	2.30E-06	7.39E-06	
2.89E-05	6.38E-05	3.10E-04	7.03E-06	9.68E-06	2.30E-05	9.68E-06	4.07E-05	4.41E-06	8.06E-06	9.26E-06	1.25E-05	7.41E-01	1.34E-06	1.17E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-06	0.00E+00	2.73E-05	4.41E-06	3.39E-06	0.00E+00	7.80E-06	0.00E+00	0.00E+00	0.00E+00	
2.69E-06	6.26E-06	4.00E-04	2.54E-06	4.39E-07	9.31E-06	4.39E-07	2.69E-05	4.41E-06	3.26E-06	4.04E-07	7.67E-06	2.57E-01	8.02E-07	1.01E-06	
8.85E-06	5.06E-05	1.25E-03	5.77E-06	1.13E-06	2.30E-05	1.13E-06	4.06E-05	4.41E-06	8.04E-06	1.03E-06	1.25E-05	5.83E-01	2.89E-06	7.62E-06	
2.90E-05	6.55E-05	3.09E-04	5.22E-06	9.69E-06	2.30E-05	9.69E-06	4.06E-05	4.41E-06	8.05E-06	9.27E-06	1.25E-05	5.51E-01	1.34E-06	8.68E-05	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.70E-06	0.00E+00	2.73E-05	4.41E-06	3.39E-06	0.00E+00	7.80E-06	0.00E+00	0.00E+00	0.00E+00	
2.70E-06	6.27E-06	4.00E-04	2.55E-06	4.45E-07	9.31E-06	4.45E-07	2.69E-05	4.41E-06	3.26E-06	4.09E-07	7.67E-06	2.58E-01	8.02E-07	1.01E-06	
8.49E-06	3.70E-05	1.31E-03	1.63E-05	2.76E-06	1.72E-04	2.76E-06	1.90E-04	4.41E-06	6.02E-05	2.54E-06	6.46E-05	1.65E+00	2.56E-06	3.37E-06	
1.96E-04	5.91E-04	5.08E-04	1.27E-05	4.28E-05	1.72E-04	4.28E-05	1.98E-04	6.61E-06	6.02E-05	4.10E-05	6.68E-05	1.34E+00	9.10E-06	2.11E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.60E-05	0.00E+00	1.04E-04	4.41E-06	3.01E-05	0.00E+00	3.45E-05	0.00E+00	0.00E+00	0.00E+00	
7.82E-06	4.53E-05	1.34E-03	1.84E-05	2.77E-06	2.01E-04	2.77E-06	2.18E-04	4.41E-06	7.02E-05	2.55E-06	7.46E-05	1.87E+00	2.38E-06	4.57E-06	
2.55E-04	9.44E-04	6.74E-04	1.50E-05	5.82E-05	2.01E-04	5.82E-05	2.27E-04	6.61E-06	7.02E-05	5.56E-05	7.68E-05	1.58E+00	1.18E-05	2.49E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-04	0.00E+00	1.18E-04	4.41E-06	3.51E-05	0.00E+00	3.95E-05	0.00E+00	0.00E+00	0.00E+00	
1.75E-03	1.06E-03	2.26E-02	4.03E-06	4.84E-06	2.65E-05	4.84E-06	3.53E-05	2.20E-06	9.26E-06	4.51E-06	1.15E-05	4.07E-01	2.94E-04	7.93E-05	
9.12E-06	5.22E-05	1.29E-03	6.99E-06	1.12E-06	2.33E-05	1.12E-06	4.09E-05	4.41E-06	8.16E-06	1.03E-06	1.26E-05	7.07E-01	2.97E-06	7.76E-06	
1.06E-05	2.40E-05	3.37E-04	6.82E-06	2.32E-06	2.34E-05	2.32E-06	4.11E-05	4.41E-06	8.20E-06	2.22E-06	1.26E-05	7.19E-01	4.94E-07	1.13E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-06	0.00E+00	2.73E-05	4.41E-06	3.40E-06	0.00E+00	7.81E-06	0.00E+00	0.00E+00	0.00E+00	
2.70E-06	6.27E-06	4.00E-04	2.55E-06	4.47E-07	9.32E-06	4.47E-07	2.70E-05	4.41E-06	3.26E-06	4.11E-07	7.67E-06	2.58E-01	8.03E-07	1.01E-06	
1.78E-05	4.85E-04	3.19E-04	4.24E-05	3.27E-06	9.92E-05	3.27E-06	1.26E-04	6.61E-06	3.47E-05	3.01E-06	4.13E-05	4.29E+00	6.32E-06	3.98E-05	
1.90E-04	5.52E-03	5.46E-04	2.27E-05	4.65E-05	9.87E-05	4.65E-05	1.34E-04	8.82E-06	3.46E-05	4.45E-05	4.34E-05	2.40E+00	8.84E-06	3.78E-04	
2.32E-05	2.02E-03	7.87E-05	3.18E-05	5.18E-05	1.80E-04	5.18E-05	2.07E-04	6.61E-06	6.31E-05	4.96E-05	6.97E-05	3.36E+00	1.08E-06	5.29E-04	
1.46E-05	5.46E-04	3.56E-04	3.34E-05	2.80E-06	9.88E-05	2.80E-06	1.25E-04	6.61E-06	3.46E-05	2.57E-06	4.12E-05	3.38E+00	3.87E-06	3.17E-05	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-05	0.00E+00	7.58E-05	6.61E-06	1.73E-05	0.00E+00	2.39E-05	0.00E+00	0.00E+00	0.00E+00	
3.13E-05	5.51E-03	3.88E-04	3.61E-05	8.74E-06	0.00E+00	8.74E-06	0.00E+00	0.00E+00	0.00E+00	8.36E-06	0.00E+00	3.81E+00	1.45E-06	6.00E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1.72E-05	1.64E-04	3.92E-04	1.52E-05	2.82E-06	9.90E-05	2.82E-06	1.17E-04	4.41E-06	3.47E-05	2.60E-06	3.91E-05	1.54E+00	4.01E-06	1.63E-05	
1.26E-05	5.70E-04	1.06E-04	2.12E-05	6.35E-06	9.90E-05	6.35E-06	1.25E-04	6.61E-06	3.47E-05	6.07E-06	4.13E-05	2.24E+00	5.86E-07	3.53E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-05	0.00E+00	7.48E-05	6.32E-06	1.73E-05	0.00E+00	2.37E-05	0.00E+00	0.00E+00	0.00E+00	
7.55E-05	4.21E-04	1.49E-02	0.00E+00	8.10E-06	9.90E-05	8.10E-06	1.25E-04	6.61E-06	3.47E-05	7.45E-06	4.13E-05	2.36E+00	5.29E-03	4.80E-04	
1.17E-05	3.85E-04	6.00E-05	2.11E-05	1.18E-05	9.33E-05	1.18E-05	1.20E-04	6.61E-06	3.26E-05	1.13E-05	3.93E-05	2.23E+00	5.44E-07	3.51E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-05	0.00E+00	7.31E-05	6.61E-06	1.63E-05	0.00E+00	2.29E-05	0.00E+00	0.00E+00	0.00E+00	
1.17E-05	3.86E-04	6.01E-05	2.11E-05	1.18E-05	9.33E-05	1.18E-05	1.20E-04	6.61E-06	3.26E-05	1.13E-05	3.93E-05	2.23E+00	5.44E-07	3.51E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-05	0.00E+00	7.31E-05	6.61E-06	1.63E-05	0.00E+00	2.29E-05	0.00E+00	0.00E+00	0.00E+00	
1.17E-05	3.90E-04	6.00E-05	2.11E-05	1.18E-05	9.33E-05	1.18E-05	1.20E-04	6.61E-06	3.26E-05	1.13E-05	3.93E-05	2.23E+00	5.44E-07	3.51E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-05	0.00E+00	7.31E-05	6.61E-06	1.63E-05	0.00E+00	2.29E-05	0.00E+00	0.00E+00	0.00E+00	
1.27E-05	4.29E-04	6.53E-05	1.86E-05	1.26E-05	9.33E-05	1.26E-05	1.20E-04	6.61E-06	3.26E-05	1.21E-05	3.93E-05	1.97E+00	5.92E-07	3.10E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-05	0.00E+00	7.31E-05	6.61E-06	1.63E-05	0.00E+00	2.29E-05	0.00E+00	0.00E+00	0.00E+00	
1.33E-05	7.58E-04	1.16E-04	2.17E-05	4.14E-06	1.05E-04	4.14E-06	1.31E-04	6.61E-06	3.67E-05	3.96E-06	4.33E-05	2.29E+00	6.16E-07	3.60E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.24E-05	0.00E+00	7.89E-05	6.61E-06	1.84E-05	0.00E+00	2.50E-05	0.00E+00	0.00E+00	0.00E+00	
2.75E-05	1.32E-04	8.42E-03	0.00E+00	4.45E-06	1.05E-04	4.45E-06	1.31E-04	6.61E-06	3.67E-05	4.09E-06	4.33E-05	2.22E+00	1.92E-03	4.52E-04	
1.32E-05	7.52E-04	1.16E-04	2.17E-05	4.13E-06	1.05E-04	4.13E-06	1.31E-04	6.61E-06	3.67E-05	3.95E-06	4.33E-05	2.29E+00	6.14E-07	3.60E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.24E-05	0.00E+00	7.89E-05	6.61E-06	1.84E-05	0.00E+00	2.50E-05	0.00E+00	0.00E+00	0.00E+00	
2.75E-05	1.32E-04	8.42E-03	0.00E+00	4.45E-06	1.05E-04	4.45E-06	1.31E-04	6.61E-06	3.67E-05	4.09E-06	4.33E-05	2.22E+00	1.92E-03	4.52E-04	
1.33E-05	7.64E-04	1.16E-04	2.17E-05	4.15E-06	1.05E-04	4.15E-06	1.31E-04	6.61E-06	3.67E-05	3.98E-06	4.33E-05	2.29E+00	6.16E-07	3.60E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.24E-05	0.00E+00	7.89E-05	6.61E-06	1.84E-05	0.00E+00	2.50E-05	0.00E+00	0.00E+00	0.00E+00	
2.75E-05	1.32E-04	8.42E-03	0.00E+00	4.45E-06	1.05E-04	4.45E-06	1.31E-04	6.61E-06	3.67E-05	4.09E-06	4.33E-05	2.22E+00	1.92E-03	4.52E-04	
1.89E-05	1.33E-03	1.56E-04	2.21E-05	5.56E-06	1.05E-04	5.56E-06	1.31E-04	6.61E-06	3.67E-05	5.32E-06	4.33E-05	2.33E+00	8.79E-07	3.68E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.24E-05	0.00E+00	7.89E-05	6.61E-06	1.84E-05	0.00E+00	2.50E-05	0.00E+00	0.00E+00	0.00E+00	
2.67E-05	2.22E-04	8.21E-03	0.00E+00	3.94E-06	1.05E-04	3.94E-06	1.31E-04	6.61E-06	3.67E-05	3.62E-06	4.33E-05	2.26E+00	1.87E-03	4.60E-04	
1.20E-05	5.78E-04	9.25E-05	2.10E-05	6.77E-06	9.89E-05	6.77E-06	1.25E-04	6.61E-06	3.46E-05	6.48E-06	4.12E-05	2.22E+00	5.57E-07	3.49E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-05	0.00E+00	7.59E-05	6.61E-06	1.73E-05	0.00E+00	2.39E-05	0.00E+00	0.00E+00	0.00E+00	
2.20E-05	1.15E-04	5.89E-03	0.00E+00	3.44E-06	9.89E-05	3.44E-06	1.25E-04	6.61E-06	3.46E-05	3.16E-06	4.12E-05	1.93E+00	1.54E-03	3.94E-04	
1.20E-05	5.75E-04	9.23E-05	2.10E-05	6.76E-06	9.89E-05	6.76E-06	1.25E-04	6.61E-06	3.46E-05	6.47E-06	4.12E-05	2.22E+00	5.57E-07	3.49E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-05	0.00E+00	7.59E-05	6.61E-06	1.73E-05	0.00E+00	2.39E-05	0.00E+00	0.00E+00	0.00E+00	

1.00E-06

lbs/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
2.20E-05	1.15E-04	5.89E-03	0.00E+00	3.43E-06	9.89E-05	3.43E-06	1.25E-04	6.61E-06	3.46E-05	3.16E-06	4.12E-05	1.93E+00	1.54E-03	3.94E-04	
1.20E-05	5.82E-04	9.23E-05	2.10E-05	6.81E-06	9.89E-05	6.81E-06	1.25E-04	6.61E-06	3.46E-05	6.51E-06	4.12E-05	2.22E+00	5.57E-07	3.49E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-05	0.00E+00	7.59E-05	6.61E-06	1.73E-05	0.00E+00	2.39E-05	0.00E+00	0.00E+00	0.00E+00	
2.20E-05	1.15E-04	5.89E-03	0.00E+00	3.43E-06	9.89E-05	3.43E-06	1.25E-04	6.61E-06	3.46E-05	3.16E-06	4.12E-05	1.93E+00	1.54E-03	3.94E-04	
1.51E-05	8.94E-04	1.12E-04	2.12E-05	8.38E-06	9.89E-05	8.38E-06	1.25E-04	6.61E-06	3.46E-05	8.01E-06	4.12E-05	2.24E+00	7.01E-07	3.52E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-05	0.00E+00	7.59E-05	6.61E-06	1.73E-05	0.00E+00	2.39E-05	0.00E+00	0.00E+00	0.00E+00	
2.14E-05	1.66E-04	5.95E-03	0.00E+00	3.14E-06	9.89E-05	3.14E-06	1.25E-04	6.61E-06	3.46E-05	2.89E-06	4.12E-05	1.96E+00	1.50E-03	4.00E-04	
1.20E-05	5.92E-04	9.19E-05	2.10E-05	6.82E-06	9.89E-05	6.82E-06	1.25E-04	6.61E-06	3.46E-05	6.52E-06	4.12E-05	2.22E+00	5.57E-07	3.49E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-05	0.00E+00	7.59E-05	6.61E-06	1.73E-05	0.00E+00	2.39E-05	0.00E+00	0.00E+00	0.00E+00	
2.20E-05	1.16E-04	5.89E-03	0.00E+00	3.43E-06	9.89E-05	3.43E-06	1.25E-04	6.61E-06	3.46E-05	3.15E-06	4.12E-05	1.93E+00	1.54E-03	3.94E-04	
1.48E-05	9.00E-04	1.12E-04	1.90E-05	8.31E-06	9.89E-05	8.31E-06	1.25E-04	6.61E-06	3.46E-05	7.95E-06	4.12E-05	2.01E+00	6.86E-07	3.17E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.95E-05	0.00E+00	7.59E-05	6.61E-06	1.73E-05	0.00E+00	2.39E-05	0.00E+00	0.00E+00	0.00E+00	
2.15E-05	1.59E-04	5.94E-03	0.00E+00	3.18E-06	9.89E-05	3.18E-06	1.25E-04	6.61E-06	3.46E-05	2.92E-06	4.12E-05	1.92E+00	1.50E-03	3.91E-04	
1.16E-05	4.88E-04	5.95E-05	1.99E-05	1.23E-05	9.33E-05	1.23E-05	1.20E-04	6.61E-06	3.26E-05	1.18E-05	3.93E-05	2.10E+00	5.39E-07	3.30E-04	
1.16E-05	4.91E-04	5.96E-05	1.99E-05	1.23E-05	9.33E-05	1.23E-05	1.20E-04	6.61E-06	3.26E-05	1.18E-05	3.93E-05	2.10E+00	5.41E-07	3.31E-04	
1.16E-05	4.85E-04	5.93E-05	1.98E-05	1.23E-05	9.33E-05	1.23E-05	1.20E-04	6.61E-06	3.26E-05	1.18E-05	3.93E-05	2.09E+00	5.38E-07	3.30E-04	
1.25E-05	5.12E-04	6.40E-05	1.79E-05	1.30E-05	9.33E-05	1.30E-05	1.20E-04	6.61E-06	3.26E-05	1.25E-05	3.93E-05	1.89E+00	5.80E-07	2.97E-04	
2.17E-05	8.78E-04	1.17E-04	2.25E-05	7.06E-06	1.02E-04	7.06E-06	1.28E-04	6.61E-06	3.56E-05	6.75E-06	4.22E-05	2.37E+00	1.01E-06	3.74E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.09E-05	0.00E+00	7.73E-05	6.61E-06	1.78E-05	0.00E+00	2.44E-05	0.00E+00	0.00E+00	0.00E+00	
2.78E-05	1.34E-04	6.74E-03	0.00E+00	3.93E-06	1.02E-04	3.93E-06	1.28E-04	6.61E-06	3.56E-05	3.61E-06	4.22E-05	2.15E+00	1.95E-03	4.39E-04	
2.21E-05	9.13E-04	1.18E-04	2.25E-05	7.18E-06	1.02E-04	7.18E-06	1.28E-04	6.61E-06	3.56E-05	6.87E-06	4.22E-05	2.38E+00	1.03E-06	3.75E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.09E-05	0.00E+00	7.73E-05	6.61E-06	1.78E-05	0.00E+00	2.44E-05	0.00E+00	0.00E+00	0.00E+00	
2.77E-05	1.45E-04	6.75E-03	0.00E+00	3.88E-06	1.02E-04	3.88E-06	1.28E-04	6.61E-06	3.56E-05	3.57E-06	4.22E-05	2.16E+00	1.94E-03	4.41E-04	
2.00E-05	7.51E-04	1.11E-04	2.25E-05	6.35E-06	1.02E-04	6.35E-06	1.28E-04	6.61E-06	3.56E-05	6.08E-06	4.22E-05	2.38E+00	9.29E-07	3.75E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.09E-05	0.00E+00	7.73E-05	6.61E-06	1.78E-05	0.00E+00	2.44E-05	0.00E+00	0.00E+00	0.00E+00	
2.78E-05	1.39E-04	6.75E-03	0.00E+00	3.91E-06	1.02E-04	3.91E-06	1.28E-04	6.61E-06	3.56E-05	3.59E-06	4.22E-05	2.17E+00	1.94E-03	4.41E-04	
1.96E-05	7.79E-04	1.09E-04	2.22E-05	6.43E-06	1.02E-04	6.43E-06	1.28E-04	6.61E-06	3.56E-05	6.16E-06	4.22E-05	2.35E+00	9.12E-07	3.70E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.09E-05	0.00E+00	7.73E-05	6.61E-06	1.78E-05	0.00E+00	2.44E-05	0.00E+00	0.00E+00	0.00E+00	
2.78E-05	1.31E-04	6.74E-03	0.00E+00	3.95E-06	1.02E-04	3.95E-06	1.28E-04	6.61E-06	3.56E-05	3.63E-06	4.22E-05	2.15E+00	1.95E-03	4.39E-04	
1.12E-05	4.23E-04	7.81E-05	2.12E-05	5.09E-06	1.00E-04	5.09E-06	1.27E-04	6.61E-06	3.51E-05	4.87E-06	4.17E-05	2.23E+00	5.19E-07	3.52E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.02E-05	0.00E+00	7.66E-05	6.61E-06	1.76E-05	0.00E+00	2.42E-05	0.00E+00	0.00E+00	0.00E+00	
2.46E-05	1.20E-04	6.05E-03	0.00E+00	3.61E-06	1.00E-04	3.61E-06	1.27E-04	6.61E-06	3.51E-05	3.32E-06	4.17E-05	2.02E+00	1.72E-03	4.11E-04	
1.12E-05	4.15E-04	7.81E-05	2.12E-05	5.06E-06	1.00E-04	5.06E-06	1.27E-04	6.61E-06	3.51E-05	4.84E-06	4.17E-05	2.23E+00	5.19E-07	3.52E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.02E-05	0.00E+00	7.66E-05	6.61E-06	1.76E-05	0.00E+00	2.42E-05	0.00E+00	0.00E+00	0.00E+00	
2.46E-05	1.20E-04	6.05E-03	0.00E+00	3.61E-06	1.00E-04	3.61E-06	1.27E-04	6.61E-06	3.51E-05	3.32E-06	4.17E-05	2.02E+00	1.72E-03	4.11E-04	
1.11E-05	4.04E-04	7.73E-05	2.12E-05	5.03E-06	1.00E-04	5.03E-06	1.27E-04	6.61E-06	3.51E-05	4.81E-06	4.17E-05	2.24E+00	5.14E-07	3.52E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.02E-05	0.00E+00	7.66E-05	6.61E-06	1.76E-05	0.00E+00	2.42E-05	0.00E+00	0.00E+00	0.00E+00	
2.46E-05	1.20E-04	6.05E-03	0.00E+00	3.61E-06	1.00E-04	3.61E-06	1.27E-04	6.61E-06	3.51E-05	3.32E-06	4.17E-05	2.02E+00	1.72E-03	4.11E-04	
2.32E-05	1.49E-04	3.48E-04	3.35E-05	3.29E-06	9.92E-05	3.29E-06	1.26E-04	6.61E-06	3.47E-05	3.03E-06	4.13E-05	3.39E+00	6.08E-06	1.50E-05	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.96E-05	0.00E+00	7.61E-05	6.61E-06	1.74E-05	0.00E+00	2.40E-05	0.00E+00	0.00E+00	0.00E+00	
2.53E-05	2.68E-03	8.57E-05	2.66E-05	6.62E-05	1.81E-04	6.62E-05	2.60E-04	1.98E-05	6.32E-05	6.33E-05	8.30E-05	2.81E+00	1.18E-06	4.43E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.03E-05	0.00E+00	1.70E-04	1.98E-05	3.16E-05	0.00E+00	5.14E-05	0.00E+00	0.00E+00	0.00E+00	
2.95E-05	3.38E-04	6.35E-03	0.00E+00	4.34E-06	1.81E-04	4.34E-06	2.60E-04	1.98E-05	6.32E-05	3.99E-06	8.30E-05	2.25E+00	2.06E-03	4.60E-04	
2.47E-05	2.95E-03	8.34E-05	2.55E-05	6.54E-05	1.81E-04	6.54E-05	2.60E-04	1.98E-05	6.32E-05	6.26E-05	8.30E-05	2.70E+00	1.14E-06	4.25E-04	
2.54E-05	3.04E-03	8.61E-05	2.55E-05	6.93E-05	1.81E-04	6.93E-05	2.60E-04	1.98E-05	6.32E-05	6.63E-05	8.30E-05	2.69E+00	1.18E-06	4.25E-04	
2.22E-05	2.73E-03	1.40E-04	2.86E-05	3.63E-05	2.08E-04	3.63E-05	2.87E-04	1.98E-05	7.27E-05	3.47E-05	9.25E-05	3.02E+00	1.03E-06	4.76E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-04	0.00E+00	1.83E-04	1.98E-05	3.63E-05	0.00E+00	5.62E-05	0.00E+00	0.00E+00	0.00E+00	
2.26E-05	2.83E-03	1.43E-04	2.85E-05	3.77E-05	2.08E-04	3.77E-05	2.87E-04	1.98E-05	7.27E-05	3.61E-05	9.25E-05	3.01E+00	1.05E-06	4.75E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-04	0.00E+00	1.83E-04	1.98E-05	3.63E-05	0.00E+00	5.62E-05	0.00E+00	0.00E+00	0.00E+00	
3.70E-05	3.82E-04	1.10E-02	0.00E+00	5.57E-06	2.08E-04	5.57E-06	2.87E-04	1.98E-05	7.27E-05	5.12E-06	9.25E-05	2.54E+00	2.59E-03	5.18E-04	
5.48E-05	3.56E-03	3.12E-04	3.33E-05	1.98E-05	2.37E-04	1.98E-05	3.16E-04	1.98E-05	8.28E-05	1.89E-05	1.03E-04	3.52E+00	2.54E-06	5.54E-04	

lbs/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-04	0.00E+00	1.99E-04	1.98E-05	4.19E-05	0.00E+00	6.17E-05	0.00E+00	0.00E+00	0.00E+00	
5.39E-05	6.43E-04	1.81E-02	0.00E+00	7.16E-06	2.35E-04	7.16E-06	3.15E-04	1.98E-05	8.23E-05	6.59E-06	1.02E-04	3.22E+00	3.77E-03	6.57E-04	
1.89E-05	1.76E-03	9.56E-05	3.01E-05	2.97E-05	1.96E-04	2.97E-05	2.75E-04	1.98E-05	6.85E-05	2.85E-05	8.83E-05	3.18E+00	8.78E-07	5.01E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.79E-05	0.00E+00	1.77E-04	1.98E-05	3.43E-05	0.00E+00	5.41E-05	0.00E+00	0.00E+00	0.00E+00	
3.36E-05	3.62E-04	8.91E-03	0.00E+00	4.97E-06	1.96E-04	4.97E-06	2.75E-04	1.98E-05	6.85E-05	4.57E-06	8.83E-05	2.48E+00	2.35E-03	5.05E-04	
2.16E-05	2.25E-03	1.12E-04	3.07E-05	3.71E-05	1.94E-04	3.71E-05	2.73E-04	1.98E-05	6.78E-05	3.55E-05	8.76E-05	3.24E+00	1.00E-06	5.11E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.79E-05	0.00E+00	1.77E-04	1.98E-05	3.42E-05	0.00E+00	5.41E-05	0.00E+00	0.00E+00	0.00E+00	
3.36E-05	4.01E-04	9.42E-03	0.00E+00	4.89E-06	1.94E-04	4.89E-06	2.73E-04	1.98E-05	6.77E-05	4.49E-06	8.76E-05	2.51E+00	2.35E-03	5.12E-04	
2.13E-05	2.20E-03	1.10E-04	3.05E-05	3.62E-05	1.94E-04	3.62E-05	2.73E-04	1.98E-05	6.78E-05	3.47E-05	8.76E-05	3.22E+00	9.91E-07	5.08E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.78E-05	0.00E+00	1.77E-04	1.98E-05	3.42E-05	0.00E+00	5.41E-05	0.00E+00	0.00E+00	0.00E+00	
3.36E-05	3.87E-04	9.25E-03	0.00E+00	4.92E-06	1.93E-04	4.92E-06	2.73E-04	1.98E-05	6.77E-05	4.52E-06	8.75E-05	2.50E+00	2.35E-03	5.10E-04	
5.33E-05	7.99E-03	1.27E-04	8.01E-05	3.92E-05	4.63E-04	3.92E-05	5.42E-04	1.98E-05	1.62E-04	3.75E-05	1.82E-04	8.46E+00	2.47E-06	1.33E-03	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E-04	0.00E+00	3.11E-04	1.98E-05	8.10E-05	0.00E+00	1.01E-04	0.00E+00	0.00E+00	0.00E+00	
8.26E-06	3.25E-04	2.11E-02	0.00E+00	2.53E-06	4.63E-04	2.53E-06	5.42E-04	1.98E-05	1.62E-04	2.33E-06	1.82E-04	2.89E+00	5.43E-04	5.90E-04	
2.25E-05	2.60E-03	1.05E-04	2.64E-05	4.82E-05	1.90E-04	4.82E-05	2.69E-04	1.98E-05	6.65E-05	4.61E-05	8.64E-05	2.79E+00	1.05E-06	4.39E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.55E-05	0.00E+00	1.75E-04	1.98E-05	3.34E-05	0.00E+00	5.32E-05	0.00E+00	0.00E+00	0.00E+00	
3.21E-05	3.73E-04	8.35E-03	0.00E+00	4.73E-06	1.90E-04	4.73E-06	2.69E-04	1.98E-05	6.65E-05	4.35E-06	8.63E-05	2.37E+00	2.25E-03	4.83E-04	
2.49E-05	2.44E-03	2.29E-04	3.21E-05	1.65E-05	2.24E-04	1.65E-05	3.03E-04	1.98E-05	7.82E-05	1.58E-05	9.81E-05	3.39E+00	1.16E-06	5.35E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-04	0.00E+00	1.94E-04	1.98E-05	4.01E-05	0.00E+00	5.99E-05	0.00E+00	0.00E+00	0.00E+00	
9.42E-04	5.55E-03	6.38E-02	3.91E-05	3.43E-06	2.14E-04	3.43E-06	2.58E-04	1.10E-05	7.48E-05	3.16E-06	8.58E-05	3.96E+00	2.03E-04	2.30E-04	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-04	0.00E+00	1.51E-04	1.10E-05	3.74E-05	0.00E+00	4.85E-05	0.00E+00	0.00E+00	0.00E+00	
7.12E-06	3.47E-05	1.26E-03	1.85E-05	2.87E-06	2.01E-04	2.87E-06	2.18E-04	4.41E-06	7.02E-05	2.64E-06	7.46E-05	1.87E+00	2.70E-06	6.09E-06	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-04	0.00E+00	1.87E-04	1.64E-05	4.24E-05	0.00E+00	5.88E-05	0.00E+00	0.00E+00	0.00E+00	

1.00E-06

MTens/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
1.42E-08	5.77E-07	8.97E-08	9.66E-09	1.20E-08	4.61E-08	4.09E-09	5.81E-08	3.00E-09	1.61E-08	3.92E-09	1.91E-08	1.02E-03	6.61E-10	1.61E-07	
1.21E-08	8.08E-08	3.42E-06	0.00E+00	1.20E-08	4.61E-08	1.72E-09	5.81E-08	3.00E-09	1.61E-08	1.58E-09	1.91E-08	9.00E-04	8.50E-07	1.84E-07	
2.94E-09	2.08E-08	4.94E-07	2.17E-09	8.00E-09	8.95E-09	4.95E-10	1.69E-08	2.00E-09	3.13E-09	4.55E-10	5.13E-09	2.20E-04	1.01E-09	3.31E-09	
4.62E-09	1.13E-08	1.45E-07	1.71E-09	8.00E-09	8.97E-09	1.02E-09	1.70E-08	2.00E-09	3.14E-09	9.80E-10	5.14E-09	1.81E-04	2.15E-10	2.85E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	4.40E-09	0.00E+00	1.24E-08	2.00E-09	1.54E-09	0.00E+00	3.54E-09	0.00E+00	0.00E+00	0.00E+00	
1.22E-09	2.84E-09	1.82E-07	1.15E-09	8.00E-09	4.22E-09	2.02E-10	1.22E-08	2.00E-09	1.48E-09	1.86E-10	3.48E-09	1.17E-04	3.66E-10	4.65E-10	
3.11E-09	2.16E-08	5.13E-07	2.52E-09	8.00E-09	1.05E-08	5.31E-10	1.85E-08	2.00E-09	3.68E-09	4.88E-10	5.68E-09	2.54E-04	1.04E-09	3.35E-09	
1.31E-08	2.89E-08	1.41E-07	3.19E-09	8.00E-09	1.04E-08	4.39E-09	1.84E-08	2.00E-09	3.66E-09	4.20E-09	5.66E-09	3.36E-04	6.10E-10	5.30E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	4.40E-09	0.00E+00	1.24E-08	2.00E-09	1.54E-09	0.00E+00	3.54E-09	0.00E+00	0.00E+00	0.00E+00	
1.22E-09	2.84E-09	1.81E-07	1.15E-09	8.00E-09	4.22E-09	1.99E-10	1.22E-08	2.00E-09	1.48E-09	1.83E-10	3.48E-09	1.17E-04	3.64E-10	4.60E-10	
4.01E-09	2.30E-08	5.68E-07	2.62E-09	8.00E-09	1.04E-08	5.11E-10	1.84E-08	2.00E-09	3.65E-09	4.69E-10	5.65E-09	2.65E-04	1.31E-09	3.45E-09	
1.31E-08	2.97E-08	1.40E-07	2.37E-09	8.00E-09	1.04E-08	4.39E-09	1.84E-08	2.00E-09	3.65E-09	4.20E-09	5.65E-09	2.50E-04	6.10E-10	3.94E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	4.40E-09	0.00E+00	1.24E-08	2.00E-09	1.54E-09	0.00E+00	3.54E-09	0.00E+00	0.00E+00	0.00E+00	
1.22E-09	2.84E-09	1.82E-07	1.15E-09	8.00E-09	4.22E-09	2.02E-10	1.22E-08	2.00E-09	1.48E-09	1.85E-10	3.48E-09	1.17E-04	3.64E-10	4.59E-10	
3.85E-09	1.68E-08	5.96E-07	7.40E-09	8.00E-09	7.80E-08	1.25E-09	8.60E-08	2.00E-09	2.73E-08	1.15E-09	2.93E-08	7.49E-04	1.16E-09	1.53E-09	
8.89E-08	2.68E-07	2.31E-07	5.75E-09	1.20E-08	7.80E-08	1.94E-08	9.00E-08	3.00E-09	2.73E-08	1.86E-08	3.03E-08	6.07E-04	4.13E-09	9.57E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	3.90E-08	0.00E+00	4.70E-08	2.00E-09	1.37E-08	0.00E+00	1.57E-08	0.00E+00	0.00E+00	0.00E+00	
3.55E-09	2.05E-08	6.09E-07	8.36E-09	8.00E-09	9.10E-08	1.26E-09	9.90E-08	2.00E-09	3.19E-08	1.16E-09	3.39E-08	8.46E-04	1.08E-09	2.07E-09	
1.16E-07	4.28E-07	3.06E-07	6.79E-09	1.20E-08	9.10E-08	2.64E-08	1.03E-07	3.00E-09	3.19E-08	2.52E-08	3.49E-08	7.16E-04	5.37E-09	1.13E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	4.55E-08	0.00E+00	5.35E-08	2.00E-09	1.59E-08	0.00E+00	1.79E-08	0.00E+00	0.00E+00	0.00E+00	
7.92E-07	4.79E-07	1.02E-05	1.83E-09	4.00E-09	1.20E-08	2.19E-09	1.60E-08	1.00E-09	4.20E-09	2.05E-09	5.20E-09	1.85E-04	1.33E-07	3.60E-08	
4.14E-09	2.37E-08	5.84E-07	3.17E-09	8.00E-09	1.06E-08	5.09E-10	1.86E-08	2.00E-09	3.70E-09	4.68E-10	5.70E-09	3.21E-04	1.35E-09	3.52E-09	
4.82E-09	1.09E-08	1.53E-07	3.09E-09	8.00E-09	1.06E-08	1.05E-09	1.86E-08	2.00E-09	3.72E-09	1.00E-09	5.72E-09	3.26E-04	2.24E-10	5.14E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-09	4.40E-09	0.00E+00	1.24E-08	2.00E-09	1.54E-09	0.00E+00	3.54E-09	0.00E+00	0.00E+00	0.00E+00	
1.22E-09	2.84E-09	1.82E-07	1.15E-09	8.00E-09	4.23E-09	2.03E-10	1.22E-08	2.00E-09	1.48E-09	1.87E-10	3.48E-09	1.17E-04	3.64E-10	4.60E-10	
8.07E-09	2.20E-07	1.45E-07	1.92E-08	1.20E-08	4.50E-08	1.48E-09	5.70E-08	3.00E-09	1.58E-08	1.36E-09	1.88E-08	1.94E-03	2.87E-09	1.81E-08	
8.63E-08	2.50E-06	2.48E-07	1.03E-08	1.60E-08	4.48E-08	2.11E-08	6.08E-08	4.00E-09	1.57E-08	2.02E-08	1.97E-08	1.09E-03	4.01E-09	1.71E-07	
1.05E-08	9.16E-07	3.57E-08	1.44E-08	1.20E-08	8.18E-08	2.35E-08	9.38E-08	3.00E-09	2.86E-08	2.25E-08	3.16E-08	1.52E-03	4.90E-10	2.40E-07	
6.60E-09	2.48E-07	1.62E-07	1.51E-08	1.20E-08	4.48E-08	1.27E-09	5.68E-08	3.00E-09	1.57E-08	1.17E-09	1.87E-08	1.53E-03	1.75E-09	1.44E-08	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.24E-08	0.00E+00	3.44E-08	3.00E-09	7.84E-09	0.00E+00	1.08E-08	0.00E+00	0.00E+00	0.00E+00	
1.42E-08	2.50E-06	1.76E-07	1.64E-08	0.00E+00	0.00E+00	3.96E-09	0.00E+00	0.00E+00	0.00E+00	3.79E-09	0.00E+00	1.73E-03	6.59E-10	2.72E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
7.80E-09	7.44E-08	1.78E-07	6.89E-09	8.00E-09	4.49E-08	1.28E-09	5.29E-08	2.00E-09	1.57E-08	1.18E-09	1.77E-08	6.97E-04	1.82E-09	7.40E-09	
5.72E-09	2.59E-07	4.82E-08	9.64E-09	1.20E-08	4.49E-08	2.88E-09	5.69E-08	3.00E-09	1.57E-08	2.75E-09	1.87E-08	1.02E-03	2.66E-10	1.60E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-08	2.25E-08	0.00E+00	3.39E-08	2.87E-09	7.86E-09	0.00E+00	1.07E-08	0.00E+00	0.00E+00	0.00E+00	
3.43E-08	1.91E-07	6.76E-06	0.00E+00	1.20E-08	4.49E-08	3.67E-09	5.69E-08	3.00E-09	1.57E-08	3.38E-09	1.87E-08	1.07E-03	2.40E-06	2.18E-07	
5.31E-09	1.75E-07	2.72E-08	9.57E-09	1.20E-08	4.23E-08	5.34E-09	5.43E-08	3.00E-09	1.48E-08	5.10E-09	1.78E-08	1.01E-03	2.47E-10	1.59E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.12E-08	0.00E+00	3.32E-08	3.00E-09	7.40E-09	0.00E+00	1.04E-08	0.00E+00	0.00E+00	0.00E+00	
5.32E-09	1.75E-07	2.72E-08	9.58E-09	1.20E-08	4.23E-08	5.34E-09	5.43E-08	3.00E-09	1.48E-08	5.11E-09	1.78E-08	1.01E-03	2.47E-10	1.59E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.12E-08	0.00E+00	3.32E-08	3.00E-09	7.40E-09	0.00E+00	1.04E-08	0.00E+00	0.00E+00	0.00E+00	
5.31E-09	1.77E-07	2.72E-08	9.57E-09	1.20E-08	4.23E-08	5.37E-09	5.43E-08	3.00E-09	1.48E-08	5.14E-09	1.78E-08	1.01E-03	2.47E-10	1.59E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.12E-08	0.00E+00	3.32E-08	3.00E-09	7.40E-09	0.00E+00	1.04E-08	0.00E+00	0.00E+00	0.00E+00	
5.78E-09	1.95E-07	2.96E-08	8.46E-09	1.20E-08	4.23E-08	5.74E-09	5.43E-08	3.00E-09	1.48E-08	5.49E-09	1.78E-08	8.93E-04	2.68E-10	1.41E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.12E-08	0.00E+00	3.32E-08	3.00E-09	7.40E-09	0.00E+00	1.04E-08	0.00E+00	0.00E+00	0.00E+00	
6.02E-09	3.44E-07	5.26E-08	9.82E-09	1.20E-08	4.76E-08	1.88E-09	5.96E-08	3.00E-09	1.66E-08	1.80E-09	1.96E-08	1.04E-03	2.80E-10	1.63E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.38E-08	0.00E+00	3.58E-08	3.00E-09	8.32E-09	0.00E+00	1.13E-08	0.00E+00	0.00E+00	0.00E+00	
1.25E-08	6.00E-08	3.82E-06	0.00E+00	1.20E-08	4.76E-08	2.02E-09	5.96E-08	3.00E-09	1.66E-08	1.85E-09	1.96E-08	1.01E-03	8.73E-07	2.05E-07	
6.00E-09	3.41E-07	5.25E-08	9.83E-09	1.20E-08	4.76E-08	1.87E-09	5.96E-08	3.00E-09	1.66E-08	1.79E-09	1.96E-08	1.04E-03	2.79E-10	1.63E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.38E-08	0.00E+00	3.58E-08	3.00E-09	8.32E-09	0.00E+00	1.13E-08	0.00E+00	0.00E+00	0.00E+00	
1.25E-08	6.00E-08	3.82E-06	0.00E+00	1.20E-08	4.76E-08	2.02E-09	5.96E-08	3.00E-09	1.66E-08	1.85E-09	1.96E-08	1.00E-03	8.73E-07	2.05E-07	
6.02E-09	3.47E-07	5.26E-08	9.82E-09	1.20E-08	4.76E-08	1.88E-09	5.96E-08	3.00E-09	1.66E-08	1.80E-09	1.96E-08	1.04E-03	2.79E-10	1.63E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.38E-08	0.00E+00	3.58E-08	3.00E-09	8.32E-09	0.00E+00	1.13E-08	0.00E+00	0.00E+00	0.00E+00	
1.25E-08	6.00E-08	3.82E-06	0.00E+00	1.20E-08	4.76E-08	2.02E-09	5.96E-08	3.00E-09	1.66E-08	1.85E-09	1.96E-08	1.01E-03	8.73E-07	2.05E-07	
8.59E-09	6.03E-07	7.09E-08	1.00E-08	1.20E-08	4.76E-08	2.52E-09	5.96E-08	3.00E-09	1.66E-08	2.41E-09	1.96E-08	1.06E-03	3.99E-10	1.67E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.38E-08	0.00E+00	3.58E-08	3.00E-09	8.32E-09	0.00E+00	1.13E-08	0.00E+00	0.00E+00	0.00E+00	
1.21E-08	1.01E-07	3.73E-06	0.00E+00	1.20E-08	4.76E-08	1.79E-09	5.96E-08	3.00E-09	1.66E-08	1.64E-09	1.96E-08	1.02E-03	8.48E-07	2.09E-07	
5.44E-09	2.62E-07	4.19E-08	9.52E-09	1.20E-08	4.49E-08	3.07E-09	5.69E-08	3.00E-09	1.57E-08	2.94E-09	1.87E-08	1.01E-03	2.53E-10	1.58E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.24E-08	0.00E+00	3.44E-08	3.00E-09	7.85E-09	0.00E+00	1.09E-08	0.00E+00	0.00E+00	0.00E+00	
9.97E-09	5.19E-08	2.67E-06	0.00E+00	1.20E-08	4.49E-08	1.56E-09	5.69E-08	3.00E-09	1.57E-08	1.43E-09	1.87E-08	8.77E-04	6.98E-07	1.79E-07	
5.44E-09	2.61E-07	4.19E-08	9.52E-09	1.20E-08	4.49E-08	3.07E-09	5.69E-08	3.00E-09	1.57E-08	2.93E-09	1.87E-08	1.01E-03	2.53E-10	1.58E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.24E-08	0.00E+00	3.44E-08	3.00E-09	7.85E-09	0.00E+00	1.09E-08	0.00E+00	0.00E+00	0.00E+00	

MTens/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
9.97E-09	5.20E-08	2.67E-06	0.00E+00	1.20E-08	4.49E-08	1.56E-09	5.69E-08	3.00E-09	1.57E-08	1.43E-09	1.87E-08	8.77E-04	6.97E-07	1.79E-07	
5.44E-09	2.64E-07	4.19E-08	9.52E-09	1.20E-08	4.49E-08	3.09E-09	5.69E-08	3.00E-09	1.57E-08	2.95E-09	1.87E-08	1.01E-03	2.53E-10	1.58E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.24E-08	0.00E+00	3.44E-08	3.00E-09	7.85E-09	0.00E+00	1.09E-08	0.00E+00	0.00E+00	0.00E+00	
9.97E-09	5.20E-08	2.67E-06	0.00E+00	1.20E-08	4.49E-08	1.56E-09	5.69E-08	3.00E-09	1.57E-08	1.43E-09	1.87E-08	8.77E-04	6.97E-07	1.79E-07	
6.85E-09	4.06E-07	5.10E-08	9.61E-09	1.20E-08	4.49E-08	3.80E-09	5.69E-08	3.00E-09	1.57E-08	3.64E-09	1.87E-08	1.01E-03	3.18E-10	1.60E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.24E-08	0.00E+00	3.44E-08	3.00E-09	7.85E-09	0.00E+00	1.09E-08	0.00E+00	0.00E+00	0.00E+00	
9.71E-09	7.53E-08	2.70E-06	0.00E+00	1.20E-08	4.49E-08	1.42E-09	5.69E-08	3.00E-09	1.57E-08	1.31E-09	1.87E-08	8.91E-04	6.79E-07	1.82E-07	
5.44E-09	2.69E-07	4.17E-08	9.52E-09	1.20E-08	4.49E-08	3.09E-09	5.69E-08	3.00E-09	1.57E-08	2.96E-09	1.87E-08	1.01E-03	2.53E-10	1.58E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.24E-08	0.00E+00	3.44E-08	3.00E-09	7.85E-09	0.00E+00	1.09E-08	0.00E+00	0.00E+00	0.00E+00	
9.96E-09	5.24E-08	2.67E-06	0.00E+00	1.20E-08	4.49E-08	1.56E-09	5.69E-08	3.00E-09	1.57E-08	1.43E-09	1.87E-08	8.78E-04	6.97E-07	1.79E-07	
6.70E-09	4.08E-07	5.08E-08	8.64E-09	1.20E-08	4.49E-08	3.77E-09	5.69E-08	3.00E-09	1.57E-08	3.61E-09	1.87E-08	9.12E-04	3.11E-10	1.44E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.24E-08	0.00E+00	3.44E-08	3.00E-09	7.85E-09	0.00E+00	1.09E-08	0.00E+00	0.00E+00	0.00E+00	
9.74E-09	7.21E-08	2.69E-06	0.00E+00	1.20E-08	4.49E-08	1.44E-09	5.69E-08	3.00E-09	1.57E-08	1.33E-09	1.87E-08	8.70E-04	6.82E-07	1.77E-07	
5.27E-09	2.21E-07	2.70E-08	9.01E-09	1.20E-08	4.23E-08	5.59E-09	5.43E-08	3.00E-09	1.48E-08	5.34E-09	1.78E-08	9.51E-04	2.45E-10	1.50E-07	
5.28E-09	2.23E-07	2.70E-08	9.01E-09	1.20E-08	4.23E-08	5.60E-09	5.43E-08	3.00E-09	1.48E-08	5.36E-09	1.78E-08	9.52E-04	2.45E-10	1.50E-07	
5.25E-09	2.20E-07	2.69E-08	8.99E-09	1.20E-08	4.23E-08	5.57E-09	5.43E-08	3.00E-09	1.48E-08	5.33E-09	1.78E-08	9.50E-04	2.44E-10	1.50E-07	
5.67E-09	2.32E-07	2.90E-08	8.10E-09	1.20E-08	4.23E-08	5.90E-09	5.43E-08	3.00E-09	1.48E-08	5.65E-09	1.78E-08	8.55E-04	2.63E-10	1.35E-07	
9.86E-09	3.98E-07	5.30E-08	1.02E-08	1.20E-08	4.62E-08	3.20E-09	5.82E-08	3.00E-09	1.62E-08	3.06E-09	1.92E-08	1.08E-03	4.58E-10	1.70E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.31E-08	0.00E+00	3.51E-08	3.00E-09	8.08E-09	0.00E+00	1.11E-08	0.00E+00	0.00E+00	0.00E+00	
1.26E-08	6.09E-08	3.06E-06	0.00E+00	1.20E-08	4.62E-08	1.78E-09	5.82E-08	3.00E-09	1.62E-08	1.64E-09	1.92E-08	9.77E-04	8.82E-07	1.99E-07	
1.00E-08	4.14E-07	5.37E-08	1.02E-08	1.20E-08	4.62E-08	3.26E-09	5.82E-08	3.00E-09	1.62E-08	3.12E-09	1.92E-08	1.08E-03	4.66E-10	1.70E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.31E-08	0.00E+00	3.51E-08	3.00E-09	8.08E-09	0.00E+00	1.11E-08	0.00E+00	0.00E+00	0.00E+00	
1.26E-08	6.57E-08	3.06E-06	0.00E+00	1.20E-08	4.62E-08	1.76E-09	5.82E-08	3.00E-09	1.62E-08	1.62E-09	1.92E-08	9.80E-04	8.80E-07	2.00E-07	
9.07E-09	3.41E-07	5.04E-08	1.02E-08	1.20E-08	4.62E-08	2.88E-09	5.82E-08	3.00E-09	1.62E-08	2.76E-09	1.92E-08	1.08E-03	4.21E-10	1.70E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.31E-08	0.00E+00	3.51E-08	3.00E-09	8.08E-09	0.00E+00	1.11E-08	0.00E+00	0.00E+00	0.00E+00	
1.26E-08	6.30E-08	3.06E-06	0.00E+00	1.20E-08	4.62E-08	1.77E-09	5.82E-08	3.00E-09	1.62E-08	1.63E-09	1.92E-08	9.82E-04	8.81E-07	2.00E-07	
8.91E-09	3.53E-07	4.96E-08	1.01E-08	1.20E-08	4.62E-08	2.92E-09	5.82E-08	3.00E-09	1.62E-08	2.79E-09	1.92E-08	1.06E-03	4.14E-10	1.68E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.31E-08	0.00E+00	3.51E-08	3.00E-09	8.08E-09	0.00E+00	1.11E-08	0.00E+00	0.00E+00	0.00E+00	
1.26E-08	5.93E-08	3.06E-06	0.00E+00	1.20E-08	4.62E-08	1.79E-09	5.82E-08	3.00E-09	1.62E-08	1.65E-09	1.92E-08	9.77E-04	8.83E-07	1.99E-07	
5.07E-09	1.92E-07	3.54E-08	9.60E-09	1.20E-08	4.55E-08	2.31E-09	5.75E-08	3.00E-09	1.59E-08	2.21E-09	1.89E-08	1.01E-03	2.36E-10	1.60E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.27E-08	0.00E+00	3.47E-08	3.00E-09	7.96E-09	0.00E+00	1.10E-08	0.00E+00	0.00E+00	0.00E+00	
1.11E-08	5.43E-08	2.75E-06	0.00E+00	1.20E-08	4.55E-08	1.64E-09	5.75E-08	3.00E-09	1.59E-08	1.50E-09	1.89E-08	9.16E-04	7.79E-07	1.87E-07	
5.07E-09	1.88E-07	3.54E-08	9.60E-09	1.20E-08	4.55E-08	2.30E-09	5.75E-08	3.00E-09	1.59E-08	2.20E-09	1.89E-08	1.01E-03	2.36E-10	1.60E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.27E-08	0.00E+00	3.47E-08	3.00E-09	7.96E-09	0.00E+00	1.10E-08	0.00E+00	0.00E+00	0.00E+00	
1.11E-08	5.43E-08	2.75E-06	0.00E+00	1.20E-08	4.55E-08	1.64E-09	5.75E-08	3.00E-09	1.59E-08	1.50E-09	1.89E-08	9.16E-04	7.79E-07	1.87E-07	
5.02E-09	1.83E-07	3.51E-08	9.61E-09	1.20E-08	4.55E-08	2.28E-09	5.75E-08	3.00E-09	1.59E-08	2.18E-09	1.89E-08	1.01E-03	2.33E-10	1.60E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.27E-08	0.00E+00	3.47E-08	3.00E-09	7.96E-09	0.00E+00	1.10E-08	0.00E+00	0.00E+00	0.00E+00	
1.11E-08	5.43E-08	2.75E-06	0.00E+00	1.20E-08	4.55E-08	1.64E-09	5.75E-08	3.00E-09	1.59E-08	1.50E-09	1.89E-08	9.16E-04	7.79E-07	1.87E-07	
1.05E-08	6.78E-08	1.58E-07	1.52E-08	1.20E-08	4.50E-08	1.49E-09	5.70E-08	3.00E-09	1.58E-08	1.37E-09	1.88E-08	1.54E-03	2.76E-09	6.81E-09	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.25E-08	0.00E+00	3.45E-08	3.00E-09	7.88E-09	0.00E+00	1.09E-08	0.00E+00	0.00E+00	0.00E+00	
1.15E-08	1.21E-06	3.89E-08	1.21E-08	3.60E-08	8.19E-08	3.00E-08	1.18E-07	9.00E-09	2.87E-08	2.87E-08	3.77E-08	1.28E-03	5.34E-10	2.01E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	4.09E-08	0.00E+00	7.69E-08	9.00E-09	1.43E-08	0.00E+00	2.33E-08	0.00E+00	0.00E+00	0.00E+00	
1.34E-08	1.53E-07	2.88E-06	0.00E+00	3.60E-08	8.19E-08	1.97E-09	1.18E-07	9.00E-09	2.87E-08	1.81E-09	3.77E-08	1.02E-03	9.35E-07	2.08E-07	
1.12E-08	1.34E-06	3.78E-08	1.16E-08	3.60E-08	8.19E-08	2.97E-08	1.18E-07	9.00E-09	2.87E-08	2.84E-08	3.77E-08	1.22E-03	5.19E-10	1.93E-07	
1.15E-08	1.38E-06	3.90E-08	1.16E-08	3.60E-08	8.19E-08	3.14E-08	1.18E-07	9.00E-09	2.87E-08	3.01E-08	3.77E-08	1.22E-03	5.36E-10	1.93E-07	
1.01E-08	1.24E-06	6.36E-08	1.30E-08	3.60E-08	9.42E-08	1.65E-08	1.30E-07	9.00E-09	3.30E-08	1.58E-08	4.20E-08	1.37E-03	4.67E-10	2.16E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	4.71E-08	0.00E+00	8.31E-08	9.00E-09	1.65E-08	0.00E+00	2.55E-08	0.00E+00	0.00E+00	0.00E+00	
1.02E-08	1.28E-06	6.48E-08	1.29E-08	3.60E-08	9.42E-08	1.71E-08	1.30E-07	9.00E-09	3.30E-08	1.64E-08	4.20E-08	1.37E-03	4.75E-10	2.15E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	4.71E-08	0.00E+00	8.31E-08	9.00E-09	1.65E-08	0.00E+00	2.55E-08	0.00E+00	0.00E+00	0.00E+00	
1.68E-08	1.73E-07	4.98E-06	0.00E+00	3.60E-08	9.42E-08	2.52E-09	1.30E-07	9.00E-09	3.30E-08	2.32E-09	4.20E-08	1.15E-03	1.17E-06	2.35E-07	
2.48E-08	1.62E-06	1.42E-07	1.51E-08	3.60E-08	1.07E-07	8.98E-09	1.43E-07	9.00E-09	3.75E-08	8.59E-09	4.65E-08	1.60E-03	1.15E-09	2.51E-07	

MTens/Mile															
ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	5.43E-08	0.00E+00	9.03E-08	9.00E-09	1.90E-08	0.00E+00	2.80E-08	0.00E+00	0.00E+00	0.00E+00	
2.45E-08	2.92E-07	8.20E-06	0.00E+00	3.60E-08	1.07E-07	3.25E-09	1.43E-07	9.00E-09	3.73E-08	2.99E-09	4.63E-08	1.46E-03	1.71E-06	2.98E-07	
8.57E-09	7.97E-07	4.34E-08	1.37E-08	3.60E-08	8.88E-08	1.35E-08	1.25E-07	9.00E-09	3.11E-08	1.29E-08	4.01E-08	1.44E-03	3.98E-10	2.27E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	4.44E-08	0.00E+00	8.04E-08	9.00E-09	1.55E-08	0.00E+00	2.45E-08	0.00E+00	0.00E+00	0.00E+00	
1.52E-08	1.64E-07	4.04E-06	0.00E+00	3.60E-08	8.88E-08	2.26E-09	1.25E-07	9.00E-09	3.11E-08	2.07E-09	4.01E-08	1.12E-03	1.07E-06	2.29E-07	
9.78E-09	1.02E-06	5.08E-08	1.39E-08	3.60E-08	8.78E-08	1.68E-08	1.24E-07	9.00E-09	3.07E-08	1.61E-08	3.97E-08	1.47E-03	4.54E-10	2.32E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	4.44E-08	0.00E+00	8.04E-08	9.00E-09	1.55E-08	0.00E+00	2.45E-08	0.00E+00	0.00E+00	0.00E+00	
1.52E-08	1.82E-07	4.27E-06	0.00E+00	3.60E-08	8.78E-08	2.22E-09	1.24E-07	9.00E-09	3.07E-08	2.04E-09	3.97E-08	1.14E-03	1.07E-06	2.32E-07	
9.68E-09	9.99E-07	4.99E-08	1.38E-08	3.60E-08	8.78E-08	1.64E-08	1.24E-07	9.00E-09	3.07E-08	1.57E-08	3.97E-08	1.46E-03	4.50E-10	2.30E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	4.44E-08	0.00E+00	8.04E-08	9.00E-09	1.55E-08	0.00E+00	2.45E-08	0.00E+00	0.00E+00	0.00E+00	
1.52E-08	1.75E-07	4.19E-06	0.00E+00	3.60E-08	8.77E-08	2.23E-09	1.24E-07	9.00E-09	3.07E-08	2.05E-09	3.97E-08	1.14E-03	1.07E-06	2.31E-07	
2.42E-08	3.62E-06	5.78E-08	3.64E-08	3.60E-08	2.10E-07	1.78E-08	2.46E-07	9.00E-09	7.35E-08	1.70E-08	8.25E-08	3.84E-03	1.12E-09	6.05E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	1.05E-07	0.00E+00	1.41E-07	9.00E-09	3.68E-08	0.00E+00	4.58E-08	0.00E+00	0.00E+00	0.00E+00	
3.75E-09	1.48E-07	9.55E-06	0.00E+00	3.60E-08	2.10E-07	1.15E-09	2.46E-07	9.00E-09	7.35E-08	1.06E-09	8.25E-08	1.31E-03	2.46E-07	2.68E-07	
1.02E-08	1.18E-06	4.75E-08	1.20E-08	3.60E-08	8.62E-08	2.18E-08	1.22E-07	9.00E-09	3.02E-08	2.09E-08	3.92E-08	1.26E-03	4.74E-10	1.99E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	4.33E-08	0.00E+00	7.93E-08	9.00E-09	1.52E-08	0.00E+00	2.42E-08	0.00E+00	0.00E+00	0.00E+00	
1.46E-08	1.69E-07	3.79E-06	0.00E+00	3.60E-08	8.62E-08	2.15E-09	1.22E-07	9.00E-09	3.02E-08	1.97E-09	3.92E-08	1.07E-03	1.02E-06	2.19E-07	
1.13E-08	1.11E-06	1.04E-07	1.46E-08	3.60E-08	1.01E-07	7.49E-09	1.37E-07	9.00E-09	3.55E-08	7.17E-09	4.45E-08	1.54E-03	5.25E-10	2.43E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-08	5.19E-08	0.00E+00	8.79E-08	9.00E-09	1.82E-08	0.00E+00	2.72E-08	0.00E+00	0.00E+00	0.00E+00	
4.27E-07	2.52E-06	2.89E-05	1.77E-08	2.00E-08	9.69E-08	1.56E-09	1.17E-07	5.00E-09	3.39E-08	1.43E-09	3.89E-08	1.79E-03	9.21E-08	1.05E-07	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-08	4.85E-08	0.00E+00	6.85E-08	5.00E-09	1.70E-08	0.00E+00	2.20E-08	0.00E+00	0.00E+00	0.00E+00	
3.23E-09	1.57E-08	5.72E-07	8.40E-09	8.00E-09	9.10E-08	1.30E-09	9.90E-08	2.00E-09	3.19E-08	1.20E-09	3.39E-08	8.50E-04	1.22E-09	2.76E-09	
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.98E-08	5.50E-08	0.00E+00	8.48E-08	7.44E-09	1.93E-08	0.00E+00	2.67E-08	0.00E+00	0.00E+00	0.00E+00	

We Can Model Regional Emissions, But Are the Results Meaningful for CEQA?

Authors: AEP Climate Change Committee (Michael Hendrix, Dave Mitchell, Haseeb Qureshi, Jennifer Reed, Brian Schuster, Nicole Vermilion, and Rich Walters)

On December 24, 2018, the California Supreme Court, *Sierra Club v. County of Fresno (Friant Ranch, L.P.] (2018) 6 Cal.5th 502, Case No. S219783 (Friant Ranch*), held that simply identifying that a project exceeds an emissions threshold is not sufficient to identify a project's significant effect on the environment relative to the health effects of project emissions. The Court found that an EIR should make a reasonable effort to substantively connect a project's criteria pollutant emissions to likely health consequences, or explain why it is not currently feasible to provide such an analysis. In 2019, there were several CEQA documents that included health effects modeling to provide additional analysis for projects with criteria air pollutant emissions that exceed a significance threshold. While it is technically possible to conduct this modeling, we argue that this additional layer of quantitative analysis may not always provide decision-makers and the public with additional meaningful information. It is the air districts that are best suited to provide frameworks for how to identify health effects of regional criteria pollutant emissions under CEQA.

Introduction

Significance thresholds for regional criteria pollutants used by California air districts and lead agencies represent the maximum emissions from a project that are not expected to cause or contribute to an exceedance of the most stringent applicable national or state ambient air quality standard (AAQS). By analyzing the project's emissions against these thresholds, the CEQA document assesses whether these emissions directly contribute to any regional or local exceedances of the applicable AAQS and exposure levels. The basis of the ruling in Friant Ranch was that the EIR did not provide a meaningful analysis of the adverse health effects that would be associated with the project's criteria pollutant emissions, which were identified as being far above the relevant thresholds. The discussion of the adverse health effects in the EIR was general in nature and did not connect the levels of the pollutants that would be emitted by the project to adverse health effects.

The process of correlating project-related criteria pollutant emissions to health-based consequences is called a health impact assessment (HIA). An HIA involves two steps: 1) running a regional photochemical grid model (PGM) to estimate the small increases in concentrations of ozone and particulate matter (PM) in the region as a result of a project's emissions of criteria and precursor pollutants; and 2) running the U.S. EPA Benefits Mapping and Analysis Program (BenMAP) to estimate the resulting health impacts from these increases in concentrations of ozone and PM.

Limitations of Regional-Scale Dispersion Models

It is technically feasible to conduct regional-scale criteria pollutant modeling for a development project. Particulate matter (PM) can be divided into two categories: directly emitted PM and secondary PM. Secondary PM, is formed via complex chemical reactions in the atmosphere between precursor chemicals such as sulfur oxides (SO_x) and NO_x, Ozone (O_3) is a secondary pollutant formed from the oxidation of reactive organic gases (ROGs) and nitrogen oxides (NOx) in the presence of sunlight. Rates of ozone formation are a function of a variety of complex physical factors, including the presence of sunlight and precursor pollutants, natural topography, nearby structures that cause building downwash, atmospheric stability, and wind patterns.. Secondary formation of PM and ozone can occur far from the original emissions source from regional transport due to wind and topography (e.g. low-level jet stream). As such, modeling concentrations of secondary PM and ozone require photochemical grid models (PGMs), such as CMAQ and CAMx. These models have a much larger "grid" system and much lower resolution than localized dispersion modeling (e.g., AERMOD). For example, common grid cells in PGMs are 4x4 kilometers, while AERMOD can identify concentrations at the meter-level.

Photochemical modeling also depends on all emission sources in the entire domain. Low resolution and spatial averaging produces "noise" and model uncertainty that can exceed a project's specific emissions. Additionally, regional-scale models are highly contingent upon background concentrations. Factors such as meteorology and topography greatly affect the certainty levels of predicted concentrations at receptor points. As a result, there are statistical ranges of uncertainty through all the modeling steps. Due to these factors, it is difficult to predict ground-level secondary PM and ozone concentrations associated with relatively small emission sources with a high degree of certainty. While it is possible to use a regional-scale model to predict these regional concentrations, when a project's emissions are less than the regional model's resolution, the resultant ambient air quality concentrations will be within the margin of uncertainty. In CEQA terms, this would fit the definition of "speculative". Only when the scale of emissions would result in changes in ambient air quality beyond the model margin of uncertainty would the results not be "speculative" as defined by CEQA.

Identifying Health Effects due to Ambient Air Quality Changes

BenMap is a model developed by the USEPA to understand the health effects from changes in ozone and PM concentrations. If there is an acceptable level of confidence that the results provided by the regional dispersion modeling are valid, then these concentrations can be translated into health outcomes using BenMap. The health outcomes in BenMap are based on changes in ambient air concentrations and the population exposed to these changes. Data provided by this analysis may indicate increased number of workdays lost to illness, hospital admissions (respiratory), emergency room visits (asthma), or mortality, among other health effects. These are called "health incidences."

Translating the incremental increase in PM and ozone concentrations to specific health effects is also subject to uncertainty. For example, regional models assign the same toxicity to PM regardless of the source of PM (such as road dust as exhaust), and thus potentially overpredict adverse health effects of PM. BenMap also assumes that health effects can occur at any concentration, including small incremental concentrations, and assumes that impacts seen at large concentration differences can be linearly scaled down to small increases in concentration, with no consideration of potential thresholds below which health impacts may not occur. Additionally, BenMap is used for assessing impacts over large areas and populations and was not intended to be used for individual projects. For health incidences, the number of hospitalizations or increase in morbidity predicted by BenMap is greatly affected by the population characteristics.[1] Small increases in emissions in an area with a high population have a much greater affect than large increases in emissions over an area with a small population. As a result, the same amount of emissions generated in an urban area could result in greater health consequences than if the same emissions occurred on the urban periphery, where fewer people may be affected. This will also depend on other factors including meteorology and photochemistry, as discussed above. Emissions in areas with conditions that favor high air dispersion or unfavorable ozone formation will likely have relatively lower effects on ambient air quality and health outcomes.

While BenMap provides additional statistical information about health consequences requested by the Court in the Friant Ranch decision, this information is only meaningful when presented with the full health context of the region or locality at hand. For example, if the BenMap analysis says that the project would result in two additional hospital admissions, this result alone is not useful unless one identifies how many hospital admissions are caused by poor air quality now (without the project) and how many hospital admissions occur

[1] BenMap assigns prevalence rate for asthma and other health effects based on indicators such as gender, race, age, ethnicity, etc. The BenMap user manual specifically states that there are a wide range of variables that can be included in the health effect function. The health effect function was developed based on epidemiological studies, and specifically states that "there are a number of issues that arise when deriving and choosing between health effect functions that go well beyond this user manual. Hence, it is important to have a trained health researcher assist in developing the impact function data file."

overall (due to air quality and other causes). Because health is not solely influenced by ambient air quality, and has many factors that are highly variable across geographies and populations, there is an added level of uncertainty in using a generalized identification of health effects due to air quality conditions overlaid onto a specific diverse set of health conditions and other factors. Regardless of the uncertainty levels, if regional health effects are identified for a project, then the CEQA analysis needs to provide a full health baseline for decision-makers and the public to be able to understand the marginal change due to project criteria pollutant emissions. Given the margin of uncertainty at each step in the process (regional scale modeling, existing ambient air quality effects on health, population health conditions vulnerability, and marginal health effects of air pollution), the identification of marginal health effects due to individual projects using regional air quality modelling and tools such as BenMap are likely to be within the level of uncertainty and thus defined as "speculative" per CEQA.

The Role of Air Districts

Regional, community, multiscale air quality modeling conducted by the air districts for each individual air basin or locality within the air basin would be the most appropriate indictor of health effects for projects. The AQMPs provide a forecast of regional emissions based on regional dispersion modeling for all sources within the air basin. Regional-scale models attempt to account for all emissions sources within an air basin.

The regional scale model requires inputs such as existing and future regional sources of pollutants and global meteorological data, which are generally not accessible by CEQA practitioners. Modeling of future years should consider future concentrations of air pollutants based on regional growth projections and existing programs, rules, and regulations adopted by Federal, State, and local air districts. In general, air pollution in California is decreasing as a result of Federal and State laws. Based on the air quality management plans (AQMPs) required for air districts in a nonattainment area, air quality in the air basins are anticipated to improve despite an increase in population and employment growth. Air districts are charged with assessing programs, rules, and regulations so that the increase in population and employment does not conflict with the mandate to achieve the AAQS. Because emissions forecasting and health outcomes based on the regional growth projections to achieve the AAQS is under the purview of the air districts, it should also fall on the air districts to identify the potential health outcomes associated with individual project's criteria pollutant emissions.

The South Coast Air Quality Management District (South Coast AQMD) and the Sacramento Metropolitan Air Quality Management District (Sacramento Metropolitan AQMD) are exploring concepts for project-level analysis in light of Friant Ranch to assist local lead agencies.

» South Coast AQMD is looking at the largest land use development project they have had in the air basin and doing a sensitivity analysis (using CAMx for photochemical grid modeling and BenMap for health outcomes) to see how locating a very large project in different parts of the air basin (Los Angeles, Inland Empire, v. Orange County) would affect the health incidence.

» Sacramento Metropolitan AQMD is also looking at a screening process. Rather than looking at the upper end (i.e., largest project in the air basin), Sacramento Metropolitan AQMD is starting at the smallest project that exceeds the regional significance threshold and running CAMx and BenMap at different locations in the air basin to see how it affects regional health incidences.

Guidance from Air Districts would be the most effective way to incorporate meaningful information concerning regional health effects of project criteria pollutants in CEQA analyses, including guidance as to when modelling is and is not useful and meaningful, how modelling should be conducted, and how to best present additional information to inform decision-makers and the public about a project's impacts.

So…until air districts do their part, what should we do?

PROJECTS WITH CRITERIA POLLUTANT EMISSIONS BELOW AIR DISTRICT THRESHOLDS

The Friant Ranch ruling was about providing disclosure of health effects of project emissions that were well over the significance thresholds. Since the air district thresholds are tied to a level the air districts find to not have a significant effect on ambient air quality, there should be no need to discuss the health effects of criteria pollutant emissions that are less than the significance thresholds.

PROJECTS WITH CRITERIA POLLUTANT EMISSIONS ABOVE AIR DISTRICT THRESHOLDS

Pursuant to Section 15125 of the CEQA Guidelines, the environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant. For CEQA, the health effects associated with buildout of a project would occur at the project's horizon year. Because CEQA requires an analysis of the change from existing conditions, the change in effects would be associated with changes in ambient air quality and associated health outcomes between existing conditions and the project's horizon year. Therefore, in order to show how a project affects health outcomes in an air basin, the CEQA documents will need to qualitatively or quantitatively address: (1) existing ambient criteria pollutant concentrations, health incidences due to existing air quality, and health incidences overall; 2) future (without project) ambient criteria pollutant concentrations and health incidences, and 3) future (with project) ambient criteria pollutant concentrations and health incidences.

Projects with significant criteria pollutant emissions could use regional modelling and BenMap to identify health effects of project emissions, but it is likely that many (or most) projects that are not regionally substantial in scale will be shown to have minimal regional changes in PM and ozone concentrations and therefore minimal changes in associated health effects. In addition, many projects may have emissions that are less than the uncertainty level of regional air quality models and BenMap health effects modeling; in these cases, quantitative results will not be meaningful. Thus, absent better direction from air districts, CEQA lead agencies will have to determine on a case by case basis whether a qualitative discussion of health effects will suffice, or whether regional modeling, despite its limitations, should be conducted for the project.

Where a project has substantial criteria pollutant emissions when considered on a regional scale, and there is reason to believe that the modeling of ambient air quality and regional health effects would produce non-speculative results when considering modeling uncertainties, then CEQA lead agencies should use regional modelling.

Conclusion

The purpose of CEQA is to inform the public as to the potential for a project to result in one or more significant adverse effects on the environment (including health effects). A CEQA document must provide an understandable and clear environmental analysis and provide an adequate basis for decision making and public disclosure. Regional dispersion modeling of criteria pollutants and secondary pollutants like PM and ozone can provide additional information, but that information may be within the margin of modelling uncertainty and/or may not be meaningful for the public and decision-makers unless a full health context is presented in the CEQA document. Simply providing health outcomes based on use of a regional-scale model and BenMap may not satisfy the goal to provide decision-makers and the public with information that would assist in weighting the environmental consequences of a project. A CEQA document must provide an analysis that is understandable for decision making and public disclosure. Regional scale modeling may provide a technical method for this type of analysis, but it does not necessarily provide a meaningful way to connect the magnitude of a project's criteria pollutant emissions to health effects without speculation.

In order to accurately connect the dots, we urge California air districts to provide more guidance on how to identify and describe the health effects of exceeding regional criteria pollutant thresholds. The air districts are the primary agency responsible for ensuring that the air basins attain the AAQS and ensure the health and welfare of its residents relative to air quality. Because emissions forecasting and health outcomes are based on the regional growth projections to achieve the AAQS is under the purview of the air districts, it should fall on the air districts to identify the potential health outcomes associated with exceeding the CEQA thresholds for projects. The air districts should provide lead agencies with a consistent, reliable, and meaningful analytical approach to correlate specific health effects that may result from a project's criteria pollutant emissions.

Glossary

AAQS – Ambient Air Quality Standards

BenMap – Benefits Mapping and Analysis Program

CAMx – Comprehensive Air Quality Model with extensions

CMAQ – Community Multiscale Air Quality

NOx – Nitrogen Oxides

PM – Particulate Matter

SOx – Sulfur Oxides

State – California

USEPA – United States Environmental Protection Agency

S219783

IN THE SUPREME COURT OF C ALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,

Plaintiffs and Appellants,

v.

COUNTY OF FRESNO,

Defendant and Respondent,

and,

FRIANT RANCH, L.P.,

Real Party in Interest and Respondent.

After a Published Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726
Honorable Rosendo A. Pena, Jr.

APPLICATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FOR LEAVE TO FILE BRIEF OF *AMICUS CURIAE* IN SUPPORT OF NEITHER PARTY AND *[PROPOSED]* BRIEF OF *AMICUS CURIAE*

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TO THE HONORABLE CHIEF JUSTICE AND JUSTICES OF THE SUPREME COURT:

APPLICATION FOR LEAVE TO FILE *AMICUS CURIAE* BRIEF

Pursuant to Rule 8.520(f) of the California Rules of Court, the South Coast Air Quality Management District (SCAQMD) respectfully requests leave to file the attached *amicus curiae* brief. Because SCAQMD's position differs from that of either party, we request leave to submit this amicus brief in support of neither party.

HOW THIS BRIEF WILL ASSIST THE COURT

SCAQMD's proposed amicus brief takes a position on two of the issues in this case. In both instances, its position differs from that of either party. The issues are:

1) Does the California Environmental Quality Act (CEQA) require an environmental impact report (EIR) to correlate a project's air pollution emissions with specific levels of health impacts?
2) What is the proper standard of review for determining whether an EIR provides sufficient information on the health impacts caused by a project's emission of air pollutants?

This brief will assist the Court by discussing the practical realities of correlating identified air quality impacts with specific health outcomes. In short, CEQA requires agencies to provide detailed information about a project's air quality impacts that is sufficient for the public and decisionmakers to adequately evaluate the project and meaningfully understand its impacts. However, the level of analysis is governed by a rule of reason; CEQA only requires agencies to conduct analysis if it is reasonably feasible to do so.

With regard to health-related air quality impacts, an analysis that correlates a project's air pollution emissions with specific levels of health impacts will be feasible in some cases but not others. Whether it is feasible depends on a variety of factors, including the nature of the project and the nature of the analysis under consideration. The feasibility of analysis may also change over time as air districts and others develop new tools for measuring projects' air quality related health impacts. Because SCAQMD has among the most sophisticated air quality modeling and health impact evaluation capability of any of the air districts in the State, it is uniquely situated to express an opinion on the extent to which the Court should hold that CEQA requires lead agencies to correlate air quality impacts with specific health outcomes.

SCAQMD can also offer a unique perspective on the question of the appropriate standard of review. SCAQMD submits that the proper standard of review for determining whether an EIR is sufficient as an informational document is more nuanced than argued by either party. In our view, this is a mixed question of fact and law. It includes determining whether additional analysis is feasible, which is primarily a factual question that should be reviewed under the substantial evidence standard. However, it also involves determining whether the omission of a particular analysis renders an EIR insufficient to serve CEQA's purpose as a meaningful, informational document. If a lead agency has not determined that a requested analysis is infeasible, it is the court's role to determine whether the EIR nevertheless meets CEQA's purposes, and courts should not defer to the lead agency's conclusions regarding the legal sufficiency of an EIR's analysis. The ultimate question of whether an EIR's analysis is "sufficient" to serve CEQA's informational purposes is predominately a question of law that courts should review de novo.

This brief will explain the rationale for these arguments and may assist the Court in reaching a conclusion that accords proper respect to a lead agency's factual conclusions while maintaining judicial authority over the ultimate question of what level of analysis CEQA requires.

STATEMENT OF INTEREST OF *AMICUS CURIAE*

The SCAQMD is the regional agency primarily responsible for air pollution control in the South Coast Air Basin, which consists of all of Orange County and the non-desert portions of the Los Angeles, Riverside, and San Bernardino Counties. (Health & Saf. Code § 40410; Cal. Code Regs., tit. 17, § 60104.) The SCAQMD participates in the CEQA process in several ways. Sometimes it acts as a lead agency that prepares CEQA documents for projects. Other times it acts as a responsible agency when it has permit authority over some part of a project that is undergoing CEQA review by a different lead agency. Finally, SCAQMD also acts as a commenting agency for CEQA documents that it receives because it is a public agency with jurisdiction by law over natural resources affected by the project.

In all of these capacities, SCAQMD will be affected by the decision in this case. SCAQMD sometimes submits comments requesting that a lead agency perform an additional type of air quality or health impacts analysis. On the other hand, SCAQMD sometimes determines that a particular type of health impact analysis is not feasible or would not produce reliable and informative results. Thus, SCAQMD will be affected by the Court's resolution of the extent to which CEQA requires EIRs to correlate emissions and health impacts, and its resolution of the proper standard of review.

CERTIFICATION REGARDING AUTHORSHIP AND FUNDING

No party or counsel in the pending case authored the proposed amicus curiae brief in whole or in part, or made any monetary contribution intended to fund the preparation or submission of the brief. No person or entity other than the proposed *Amicus Curiae* made any monetary contribution intended to fund the preparation or submission of the brief.

Respectfully submitted,

DATED: April 3, 2015

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BRIEF OF AMICUS CURIAE

SUMMARY OF ARGUMENT

The South Coast Air Quality Management District (SCAQMD) submits that this Court should not try to establish a hard-and-fast rule concerning whether lead agencies are required to correlate emissions of air pollutants with specific health consequences in their environmental impact reports (EIR). The level of detail required in EIRs is governed by a few, core CEQA (California Environmental Quality Act) principles. As this Court has stated, "[a]n EIR must include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." (*Laurel Heights Improvement Assn. v. Regents of the Univ of Cal.* (1988) 47 Cal.3d 376, 405 ["*Laurel Heights I*"]) Accordingly, "an agency must use its best efforts to find out and disclose all that it reasonably can." (*Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 428 (quoting CEQA Guidelines § 15144)[1].). However, "[a]nalysis of environmental effects need not be exhaustive, but will be judged in light of what is reasonably feasible." (*Association of Irritated Residents v. County of Madera* (2003) 107 Cal.App.4th 1383, 1390; CEQA Guidelines §§ 15151, 15204(a).)

With regard to analysis of air quality related health impacts, EIRs must generally quantify a project's pollutant emissions, but in some cases it is not feasible to correlate these emissions to specific, quantifiable health impacts (e.g., premature mortality; hospital admissions). In such cases, a general description of the adverse health impacts resulting from the pollutants at issue may be sufficient. In other cases, due to the magnitude

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[1] The CEQA Guidelines are found at Cal. Code Regs., tit. 14 §§ 15000, *et seq.*

or nature of the pollution emissions, as well as the specificity of the project involved, it may be feasible to quantify health impacts. Or there may be a less exacting, but still meaningful analysis of health impacts that can feasibly be performed. In these instances, agencies should disclose those impacts.

SCAQMD also submits that whether or not an EIR complies with CEQA's informational mandates by providing sufficient, feasible analysis is a mixed question of fact and law. Pertinent here, the question of whether an EIR's discussion of health impacts from air pollution is sufficient to allow the public to understand and consider meaningfully the issues involves two inquiries: (1) Is it feasible to provide the information or analysis that a commenter is requesting or a petitioner is arguing should be required?; and (2) Even if it is feasible, is the agency relying on other policy or legal considerations to justify not preparing the requested analysis? The first question of whether an analysis is feasible is primarily a question of fact that should be judged by the substantial evidence standard. The second inquiry involves evaluating CEQA's information disclosure purposes against the asserted reasons to not perform the requested analysis. For example, an agency might believe that its EIR meets CEQA's informational disclosure standards even without a particular analysis, and therefore choose not to conduct that analysis. SCAQMD submits that this is more of a legal question, which should be reviewed de novo as a question of law.

ARGUMENT

I. RELEVANT FACTUAL AND LEGAL FRAMEWORK.

A. Air Quality Regulatory Background

The South Coast Air Quality Management District (SCAQMD) is one of the local and regional air pollution control districts and air quality

management districts in California. The SCAQMD is the regional air pollution agency for the South Coast Air Basin, which consists of all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties. (Health & Saf. Code § 40410, 17 Cal. Code Reg. § 60104.) The SCAQMD also includes the Coachella Valley in Riverside County (Palm Springs area to the Salton Sea). (SCAQMD, *Final 2012 AQMP (Feb. 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "chapter 7" hyperlink; pp 7-1, 7-3 (last visited Apr. 1, 2015).) The SCAQMD's jurisdiction includes over 16 million residents and has the worst or nearly the worst air pollution levels in the country for ozone and fine particulate matter. (SCAQMD, *Final 2012 AQMP (Feb. 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "Executive Summary" hyperlink p. ES-1 (last visited Apr. 1, 2015).)

Under California law, the local and regional districts are primarily responsible for controlling air pollution from all sources except motor vehicles. (Health & Saf. Code § 40000.) The California Air Resources Board (CARB), part of the California Environmental Protection Agency, is primarily responsible for controlling pollution from motor vehicles. (*Id.*) The air districts must adopt rules to achieve and maintain the state and federal ambient air quality standards within their jurisdictions. (Health & Saf. Code § 40001.)

The federal Clean Air Act (CAA) requires the United States Environmental Protection Agency (EPA) to identify pollutants that are widely distributed and pose a threat to human health, developing a so-called "criteria" document. (42 U.S.C. § 7408; CAA § 108.) These pollutants are frequently called "criteria pollutants." EPA must then establish "national ambient air quality standards" at levels "requisite to protect public health",

allowing "an adequate margin of safety." (42 U.S.C. § 7409; CAA § 109.) EPA has set standards for six identified pollutants: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter (PM), and lead. (U.S. EPA, National Ambient Air Quality Standards (NAAQS), http://www.epa.gov/air/criteria.html (last updated Oct. 21, 2014).)[2]

Under the Clean Air Act, EPA sets emission standards for motor vehicles and "nonroad engines" (mobile farm and construction equipment, marine vessels, locomotives, aircraft, etc.). (42 U.S.C. §§ 7521, 7547; CAA §§ 202, 213.) California is the only state allowed to establish emission standards for motor vehicles and most nonroad sources; however, it may only do so with EPA's approval. (42 U.S.C. §§ 7543(b), 7543(e); CAA §§ 209(b), 209(c).) Sources such as manufacturing facilities, power plants and refineries that are not mobile are often referred to as "stationary sources." The Clean Air Act charges state and local agencies with the primary responsibility to attain the national ambient air quality standards. (42 U.S.C. § 7401(a)(3); CAA § 101(a)(3).) Each state must adopt and implement a plan including enforceable measures to achieve and maintain the national ambient air quality standards. (42 U.S.C. § 7410; CAA § 110.) The SCAQMD and CARB jointly prepare portion of the plan for the South Coast Air Basin and submit it for approval by EPA. (Health & Saf. Code §§ 40460, et seq.)

The Clean Air Act also requires state and local agencies to adopt a permit program requiring, among other things, that new or modified "major" stationary sources use technology to achieve the "lowest achievable emission rate," and to control minor stationary sources as

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[2] Particulate matter (PM) is further divided into two categories: fine particulate or $PM_{2.5}$ (particles with a diameter of less than or equal to 2.5 microns) and coarse particulate (PM_{10}) (particles with a diameter of 10 microns or less). (U.S. EPA, Particulate Matter (PM), http://www.epa.gov/airquality/particlepollution/ (last visited Apr. 1, 2015).)

needed to help attain the standards. (42 U.S.C. §§ 7502(c)(5), 7503(a)(2), 7410(a)(2)(C); CAA §§ 172(c)(5), 173(a)(2), 110(a)(2)(C).) The air districts implement these permit programs in California. (Health & Saf. Code §§ 42300, et seq.)

The Clean Air Act also sets out a regulatory structure for over 100 so-called "hazardous air pollutants" calling for EPA to establish "maximum achievable control technology" (MACT) for sources of these pollutants. (42 U.S.C. § 7412(d)(2); CAA § 112(d)(2).) California refers to these pollutants as "toxic air contaminants" (TACs) which are subject to two state-required programs. The first program requires "air toxics control measures" for specific categories of sources. (Health & Saf. Code § 39666.) The other program requires larger stationary sources and sources identified by air districts to prepare "health risk assessments" for impacts of toxic air contaminants. (Health & Saf. Code §§ 44320(b), 44322, 44360.) If the health risk exceeds levels identified by the district as "significant," the facility must implement a "risk reduction plan" to bring its risk levels below "significant" levels. Air districts may adopt additional more stringent requirements than those required by state law, including requirements for toxic air contaminants. (Health & Saf. Code § 41508; *Western Oil & Gas Assn. v. Monterey Bay Unified APCD* (1989) 49 Cal.3d 408, 414.) For example, SCAQMD has adopted a rule requiring new or modified sources to keep their risks below specified levels and use best available control technology (BACT) for toxics. (SCAQMD, *Rule 1401-New Source Review of Toxic Air Contaminants*, http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-xiv; then follow "Rule 1401" hyperlink (last visited Apr. 1, 2015).)

B. The SCAQMD's Role Under CEQA

The California Environmental Quality Act (CEQA) requires public agencies to perform an environmental review and appropriate analysis for projects that they implement or approve. (Pub. Resources Code § 21080(a).) The agency with primary approval authority for a particular project is generally the "lead agency" that prepares the appropriate CEQA document. (CEQA Guidelines §§ 15050, 15051.) Other agencies having a subsequent approval authority over all or part of a project are called "responsible" agencies that must determine whether the CEQA document is adequate for their use. (CEQA Guidelines §§ 15096(c), 15381.) Lead agencies must also consult with and circulate their environmental impact reports to "trustee agencies" and agencies "with jurisdiction by law" including "authority over resources which may be affected by the project." (Pub. Resources Code §§ 21104(a), 21153; CEQA Guidelines §§ 15086(a)(3), 15073(c).) The SCAQMD has a role in all these aspects of CEQA.

Fulfilling its responsibilities to implement its air quality plan and adopt rules to attain the national ambient air quality standards, SCAQMD adopts a dozen or more rules each year to require pollution reductions from a wide variety of sources. The SCAQMD staff evaluates each rule for any adverse environmental impact and prepares the appropriate CEQA document. Although most rules reduce air emissions, they may have secondary environmental impacts such as use of water or energy or disposal of waste—e.g., spent catalyst from control equipment.[3]

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[3] The SCAQMD's CEQA program for its rules is a "Certified Regulatory Program" under which it prepares a "functionally equivalent" document in lieu of a negative declaration or EIR. (Pub. Resources Code § 21080.5, CEQA Guidelines § 15251(l).)

The SCAQMD also approves a large number of permits every year to construct new, modified, or replacement facilities that emit regulated air pollutants. The majority of these air pollutant sources have already been included in an earlier CEQA evaluation for a larger project, are currently being evaluated by a local government as lead agency, or qualify for an exemption. However, the SCAQMD sometimes acts as lead agency for major projects where the local government does not have a discretionary approval. In such cases, SCAQMD prepares and certifies a negative declaration or environmental impact report (EIR) as appropriate.[4] SCAQMD evaluates perhaps a dozen such permit projects under CEQA each year. SCAQMD is often also a "responsible agency" for many projects since it must issue a permit for part of the projects (e.g., a boiler used to provide heat in a commercial building). For permit projects evaluated by another lead agency under CEQA, SCAQMD has the right to determine that the CEQA document is inadequate for its purposes as a responsible agency, but it may not do so because its permit program already requires all permitted sources to use the best available air pollution control technology. (SCAQMD, *Rule 1303(a)(1) – Requirements*, http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-xiii; then follow "Rule 1303" hyperlink (last visited Apr. 1, 2015).)

Finally, SCAQMD receives as many as 60 or more CEQA documents each month (around 500 per year) in its role as commenting agency or an agency with "jurisdiction by law" over air quality—a natural resource affected by the project. (Pub. Resources Code §§ 21104(a), 21153; CEQA Guidelines § 15366(a)(3).) The SCAQMD staff provides comments on as many as 25 or 30 such documents each month.

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[4] The SCAQMD's permit projects are not included in its Certified Regulatory Program, and are evaluated under the traditional local government CEQA analysis. (Pub. Resources Code §§ 21150-21154.)

(SCAQMD Governing Board Agenda, Apr. 3, 2015, Agenda Item 16, Attachment A, http://www.aqmd.gov/home/library/meeting-agendas-minutes/agenda?title=governing-board-meeting-agenda-april-3-2015; then follow "16. Lead Agency Projects and Environmental Documents Received by SCAQMD" hyperlink (last visited Apr. 1, 2015).) Of course, SCAQMD focuses its commenting efforts on the more significant projects.

Typically, SCAQMD comments on the adequacy of air quality analysis, appropriateness of assumptions and methodology, and completeness of the recommended air quality mitigation measures. Staff may comment on the need to prepare a health risk assessment detailing the projected cancer and noncancer risks from toxic air contaminants resulting from the project, particularly the impacts of diesel particulate matter, which CARB has identified as a toxic air contaminant based on its carcinogenic effects. (California Air Resources Board, Resolution 98-35, Aug. 27, 1998, http://www.arb.ca.gov/regact/diesltac/diesltac.htm; then follow Resolution 98-35 hyperlink (last visited Apr. 1, 2015).) Because SCAQMD already requires new or modified stationary sources of toxic air contaminants to use the best available control technology for toxics and to keep their risks below specified levels, (SCAQMD Rule 1401, supra, note 15), the greatest opportunity to further mitigate toxic impacts through the CEQA process is by reducing emissions—particularly diesel emissions—from vehicles.

II. THIS COURT SHOULD NOT SET A HARD-AND-FAST RULE CONCERNING THE EXTENT TO WHICH AN EIR MUST CORRELATE A PROJECT'S EMISSION OF POLLUTANTS WITH RESULTING HEALTH IMPACTS.

Numerous cases hold that courts do not review the correctness of an EIR's conclusions but rather its sufficiency as an informative document. (*Laurel Heights 1, supra*, 47 Cal.3d at p. 392; *Citizens of Goleta Valley v.*

Bd. of Supervisors (1990) 52 Cal.3d 553, 569; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1197.)

As stated by the Court of Appeal in this case, where an EIR has addressed a topic, but the petitioner claims that the information provided about that topic is insufficient, courts must "draw[] a line that divides *sufficient* discussions from those that are *insufficient*." (*Sierra Club v. County of Fresno* (2014) 226 Cal.App.4th 704 (superseded by grant of review) 172 Cal.Rptr.3d 271, 290.) The Court of Appeal readily admitted that "[t]he terms themselves – sufficient and insufficient – provide little, if any, guidance as to where the line should be drawn. They are simply labels applied once the court has completed its analysis." (*Id.*)

The CEQA Guidelines, however, provide guidance regarding what constitutes a sufficient discussion of impacts. Section 15151 states that "the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible." Case law reflects this: "Analysis of environmental effects need not be exhaustive, but will be judged in light of what was reasonably feasible." (*Association of Irritated Residents v. County of Madera, supra,* 107 Cal.App.4th at p. 1390; see also CEQA Guidelines § 15204(a).)

Applying this test, this Court cannot realistically establish a hard-and-fast rule that an analysis correlating air pollution impacts of a project to quantified resulting health impacts is always required, or indeed that it is never required. Simply put, in some cases such an analysis will be "feasible"; in some cases it will not.

For example, air pollution control districts often require a proposed new source of toxic air contaminants to prepare a "health risk assessment" before issuing a permit to construct. District rules often limit the allowable cancer risk the new source may cause to the "maximally exposed individual" (worker and residence exposures). (*See, e.g.*, SCAQMD Rule 1401(c)(8); 1401(d)(1), *supra* note 15.) In order to perform this analysis, it

is necessary to have data regarding the sources and types of air toxic contaminants, location of emission points, velocity of emissions, the meteorology and topography of the area, and the location of receptors (worker and residence). (SCAQMD, *Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act (AB2588), pp. 11-16*; (last visited Apr. 1, 2015) http://www.aqmd.gov/home/library/documents-support-material; "Guidelines" hyperlink; AB2588; then follow AB2588 Risk Assessment Guidelines hyperlink.)

Thus, it is feasible to determine the health risk posed by a new gas station locating at an intersection in a mixed use area, where receptor locations are known. On the other hand, it may not be feasible to perform a health risk assessment for airborne toxics that will be emitted by a generic industrial building that was built on "speculation" (i.e., without knowing the future tenant(s)). Even where a health risk assessment can be prepared, however, the resulting maximum health risk value is only a calculation of risk—it does not necessarily mean anyone will contract cancer as a result of the project.

In order to find the "cancer burden" or expected additional cases of cancer resulting from the project, it is also necessary to know the numbers and location of individuals living within the "zone of impact" of the project: i.e., those living in areas where the projected cancer risk from the project exceeds one in a million. (SCAQMD, Health Risk Assessment Summary form, http://www.aqmd.gov/home/forms ; filter by "AB2588" category; then "Health Risk Assessment" hyperlink (last visited Apr. 1, 2015).) The affected population is divided into bands of those exposed to at least 1 in a million risk, those exposed to at least 10 in a million risk, etc. up to those exposed at the highest levels. (*Id.*) This data allows agencies to calculate an approximate number of additional cancer cases expected from

the project. However, it is not possible to predict which particular individuals will be affected.

For the so-called criteria pollutants[5], such as ozone, it may be more difficult to quantify health impacts. Ozone is formed in the atmosphere from the chemical reaction of the nitrogen oxides (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. (U.S. EPA, Ground Level Ozone, http://www.epa.gov/airquality/ozonepollution/ (last updated Mar. 25, 2015).) It takes time and the influence of meteorological conditions for these reactions to occur, so ozone may be formed at a distance downwind from the sources. (U.S. EPA, *Guideline on Ozone Monitoring Site Selection* (Aug. 1998) EPA-454/R-98-002 § 5.1.2, http://www.epa.gov/ttnamti1/archive/cpreldoc.html (last visited Apr. 1, 2015).) NO_x and VOC are known as "precursors" of ozone.

Scientifically, health effects from ozone are correlated with increases in the ambient level of ozone in the air a person breathes. (U.S. EPA, *Health Effects of Ozone in the General Population,* Figure 9, http://www.epa.gov/apti/ozonehealth/population.html#levels (last visited Apr. 1, 2015).) However, it takes a large amount of additional precursor emissions to cause a modeled increase in ambient ozone levels over an entire region. For example, the SCAQMD's 2012 AQMP showed that reducing NO_x by 432 tons per day (157,680 tons/year) and reducing VOC by 187 tons per day (68,255 tons/year) would reduce ozone levels at the SCAQMD's monitor site with the highest levels by only 9 parts per billion. (South Coast Air Quality Management District, *Final 2012 AQMP (February 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "Appendix V: Modeling & Attainment Demonstrations" hyperlink,

[5] See discussion of types of pollutants, supra, Part I.A.

pp. v-4-2, v-7-4, v-7-24.) SCAQMD staff does not currently know of a way to accurately quantify ozone-related health impacts caused by NO_x or VOC emissions from relatively small projects.

On the other hand, this type of analysis may be feasible for projects on a regional scale with very high emissions of NO_x and VOCs, where impacts are regional. For example, in 2011 the SCAQMD performed a health impact analysis in its CEQA document for proposed Rule 1315, which authorized various newly-permitted sources to use offsets from the districts "internal bank" of emission reductions. This CEQA analysis accounted for essentially *all* the increases in emissions due to new or modified sources in the District between 2010 and 2030.[6] The SCAQMD was able to correlate this very large emissions increase (e.g., 6,620 pounds per day NO_x (1,208 tons per year), 89,180 pounds per day VOC (16,275 tons per year)) to expected health outcomes from ozone and particulate matter (e.g., 20 premature deaths per year and 89,947 school absences in the year 2030 due to ozone).[7] (SCAQMD Governing Board Agenda, February 4, 2011, Agenda Item 26, *Assessment for: Re-adoption of Proposed Rule 1315 – Federal New Source Review Tracking System* (see hyperlink in fn 6*)* at p. 4.1-35, Table 4.1-29.)

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[6] (SCAQMD Governing Board Agenda, February 4, 2011, Agenda Item 26, Attachment G, *Assessment for: Re-adoption of Proposed Rule 1315 – Federal New Source Review Tracking System, Vol. 1, p.4.0-6,* http://www.aqmd.gov/home/library/meeting-agendas-minutes/agenda?title=governing-board-meeting-agenda-february-4-2011; the follow "26. Adopt Proposed Rule 1315 – Federal New Source Review Tracking System" (last visited April 1, 2015).)

[7] The SCAQMD was able to establish the location of future NO_x and VOC emissions by assuming that new projects would be built in the same locations and proportions as existing stationary sources. This CEQA document was upheld by the Los Angeles County Superior Court in *Natural Res. Def. Council v SCAQMD*, Los Angeles Superior Court No. BS110792).

However, a project emitting only 10 tons per year of NO_x or VOC is small enough that its regional impact on ambient ozone levels may not be detected in the regional air quality models that are currently used to determine ozone levels. Thus, in this case it would not be feasible to directly correlate project emissions of VOC or NO_x with specific health impacts from ozone. This is in part because ozone formation is not linearly related to emissions. Ozone impacts vary depending on the location of the emissions, the location of other precursor emissions, meteorology and seasonal impacts, and because ozone is formed some time later and downwind from the actual emission. (EPA Guideline on Ozone Monitoring Site Selection (Aug. 1998) EPA-454/R-98-002, § 5.1.2; https://www.epa.gov/ttnamti1/archive/cpreldoc.html; then search "Guideline on Ozone Monitoring Site Selection" click on pdf) (last viewed Apr. 1, 2015).)

SCAQMD has set its CEQA "significance" threshold for NO_x and VOC at 10 tons per year (expressed as 55 lb/day). (SCAQMD, *Air Quality Analysis Handbook*, http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook; then follow "SCAQMD Air Quality Significance Thresholds" hyperlink (last visited Apr. 1, 2015).) This is because the federal Clean Air Act defines a "major" stationary source for "extreme" ozone nonattainment areas such as SCAQMD as one emitting 10 tons/year. (42 U.S.C. §§ 7511a(e), 7511a(f); CAA §§ 182(e), 182(f).) Under the Clean Air Act, such sources are subject to enhanced control requirements (42 U.S.C. §§ 7502(c)(5), 7503; CAA §§ 172(c)(5), 173), so SCAQMD decided this was an appropriate threshold for making a CEQA "significance" finding and requiring feasible mitigation. Essentially, SCAQMD takes the position that a source that emits 10 tons/year of NO_x or VOC would contribute cumulatively to ozone formation. Therefore, lead agencies that use SCAQMD's thresholds of significance may determine

that many projects have "significant" air quality impacts and must apply all feasible mitigation measures, yet will not be able to precisely correlate the project to quantifiable health impacts, unless the emissions are sufficiently high to use a regional modeling program.

In the case of particulate matter ($PM_{2.5}$)[8], another "criteria" pollutant, SCAQMD staff is aware of two possible methods of analysis. SCAQMD used regional modeling to predict expected health impacts from its proposed Rule 1315, as mentioned above. Also, the California Air Resources Board (CARB) has developed a methodology that can predict expected mortality (premature deaths) from large amounts of $PM_{2.5}$. (California Air Resources Board, *Health Impacts Analysis: PM Premature Death Relationship*, http://www.arb.ca.gov/research/health/pm-mort/pm-mort_arch.htm (last reviewed Jan. 19, 2012).) SCAQMD used the CARB methodology to predict impacts from three very large power plants (e.g., 731-1837 lbs/day). (Final Environmental Assessment for Rule 1315, *supra*, pp 4.0-12, 4.1-13, 4.1-37 (e.g., 125 premature deaths in the entire SCAQMD in 2030), 4.1-39 (0.05 to 1.77 annual premature deaths from power plants.) Again, this project involved large amounts of additional $PM_{2.5}$ in the District, up to 2.82 tons/day (5,650 lbs/day of $PM_{2.5}$, or, or 1029 tons/year. (*Id.* at table 4.1-4, p. 4.1-10.)

However, the primary author of the CARB methodology has reported that this $PM_{2.5}$ health impact methodology is not suited for small projects and may yield unreliable results due to various uncertainties. [9] (SCAQMD, *Final Subsequent Mitigated Negative Declaration for: Warren*

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[8] SCAQMD has not attained the latest annual or 24-hour national ambient air quality standards for "$PM_{2.5}$" or particulate matter less than 2.5 microns in diameter.

[9] Among these uncertainties are the representativeness of the population used in the methodology, and the specific source of PM and the corresponding health impacts. (*Id.* at p. 2-24.)

E&P, Inc. WTU Central Facility, New Equipment Project (certified July 19, 2011), http://www.aqmd.gov/home/library/documents-support-material/lead-agency-permit-projects/permit-project-documents---year-2011; then follow "Final Subsequent Mitigated Negative Declaration for Warren E&P Inc. WTU Central Facility, New Equipment Project" hyperlink, pp. 2-22, 2-23 (last visited Apr. 1, 2015).) Therefore, when SCAQMD prepared a CEQA document for the expansion of an existing oil production facility, with very small $PM_{2.5}$ increases (3.8 lb/day) and a very small affected population, staff elected not to use the CARB methodology for using estimated $PM_{2.5}$ emissions to derive a projected premature mortality number and explained why it would be inappropriate to do so. (*Id.* at pp 2-22 to 2-24.) SCAQMD staff concluded that use of this methodology for such a small source could result in unreliable findings and would not provide meaningful information. (*Id.* at pp. 2-23, 2-25.) This CEQA document was not challenged in court.

In the above case, while it may have been technically possible to plug the data into the methodology, the results would not have been reliable or meaningful. SCAQMD believes that an agency should not be required to perform analyses that do not produce reliable or meaningful results. This Court has already held that an agency may decline to use even the "normal" "existing conditions" CEQA baseline where to do so would be misleading or without informational value. (*Neighbors for Smart Rail v. Exposition Metro Line* (2013) 57 Cal.4th 439, 448, 457.) The same should be true for a decision that a particular study or analysis would not provide reliable or meaningful results.[10]

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[10] Whether a particular study would result in "informational value" is a part of deciding whether it is "feasible." CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and

Therefore, it is not possible to set a hard-and-fast rule on whether a correlation of air quality impacts with specific quantifiable health impacts is required in all cases. Instead, the result turns on whether such an analysis is reasonably feasible in the particular case.[11] Moreover, what is reasonably feasible may change over time as scientists and regulatory agencies continually seek to improve their ability to predict health impacts. For example, CARB staff has been directed by its Governing Board to reassess and improve the methodology for estimating premature deaths. (California Air Resources Board, *Health Impacts Analysis: PM Mortality Relationship*, http://www.arb.ca.gov/research/health/pm-mort/pm-mort.htm (last reviewed Dec. 29, 2010).) This factor also counsels against setting any hard-and-fast rule in this case.

III. THE QUESTION OF WHETHER AN EIR CONTAINS SUFFICIENT ANALYSIS TO MEET CEQA'S REQUIREMENTS IS A MIXED QUESTION OF FACT AND LAW GOVERNED BY TWO DIFFERENT STANDARDS OF REVIEW.

A. Standard of Review for Feasibility Determination and Sufficiency as an Informative Document

A second issue in this case is whether courts should review an EIR's informational sufficiency under the "substantial evidence" test as argued by Friant Ranch or the "independent judgment" test as argued by Sierra Club.

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technological factors." (Pub. Resources Code § 21061.1.) A study cannot be "accomplished in a *successful* manner" if it produces unreliable or misleading results.

[11] In this case, the lead agency did not have an opportunity to determine whether the requested analysis was feasible because the comment was non-specific. Therefore, SCAQMD suggests that this Court, after resolving the legal issues in the case, direct the Court of Appeal to remand the case to the lead agency for a determination of whether the requested analysis is feasible. Because Fresno County, the lead agency, did not seek review in this Court, it seems likely that the County has concluded that at least some level of correlation of air pollution with health impacts is feasible.

As this Court has explained, "a reviewing court must adjust its scrutiny to the nature of the alleged defect, depending on whether the claim is predominantly one of improper procedure or a dispute over the facts." (*Vineyard Area Citizens v. City of Rancho Cordova, supra,* 40 Cal.4th at 435.) For questions regarding compliance with proper procedure or other legal questions, courts review an agency's action de novo under the "independent judgment" test. (*Id.*) On the other hand, courts review factual disputes only for substantial evidence, thereby "accord[ing] greater deference to the agency's substantive factual conclusions." (*Id.*)

Here, Friant Ranch and Sierra Club agree that the case involves the question of whether an EIR includes sufficient information regarding a project's impacts. However, they disagree on the proper standard of review for answering this question: Sierra Club contends that courts use the independent judgment standard to determine whether an EIR's analysis is sufficient to meet CEQA's informational purposes,[12] while Friant Ranch contends that the substantial evidence standard applies to this question.

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[12] Sierra Club acknowledges that courts use the substantial evidence standard when reviewing predicate factual issues, but argues that courts ultimately decide as a matter of law what CEQA requires. (Answering Brief, pp. 14, 23.)

SCAQMD submits that the issue is more nuanced than either party contends. We submit that, whether a CEQA document includes sufficient analysis to satisfy CEQA's informational mandates is a mixed question of fact and law,[13] containing two levels of inquiry that should be judged by different standards.[14]

The state CEQA Guidelines set forth standards for the adequacy of environmental analysis. Guidelines Section 15151 states:

> An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection, but for adequacy, completeness, and a good-faith effort at full disclosure.

In this case, the basic question is whether the underlying analysis of air quality impacts made the EIR "sufficient" as an informative document. However, whether the EIR's analysis was sufficient is judged in light of what was reasonably feasible. This represents a mixed question of fact and law that is governed by two different standards of review.

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[13] Friant Ranch actually states that the claim that an EIR lacks sufficient relevant information is, "most properly thought of as raising mixed questions of fact and law." (Opening Brief, p. 27.) However, the remainder of its argument claims that the court should apply the substantial evidence standard of review to all aspects of the issue.

[14] Mixed questions of fact and law issues may implicate predominantly factual subordinate questions that are reviewed under the substantial evidence test even though the ultimate question may be reviewed by the independent judgment test. *Crocker National Bank v. City and County of San Francisco* (1989) 49 Cal.3d 881, 888-889.

SCAQMD submits that an EIR's sufficiency as an informational document is ultimately a legal question that courts should determine using their independent judgment. This Court's language in *Laurel Heights I* supports this position. As this Court explained: "The court does not pass upon the correctness of the EIR's environmental conclusions, but only upon its *sufficiency as an informative document.*" (*Laurel Heights I, supra,* 47 Cal.3d at 392-393) (emphasis added.) As described above, the Court in *Vineyard Area Citizens v. City of Rancho Cordova, supra,* 40 Cal.4th at 431, also used its independent judgment to determine what level of analysis CEQA requires for water supply impacts. The Court did not defer to the lead agency's opinion regarding the law's requirements; rather, it determined for itself what level of analysis was necessary to meet "[t]he law's informational demands." (*Id.* at p. 432.) Further, existing case law also holds that where an agency fails to comply with CEQA's information disclosure requirements, the agency has "failed to proceed in the manner required by law." (*Save Our Peninsula Comm. v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 118.)

However, whether an EIR satisfies CEQA's requirements depends in part on whether it was reasonably feasible for an agency to conduct additional or more thorough analysis. EIRs must contain "a detailed statement" of a project's impacts (Pub. Res. Code § 21061), and an agency must "use its best efforts to find out and disclose all that it reasonably can." (CEQA Guidelines § 15144.) Nevertheless, "the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible." (CEQA Guidelines § 15151.)

SCAQMD submits that the question of whether additional analysis or a particular study suggested by a commenter is "feasible" is generally a question of fact. Courts have already held that whether a particular alternative is "feasible" is reviewed by the substantial evidence test.

(*Uphold Our Heritage v. Town of Woodside* (2007) 147 Cal.App.4th 587, 598-99; *Center for Biological Diversity v. County of San Bernardino* (2010) 185 Cal.App.4th 866, 883.) Thus, if a lead agency determines that a particular study or analysis is infeasible, that decision should generally be judged by the substantial evidence standard. However, SCAQMD urges this Court to hold that lead agencies must explain the basis of any determination that a particular analysis is infeasible in the EIR itself. An EIR must discuss information, including issues related to the feasibility of particular analyses "in sufficient detail to enable meaningful participation and criticism by the public. '[W]hatever is required to be considered in an EIR must be in that formal report; what any official might have known from other writings or oral presentations cannot supply what is lacking in the report.'" (*Laurel Heights I, supra*, 47 Cal.3d at p. 405 (quoting *Santiago County Water District v. County of Orange* (1981) 118 Cal.App.3d 818, 831) (discussing analysis of alternatives).) The evidence on which the determination is based should also be summarized in the EIR itself, with appropriate citations to reference materials if necessary. Otherwise commenting agencies such as SCAQMD would be forced to guess where the lead agency's evidence might be located, thus thwarting effective public participation.

Moreover, if a lead agency determines that a particular study or analysis would not result in reliable or useful information and for that reason is not feasible, that determination should be judged by the substantial evidence test. (See *Neighbors for Smart Rail v. Exposition Metro Line Construction Authority, supra*, 57 Cal.4th 439, 448, 457:

whether "existing conditions" baseline would be misleading or uninformative judged by substantial evidence standard.[15])

If the lead agency's determination that a particular analysis or study is not feasible is supported by substantial evidence, then the agency has not violated CEQA's information disclosure provisions, since it would be infeasible to provide additional information. This Court's decisions provide precedent for such a result. For example, this Court determined that the issue of whether the EIR should have included a more detailed discussion of future herbicide use was resolved because substantial evidence supported the agency's finding that "the precise parameters of future herbicide use could not be predicted." *Ebbetts Pass Forest Watch v. California Dept. of Forestry & Fire Protection* (2008) 43 Cal.4th 936, 955.

Of course, SCAQMD expects that courts will continue to hold lead agencies to their obligations to consult with, and not to ignore or misrepresent, the views of sister agencies having special expertise in the area of air quality. (*Berkeley Keep Jets Over the Bay v. Board of Port Commissioners* (2007) 91 Cal.App.4th 1344, 1364 n.11.) In some cases, information provided by such expert agencies may establish that the purported evidence relied on by the lead agency is not in fact "substantial". (*Id.* at pp. 1369-1371.)

In sum, courts retain ultimate responsibility to determine what CEQA requires. However, the law does not require exhaustive analysis, but only what is reasonably feasible. Agencies deserve deference for their factual determinations regarding what type of analysis is reasonably feasible. On the other hand, if a commenter requests more information, and the lead agency declines to provide it but does *not* determine that the

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[15] The substantial evidence standard recognizes that the courts "have neither the resources nor the scientific expertise" to weigh conflicting evidence on technical issues. (*Laurel Heights I, supra,* 47 Cal.3d 376, 393.)

requested study or analysis would be infeasible, misleading or uninformative, the question becomes whether the omission of that analysis renders the EIR inadequate to satisfy CEQA's informational purposes. (*Id.* at pp. 1370-71.) Again, this is predominantly a question of law and should be judged by the de novo or independent judgment standard of review. Of course, this Court has recognized that a "project opponent or reviewing court can always imagine some additional study or analysis that might provide helpful information. It is not for them to design the EIR. That further study...might be helpful does not make it necessary." (*Laurel Heights I, supra,* 47 Cal.3d 376, 415 – see also CEQA Guidelines § 15204(a) [CEQA "does not require a lead agency to conduct every test. . . recommended or demanded by commenters."].) Courts, then, must adjudicate whether an omission of particular information renders an EIR inadequate to serve CEQA's informational purposes.[16]

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[16] We recognize that there is case law stating that the substantial evidence standard applies to "challenges to the scope of an EIR's analysis of a topic" as well as the methodology used and the accuracy of the data relied on in the document "because these types of challenges involve factual questions." (*Bakersfield Citizens for Local Control v. City of Bakersfield, supra,* 124 Cal.App.4th 1184, 1198, and cases relied on therein.) However, we interpret this language to refer to situations where the question of the scope of the analysis really is factual—that is, where it involves whether further analysis is feasible, as discussed above. This interpretation is supported by the fact that the *Bakersfield* court expressly rejected an argument that a claimed "omission of information from the EIR should be treated as inquiries whether there is substantial evidence supporting the decision approving the project. " *Bakersfield, supra,* 124 Cal.App.4th at p. 1208. And the *Bakersfield* court ultimately decided that the lead agency must analyze the connection between the identified air pollution impacts and resulting health impacts, even though the EIR already included some discussion of air-pollution-related respiratory illnesses. *Bakersfield, supra,* 124 Cal.App.4th at p. 1220. Therefore, the court must not have interpreted this question as one of the "scope of the analysis" to be judged by the substantial evidence standard.

B. Friant Ranch's Rationale for Rejecting the Independent Judgment Standard of Review is Unsupported by Case Law.

In its brief, Friant Ranch makes a distinction between cases where a required CEQA topic is not discussed at all (to be reviewed by independent judgment as a failure to proceed in the manner required by law) and cases where a topic is discussed, but the commenter claims the information provided is insufficient (to be judged by the substantial evidence test). (Opening Brief, pp. 13-17.) The Court of Appeal recognized these two types of cases, but concluded that both raised questions of law. (*Sierra Club v. County of Fresno* (2014) 226 Cal.App.4th 704 (superseded by grant of review) 172 Cal.Rptr.3d 271, 290.) We believe the distinction drawn by Friant Ranch is unduly narrow, and inconsistent with cases which have concluded that CEQA documents are insufficient. In many instances, CEQA's requirements are stated broadly, and the courts must interpret the law to determine what level of analysis satisfies CEQA's mandate for providing meaningful information, even though the EIR discusses the issue to some extent.

For example, the CEQA Guidelines require discussion of the existing environmental baseline. In *County of Amador v. El Dorado County Water Agency* (1999) 76 Cal.App.4th 931, 954-955, the lead agency had discussed the environmental baseline by describing historic month-end water levels in the affected lakes. However, the court held that this was not an adequate baseline discussion because it failed to discuss the timing and amounts of past actual water releases, to allow comparison with the proposed project. The court evidently applied the independent judgment test to its decision, even though the agency discussed the issue to some extent.

Likewise, in *Vineyard Area Citizens* (2007) 40 Cal.4th 412, this Court addressed the question of whether an EIR's analysis of water supply impacts complied with CEQA. The parties agreed that the EIR was required to analyze the effects of providing water to the development project, "and that in order to do so the EIR had, in some manner, to identify the planned sources of that water." (*Vineyard Area Citizens, supra,* at p. 428.) However, the parties disagreed as to the level of detail required for this analysis and "what level of uncertainty regarding the availability of water supplies can be tolerated in an EIR . . . ." (*Id.*) In other words, the EIR had analyzed water supply impacts for the project, but the petitioner claimed that the analysis was insufficient.

This Court noted that neither CEQA's statutory language or the CEQA Guidelines specifically addressed the question of how precisely an EIR must discuss water supply impacts. (*Id.*) However, it explained that CEQA "states that '[w]hile foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can.'" (*Id.*, [Guidelines § 15144].) The Court used this general principle, along with prior precedent, to elucidate four "principles for analytical adequacy" that are necessary in order to satisfy "CEQA's informational purposes." (*Vineyard Area Citizens, supra,* at p. 430.) The Court did not defer to the agency's determination that the EIR's analysis of water supply impacts was sufficient. Rather, this Court used its independent judgment to determine for itself the level of analysis required to satisfy CEQA's fundamental purposes. (*Vineyard Area Citizens, supra*, at p. 441: an EIR does not serve its purposes where it neglects to explain likely sources of water and "... leaves long term water supply considerations to later stages of the project.")

Similarly, the CEQA Guidelines require an analysis of noise impacts of the project. (Appendix G, "Environmental Checklist Form."[17]) In *Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1123, the court held that the lead agency's noise impact analysis was inadequate even though it had addressed the issue and concluded that the increase would not be noticeable. If the court had been using the substantial evidence standard, it likely would have upheld this discussion.

Therefore, we do not agree that the issue can be resolved on the basis suggested by Friant Ranch, which would apply the substantial evidence standard to *every* challenge to an analysis that addresses a required CEQA topic. This interpretation would subvert the courts' proper role in interpreting CEQA and determining what the law requires.

Nor do we agree that the Court of Appeal in this case violated CEQA's prohibition on courts interpreting its provisions "in a manner which imposes procedural or substantive requirements beyond those explicitly stated in this division or in the state guidelines." (Pub. Resources Code § 21083.1.) CEQA requires an EIR to describe *all* significant impacts of the project on the environment. (Pub. Resources Code § 21100(b)(2); *Vineyard Area Citizens, supra,* at p. 428.) Human beings are part of the environment, so CEQA requires EIRs to discuss a project's significant impacts on human health. However, except in certain particular circumstances,[18] neither the CEQA statute nor Guidelines specify the precise level of analysis that agencies must undertake to satisfy the law's requirements. (see, e.g., CEQA Guidelines § 15126.2(a) [EIRs must describe "health and safety problems caused by {a project's} physical changes"].) Accordingly, courts must interpret CEQA as a whole to

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[17] Association of Environmental Professionals, 2015 CEQA Statute and Guidelines (2015) p.287.

[18] E.g., Pub. Resources Code § 21151.8(C)(3)(B)(iii) (requiring specific type of health risk analysis for siting schools).

determine whether a particular EIR is sufficient as an informational document. A court determining whether an EIR's discussion of human health impacts is legally sufficient does not constitute imposing a new substantive requirement.[19] Under Friant Ranch's theory, the above-referenced cases holding a CEQA analysis inadequate would have violated the law. This is not a reasonable interpretation.

IV. COURTS MUST SCRUPULOUSLY ENFORCE THE REQUIREMENTS THAT LEAD AGENCIES CONSULT WITH AND OBTAIN COMMENTS FROM AIR DISTRICTS

Courts must "scrupulously enforce" CEQA's legislatively mandated requirements. (*Vineyard Area Citizens, supra*, 40 Cal.4th 412, 435.) Case law has firmly established that lead agencies must consult with the relevant air pollution control district before conducting an initial study, and must provide the districts with notice of the intention to adopt a negative declaration (or EIR). (*Schenck v. County of Sonoma* (2011) 198 Cal.App.4th 949, 958.) As *Schenck* held, neither publishing the notice nor providing it to the State Clearinghouse was a sufficient substitute for sending notice directly to the air district. (*Id.*) Rather, courts "must be satisfied that [administrative] agencies have fully complied with the procedural requirements of CEQA, since only in this way can the important public purposes of CEQA be protected from subversion." *Schenck,* 198 Cal.App.4th at p. 959 (citations omitted).[20]

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[19] We submit that Public Resources Code Section 21083.1 was intended to prevent courts from, for example, holding that an agency must analyze economic impacts of a project where there are no resulting environmental impacts (see CEQA Guidelines § 15131) , or imposing new procedural requirements, such as imposing additional public notice requirements not set forth in CEQA or the Guidelines.

[20] Lead agencies must consult air districts, as public agencies with jurisdiction by law over resources affected by the project, *before* releasing an EIR. (Pub. Resources Code §§ 21104(a); 21153.) Moreover, air

Lead agencies should be aware, therefore, that failure to properly seek and consider input from the relevant air district constitutes legal error which may jeopardize their project approvals. For example, the court in *Fall River Wild Trout Foundation v. County of Shasta,* (1999) 70 Cal.App.4th 482, 492 held that the failure to give notice to a trustee agency (Department of Fish and Game) was prejudicial error requiring reversal. The court explained that the lack of notice prevented the Department from providing any response to the CEQA document. (*Id.* at p. 492.) It therefore prevented relevant information from being presented to the lead agency, which was prejudicial error because it precluded informed decision-making. (*Id.*)[21]

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districts should be considered "state agencies" for purposes of the requirement to consult with "trustee agencies" as set forth in Public Resources Code § 20180.3(a). This Court has long ago held that the districts are not mere "local agencies" whose regulations are superseded by those of a state agency regarding matters of statewide concern, but rather have concurrent jurisdiction over such issues. (*Orange County Air Pollution Control District v. Public Util. Com.* (1971) 4 Cal.3d 945, 951, 954.) Since air pollution is a matter of statewide concern, *Id* at 952, air districts should be entitled to trustee agency status in order to ensure that this vital concern is adequately protected during the CEQA process.

[21] In *Schenck,* the court concluded that failure to give notice to the air district was not prejudicial, but this was partly because the trial court had already corrected the error before the case arrived at the Court of Appeal. The trial court issued a writ of mandate requiring the lead agency to give notice to the air district. The air district responded by concurring with the lead agency that air impacts were not significant. (*Schenck,* 198 Cal.App.4th 949, 960.) We disagree with the *Schenck* court that the failure to give notice to the air district would not have been prejudicial (even in the absence of the trial court writ) merely because the lead agency purported to follow the air district's published CEQA guidelines for significance. (*Id.*, 198 Cal.App.4th at p. 960.) In the first place, absent notice to the air district, it is uncertain whether the lead agency properly followed those guidelines. Moreover, it is not realistic to expect that an air district's published guidelines would necessarily fully address all possible air-quality related issues that can arise with a CEQA project, or that those

Similarly, lead agencies must obtain additional information requested by expert agencies, including those with jurisdiction by law, if that information is necessary to determine a project's impacts. (*Sierra Club v. State Bd. Of Forestry* (1994) 7 Cal.4th 1215, 1236-37.) Approving a project without obtaining that information constitutes a failure to proceed in the manner prescribed by CEQA. (*Id.* at p. 1236.)

Moreover, a lead agency can save significant time and money by consulting with the air district early in the process. For example, the lead agency can learn what the air district recommends as an appropriate analysis on the facts of its case, including what kinds of health impacts analysis may be available, and what models are appropriate for use. This saves the lead agency from the need to do its analysis all over again and possibly needing to recirculate the document after errors are corrected, if new significant impacts are identified. (CEQA Guidelines § 15088.5(a).) At the same time, the air district's expert input can help the lead agency properly determine whether another commenter's request for additional analysis or studies is reasonable or feasible. Finally, the air district can provide input on what mitigation measures would be feasible and effective.

Therefore, we suggest that this Court provide guidance to lead agencies reminding them of the importance of consulting with the relevant air districts regarding these issues. Otherwise, their feasibility decisions may be vulnerable to air district evidence that establishes that there is no substantial evidence to support the lead agency decision not to provide specific analysis. (*See Berkeley Keep Jets Over the Bay, supra,* 91 Cal.App.4th 1344, 1369-1371.)

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guidelines would necessarily be continually modified to reflect new developments. Therefore we believe that, had the trial court not already ordered the lead agency to obtain the air district's views, the failure to give notice would have been prejudicial, as in *Fall River, supra,* 70 Cal.App.4th 482, 492.

CONCLUSION

The SCAQMD respectfully requests this Court *not* to establish a hard-and-fast rule concerning whether CEQA requires a lead agency to correlate identified air quality impacts of a project with resulting health outcomes. Moreover, the question of whether an EIR is "sufficient as an informational document" is a mixed question of fact and law containing two levels of inquiry. Whether a particular proposed analysis is feasible is predominantly a question of fact to be judged by the substantial evidence standard of review. Where the requested analysis is feasible, but the lead agency relies on legal or policy reasons not to provide it, the question of whether the EIR is nevertheless sufficient as an informational document is predominantly a question of law to be judged by the independent judgment standard of review.

Respectfully submitted,

DATED: April 3, 2015

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CERTIFICATE OF WORD COUNT

Pursuant to Rule 8.520(c)(1) of the California Rules of Court, I hereby certify that this brief contains 8,476 words, including footnotes, but excluding the Application, Table of Contents, Table of Authorities, Certificate of Service, this Certificate of Word Count, and signature blocks. I have relied on the word count of the Microsoft Word Vista program used to prepare this Certificate.

DATED: April 3, 2015 Respectfully submitted,

Barbara Baird

Barbara Baird

PROOF OF SERVICE

I am employed in the County of Los Angeles, California. I am over the age of 18 years and not a party to the within action. My business address is 21865 Copley Drive, Diamond Bar, California 91765.

On April 3, 2015 I served true copies of the following document(s) described as **APPLICATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FOR LEAVE TO FILE BRIEF OF *AMICUS CURIAE* IN SUPPORT OF NEITHER PARTY AND *[PROPOSED]* BRIEF OF *AMICUS CURIAE*** by placing a true copy of the foregoing document(s) in a sealed envelope addressed as set forth on the attached service list as follows:

BY MAIL: I enclosed the document(s) in a sealed envelope or package addressed to the persons at the addresses listed in the Service List and placed the envelope for collection and mailing following our ordinary business practices. I am readily familiar with this District's practice for collection and processing of correspondence for mailing. Under that practice, the correspondence would be deposited with the United States Postal Service, with postage thereon fully prepaid at Diamond Bar, California, in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on April 3, 2015 at Diamond Bar, California.

Patricia Anderson

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CASE NO. S219783

IN THE SUPREME COURT OF CALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,
Plaintiffs and Appellants

v.

COUNTY OF FRESNO,
Defendant and Respondent

FRIANT RANCH, L.P.,
Real Party in Interest and Respondent

After a Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726

APPLICATION FOR LEAVE TO FILE AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO AND REAL PARTY IN INTEREST AND RESPONDENT, FRIANT RANCH, L.P.

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APPLICATION

Pursuant to California Rules of Court 8.520(f)(1), proposed Amicus Curiae San Joaquin Valley Unified Air Pollution Control District hereby requests permission from the Chief Justice to file an amicus brief in support of Defendant and Respondent, County of Fresno, and Defendant and Real Parties in Interest Friant Ranch, L.P. Pursuant to Rule 8.520(f)(5) of the California Rules of Court, the proposed amicus curiae brief is combined with this Application. The brief addresses the following issue certified by this Court for review:

> Is an EIR adequate when it identifies the health impacts of air pollution and quantifies a project's expected emissions, or does CEQA further require the EIR to *correlate* a project's air quality emissions to specific health impacts?

As of the date of this filing, the deadline for the final reply brief on the merits was March 5, 2015. Accordingly, under Rule 8.520(f)(2), this application and brief are timely.

1. Background and Interest of San Joaquin Valley Unified Air Pollution Control District

The San Joaquin Valley Unified Air Pollution Control District ("Air District") regulates air quality in the eight counties comprising the San Joaquin Valley ("Central Valley"): Kern, Tulare, Madera, Fresno, Merced, San Joaquin, Stanislaus, and Kings, and is primarily responsible for attaining air quality standards within its jurisdiction. After billions of dollars of investment by Central Valley businesses, pioneering air quality regulations, and consistent efforts by residents, the Central Valley air basin has made historic improvements in air quality.

The Central Valley's geographical, topographical and meteorological features create exceptionally challenging air quality

conditions. For example, it receives air pollution transported from the San Francisco Bay Area and northern Central Valley communities, and the southern portion of the Central Valley includes three mountain ranges (Sierra, Tehachapi, and Coastal) that, under some meteorological conditions, effectively trap air pollution. Central Valley air pollution is only a fraction of what the Bay Area and Los Angeles produce, but these natural conditions result in air quality conditions that are only marginally better than Los Angeles, even though about ten times more pollution is emitted in the Los Angeles region. Bay Area air quality is much better than the Central Valley's, even though the Bay Area produces about six times more pollution. The Central Valley also receives air pollution transported from the Bay Area and northern counties in the Central Valley, including Sacramento, and transboundary anthropogenic ozone from as far away as China.

Notwithstanding these challenges, the Central Valley has reduced emissions at the same or better rate than other areas in California and has achieved unparalleled milestones in protecting public health and the environment:

- In the last decade, the Central Valley became the first air basin classified by the federal government under the Clean Air Act as a "serious nonattainment" area to come into attainment of health-based National Ambient Air Quality Standard ("NAAQS") for coarse particulate matter (PM10), an achievement made even more notable given the Valley's extensive agricultural sector. Unhealthy levels of particulate matter can cause and exacerbate a range of chronic and acute illnesses.
- In 2013, the Central Valley became the first air basin in the country to improve from a federal designation of "extreme" nonattainment to

actually attain (and quality for an attainment designation) of the 1-hour ozone NAAQS; ozone creates "smog" and, like PM10, causes adverse health impacts.

- The Central Valley also is in full attainment of federal standards for lead, nitrogen dioxide, sulfur dioxide, and carbon monoxide.
- The Central Valley continues to make progress toward compliance with its last two attainment standards, with the number of exceedences for the 8-hour ozone NAAQS reduced by 74% (for the 1997 standard) and 38% (for the 2008 standard) since 1991, and for the small particulate matter (PM2.5) NAAQS reduced by 85% (for the 1997 standard) and 61% (for the 2006 standard).

Sustained improvement in Central Valley air quality requires a rigorous and comprehensive regulatory framework that includes prohibitions (e.g., on wood-burning fireplaces in new residences), mandates (e.g., requiring the installation of best available pollution reduction technologies on new and modified equipment and industrial operations), innovations (e.g., fees assessed against residential development to fund pollution reduction actions to "offset" vehicular emissions associated with new residences), incentive programs (e.g., funding replacements of older, more polluting heavy duty trucks and school buses)[1], ongoing planning for continued air quality improvements, and enforcement of Air District permits and regulations.

The Air District is also an expert air quality agency for the eight counties and cities in the San Joaquin Valley. In that capacity, the Air District has developed air quality emission guidelines for use by the Central

[1] San Joaquin's incentive program has been so successful that through 2012, it has awarded over $ 432 million in incentive funds and has achieved 93,349 tons of lifetime emissions reductions. *See* SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, 2012 PM2.5 PLAN, 6-6 (2012) *available at* http://www.valleyair.org/Workshops/postings/2012/12-20-12PM25/FinalVersion/06%20Chapter%206%20Incentives.pdf.

Valley counties and cities that implement the California Environment Quality Act (CEQA).[2] In its guidance, the Air District has distinguished between toxic air contaminants and criteria air pollutants.[3] Recognizing this distinction, the Air District's CEQA Guidance has adopted distinct thresholds of significance for *criteria* pollutants (i.e., ozone, PM2.5 and their respective precursor pollutants) based upon scientific and factual data which demonstrates the level that can be accommodated on a cumulative basis in the San Joaquin Valley without affecting the attainment of the applicable NAAQS.[4] For *toxic air* pollutants, the District has adopted different thresholds of significance which scientific and factual data demonstrates has the potential to expose sensitive receptors (i.e., children, the elderly) to levels which may result in localized health impacts.[5]

The Air District's CEQA Guidance was followed by the County of Fresno in its environment review of the Friant Ranch project, for which the Air District also served as a commenting agency. The Court of Appeal's holding, however, requiring correlation between the project's criteria

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[2] *See, e.g.*, SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, PLANNING DIVISION, GUIDE FOR ASSESSING AND MITIGATING AIR QUALITY IMPACTS (2015), *available at* http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf ("CEQA Guidance").

[3] Toxic air contaminants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as birth defects. There are currently 189 toxic air contaminants regulated by the United States Environmental Protection Agency ("EPA") and the states pursuant to the Clean Air Act. 42 U.S.C. § 7412. Common TACs include benzene, perchloroethylene and asbestos. *Id.* at 7412(b).

In contrast, there are only six (6) criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead. Although criteria air pollutants can also be harmful to human health, they are distinguishable from toxic air contaminants and are regulated separately. For instance, while criteria pollutants are regulated by numerous sections throughout Title I of the Clean Air Act, the regulation of toxic air contaminants occurs solely under section 112 of the Act. Compare 42 U.S.C. §§ 7407 – 7411 & 7501 – 7515 with 42 U.S.C. § 7411.

[4] See, e.g., CEQA Guidance at http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf, pp. 64-66, 80.

[5] See, e.g., CEQA Guidance at http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf, pp. 66, 99-101.

pollutants and local health impacts, departs from the Air District's Guidance and approved methodology for assessing criteria pollutants. A close reading of the administrative record that gave rise to this issue demonstrates that the Court's holding is based on a misunderstanding of the distinction between toxic air contaminants (for which a local health risk assessment is feasible and routinely performed) and criteria air pollutants (for which a local health risk assessment is not feasible and would result in speculative results).[6] The Air District has a direct interest in ensuring the lawfulness and consistent application of its CEQA Guidance, and will explain how the Court of Appeal departed from the Air District's long-standing CEQA Guidance in addressing criteria pollutants and toxic air contaminants in this amicus brief.

2. How the Proposed Amicus Curiae Brief Will Assist the Court

As counsel for the proposed amicus curiae, we have reviewed the briefs filed in this action. In addition to serving as a "commentary agency" for CEQA purposes over the Friant Ranch project, the Air District has a strong interest in assuring that CEQA is used for its intended purpose, and believes that this Court would benefit from additional briefing explaining the distinction between criteria pollutants and toxic air contaminants and the different methodologies employed by local air pollution control agencies such as the Air District to analyze these two categories of air pollutants under CEQA. The Air District will also explain how the Court of Appeal's opinion is based upon a fundamental misunderstanding of these two different approaches by requiring the County of Fresno to correlate the project's *criteria* pollution emissions with *local* health impacts. In doing

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[6] CEQA does not require speculation. *See, e.g., Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.*, 6 Cal. 4th 1112, 1137 (1993) (upholding EIR that failed to evaluate cumulative toxic air emission increases given absence of any acceptable means for doing so).

so, the Air District will provide helpful analysis to support its position that at least insofar as criteria pollutants are concerned, CEQA does not require an EIR to correlate a project's air quality emissions to specific health impacts, because such an analysis is not reasonably feasible.

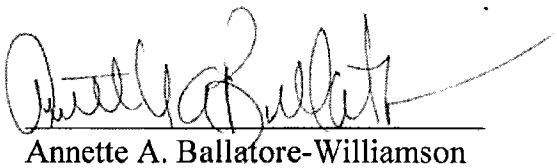
Rule 8.520 Disclosure

Pursuant to Cal. R. 8.520(f)(4), neither the Plaintiffs nor the Defendant or Real Party In Interest or their respective counsel authored this brief in whole or in part. Neither the Plaintiffs nor the Defendant or Real Party in Interest or their respective counsel made any monetary contribution towards or in support of the preparation of this brief.

CONCLUSION

On behalf of the San Joaquin Valley Unified Air Pollution Control District, we respectfully request that this Court accept the filing of the attached brief.

Dated: April 2, 2015



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SAN JOAQUIN VALLEY UNIFIED
AIR POLLUTION CONTROL
DISTRICT

CASE NO. S219783

IN THE SUPREME COURT OF CALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,
Plaintiffs and Appellants

v.

COUNTY OF FRESNO,
Defendant and Respondent

FRIANT RANCH, L.P.,
Real Party in Interest and Respondent

After a Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726

AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO AND REAL PARTY IN INTEREST AND RESPONDENT, FRIANT RANCH, L.P.

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I. INTRODUCTION.

The San Joaquin Valley Unified Air Pollution Control District ("Air District") respectfully submits that the Court of Appeal erred when it held that the air quality analysis contained in the Environmental Impact Report ("EIR") for the Friant Ranch development project was inadequate under the California Environmental Quality Act ("CEQA") because it did not include an analysis of the correlation between the project's criteria air pollutants and the potential adverse human health impacts. A close reading of the portion of the administrative record that gave rise to this issue demonstrates that the Court's holding is based on a misunderstanding of the distinction between toxic air contaminants and criteria air pollutants.

Toxic air contaminants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as birth defects. There are currently 189 toxic air contaminants (hereinafter referred to as "TACs") regulated by the United States Environmental Protection Agency ("EPA") and the states pursuant to the Clean Air Act. 42 U.S.C. § 7412. Common TACs include benzene, perchloroethylene and asbestos. *Id.* at 7412(b).

In contrast, there are only six (6) criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead. Although criteria air pollutants can also be harmful to human health,

they are distinguishable from TACs and are regulated separately. For instance, while criteria pollutants are regulated by numerous sections throughout Title I of the Clean Air Act, the regulation of TACs occurs solely under section 112 of the Act. *Compare* 42 U.S.C. §§ 7407 – 7411 & 7501 – 7515 *with* 42 U.S.C. § 7411.

The most relevant difference between criteria pollutants and TACs for purposes of this case is the manner in which human health impacts are accounted for. While it is common practice to analyze the correlation between an individual facility's TAC emissions and the expected localized human health impacts, such is not the case for criteria pollutants. Instead, the human health impacts associated with criteria air pollutants are analyzed and taken into consideration when EPA sets the national ambient air quality standard ("NAAQS") for each criteria pollutant. 42 U.S.C. § 7409(b)(1). The health impact of a particular criteria pollutant is analyzed on a regional and not a facility level based on how close the area is to complying with (attaining) the NAAQS. Accordingly, while the type of individual facility / health impact analysis that the Court of Appeal has required is a customary practice for TACs, it is not feasible to conduct a similar analysis for criteria air pollutants because currently available computer modeling tools are not equipped for this task.

It is clear from a reading of both the administrative record and the Court of Appeal's decision that the Court did not have the expertise to fully

appreciate the difference between TACs and criteria air pollutants. As a result, the Court has ordered the County of Fresno to conduct an analysis that is not practicable and not likely yield valid information. The Air District respectfully requests that this portion of the Court of Appeal's decision be reversed.

II. THE COURT OF APPEAL ERRED IN FINDING THE FRIANT RANCH EIR INADEQUATE FOR FAILING TO ANALYZE THE SPECIFIC HUMAN HEALTH IMPACTS ASSOCIATED CRITERIA AIR POLLUTANTS.

Although the Air District does not take lightly the amount of air emissions at issue in this case, it submits that the Court of Appeal got it wrong when it required Fresno County to revise the Friant Ranch EIR to include an analysis correlating the criteria air pollutant emissions associated with the project with specific, localized health-impacts. The type of analysis the Court of Appeal has required will not yield reliable information because currently available modeling tools are not well suited for this task. Further, in reviewing this issue de novo, the Court of Appeal failed to appreciate that it lacked the scientific expertise to appreciate the significant differences between a health risk assessment commonly performed for toxic air contaminants and a similar type of analysis it felt should have been conducted for criteria air pollutants.

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A. Currently Available Modeling Tools are not Equipped to Provide a Meaningful Analysis of the Correlation between an Individual Development Project's Air Emissions and Specific Human Health Impacts.

In order to appreciate the problematic nature of the Court of Appeals' decision requiring a health risk type analysis for criteria air pollutants, it is important to understand how the relevant criteria pollutants (ozone and particulate matter) are formed, dispersed and regulated.

Ground level ozone (smog) is not directly emitted into the air, but is formed when precursor pollutants such as oxides of nitrogen (NOx) and volatile organic compounds (VOCs) are emitted into the atmosphere and undergo complex chemical reactions in the process of sunlight.[1] Once formed, ozone can be transported long distances by wind.[2] Because of the complexity of ozone formation, a specific tonnage amount of NOx or VOCs emitted in a particular area does not equate to a particular concentration of ozone in that area. In fact, even rural areas that have relatively low tonnages of emissions of NOx or VOCs can have high levels of ozone concentration simply due to wind transport.[3] Conversely, the San Francisco Bay Area has six times more NOx and VOC emissions per square mile than the San Joaquin Valley, but experiences lower

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[1] *See* United States Environmental Protection Agency, *Ground-level Ozone: Basic Information*, available at: http://www.epa.gov/airquality/ozonepollution/basic.html (visited March 10, 2015).
[2] *Id.*
[3] *Id.*

concentrations of ozone (and better air quality) simply because sea breezes disperse the emissions.[4]

Particulate matter ("PM") can be divided into two categories: directly emitted PM and secondary PM.[5] While directly emitted PM can have a localized impact, the tonnage emitted does not always equate to the local PM concentration because it can be transported long distances by wind.[6] Secondary PM, like ozone, is formed via complex chemical reactions in the atmosphere between precursor chemicals such as sulfur dioxides (SOx) and NOx.[7] Because of the complexity of secondary PM formation, the tonnage of PM-forming precursor emissions in an area does not necessarily result in an equivalent concentration of secondary PM in that area.

The disconnect between the *tonnage* of precursor pollutants (NOx, SOx and VOCs) and the *concentration* of ozone or PM formed is important because it is not necessarily the tonnage of precursor pollutants that causes human health effects, but the concentration of resulting ozone or PM. Indeed, the national ambient air quality standards ("NAAQS"), which are statutorily required to be set by the United States Environmental Protection

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[4] *San Joaquin Valley Air Pollution Control District 2007 Ozone Plan*, Executive Summary p. ES-6, available at: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/03%20Executive%20Summary.pdf (visited March 10, 2015).

[5] United States Environmental Protection Agency, *Particulate Matter: Basic Information*, available at: http://www.epa.gov/airquality/particlepollution/basic.html (visited March 10, 2015).

[6] *Id.*

[7] *Id.*

Agency ("EPA") at levels that are "requisite to protect the public health," 42 U.S.C. § 7409(b)(1), are established as concentrations of ozone or particulate matter and not as tonnages of their precursor pollutants.[8]

Attainment of a particular NAAQS occurs when the concentration of the relevant pollutant remains below a set threshold on a consistent basis throughout a particular region. For example, the San Joaquin Valley attained the 1-hour ozone NAAQS when ozone concentrations remained at or below 0.124 parts per million Valley-wide on 3 or fewer days over a 3-year period.[9] Because the NAAQS are focused on achieving a particular concentration of pollution region-wide, the Air District's tools and plans for attaining the NAAQS are regional in nature.

For instance, the computer models used to simulate and predict an attainment date for the ozone or particulate matter NAAQS in the San Joaquin Valley are based on regional inputs, such as regional inventories of precursor pollutants (NOx, SOx and VOCs) and the atmospheric chemistry and meteorology of the Valley.[10] At a very basic level, the models simulate future ozone or PM levels based on predicted changes in precursor

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[8] See, e.g., United States Environmental Protection Agency, *Table of National Ambient Air Quality Standards*, available at: http://www.epa.gov/air/criteria.html#3 (visited March 10, 2015).

[9] *San Joaquin Valley Unified Air Pollution Control District 2013 Plan for the Revoked 1-Hour Ozone Standard*, Ch. 2 p. 2-16, available at: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/02Chapter2ScienceTrendsModeling.pdf (visited March 10, 2015).

[10] *Id.* at Ch. 2 p. 2-19 (visited March 12, 2015); *San Joaquin Valley Unified Air Pollution Control District 2008 PM2.5 Plan*, Appendix F, pp. F-2 – F-5, available at: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Final_Adopted_PM2.5/20%20Appendix%20F.pdf (visited March 19, 2015).

emissions Valley wide.[11] Because the NAAQS are set levels necessary to protect human health, the closer a region is to attaining a particular NAAQS, the lower the human health impact is from that pollutant.

The goal of these modeling exercises is not to determine whether the emissions generated by a particular factory or development project will affect the date that the Valley attains the NAAQS. Rather, the Air District's modeling and planning strategy is regional in nature and based on the extent to which *all* of the emission-generating sources in the Valley (current and future) must be controlled in order to reach attainment.[12]

Accordingly, the Air District has based its thresholds of significance for CEQA purposes on the levels that scientific and factual data demonstrate that the Valley can accommodate without affecting the attainment date for the NAAQS.[13] The Air District has tied its CEQA significance thresholds to the level at which stationary pollution sources permitted by the Air District must "offset" their emissions.[14] This "offset"

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[11] *Id.*

[12] Although the Air District does have a dispersion modeling tool used during its air permitting process that is used to predict whether a particular project's directly emitted PM will either cause an exceedance of the PM NAAQS or contribute to an existing exceedance, this model bases the prediction on a worst case scenario of emissions and meteorology and has no provision for predicting any associated human health impacts. Further, this analysis is only performed for stationary sources (factories, oil refineries, etc.) that are required to obtain a New Source Review permit from the Air District and not for development projects such as Friant Ranch over which the Air District has no preconstruction permitting authority. *See* San Joaquin Valley Unified Air Pollution Control District Rule 2201 §§ 2.0; 3.3.9; 4.14.1, available at: http://www.valleyair.org/rules/currntrules/Rule2201041l.pdf (visited March 19, 2015).

[13] *San Joaquin Valley Unified Air Pollution Control District Guide to Assessing and Mitigating Air Quality Impacts*, (March 19, 2015) p. 22, available at: http://www.valleyair.org/transportation/CEQA%20Rules/GAMAQI%20Jan%202002%20Rev.pdf (visited March 30, 2015).

[14] *Id.* at pp. 22, 25.

level allows for growth while keeping the cumulative effects of all new sources at a level that will not impede attainment of the NAAQS.[15] In the Valley, these thresholds are 15 tons per year of PM, and 10 tons of NOx or VOC per year. *Sierra Club*, *supra*, 172 Cal.Rptr.3d at 303; AR 4554. Thus, the CEQA air quality analysis for criteria pollutants is not really a localized, project-level impact analysis but one of regional, "cumulative impacts."

Accordingly, the significance thresholds applied in the Friant Ranch EIR (15 tons per year of PM and 10 tons of NOx or VOCs) are not intended to be indicative of any localized human health impact that the project may have. While the health effects of air pollution are of primary concern to the Air District (indeed, the NAAQS are established to protect human health), the Air District is simply not equipped to analyze whether and to what extent the criteria pollutant emissions of an individual CEQA project directly impact human health in a particular area. This is true even for projects with relatively high levels of emissions of criteria pollutant precursor emissions.

For instance, according to the EIR, the Friant Ranch project is estimated to emit 109.52 tons per year of ROG (VOC), 102.19 tons per year of NOx, and 117.38 tons per year of PM. Although these levels well

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[15] [15] *San Joaquin Valley Unified Air Pollution Control District Environmental Review Guidelines* (Aug. 2000) p. 4-11, available at: http://www.valleyair.org/transportation/CEQA%20Rules/ERG%20Adopted%20_August%202000_.pdf (visited March 12, 2015).

exceed the Air District's CEQA significance thresholds, this does not mean that one can easily determine the concentration of ozone or PM that will be created at or near the Friant Ranch site on a particular day or month of the year, or what specific health impacts will occur. Meteorology, the presence of sunlight, and other complex chemical factors all combine to determine the ultimate concentration and location of ozone or PM. This is especially true for a project like Friant Ranch where most of the criteria pollutant emissions derive not from a single "point source," but from area wide sources (consumer products, paint, etc.) or mobile sources (cars and trucks) driving to, from and around the site.

In addition, it would be extremely difficult to model the impact on NAAQS attainment that the emissions from the Friant Ranch project may have. As discussed above, the currently available modeling tools are equipped to model the impact of *all* emission sources in the Valley on attainment. According to the most recent EPA-approved emission inventory, the NOx inventory for the Valley is for the year 2014 is 458.2 tons per day, or 167,243 tons per year and the VOC (or ROG) inventory is 361.7 tons per day, or 132,020.5 tons per year.[16] Running the photochemical grid model used for predicting ozone attainment with the

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[16] *San Joaquin Valley Unified Air Pollution Control District 2007 Ozone Plan*, Appendix B pp. B-6, B-9,
available at:
http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/19%20Appendix%20B%20April%202007.pdf (visited March 12, 2015).

emissions solely from the Friant Ranch project (which equate to less than one-tenth of one percent of the total NOx and VOC in the Valley) is not likely to yield valid information given the relative scale involved.

Finally, even once a model is developed to accurately ascertain local increases in concentrations of photochemical pollutants like ozone and some particulates, it remains impossible, using today's models, to correlate that increase in concentration to a specific health impact. The reason is the same: such models are designed to determine regional, population-wide health impacts, and simply are not accurate when applied at the local level.

For these reasons, it is not the norm for CEQA practitioners, including the Air District, to conduct an analysis of the localized health impacts associated with a project's criteria air pollutant emissions as part of the EIR process. When the accepted scientific method precludes a certain type of analysis, "the court cannot impose a legal standard to the contrary." *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 717 n. 8. However, that is exactly what the Court of Appeal has done in this case. Its decision upends the way CEQA air quality analysis of criteria pollutants occurs and should be reversed.

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B. The Court of Appeal Improperly Extrapolated a Request for a Health Risk Assessment for Toxic Air Contaminants into a Requirement that the EIR contain an Analysis of Localized Health Impacts Associated with Criteria Air Pollutants.

The Court of Appeal's error in requiring the new health impact analysis for criteria air pollutants clearly stems from a misunderstanding of terms of art commonly used in the air pollution field. More specifically, the Court of Appeal (and Appellants Sierra Club et al.) appear to have confused the health risk analysis ("HRA") performed to determine the health impacts associated with a project's toxic air contaminants ("TACs"), with an analysis correlating a project's criteria air pollutants (ozone, PM and the like) with specific localized health impacts.

The first type of analysis, the HRA, is commonly performed during the Air District's stationary source permitting process for projects that emit TACs and is, thus, incorporated into the CEQA review process. An HRA is a comprehensive analysis to evaluate and predict the dispersion of TACs emitted by a project and the potential for exposure of human populations. It also assesses and quantifies both the individual and population-wide health risks associated with those levels of exposure. There is no similar analysis conducted for criteria air pollutants. Thus, the second type of analysis (required by the Court of Appeal), is not currently part of the Air District's process because, as outlined above, the health risks associated

with exposure to criteria pollutants are evaluated on a regional level based on the region's attainment of the NAAQS.

The root of this confusion between the types of analyses conducted for TACs versus criteria air pollutants appears to stem from a comment that was presented to Fresno County by the City of Fresno during the administrative process.

In its comments on the draft EIR, the City of Fresno (the only party to raise this issue) stated:

> [t]he EIR must disclose the human health related effects of the Project's air pollution impacts. (CEQA Guidelines section 15126.2(a).) The EIR fails completely in this area. The EIR should be revised to disclose and determine the significance of TAC impacts, and of human health risks due to exposure to Project-related air emissions.

(AR 4602.)

In determining that the issue regarding the correlation between the Friant Ranch project's criteria air pollutants and adverse health impacts was adequately exhausted at the administrative level, the Court of Appeal improperly read the first two sentences of the City of Fresno's comment in isolation rather than in the context of the entire comment. *See Sierra Club v. County of Fresno* (2014) 172 Cal.Rptr.3d 271, 306. Although the comment first speaks generally in terms of "human health related effects" and "air pollution," it requests only that the EIR be revised to disclose "the significance of TACs" and the "human health risks due to exposure."

The language of this request in the third sentence of the comment is significant because, to an air pollution practitioner, the language would only have indicated only that a HRA for TACs was requested, and not a separate analysis of the health impacts associated with the project's criteria air pollutants. Fresno County clearly read the comment as a request to perform an HRA for TACs and limited its response accordingly. (AR 4602.)[17] The Air District submits that it would have read the City's comment in the same manner as the County because the City's use of the terms "human health risks" and "TACs" signal that an HRA for TACs is being requested. Indeed, the Air District was also concerned that an HRA be conducted, but understood that it was not possible to conduct such an analysis until the project entered the phase where detailed site specific information, such as the types of emission sources and the proximity of the sources to sensitive receptors became available. (AR 4553.)[18] The City of Fresno was apparently satisfied with the County's discussion of human health risks, as it did not raise the issue again when it commented on the final EIR. (AR 8944 – 8960.)

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[17] Appellants do not challenge the manner in which the County addressed TACs in the EIR. (Appellants' Answer Brief p. 28 fn. 7.)

[18] Appellants rely on the testimony of Air District employee, Dan Barber, as support for their position that the County should have conducted an analysis correlating the project's criteria air pollutant emissions with localized health impacts. (Appellants Answer Brief pp. 10-11; 28.) However, Mr. Barber's testimony simply reinforces the Air District's concern that a risk assessment (HRA) be conducted once the actual details of the project become available. (AR 8863.) As to criteria air pollutants, Mr. Barber's comments are aimed at the Air District's concern about the amount of emissions and the fact that the emissions will make it "more difficult for Fresno County and the Valley to reach attainment which means that the health of Valley residents maybe [sic] adversely impacted." Mr. Barber says nothing about conducting a separate analysis of the localized health impacts the project's emissions may have.

The Court of Appeal's holding, which incorrectly extrapolates a request for an HRA for TACs into a new analysis of the localized health impacts of the project's criteria air pollutants, highlights two additional errors in the Court's decision.

First, the Court of Appeal's holding illustrates why the Court should have applied the deferential substantial evidence standard of review to the issue of whether the EIR's air quality analysis was sufficient. The regulation of air pollution is a technical and complex field and the Court of Appeal lacked the expertise to fully appreciate the difference between TACs and criteria air pollutants and tools available for analyzing each type of pollutant.

Second, it illustrates that the Court likely got it wrong when it held that the issue regarding the criteria pollutant / localized health impact analysis was properly exhausted during the administrative process. In order to preserve an issue for the court, '[t]he "exact issue" must have been presented to the administrative agency....' [Citation.] *Citizens for Responsible Equitable Environmental Development v. City of San Diego*, (2011) 196 Cal.App.4th 515, 527 129 Cal.Rptr.3d 512, 521; *Sierra Club v. City of Orange* (2008) 163 Cal.App.4th 523, 535, 78 Cal.Rptr.3d 1, 13. "'[T]he objections must be sufficiently specific so that the agency has the

opportunity to evaluate and respond to them.' [Citation.]" *Sierra Club v. City of Orange*,163 Cal.App.4th at 536.[19]

As discussed above, the City's comment, while specific enough to request a commonly performed HRA for TACs, provided the County with no notice that it should perform a new type of analysis correlating criteria pollutant tonnages to specific human health effects. Although the parties have not directly addressed the issue of failure to exhaust administrative remedies in their briefs, the Air District submits that the Court should consider how it affects the issues briefed by the parties since "[e]xhaustion of administrative remedies is a jurisdictional prerequisite to maintenance of a CEQA action." *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1199, 22 Cal.Rptr.3d 203.

III. CONCLUSION

For all of the foregoing reasons, the Air District respectfully requests that the portion of the Court of Appeal's decision requiring an analysis correlating the localized human health impacts associated with an individual project's criteria air pollutant emissions be reversed.

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[19] *Sierra Club v. City of Orange*, is illustrative here. In that case, the plaintiffs challenged an EIR approved for a large planned community on the basis that the EIR improperly broke up the various environmental impacts by separate project components or "piecemealed" the analysis in violation of CEQA. In evaluating the defense that the plaintiffs had failed to adequately raise the issue at the administrative level, the Court held that comments such as *"the use of a single document for both a project-level and a program-level EIR [is] 'confusing',"* and *"[t]he lead agency should identify any potential adverse air quality impacts that could occur from all phases of the project and all air pollutant sources related to the project,"* were too vague to fairly raise the argument of piecemealing before the agency. *Sierra Club v. City of Orange*, 163 Cal.App.4th at 537.

correlating the localized human health impacts associated with an individual project's criteria air pollutant emissions be reversed.

Respectfully submitted,

Dated: April 2, 2015

Catherine T. Redmond
Attorney for Proposed Amicus Curiae

SAN JOAQUIN VALLEY
UNIFIED
AIR POLLUTION CONTROL
DISTRICT

CERTIFICATE OF WORD COUNT

Pursuant to Rule 8.204 of the California Rules of Court, I hereby certify that this document, based on the Word County feature of the Microsoft Word software program used to compose and print this document, contains, exclusive of caption, tables, certificate of word count, signature block and certificate of service, 3806 words.

Dated: April 2, 2015

Annette A. Ballatore-Williamson
District Counsel (SBN 192176)

Sierra Club et al, v. County of Fresno, et al
Supreme Court of California Case No.: S219783
Fifth District Court of Appeal Case No.: F066798
Fresno County Superior Court Case No.: 11CECG00726

PROOF OF SERVICE

I am over the age of 18 years and not a p[arty to the above-captioned action; that my business address is San Joaquin Valley Unified Air Pollution Control District located at 1990 E. Gettysburg Avenue, Fresno, California 93726.

On April 2, 2015, I served the document described below:

APPLICATION FOR LEAVE TO FILE AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO

On all parties to this action at the following addresses and in the following manner:

PLEASE SEE ATTACHED SERVICE LIST

(XX) **(BY MAIL)** I caused a true copy of each document(s) to be laced in a sealed envelope with first-class postage affixed and placed the envelope for collection. Mail is collected daily at my office and placed in a United State Postal Service collection box for pick-up and delivery that same day.

( ) **(BY ELECTRONIC MAIL)** I caused a true and correct scanned image (.PDF file) copy to be transmitted via electronic mail transfer system in place at the San Joaquin Valley Unified Air Pollution Control District ("District"), originating from the undersigned at 1990 E. Gettysburg Avenue, Fresno, CA, to the address(es) indicated below.

( ) **(BY OVERNIGHT MAIL)** I caused a true and correct copy to be delivered via Federal Express to the following person(s) or their representative at the address(es) listed below.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that I executed this document on April 2, 2015, at Fresno, California.

Esthela Soto

SERVICE LIST

Sierra Club et al, v. County of Fresno, et al
Supreme Court of California Case No.: S219783
Fifth District Court of Appeal Case No.: F066798
Fresno County Superior Court Case No.: 11CECG00726

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CITY OF SANTA ROSA
COMMUNITY-WIDE GREENHOUSE GAS REDUCTION STRATEGY

Public Review Draft
October 2024

Prepared by:
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Prepared in collaboration with:
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SANTA ROSA FORWARD
Plan Our Future Together

SANTA ROSA AVANZA
Planeamos Nuestro Futuro

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Tables

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List of Abbreviations

AB	Assembly Bill
BAAQMD	Bay Area Air Quality Management District
BFB℠	Bicycle Friendly Business
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCAP	Community Climate Action Plan
CEQA	California Environmental Quality Act
CH_4	methane
CO_2	carbon dioxide
EDR	Energy Design Rating
EIR	environmental impact report
EV	electric vehicle
GHG	greenhouse gas
GIS	geographic information system
GWP	global warming potential
IPCC	Intergovernmental Panel on Climate Change
LAFCO	Local Agency Formation Commission
MCAP	Municipal Climate Action Plan
$MTCO_2e$	metric tons carbon dioxide equivalent
N_2O	nitrous oxide
NPDES	National Pollutant Discharge Elimination System
PG&E	Pacific Gas and Electric Company
RCPA	Regional Climate Protection Authority
RPS	Renewables Portfolio Standard
SB	Senate Bill
SCP	Sonoma Clean Power
SOI	sphere of influence
TDM	transportation demand management
UGB	urban growth boundary
VMT	vehicle miles traveled
ZEV	zero-emission vehicle

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1. Introduction

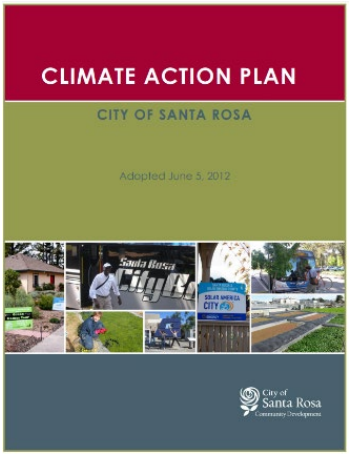
What is a GHG Reduction Strategy?

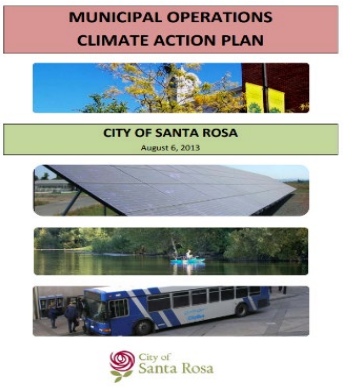
The Community-wide Greenhouse Gas (GHG) Reduction Strategy or Reduction Strategy is an update to and replacement of the City's 2012 Community Climate Action Plan (CCAP). The Reduction Strategy, prepared as part of the General Plan 2050, will serve as the City's strategic plan to reduce community-wide GHG emissions through 2050 and beyond. The Reduction Strategy establishes a roadmap to reduce the community's GHG emissions to a minimum of 40 percent below 1990 levels by 2030 and 85 percent below 1990 levels by 2045, consistent with State-mandated emission reduction targets.

Reducing GHG emissions and promoting community sustainability are priorities of the City and the General Plan 2050. This GHG Reduction Strategy is a technical companion to the General Plan 2050, highlighting the State's latest GHG reduction requirements, the steps that the City has taken to reduce emissions since publication of the 2012 CCAP, and anticipated GHG emissions savings to be achieved through implementation of the General Plan 2050.

What is the relationship between this Strategy and the City's CCAP?

The GHG Reduction Strategy is an update to and replacement of the City's CCAP. This Reduction Strategy includes GHG reduction measures and implementation programs based on the City's ongoing implementation of the CCAP through 2023, additional measures and programs identified to further reduce GHGs, an updated GHG emissions inventory, and projections of future GHG emissions. The GHG Reduction Strategy also includes some measures, as applicable, from the Municipal Operations Climate Action Plan (MCAP) but does not fully replace it. This Reduction Strategy also includes new municipal measures. Individual City departments will continue to implement some measures from the MCAP in addition to the new measures in this Reduction Strategy, but the MCAP will not continue to be updated as a formal City document. Instead, the City, together with all other businesses, institutions, and entities in the City, will be required to implement measures in the GHG Reduction Strategy so that there is one consolidated strategy for reaching climate neutrality by 2045, in accordance with the State's mandate.



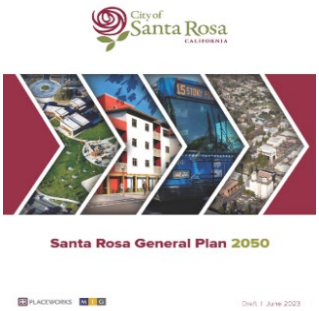


Santa Rosa's 2012 CCAP and 2013 MCAP

The City of Santa Rosa has been a leader in climate protection activities since the mid-1990s. The City and the community have been working together toward shared environmental objectives, and the City has been leading by example in its municipal operations through energy-efficiency upgrades and several GHG emissions-reducing projects, programs, and policies.

What is the relationship between this Strategy and the General Plan 2050 and General Plan 2050 Environmental Impact Report?

Santa Rosa's General Plan serves the foundational role of regulating all land uses in the city; it is the top-level planning document, providing direction for all zoning regulations, ordinances, guidelines, and area or specific plans. The goals and policies throughout the General Plan are interrelated and should be considered together when making decisions related to land use, mobility, growth, and development. City staff apply General Plan policies to give direction to development applicants and land use analysis for the City Council, Planning Commission, and other boards and commissions. In addition, the General Plan actions comprise a detailed implementation program to guide City department work programs and budgeting.



Santa Rosa's General Plan 2050

The Santa Rosa General Plan 2050 consolidates the mandated elements into six chapters that address both required and optional General Plan topics. Mandated elements include land use, transportation, open space, conservation, safety, noise, environmental justice, and housing. The General Plan 2050 presents an integrated and cross-sector approach to reducing GHG emissions in Santa Rosa. The General Plan includes goals, policies, and actions in most elements that work to reduce GHG emissions from community-wide sources and municipal operations. This stand-alone GHG Reduction Strategy, which replaces the 2012 CCAP, incorporates many of these goals, policies, and actions. It consolidates these items into a set of GHG emissions reduction measures and implementation programs and presents detailed quantification and other details consistent with California Environmental Quality Act (CEQA) Guidelines Section 15183.5, to support ongoing reductions through 2050.

The General Plan 2050 Environmental Impact Report (EIR) addresses the potential environmental impacts associated with General Plan 2050 at a programmatic level, consistent with CEQA Guidelines Section 15168. The program-level EIR evaluates the environmental impacts associated with the broad policies of General Plan 2050, including this GHG Reduction Strategy, and the likely type and amount of development allowed through the General Plan horizon of 2050.

Consistent with the State CEQA Statute and Guidelines and BAAQMD's 2022 CEQA Guidelines[1], lead agencies may use adopted GHG emissions reduction plans to assess the cumulative impacts of projects on climate change at a programmatic level (see State CEQA Guidelines Section 15183.5(a)). CEQA requires many new development projects to identify how the project may impact the environment, including the degree to which the project increases GHG emissions. The State CEQA Guidelines include provisions authorizing local governments to use adopted/qualified plans for reducing GHG emissions to address the cumulative impacts of individual future projects on GHG emissions (see State CEQA Guidelines Section 15183.5(b)(1)). Applicants for new development projects that are consistent with the community's adopted GHG emissions reduction approach may then streamline their own environmental impact review process by using these CEQA-qualified GHG reduction plans along with their associated environmental review documents to assess the cumulative impacts of proposed development projects on GHG emission levels.

[1] Refer to BAAQMD's 2022 CEQA Guidelines Appendix B, *CEQA Thresholds for Evaluating the Significance of Climate Impacts,* and Appendix C, *Guidance for Greenhouse Gas Reduction Strategies*, available at https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines.

A project-specific environmental review that relies on this Reduction Strategy for its cumulative impact analysis must show consistency with the Reduction Strategy by preparing a Consistency Checklist, which allows the applicant to identify specific GHG reduction measures from this Reduction Strategy that are applicable to the project and demonstrate how the project will implement these measures. Project applicants and City staff will identify which specific measures are applicable to each project during project review. Applicable measures and actions must be incorporated as mitigation measures and/or conditions of approval for the project.

This GHG Reduction Strategy is consistent with both the State's CEQA Guidelines (Section 15183.5) and the Bay Area Air Quality Management District's (BAAQMD) CEQA Guidelines. BAAQMD's CEQA Guidelines recommend that cities and counties develop General Plans and GHG reduction plans to be consistent with the State's goals to reduce emissions to 40 percent below 1990 levels by 2030 and carbon neutrality by 2045. In addition, BAAQMD recommends that local GHG reduction plans demonstrate their consistency with CEQA Guidelines. This Reduction Strategy includes the following elements that demonstrate it is consistent with CEQA Guidelines Section 15183.5(b)(1).

a. Quantifies emissions, both existing and projected over a specified period, resulting from activities within a defined geographic area. As discussed in Chapter 2, this GHG Reduction Strategy quantifies past, current, and future GHG emissions through the year 2050 within City Limits and the Planning Area for the General Plan 2050.
b. Establishes a level, based on substantial evidence, below which the contribution of emissions from activities covered by the plan would not be cumulatively considerable. Chapter 3 of this Reduction Strategy identifies the City's GHG emissions reduction target, consistent with the State's regulatory goals, which are to, at a minimum:
    - Reduce emissions to 40 percent below 1990 levels by 2030.
    - Reduce emissions to 85 percent below 1990 levels by 2045.
    - Support statewide net carbon neutrality by 2045.
c. Identifies and analyzes the emissions resulting from specific actions or categories of actions anticipated within the geographic area, as discussed in Chapter 3 and the Appendix.
d. Specifies a set of strategies, including implementation programs and performance standards, that, if implemented on a project-by-project basis, substantial evidence demonstrates they would collectively achieve the specified emissions level, as discussed in Chapter 3 and the Appendix.
e. Establishes a mechanism to monitor the plan's progress toward achieving specific levels and to require amendment if the plan is not achieving those levels, as discussed in Chapter 3. This Reduction Strategy and the General Plan 2050 include commitments by the City to implement the new measures and implementing programs presented and to continue implementation of existing and planned City programs presented in Chapter 3. The City will monitor and report on implementation progress, conduct GHG emissions inventories regularly and update this Strategy as needed to ensure progress toward the City's GHG reduction targets.
f. Includes an environmental review. This GHG Reduction Strategy is evaluated by the Santa Rosa 2050 General Plan Environmental Impact Report.

What area is covered by the GHG Reduction Strategy?

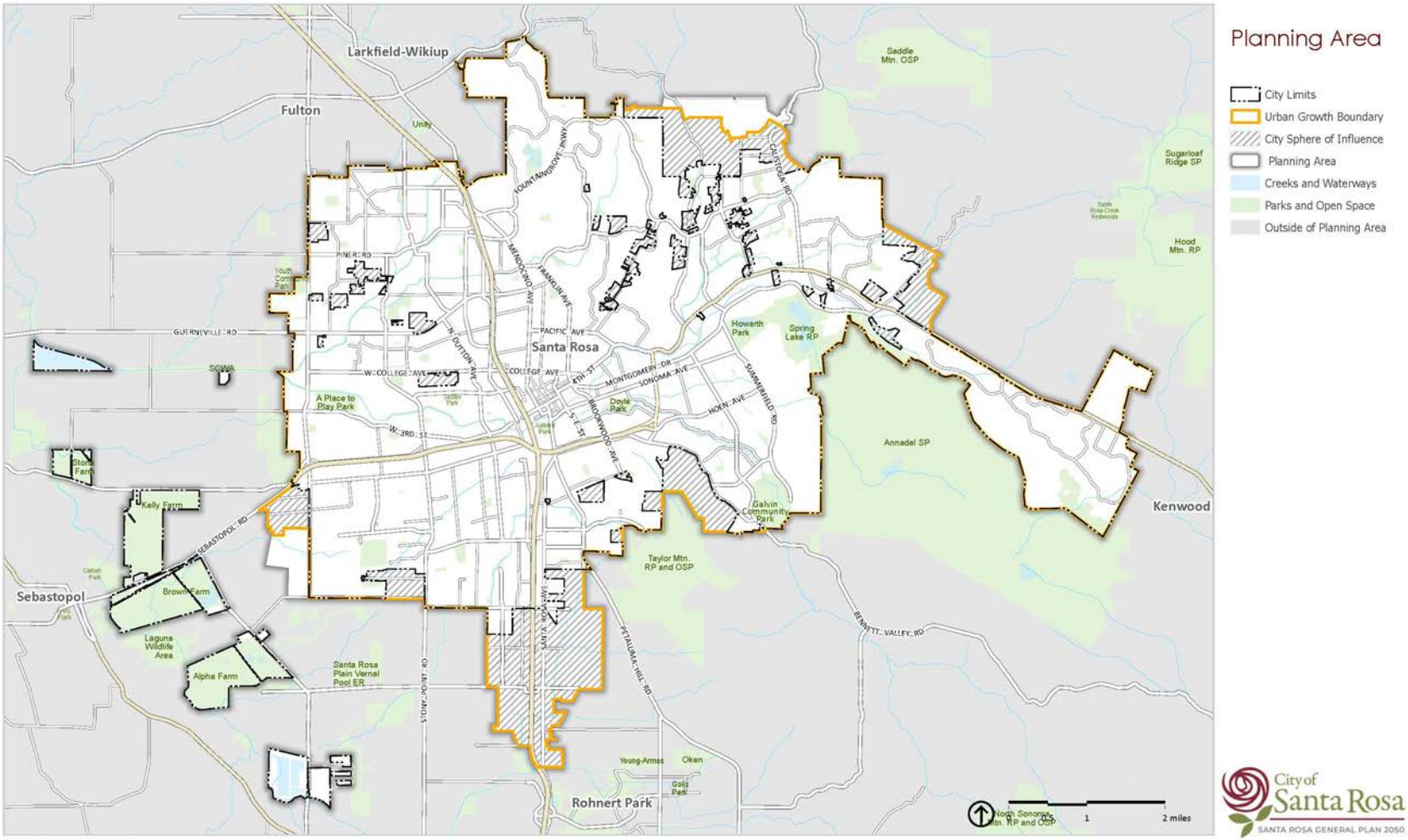
The GHG Reduction Strategy considers GHG emissions produced within the Santa Rosa City Limits and within the City's Planning Area, as shown in Figure 1. For each GHG emissions reduction measure, GHG emissions reductions are presented for both the City Limits and Planning Area. The Planning Area for the General Plan defines where the City has an interest in land use and includes land within the incorporated city, sphere of influence (SOI), and urban growth boundary (UGB). The Santa Rosa Planning Area covers about 49 square miles.

The Santa Rosa City Limits encompass approximately 41 square miles, 67 percent of which is developed or is developable. An additional 13 percent of the city is made up of local, regional, and state parkland and open space, including creeks and waterways. The remaining 20 percent of the city is undevelopable because it is unusable due to topography such as steep terrain, or right-of-way (roads and railroads).

The SOI is the unincorporated area adjacent to the city that receives services from the city or may in the future. As shown on Figure 1, the Sonoma County Local Agency Formation Commission (LAFCO) identifies unincorporated neighborhoods north, northeast, south, and southwest of the City Limit, in addition to unincorporated islands in the city as within Santa Rosa's SOI. To be eligible for annexation by the City, land must be in the city's LAFCO-designated SOI.

As the name suggests, the UGB separates urban areas from the surrounding natural and agricultural lands, or greenbelts, and limits how far out a city can expand. In 1990, Santa Rosa voters approved a five-year UGB, followed by a two-decade UGB measure in 1996 and an extension in 2010 to ensure that the current UGB will not be significantly changed until at least 2035. The UGB, as shown on Figure 1, covers about 45.5 square miles and encompasses all incorporated city land plus some unincorporated land expected to be annexed at some point in the future. The UGB is coterminous with the outer bounds of the SOI.

Figure 1. City Limits and Planning Area



Source: City of Santa Rosa 2023

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2. Community Greenhouse Gas Emissions

This section presents the results of the community's inventory of past and present GHG emissions, as well as projections for future GHG emissions if no action is taken to reduce emissions. This Reduction Strategy uses "community" to refer to the broader community of Santa Rosa and "city-wide" to refer to the area specifically within the City Limits. This Reduction Strategy also analyzes GHG emissions resulting in development of the Planning Area as identified in the General Plan 2050 for consistency. Refer to Figure 1 for boundaries.

A GHG emissions inventory identifies GHG emissions that result from activities of residents, employees, and other community members occurring within the community. Municipal agencies like the City of Santa Rosa (City) prepare GHG inventories to better understand the sources and quantities of GHGs attributed to day-to-day activities. The City has in the past prepared community GHG inventories for the calendar years 2000 and 2007 and City operations (also referred to municipal or government operations) GHG inventories for the calendar years 2000, 2007, and 2010.

As part of preparation of General Plan 2050 and this Reduction Strategy, the City reviewed and updated the 2007 community GHG emissions inventory, prepared a new inventory for the 2019 calendar year, and forecasted GHG emissions through 2050. As such, the community inventories and associated GHG projections do not account for any potential changes in transportation or resource use directly resulting from the COVID-19 pandemic, the long-term effects of which are not currently known.

The City's 2007 inventory serves as the City's emissions baseline, which is necessary for estimating 1990 GHG emissions, tracking the City's progress towards meeting the State's GHG emission reduction targets, and projecting future GHG emissions. Comparing the updated 2007 inventory to the more recent 2019 inventory provides a more recent picture of contributors to community emissions, and helps the City identify which GHG emissions-reduction actions have been most successful. As the City continues to implement its GHG reduction measures, City staff will use the 2019 inventory and future inventories to track future progress.

GHG Emissions Inventory Protocols

A series of guidance documents called protocols provide recommendations on how to assess a community's GHG emissions. Protocols indicate which sectors are analyzed in local government GHG inventories and emissions from those sectors are measured. Following protocols is a standardized approach for all GHG inventories and results in reliable estimates of local emissions levels that can be compared across multiple years and communities.

The City updated the 2007 city-wide GHG emissions inventory and prepared a 2019 city-wide GHG emissions inventory following standard protocols, methods, and best practices supported by the California Governor's Office of Planning and Research, California Air Resources Board (CARB), BAAQMD, and the California Air Pollution Control Officers Association (CAPCOA). The City followed two protocols: (1) the United States Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (U.S. Community Protocol), and (2) the Global Protocol for Community-Scale Greenhouse Gas Inventories (Global Protocol) to assess GHG emissions from sources that are not covered in the U.S. Community Protocol.[2]

[2] The Bay Area Air Quality Management District recommends use of these protocols in local government planning efforts in its 2022 CEQA Guidelines (https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines). The California Air

Units of Measure and Emission Factors

GHG emissions are generated by various activities that are common in daily life. Some daily activities release GHG emissions in the location of the activity, such as emissions from combustion of natural gas used in community homes or businesses. Other activities cause GHG emissions to be released elsewhere, such as GHG emissions from power plants in other communities that generate the electricity that is used in Santa Rosa. In a few cases, the activity occurs partially in Santa Rosa and partially elsewhere, such as emissions from vehicle trips between Santa Rosa and another community. Overall, the community inventory is an assessment of GHG emissions that are attributed to Santa Rosa, although the emissions themselves or even the activities may not actually occur within the Santa Rosa City Limits or Planning Area.

The community GHG inventories include emissions from three GHGs: (1) carbon dioxide (CO_2), (2) methane (CH_4), and (3) nitrous oxide (N_2O). Although there are other GHGs inventoried by the State of California and the federal government, local government inventories focus on these three primary GHGs that are the most abundant at the community level and have known data sources. GHGs are measured in a unit called carbon dioxide equivalent (CO_2e), which is a standard unit of measure for GHGs analyzed in the inventory. Carbon dioxide equivalent is a metric used to compare the relative potency of GHGs based on their global warming potential (GWP) by converting the amounts of gases to the equivalent amount of CO_2. **Table 1** shows the GWPs used in Santa Rosa's inventories. These inventories report amounts of GHGs in metric tons of CO_2e ($MTCO_2e$), equal to 1,000 kilograms or approximately 2,205 pounds.

The City calculated most of the GHG emissions using data on GHG-generating activities in combination with emission factors. An emissions factor describes how many metric tons of CO_2e emissions are released per unit of an activity. Some sectors, including agriculture and off-road emissions, do not have specific emission factors, because they are calculated using formulae or models.

Sectors

Consistent with the U.S. Community Protocol and Global Protocol for Community-Scale Greenhouse Gas Inventories, the City's community GHG inventory assesses GHG emissions from the following categories of activities, known as sectors.

- **Transportation.** GHG emissions created by driving on-road vehicles, including passenger and freight vehicles, in Santa Rosa. In the 2019 inventory, this sector also includes emissions from fuel use on SMART trains.
- **Residential energy.** GHG emissions attributed to the use of electricity and natural gas in residential buildings.
- **Nonresidential energy.** GHG emissions attributed to the use of electricity and natural gas in nonresidential buildings.
- **Solid waste.** GHG emissions released from trash collected from residents and businesses in Santa Rosa.

Resources Board recommends use of these protocols in its 2017 Climate Change Scoping Plan (https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf).

- Off-road equipment. GHG emissions from equipment that does not provide on-road transportation, such as tractors for construction, agricultural equipment, and equipment used for landscape maintenance.
- Agriculture. GHG emissions from fertilizer used for crop cultivation. GHG sequestration from agricultural and other undeveloped land is accounted for in the land use and sequestration category. This sector can include GHG emissions from livestock when present. Livestock were not included in the 2007 and 2019 inventories.
- Water and wastewater. This sector accounts for the community's energy-related emissions from water supply pumping and wastewater treatment, disposal, and recycled water distribution, as well as methane and nitrous oxide emissions from the wastewater treatment process.
- Land use and sequestration. Emissions released into the atmosphere from development of previously undeveloped land (a carbon source) and GHG emissions absorbed and stored in trees and soils on locally controlled lands as part of healthy ecosystems (a carbon sink, or something that removes GHGs from the atmosphere).
- Stationary sources. Emissions from fuel use at major industrial facilities permitted by state and regional air quality authorities. Stationary source emissions are informational and are not included in the community total.
- Wildfire and prescribed burns. Emissions released by wildfires and prescribed fires.

2007 City-wide GHG Emissions

In 2007, the City prepared a city-wide GHG emissions inventory to serve as the baseline year of analysis for the 2012 CCAP and ongoing climate action activities. As part of the development of this Reduction Strategy, the City updated the 2007 inventory to be consistent with current guidance and best practices, including the addition of new sectors and the use of updated methodologies for calculating GHG emissions.

- Global Warming Potentials. The City updated these values to be consistent with the Sixth Intergovernmental Panel on Climate Change (IPCC) Assessment Report.
- Sectors and Subsectors. The City added emissions from land use (a carbon source) and sequestration (a carbon sink, or something that removes GHGs from the atmosphere) activities to the 2007 inventory.
- Sector-Specific Methods. The City updated activity and emissions data for the on-road transportation and off-road equipment sectors, updated agricultural acreage, and updated emissions factors for the solid waste sector using State databases or models.

Update to Global Warming Potentials

One major revision to the 2007 city-wide GHG emissions inventory was to revise the global warming potentials (GWPs) to account for the relative difference in potencies of different GHGs. These numbers have changed as the science of GHGs has advanced. The original version of Santa Rosa's 2000 and 2007 city-wide GHG emissions inventories used

GWPs from IPCC's Second Assessment Report,[3] released in 1995. For the 2019 and updated 2007 inventories, the City updated these values to use the GWPs from the Sixth IPCC Assessment Report,[4] released in 2021. Table 1 below shows the GWPs by gas in both the second and the sixth assessment reports.

Table 1. Change in Global Warming Potentials by GHG

Gas	Second Assessment Report GWP	Sixth Assessment Report GWP
Carbon dioxide (CO_2)	1	1
Methane (CH_4) (fossil origin)	21	29.8
Methane (CH_4) (non-fossil origin)	21	27.2
Nitrous oxide (N_2O)	310	273

New Sectors and Subsectors

The City added emissions from land use and sequestration activities to the 2007 inventory. This sector accounts for GHG emissions from the conversion of land from open space or agriculture to urban land uses (a carbon source) and carbon dioxide absorbed by urban trees in urban areas (a carbon sink, or something that removes GHGs from the atmosphere).

Wildfire emissions, which include emissions associated with wildfires and prescribed fires, are typically provided for informational purposes to supplement city-wide GHG inventories. However, because there were no wildfires in 2007, wildfire emissions are not included in the 2007 city-wide GHG inventory.

Updates to Sector-Specific Methods

The City made the following additional updates to the 2007 inventory:

- Updated the emissions associated with on-road transportation and off-road equipment using data from EMFAC 2021, the latest emissions model for these two sectors developed by the California Air Resources Board (CARB). Using EMFAC 2021 instead of the OFFROAD 2007 model to calculate off-road emissions results in greater accuracy but yielded an increase in off-road emissions in the updated 2007 inventory compared with the original inventory.
- Updated the agriculture sector's fertilizer emissions estimates using geographic information system (GIS) acreage data from the California Department of Conservation's Farmland Mapping and Monitoring and Program database for the mapping of agricultural land.
- Updated emissions factors, sourced from CalRecycle, for the solid waste sector.
- Updated vehicle miles traveled (VMT) data and emissions factors for on-road vehicles to reflect the most current and accurate data available. The original inventory used CARB's EMFAC 2007 model as

[3] IPCC, 1996: Climate Change 1995, the Science of Climate Change. Contribution of WGI to the Second Assessment Report of the Intergovernmental Panel on Climate Change [Houghton, J.T., Miera Filho, L.G., Callander, B.A., Harris, N., Kattenburg, A., and Maskell, K. (eds)]. Cambridge University Press, Cambridge, United Kingdom, New York, NY, USA, and Oakleigh, Melbourne, Australia.
[4] IPCC, 2021: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp. doi:10.1017/9781009157896.

a way of estimating emissions from VMT, which only provided CO_2 emissions from the transportation sector. The City used the latest model, EMFAC 2021, to provide a more accurate assessment of VMT emissions from the transportation sector.

- Updated the GWP of methane (CH_4) and nitrous oxide (N_2O).
- Updated estimate of nonresidential electricity use.
- Updated methodology for calculating emissions associated with waste, in accordance with the Air Resources Board Landfill Tool version 1.3.
- Category added for emissions associated with land use and sequestration.

The City did not change data sources for sectors included in the 2007 inventory nor update transportation modeling.

Results of Updates to 2007 City-wide Inventory

The City updated the 2007 city-wide inventory to reflect changes to methods and protocols since 2010. This update resulted in changes to the results of most sectors, with notable increases in the off-road and agriculture sectors and decreases in the water and wastewater and waste sectors. The transportation and energy sectors experienced minor changes. Using the new methods of calculating city-wide emissions for 2007, the results show a 7 percent decrease in total emissions. Table 2 below shows the results of the updates to the 2007 baseline inventory.

Table 2. Updates to 2007 City-wide Baseline Inventory

Sector	Original Results	Updated Results	Percentage Change
Transportation	684,280	666,720	-3%
Nonresidential energy	209,880	209,610	Less than 1%
Residential energy	259,640	257,150	-1%
Off-road equipment	17,670	34,960	98%
Solid waste	139,770	52,800	-62%
Water and wastewater	9,840	8,070	-18%
Agriculture	170	220	29%
Land use and sequestration	-	3,200	-
Total Annual $MTCO_2e$	1,321,250	1,232,730	-7%
Informational items[1]			
Stationary sources	28,440	28,440	-
Wildfires and prescribed burns	-	0	-

Notes: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

[1] GHG emissions from stationary sources are regulated by the Bay Area Air Quality Management District (BAAQMD) and the California Air Resources Board (CARB). Because the City does not regulate these GHG emissions, stationary sources are provided as informational items and not included in the city-wide GHG inventory total.

2019 City-wide Inventory

As part of the preparation of the City's GHG Reduction Strategy, the City prepared a city-wide GHG emissions inventory for the year 2019. The City selected 2019 as the most recent year because the COVID-19 pandemic resulted in significant changes in activity for various sectors, many of which may not reflect "normal" levels for 2020 and 2021 and making them less useful as a foundation for estimating future emissions. The year 2019 is also used as the General Plan base year for the purposes of environmental impact analysis as required by the CEQA Guidelines. The 2019 inventory covers all sectors included in the 2007 inventory plus some subsector activity data that reflects community changes since 2007. For example, the City estimated 2019 emissions from SMART rail ridership based on annual passenger mileage for trips to and from Santa Rosa. Since there were no wildfires in 2019, wildfire emissions are not included in the 2019 city-wide GHG inventory. In 2019, Santa Rosa's city-wide GHG emissions totaled 872,300 $MTCO_2e$, as shown in Table 3 below.

Table 3. 2019 GHG City-wide Inventory Results

Sector	2019	2019 Proportion of total
Transportation	507,810	58%
Nonresidential energy	153,200	18%
Residential energy	148,280	17%
Off-road equipment	37,930	4%
Solid waste	31,560	4%
Water and wastewater	5,170	Less than 1%
Agriculture	200	Less than 1%
Land use and sequestration	-11,850	-1%
Total Annual $MTCO_2e$	872,300	100%
Informational items[1]		
Stationary sources	12,400	-
Wildfires and prescribed burns	0	0%

Notes: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.
[1] Stationary sources are not included in the city-wide GHG inventory total. They are provided as informational items.
Transportation remained the highest-emitting sector, representing 58 percent of emissions in 2019. The transportation sector is followed by nonresidential energy, residential energy, and off-road equipment as the second, third, and fourth-highest emitting sectors, respectively, in 2019.

In the 2019 city-wide GHG emissions inventory, the City included activity data and GHG emissions from the local public power provider, Sonoma Clean Power (SCP). The City joined SCP in 2014, so there are no SCP emissions in the 2007 city-wide inventory. SCP provides two types of electricity purchase options for its customers, CleanStart and EverGreen. CleanStart is the default service powered by a diverse mix of energy that, in 2019, was 96 percent carbon-free (sourced from 50 percent renewable energy, 46 percent hydroelectric power, and 4 percent from other sources).

EverGreen is 100 percent locally generated renewable power offered at all times of the day and night, by sourcing solar energy when the sun is shining and geothermal energy during the night.[5]

The land use and sequestration sector includes development activities (changes in land use, typically the development of previously undeveloped space) and urban tree sequestration. Both consider the ability of organic processes to sequester carbon. Development activities typically increase GHG emissions because they reduce the amount of land area available for sequestration. Urban trees lower community emissions by sequestering carbon. In 2019, urban trees sequestered more carbon than was emitted by development activities, resulting in negative emissions for this sector. This sector sequesters approximately 1 percent of city-wide emissions.

Summary of Changes in City-wide GHG Emissions, 2007 and 2019

Between 2007 and 2019, Santa Rosa's city-wide GHG emissions decreased by 29 percent. While most city-wide sectors experienced a decrease in GHG emissions during this time, the off-road sector experienced an increase in emissions. The land use and sequestration sector also contributed to a decrease in net city-wide GHG emissions due to the ability of open space and trees to sequester carbon. Table 4 and Figure 2 below show city-wide GHG emissions by sector in 2007 and 2019, including how GHG emissions changed over time during this period.

Table 4. City-Wide GHG Inventory Results, 2007 and 2019

Sector	2007	2019	Percentage Change
Transportation	666,720	507,810	-24%
Nonresidential energy	209,610	153,200	-27%
Residential energy	257,150	148,280	-42%
Off-road equipment	34,960	37,930	8%
Solid waste	52,800	31,560	-40%
Water and wastewater	8,070	5,170	-36%
Agriculture	220	200	-9%
Land use and sequestration	3,200	-11,850	-470%
Total Annual $MTCO_2e$	1,232,730	872,300	-29%

Note: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

Santa Rosa's city-wide GHG emissions decreased between 2007 and 2019 despite significant population and economic growth. The sectors that experienced significant decreases in annual GHG emissions between 2007 and 2019 are the land use and sequestration sector (470 percent decline), the residential energy sector (42 percent decline), the solid waste sector (40 percent decline), the water and wastewater sector (36 percent decline), the nonresidential energy sector (27 percent decline), and the transportation sector (24 percent decline).

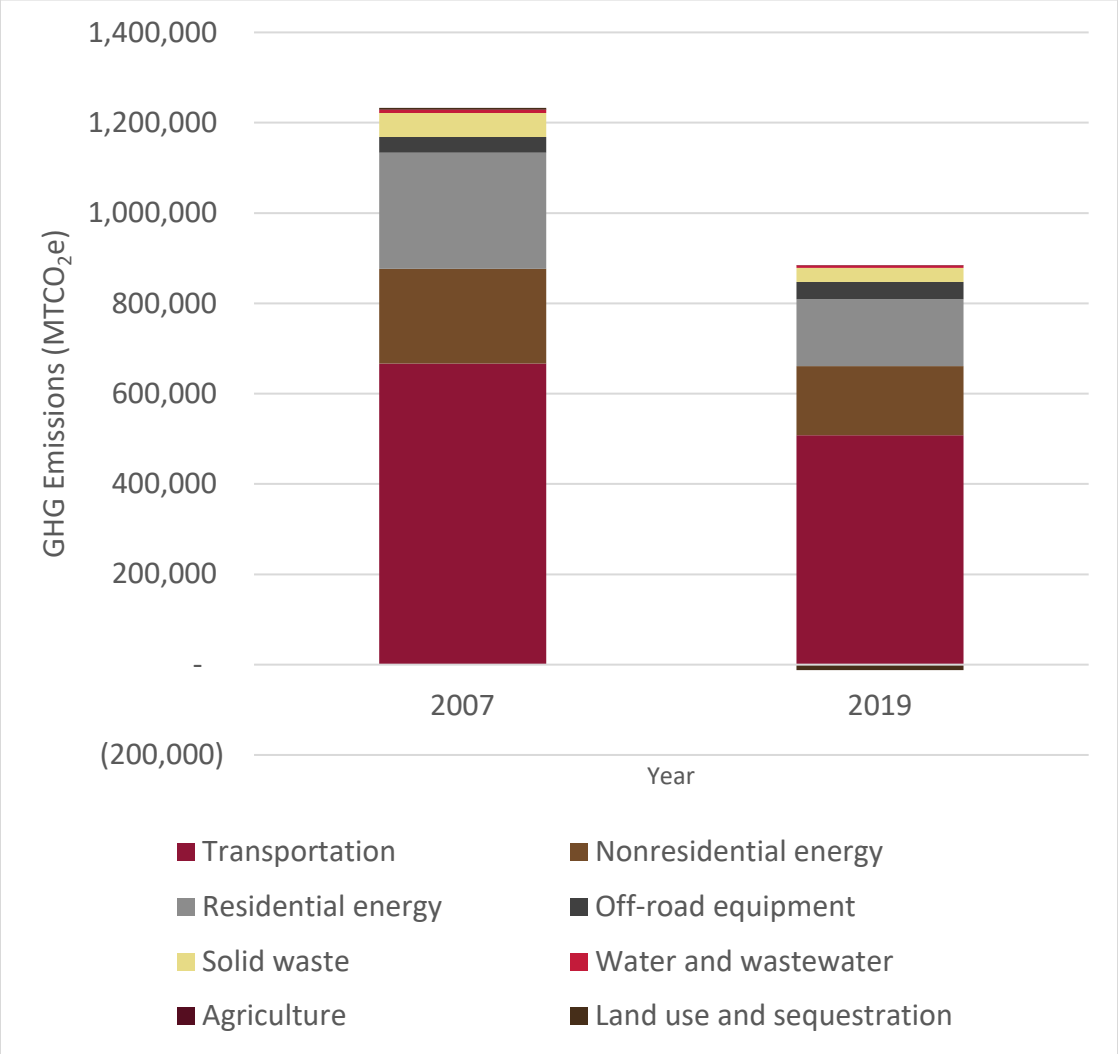
The large drop in land use and sequestration-related emissions comes from a decrease in greenfield development (i.e., conversion of agricultural lands or open space to developed areas) and increase in infill development. While residential

[5] Sonoma Clean Power, 2022, "Evergreen." Sonoma Clean Power. Retrieved online at https://sonomacleanpower.org/programs/evergreen.

electricity use declined approximately 6 percent between 2007 and 2019, likely due to increases in energy efficiency, much of the decline in residential energy GHG emissions is attributed to the community's transition to renewable and carbon-free sources of electricity. Similarly, the dramatic decline in emissions from the nonresidential sector is due to a significant increase in renewable and carbon-free electricity supplies.

A decrease in water and wastewater sector GHG emissions is in part attributed to the increased availability of renewable and carbon-free electricity and a decrease in natural gas use. Changes in how these emissions are calculated also play a part. The decrease in solid waste-related emissions appears to be due to changes in methods and data sources. Changes to transportation-related emissions are a result of decreases in total VMT (a function of changes in VMT modeling) combined with increased vehicle fuel efficiency.

Figure 2. City-wide GHG Inventory Results in, 2007 and 2019



2019 GHG Emissions in Planning Area

The GHG emission inventory results discussed in previous sections are for the City Limits of Santa Rosa. This is the area formally incorporated as part of the city, covering approximately 41 square miles. The GHG Reduction Strategy, as part of Santa Rosa's General Plan Update, also assesses GHG emissions from the Santa Rosa Planning Area. The Planning Area for the General Plan includes land within the incorporated city, SOI, and UGB, covering about 49 square miles. Under State law, a general plan must address all areas within the jurisdiction's Planning Area. Figure 1 above shows the boundaries of these different areas.

Using the land use and demographics in the Planning Area, combined with per-capita activity data for the City Limits, the City estimated the total GHG emissions for the entirety of the Planning Area. In 2019, Santa Rosa's Planning Area-wide GHG emissions totaled 928,530 $MTCO_2e$, as shown in Table 5 below.

Table 5. 2019 Planning Area GHG Inventory Results

Sector	2019	2019 Proportion of Total
Transportation	541,140	58%
Nonresidential energy	162,400	17%
Residential energy	158,340	17%
Off-road equipment	40,290	4%
Solid waste	33,630	4%
Water and wastewater	5,510	1%
Agriculture	280	Less than 1%
Land use and sequestration	-13,060	-1%
Total Annual $MTCO_2e$	928,530	100%

Note: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

The 2019 Planning Area GHG inventory results mirror the city-wide inventories with the transportation sector being the highest-emitting sector, followed by nonresidential energy, residential energy, and off-road equipment, as the second, third, and fourth-highest emitting sectors, respectively. As in the city-wide inventory, the land use and sequestration sector has a net negative effect on community-wide emissions in Santa Rosa's Planning Area.

GHG Emissions Forecasts for 2030, 2045, and 2050

A GHG emissions forecast provides information about anticipated changes in GHG emission levels and helps inform where reductions are necessary to achieve future GHG emissions reduction targets. The GHG Reduction Strategy includes forecasts for the calendar years 2030, 2045, and 2050. The forecasts are based on the 2019 city-wide and Planning Area-wide GHG emissions inventories combined with Santa Rosa's 2019 and future demographic projections. Demographic projections for the City Limits are shown in Table 6 below and for the entire Planning Area in Table 7.

Table 6. Forecast Demographic Indicators in City Limits

Indicator	2019	2030	2045	2050
Population	185,396	207,249	237,049	246,983
Households	71,033	79,038	89,954	93,592
Jobs	73,199	77,915	84,346	86,490
Service Population	258,595	285,164	321,395	333,472
Geographic Area (square miles)	41.1	41.1	41.1	41.1

Table 7. Forecast Demographic Indicators in Planning Area

Indicator	2019	2030	2045	2050
Population	197,976	221,312	253,134	263,742
Households	75,853	84,401	96,058	99,943
Jobs	77,593	82,593	89,411	91,683
Service Population	275,569	303,905	342,545	355,425
Geographic Area (square miles)	49.3	49.3	49.3	49.3

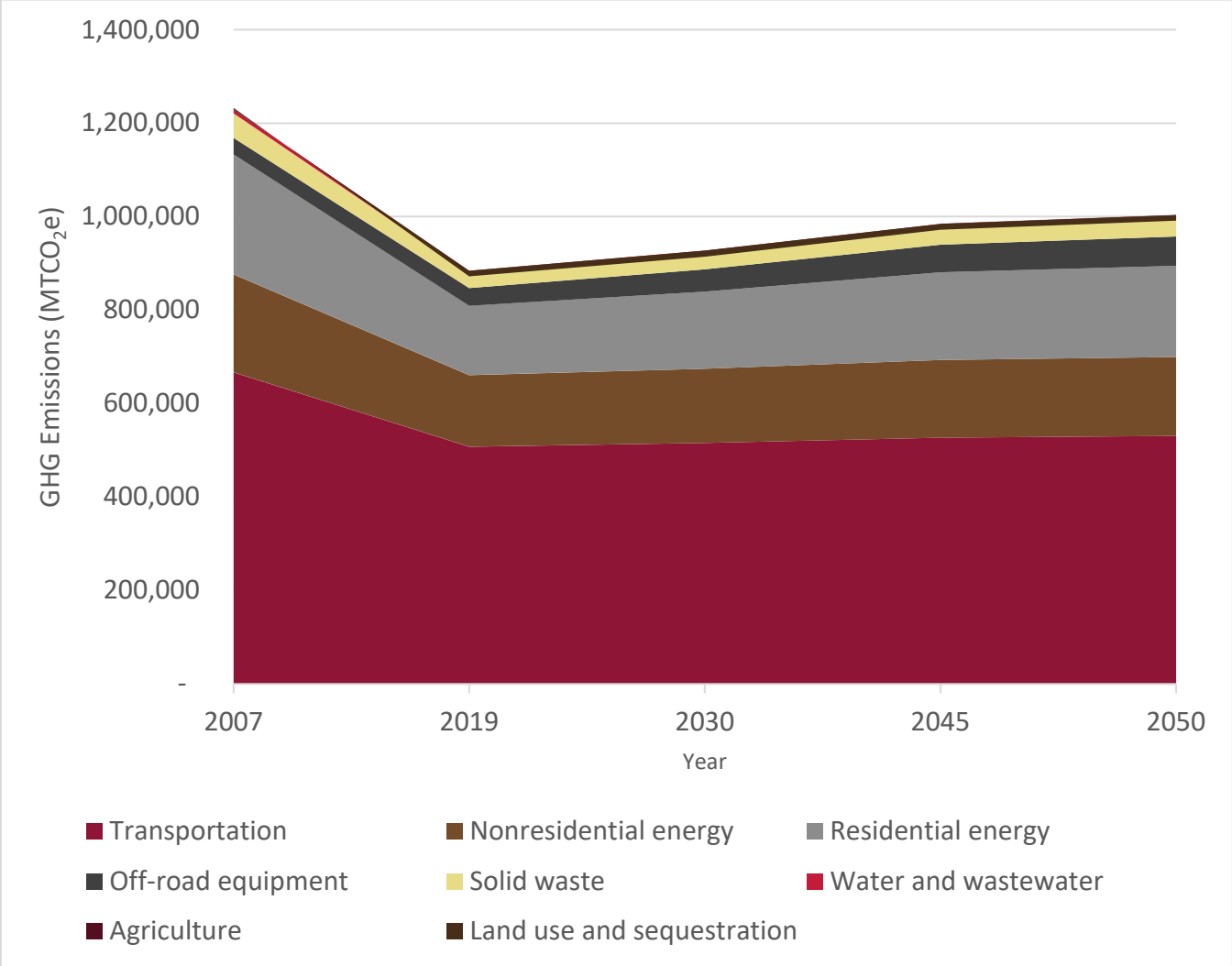
Tables 8 and 9 and Figures 3 and 4 below show 2007 and 2019 inventories and business-as-usual emissions forecasts for 2030 through 2050 for the City Limit and entire Planning Area, respectively. A business-as-usual forecast identifies the level of GHG emissions that the City Limit or Planning Area would be expected to generate in the absence of any additional actions to reduce GHG emissions at the state, regional, or local level, including actions that have been adopted but not yet implemented. The results of the 2007 and 2019 inventories are included for comparison purposes. GHG Emissions from most individual sectors are projected to remain below 2007 levels, except the off-road vehicles and equipment sector, which is forecast to generate increased GHG emissions through 2050. Table 8 and Figure 3 show the city's forecasted GHG emissions in the absence of any intervention.

Table 8. Inventory and Business-as-Usual GHG Emissions Forecast for the City Limits

Sector	2007 Inventory[1] $MTCO_2e$	2019 Inventory[1] $MTCO_2e$	2030 Forecast[2] $MTCO_2e$	2045 Forecast[2] $MTCO_2e$	2050 Forecast[2] $MTCO_2e$	Percentage Change 2007 to 2050
Transportation	666,720	507,810	515,890	526,910	530,570	-20%
Nonresidential energy	209,610	153,200	158,780	166,390	168,940	-19%
Residential energy	257,150	148,280	164,980	187,780	195,360	-24%
Off-road equipment	34,960	37,930	47,670	58,870	62,660	79%
Solid waste	52,800	31,560	34,800	39,230	40,700	-23%
Water and wastewater	8,070	5,170	5,180	5,170	5,170	-36%
Agriculture	220	200	130	40	10	-95%
Land use and sequestration	3,200	-11,850	-12,900	-12,150	-11,900	-472%
Total	1,232,730	872,300	914,530	972,240	991,510	-20%

Notes: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.
[1] Data shown for 2007 and 2019 reflect GHG emission inventories and are provided as a reference to illustrate change over time.
[2] The data shown for 2030, 2045, and 2050 are GHG emission forecasts that predict future emissions. The forecast numbers for 2030, 2045, and 2050 are based on projections from the 2019 inventory.

Figure 3. Inventory and Business-as-Usual GHG Emissions Forecast for the City Limits



Similarly, overall Planning Area GHG emissions are expected to gradually increase between 2019 and 2050, while remaining below 2007 levels. GHG emissions from most individual sectors are also expected to remain below 2007 levels by 2050, except for emissions from offroad vehicles and equipment.

Table 9 and Figure 4 show the Planning Area's forecasted GHG emissions in the absence of any new intervention.

Table 9. Inventory and Business-as-Usual GHG Emissions Forecast for the Planning Area

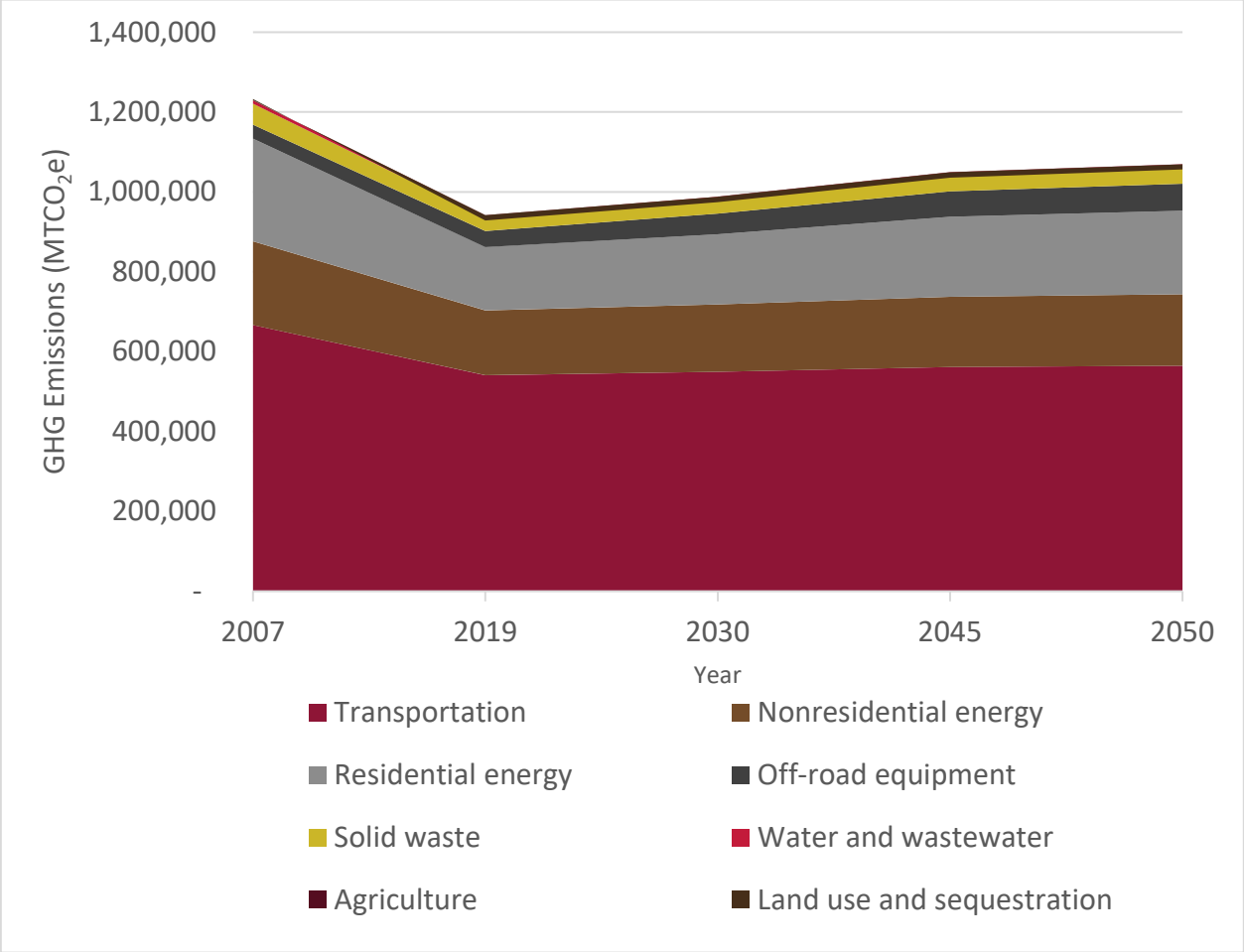
Sector	2007 Inventory[1] $MTCO_2e$	2019 Inventory[1] $MTCO_2e$	2030 Forecast[2] $MTCO_2e$	2045 Forecast[2] $MTCO_2e$	2050 Forecast[2] $MTCO_2e$	Percentage Change 2007 to 2050
Transportation	666,720	541,140	549,620	561,180	565,020	-15%
Nonresidential energy	209,610	162,400	168,310	176,380	179,080	-15%
Residential energy	257,150	158,340	176,180	200,520	208,620	-19%
Off-road equipment	34,960	40,290	51,300	63,400	67,490	93%
Solid waste	52,800	33,630	37,090	41,810	43,380	-18%
Water and wastewater	8,070	5,510	5,550	5,540	5,540	-31%
Agriculture	220	280	180	50	10	-95%
Land use and sequestration	3,200	-13,060	-14,160	-13,110	-12,750	-498%
Total	1,232,730	928,530	974,070	1,035,770	1,056,390	-14%

Notes: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.
[1] Data shown for 2007 and 2019 reflect GHG emission inventories and are provided as a reference to illustrate change over time. Estimates of the 2007 Planning Area inventory equal the City Limits due to absence of data.
[2] The data shown for 2030, 2045, and 2050 are GHG emission forecasts that predict future emissions. The forecast numbers for 2030, 2045, and 2050 are based on projections from the 2019 inventory.

GHG Emissions Reduction Targets

As part of efforts to reduce GHG emissions, both the State of California and City of Santa Rosa have established GHG emission reduction targets. In establishing GHG reduction targets, the City and State declared an objective of reducing GHG emissions to a certain level by a specific future date. This GHG Reduction Strategy is required to demonstrate compliance with GHG targets set by the State, at a minimum, for consistency with the State's CEQA Guidelines and to be considered a qualified GHG reduction plan and available for use to streamline analysis of potential GHG impacts of future projects under CEQA. Both State- and City-defined targets help direct development, resource use, and circulation policy and decision-making; help the City track its progress over time; and indicate the importance of reducing the community's climate change impact to the greatest extent feasible, as quickly as possible. This section presents the City's GHG emissions reduction targets, both regulatory and aspirational.

Figure 4. Inventory and Business-as-Usual GHG Emissions Forecast for the Planning Area



State Targets

Senate Bill (SB) 32, adopted in 2016, requires that the State reduce statewide GHG emissions to 40 percent below 1990 levels by 2030.[6] Executive Order B-55-18 (2018) established a goal for the state to achieve net carbon neutrality by 2045. Assembly Bill (AB) 1279, adopted in 2022, codified this goal into law, directing statewide achievement of net zero GHG emissions (GHGs released to the atmosphere are balanced by removals of GHG emissions) as soon as possible, but no later than 2045. AB 1279 also directs maintenance of net negative GHG emissions thereafter, and to ensure that by 2045, statewide human caused GHG emissions are reduced to at least 85 percent below 1990 levels by 2045.

[6] The State's AB 32 Scoping Plan identifies 15 percent below 2005–2008 emissions levels as the local government equivalent of 1990 GHG emissions levels. The City uses 2007 as the baseline year.

Santa Rosa's Community-wide Targets

2020 and pre-2020 Community-wide GHG Emissions Reduction Targets

In August 2005, the Santa Rosa City Council adopted Resolution Number 26341, which set a community-wide GHG emissions reduction target of 25 percent from 1990 levels by 2015. In 2012, the City Council adopted a Community-wide Climate Action Plan (CCAP), which established a pathway to achieve and exceed the 2020 target (equivalent of emitting 842,290 $MTCO_2e$ per year) and to continue GHG reductions in support of the State's goal to reduce statewide GHG emissions 80 percent below 1990 levels by 2050.

City of Santa Rosa Climate Emergency Resolution (2020)

On January 14, 2020, the City Council adopted Resolution Number RES-2020-002 declaring a climate emergency and requiring immediate mobilization to restore a safe climate. This Resolution committed the City to ongoing efforts related to climate change and GHG emissions reductions through the implementation of Climate Action Subcommittee direction, the work of City departments, and collaboration with the Regional Climate Protection Authority (RCPA). The Climate Emergency Resolution includes a goal to reach carbon neutrality by 2030.

Post-2020 Community-wide GHG Emissions Reduction Targets

To meet the State's reduction targets, the City must reduce community-wide GHG emissions to 40 percent below 1990 levels by 2030 and 85 percent below 1990 levels by 2045, at a minimum. Table 10 below presents GHG emissions for the past years used to establish the baseline (1990 and 2007) and the GHG emission targets for 2030 and 2045.

Table 10. Santa Rosa City Limits GHG Emission Reduction Targets

Target	$MTCO_2e$
1990 Emissions (15% below 2007 Baseline)	1,047,820
2007 Baseline	1,232,730
2030 Target (40% below 1990 levels)	628,690
2045 Target (85% below 1990 levels and net carbon neutrality)	157,170
2050 Target (minimum 85% below 1990 levels and net carbon neutrality) [1]	157,170

[1] The State has not adopted a quantitative GHG emissions reduction target beyond 2045; however, the State, aspires to achieve net zero GHG emissions as soon as possible, but no later than 2045, and to achieve and maintain net negative greenhouse gas emissions thereafter.

This GHG Reduction Strategy is designed to achieve net carbon neutrality by 2045 (e.g., reduce emissions 85 percent below 1990 levels and support sequestration or other activities to balance out the remaining 15 percent), consistent with the State target established by AB 1279 (California Climate Crisis Act; California Health and Safety Code Section 38562.2) in 2022. This Reduction Strategy sets the 2030, 2045, and 2050 emissions targets based on the best available science for inventorying and establishing local GHG emissions reduction targets and guidance from

BAAQMD,[7] CAPCOA,[8] and CARB,[9] which guided preparation of the GHG inventories and forecasts completed for General Plan 2050 and this Reduction Strategy (as presented in this chapter and detailed in the Appendix). The GHG emissions inventories, GHG emissions forecasts, and quantification of GHG reduction potential of measures to achieve these targets (presented in Chapter 3 and detailed in the Appendix) are also supported by best available science and best practices, the City's past efforts to prepare the MCAP and CCAP, as well to implement both plans, and ongoing work by RCPA to inventory GHG emissions and track climate action progress.

As noted previously, the City has adopted a Climate Emergency Resolution calling on Santa Rosa to achieve net carbon neutrality by 2030. Achieving net carbon neutrality by 2030 is a notable aspirational goal shared by several cities and communities around the world. At this time, achievement of carbon neutrality community-wide by 2030 would require a significant increase in City resources, technologies, staff time, and community participation, well beyond what is currently available to the City. This Reduction Strategy proposes measures and actions to achieve minimum GHG reduction targets for 2030 and 2045 to demonstrate the community's consistency with and support the State's GHG reduction targets to achieve carbon neutrality statewide no later than 2045. Although this GHG Reduction Strategy shows a quantitative path to achieving net carbon neutrality by 2045, City staff, decision makers, and community members should continue aggressive efforts to reduce GHG emissions beyond the levels identified in this strategy as opportunities allow.

Both the State and City of Santa Rosa have implemented policies and programs to help meet these ambitious GHG reduction targets. The emission impacts of these actions are discussed in the next chapter, along with the new reduction measures introduced as part of this Reduction Strategy.

Carbon Neutrality

Net carbon neutrality refers to the idea of achieving net-zero carbon emissions by balancing those emissions so that they are equal to or less than emissions that are removed from the atmosphere through sequestration or related efforts. Achieving carbon neutrality requires both significantly reducing community GHG emissions and supporting the ecosystems that sequester carbon. The City of Santa Rosa has long been committed to achieving carbon neutrality, and this GHG Reduction Strategy presents a pathway to achieving State-defined carbon neutrality targets by 2045.

[7] Bay Area Air Quality Management District. 2022. *California Environmental Quality Act Guidelines, Appendix C: Guidance for GHG Reduction Strategies*. https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa-guidelines-2022/appendix-c-ghg-reduction-strategies_final_edits-for-ascent-pdf.pdf?rev=8e5bb7d8ad504dd6accd3c04e58bdf87.
[8] California Air Pollution Control Officers Association. 2022. *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity.* https://www.caleemod.com/handbook/index.html.
[9] California Air Resources Board. 2022. *2022 Scoping Plan for Achieving Carbon Neutrality, Appendix D: Local Actions*. https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-appendix-d-local-actions.pdf

3. GHG Emissions Reduction Measures and Programs

This section describes GHG emissions reduction measures implemented on the state and local levels. It includes existing measures that have already started to be implemented, and new measures that are being introduced for the first time as part of this GHG Reduction Strategy. Projected GHG emissions reductions within the City Limits are presented for the years 2030, 2045, and 2050 for both new and existing measures. Descriptions of new measures also include implementation information, including the applicability of the measure and its supporting actions and performance assumptions.

State Reduction Measures

California has adopted and committed to implementing policies to decrease GHG emissions statewide, including from several of the major GHG-emitting sectors that are also present in Santa Rosa. Many of these policies are identified in California's Climate Change Scoping Plan, which was originally adopted in 2008 in response to the California Global Warming Solutions Act. The Scoping Plan outlines several regulatory and market-based solutions to achieving California's GHG emissions reduction goals. Successive updates to the Scoping Plan in 2014, 2017, and 2022 have revised these state actions and identified additional opportunities for GHG emissions reductions.

While the Scoping Plan and related documents lay out several policies to reduce GHG emissions, the GHG Reduction Strategy focuses on the measures that have the most direct and apparent benefits to Santa Rosa. The GHG Reduction Strategy includes an assessment of Santa Rosa's GHG emissions reduction benefits from California's policies, allowing the community to receive "credit" for the state's efforts. These efforts are:

- The Renewables Portfolio Standard (RPS), which requires increases in renewable electricity supplies.
- The Clean Car Standards, which require increased fuel efficiency of on-road vehicles and decreased carbon intensity of vehicle fuels. In 2022, the State adopted the Advanced Clean Cars II standards, which apply to vehicles produced from 2026 to 2035 and require that all new light-duty vehicles sold in California be zero-emission by 2035. Similar standards, known as the Advanced Clean Trucks, Advanced Clean Fleets, and Innovative Clean Transit regulations, require GHG reductions for larger vehicles and organizations that operate vehicle fleets.
- The updated Title 24 building energy-efficiency standards, which require new buildings to achieve increased energy-efficiency targets. The current version of these standards went into effect January 1, 2023.
- The Short-Lived Climate Pollutant Reduction Strategy, also known as SB 1383, which requires that jurisdictions provide organic waste collection services, qualifying businesses recover and donate edible food, and that all individuals and businesses dispose of organic waste in their green waste collection carts.

The projected GHG reduction benefits of these actions within the City Limits are presented in Table 11 below.

Table 11. Santa Rosa City Limits GHG Emissions Reductions from State Actions, 2007 to 2050

State Emissions Reduction Measure	2007 Inventory $MTCO_2e$	2019 Inventory $MTCO_2e$	2030 Forecast $MTCO_2e$	2045 Forecast $MTCO_2e$	2050 Forecast $MTCO_2e$	Percentage Change 2007 to 2050
Forecast emissions without state actions	1,232,730	872,300	914,530	972,240	991,510	-20%
Renewables Portfolio Standard (RPS)	-	-	-20,490	-83,050	-83,590	-
Clean Car Standards	-	-	-103,480	-192,900	-201,700	-
Title 24	-	-	-7,490	-29,190	-37,970	-
SB 1383	-	-	-9,060	-10,210	-10,590	-
Reductions from all state actions	-	-	-140,520	-315,350	-333,850	-
Emissions with state actions	1,232,730	872,300	774,010	656,890	657,660	-47%

Notes: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

Existing Community-wide Reduction Measures

The City of Santa Rosa has been a long-time leader in reducing GHG emissions. The City's 2012 CCAP identified early GHG emissions reduction actions, such as installing and using renewable energy, conducting energy-efficiency upgrades, supporting alternative modes of transportation and electric vehicles, and reducing waste. Since the 2012 CCAP was adopted, the City has worked to implement these actions alongside the community and in partnership with regional agencies. The 2019 city-wide GHG inventory accounts for the implementation of the 2012 CCAP and other climate action measures between 2012 and 2019. All City-led actions that have been implemented or increased participation since 2019 can be credited for additional GHG emissions reductions.

Existing actions whose GHG emissions reductions have been quantified include:

- **Participation in Sonoma Clean Power.** The City of Santa Rosa is a participant in Sonoma Clean Power (SCP), a community choice electricity provider that on average provides higher levels of renewable energy than the Pacific Gas and Electric Company (PG&E). In 2019, SCP provided approximately 86 percent of Santa Rosa's residential and 90 percent of its nonresidential electricity, excluding direct access electricity. All municipal accounts are enrolled in SCP's EverGreen program.
- **Solar system installations.** Since 2019, approximately 4,500 residential and 80 commercial solar energy systems have been installed in Santa Rosa.
- **Micro-mobility programs.** Between July 2022 and June 2023, the City's Bird Scooter program provided nearly 9,000 scooter rides.
- **Installation of public electric vehicle (EV) chargers.** According to the Alternative Fuels Data Center, Santa Rosa has approximately 69 public EV charging locations, corresponding to over 160 charging ports.

- Installation of graywater systems. Since the beginning of 2020, the City has rebated the installation of seven graywater systems.
- Cash for Grass Rebate Program. The City's Cash for Grass Rebate Program provides rebates for qualifying residents and building owners who replace their lawns with water-efficient landscaping. Between 2020 and 2023, the Cash for Grass Rebate Program resulted in the conversion of 639 sites and removal of 700,984 square feet of lawn.
- WaterSmart Check-up Program. The City's WaterSmart Check-up Program provides free water-efficient fixtures and reviews the customer's irrigation system for inefficiencies. The program saves approximately 1.3 million gallons of water per year.
- Expansion and upgrading of the City's bike network. Since 2020, the City has constructed 0.6 miles of new bike lanes and has upgraded 5.6 miles, primarily from Class II to Class IIB bike lanes.[10] The City has committed to adding another 4 miles of bike lanes to the bike network by the end of 2024.
- Electric new construction reach code. On November 19, 2019, the City passed a reach code that required new residential construction of three stories and below to be all electric. In 2022, the City extended the all-electric reach code requirement for low-rise residential buildings through the 2022 California Building Code cycle (Ordinance 2022-015). The 2022 reach code provides exemptions for reconstructed buildings lost in a disaster, attached dwelling units, and new construction where existing utility infrastructure would have to be removed at the owner's expense. The GHG reductions beyond 2024, as shown in Table 12, reflect the annual benefits of all-electric buildings built during implementation of the 2019 and 2022 reach codes, through June 30, 2024.[11]

The projected GHG reduction benefits of these actions within the City Limits are presented in Table 12 below.

[10] Class II bike lanes are on-street facilities designated for bicyclists using stripes and stencils. Class IIB bike lanes include buffer striping to provide greater separation between bicyclists and parked or moving vehicles.

[11] The City has suspended its enforcement of Ordinance 2022-015 because of a decision on January 2, 2024, by the U.S. Court of Appeals 9th Circuit that invalidated a City of Berkeley ordinance that prohibited natural gas infrastructure in new buildings, precluding cities and counties from adopting ordinances that prohibit the installation of gas plumbing in buildings. The City is currently evaluating options for a replacement reach code that will achieve similar objectives for energy efficiency and GHG emissions reductions in a manner that is consistent with the recent court decision.

Table 12. Santa Rosa City Limits GHG Emissions Reductions from Municipal Actions, 2007 to 2050

State Emissions Reduction Measure	2007 Inventory $MTCO_2e$	2019 Inventory $MTCO_2e$	2030 Forecast $MTCO_2e$	2045 Forecast $MTCO_2e$	2050 Forecast $MTCO_2e$	Percentage Change 2007 to 2050
Forecast emissions with state actions	1,232,730	872,300	774,010	656,890	657,660	-47%
Sonoma Clean Power	-	-	-10,810	0	0	-
Solar installations	-	-	-150	0	0	-
Micro-mobility	-	-	Less than -10	Less than -10	Less than -10	-
Public EV chargers	-	-	-6,720	-5,750	-5,690	-
Graywater systems			Less than -10	Less than -10	Less than -10	
Cash for Grass Rebate Program			Less than -10	Less than -10	Less than -10	
WaterSmart Check-up Program			Less than -10	Less than -10	Less than -10	
New bike lanes			-10	-10	-10	
All-electric reach code (or equivalent)			-5,490	-5,520	-5,520	
Reductions from all municipal actions	-	-	-23,180	-11,280	-11,220	-
Emissions with municipal actions	1,232,730	872,300	750,830	645,610	646,440	-48%

Notes: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

These GHG emissions reductions are an important contributor to the City's ability to meet its community-wide GHG reduction targets. However, the City must implement additional emissions-reducing actions to meet state targets. This GHG Reduction Strategy builds on the City's already significant progress through the new measures described below.

New Community-wide Reduction Measures and Programs

This GHG Reduction Strategy presents 17 new climate action measures. All measures are expected to further reduce GHG emissions and help the City meet its climate action, sustainability, and resilience goals. However, lack of both reliable data and a standardized protocol for quantifying emissions reductions for three of these measures (Measures 15, 16, and 17) prevents them from being quantified. Due to the City's already high rates of recycled water use, Measure 13 (Expand water catchment and reuse opportunities) also does not result in quantifiable emissions reductions. These three measures are classified as supportive measures. The GHG Reduction Strategy demonstrates a feasible pathway to reduce GHG emissions to at least 40 percent below 1990 levels by 2030 and 85 percent below 1990 levels no later than 2045 with a commitment to accelerate reductions, as feasible, in support of the City's and State's carbon neutrality goals. (Supported by General Plan Policy 3-7.1)

The measures are designed to help meet the City's GHG reduction goal to achieve net carbon neutrality by 2045 (Goal 3-7 of the General Plan 2050) and are organized by the following five objectives. Table 13 below lists the objectives and their associated measures. Each of the first four objectives corresponds to a GHG emissions sector: transportation and off-road equipment, residential and nonresidential building energy use, solid waste, water and wastewater, and land use and sequestration.

1. Objective: Decrease Community-Wide Vehicle Miles Traveled (VMT) And Increase The Use Of Zero-Emission Vehicles And Equipment.
2. Objective: Reduce Community-Wide Energy Use And Transition To Carbon-Free Energy Sources.
3. Objective: Achieve A Zero Waste Future For Santa Rosa.
4. Objective: Use Water Efficiently And Enhance Drought Resilience.
5. Objective: Enhance Sustainable And Carbon-Free Practices Community-Wide.

When implemented, these measures will reduce GHG emissions, improve community adaptation and resilience to climate change-related hazards, and address other sustainability issues. The Project Team developed these GHG reduction measures following current best practices and guidance, the lessons learned through implementation of the 2012 CCAP, and input and feedback from residents and key stakeholders who represent many different community organizations and businesses.

Objectives and measures are supported by a series of General Plan goals, which are identified below the corresponding objective or measure language. Each measure is enacted through a series of implementing programs, some of which are policies or actions from the General Plan and identified as such with their General Plan policy or action number. This integration of the General Plan into the GHG Reduction Strategy helps ensure that the documents are consistent and that they form a unified approach to reduce Santa Rosa's GHG emissions.

Implementation programs are organized in three categories, as follows:

- Municipal programs refer to programs over which the City has sole authority, including operation, maintenance, and management of City facilities, services, and programs, such as making changes to municipal facilities or purchasing policies.
- Regulatory programs refer to the passage, development, or implementation of local regulations, such as amendments to the municipal code.

- **Education, outreach, and coordination programs** include efforts to inform the community about sustainability issues, initiatives, and benefits and to create and sustain partnerships that support the successful implementation of the measure.

Table 13. New Community-wide GHG Emissions Reduction Objectives and Measures

OBJECTIVE: DECREASE COMMUNITY-WIDE VEHICLE MILES TRAVELED (VMT) AND INCREASE THE USE OF ZERO-EMISSION VEHICLES AND EQUIPMENT.	
Measure 1	Locate and design new development to minimize vehicle dependence.
Measure 2	Improve the frequency, coverage, and effectiveness of local and regional transit and rail networks
Measure 3	Develop and expand transportation demand management (TDM) programs to reduce VMT and dependence on single-occupancy vehicle trips.
Measure 4	Enhance active transportation and micromobility systems.
Measure 5	Accelerate the adoption of zero-emission light-duty and heavy-duty vehicles. [1]
Measure 6	Transition to zero-emission motorized equipment, including construction and landscaping equipment.
OBJECTIVE: REDUCE COMMUNITY-WIDE ENERGY USE AND TRANSITION TO CARBON-FREE ENERGY SOURCES.	
Measure 7	Reduce community-wide energy use, increase energy efficiency, and advance electrification in existing buildings, including municipal buildings.
Measure 8	Transition to carbon neutral new buildings.
Measure 9	Increase local renewable energy generation and the use of renewable, carbon free, and distributed energy systems, including energy storage, throughout the city.
OBJECTIVE: ACHIEVE A ZERO-WASTE FUTURE FOR SANTA ROSA.	
Measure 10	Reduce the amount of recyclable and compostable material sent to landfills.
Measure 11	Reduce total waste generation.
OBJECTIVE: USE WATER EFFICIENTLY AND ENHANCE DROUGHT RESILIENCE.	
Measure 12	Improve indoor and outdoor water use efficiency.
Measure 13	Expand water catchment and reuse opportunities. [2]
OBJECTIVE: ENHANCE SUSTAINABLE AND CARBON-FREE PRACTICES COMMUNITY-WIDE.	
Measure 14	Increase local natural carbon sequestration opportunities.
Measure 15	Reduce embedded carbon in goods and services used by the City and community members. [2]
Measure 16	Maximize opportunities for local food production. [2]
Measure 17	Integrate climate action across all City departments and programs. [2]

[1] For regulatory purposes, medium-duty vehicles are classed with heavy-duty vehicles.
[2] These measures do not result in quantifiable GHG emissions reductions.

Achievement of State and local GHG reduction targets requires the City to implement the measures in this GHG Reduction Strategy and to regularly report on the progress made. Each measure in this Reduction Strategy is accompanied by substantive evidence and implementation guidance that ensures that each measure is assigned to a lead City department responsible for implementation. Details about how the GHG emissions savings for each measure were calculated are presented in the Appendix.

Each measure is presented in this chapter with its supporting implementation programs and details. The description of each measure includes narrative text to describe the measure, its projected GHG emissions savings within City Limits (if applicable), implementing programs, supportive General Plan policies, measure performance standards, applicability, measure type, timeframe, lead department(s), supporting department(s), supporting partners, and Expected Funding Sources, as defined below.

- Performance Standards: Quantifies the development and activity change that the City needs to implement by 2030, 2045, and 2050 to achieve the full projected GHG emission reductions from each measure. Additional quantitative details and substantial evidence for each measure can be found in the Appendix.
- Applicability: The people, development, land uses, activities, and other aspects of the community that the measure applies to.
- Timeframe of Implementation: Identifies the year by which a measure should be effective by the fiscal year's end. The exact status of a measure will vary based on its actions, and many measures will be ongoing through and beyond 2030. An effective measure will be one that is actively on track to achieve its targeted GHG emissions reductions, supports adaptation to climate change effects, or achieves long-term resilience. For a measure to be effective, the necessary programs and efforts should be active, and any infrastructure or other capital improvements should be in place. The effective year is not the end year—many of the measures are intended to remain in effect for the foreseeable future, so they do not have end dates. Time frames for effectively setting up the measures are:
    - Short-term (by 2024)
    - Medium-term (by 2027)
    - Long-term (by 2030)
- Responsible and Supporting City Departments: The lead City department(s) tasked with implementing the measure and City departments that have a supporting role in implementation.
- Supporting Community Partners: Example of local organizations that the City will partner with to implement the given policy. This is not an exhaustive list; additional community partners will be welcome.
- Funding Sources: Expected sources of funding for the measure.

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.

Vehicle travel is a significant part of daily life. However, personal and commercial vehicles are currently one of Santa Rosa's primary sources of GHG emissions and air pollutants. The State of California has long recognized transportation's contribution to GHG emissions and has taken several actions to increase the use of zero-emission vehicles (ZEVs). Most recently, the State adopted new regulations that require all new passenger vehicles sold in California to be zero-emission by 2035. Locally, recent shifts towards telecommuting have helped reduce commute emissions.

The GHG Reduction Strategy establishes a framework for reducing vehicle and equipment emissions by reducing the VMT of personal and commercial vehicles, promoting public and active transportation, changing development patterns to promote affordable housing[12] and facilitate easy access to goods and services, expanding micro-mobility options, and accelerating the switch to zero-emission fuels for vehicles and equipment. In addition to reducing GHG emissions, these measures will also improve public health, air quality, and overall quality of life in Santa Rosa.

Measures included under this objective are:

- Measure 1: Locate and design development to minimize vehicle dependence.
- Measure 2: Improve the frequency, coverage, and effectiveness of local and regional transit and rail networks.
- Measure 3: Develop and expand transportation demand management (TDM) programs to reduce VMT and dependence on single-occupancy vehicle trips.
- Measure 4: Enhance active transportation and micro-mobility systems.
- Measure 5: Accelerate the adoption of zero-emission light-duty and heavy-duty vehicles.

Supportive General Plan Goals:

General Plan Goal 2-1:	Ensure that growth and change serve community needs, protect the environment, improve the City's fiscal stability, and enhance quality of life for all members of the community.
General Plan Goal 2-2:	Promote city-centered growth and investment with a neighborhood-focused approach to create complete and connected communities that provide community members' daily needs within easy walking or biking distance.
General Plan Goal 2-3:	Create dense and varied housing types near transit to reduce greenhouse gas emissions and promote livability.
General Plan Goal 2-5:	Create a business-friendly, diverse, and sustainable economy through the attraction of new business, and the expansion, retention, and support of existing business.
General Plan Goal 2-8:	Enliven and maintain vibrant, convenient, and attractive commercial centers.

[12] Affordable housing provides greater opportunity for lower-income households to live closer to job centers and achieve a jobs/housing balance match near transit. It is also an important tool to address the limited availability of affordable housing that might force residents to live far from jobs or school, requiring longer commutes.

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.	
General Plan Goal 3-1:	Provide an integrated land use and transportation system with safe and efficient movement of people and goods for all modes of travel that prioritizes reduction of VMT and transportation-related GHG emissions.
General Plan Goal 3-2:	Provide a safe and accessible active and public transportation network that emphasizes active transportation connections and service to Equity Priority Areas and Areas of Change
General Plan Goal 3-3:	Transition away from single-occupancy vehicles.
General Plan Goal 3-6:	Use nature- and science-based strategies to preserve and create environments that provide ecosystem benefits.
General Plan Goal 3-7:	Strive to achieve net carbon neutrality no later than 2045.

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.

Measure 1: Locate and design new development to minimize vehicle dependence.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
12,040	10,090	11,940

Implementing Programs:

Regulatory Programs:

1.1. Implement the City's General Plan and update the Zoning Code to maximize new development in mixed-use areas and around Transit Emphasis Corridors and Key Transit Hubs, including upzoning vacant and underused parcels in suitable areas, and encourage the establishment of neighborhood-scale services in suitable locations in residential areas, including, but not limited to, implementing the following General Plan Actions:

a. Work with landowners and developers to encourage development that will increase access to goods and services that support daily life, such as access to fresh produce, recreation and sporting opportunities, community gathering places, active transportation infrastructure, and transit. (General Plan Action 2-2.1)

b. Explore ways to encourage development in Areas of Change that includes services within one-half mile walking and biking distance of residential neighborhoods. (General Plan Action 2-2.5)

c. Explore ways to encourage shared parking areas and shared driveways / vehicle access points in private development. (General Plan Action 2-2.6)

d. Update the Zoning Code to permit residential and mixed-use development by right in some nonresidential zoning districts, as mandated by State law. (General Plan Action 2-3.1)

e. Identify barriers and/or incentives to mixed-use redevelopment in areas that are currently lacking components of a complete neighborhood and mitigate/implement these. (General Plan Action 2-3.2)

f. Require development at the midpoint or higher of the density range in the Medium and Medium High Density Residential land use designations, unless topography, parcel configuration, heritage trees, historic preservation, safety, hazard, or utility constraints make achieving the midpoint infeasible. (General Plan Action 2-3.4)

g. Work with developers and landowners to direct region-serving, high volume retail outlets to locations within one-quarter mile of Highway 101 to minimize traffic on city streets. (General Plan Action 2-8.2)

h. Identify new program options to allow and support micro-entrepreneurship and home businesses. (General Plan Action 2-5.4)

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.	
Measure 1: Locate and design new development to minimize vehicle dependence. 	
1.2. Require Transportation Demand Management (TDM) strategies for new developments in order to reduce VMT and reduce parking demand.	
Supportive General Plan Policies:	
General Plan Policy 2-2.1:	Support development of complete neighborhoods, especially in Areas of Change, ensuring they offer convenient, equitable access to goods and services needed to support daily life, such as healthy food, recreation, active transportation infrastructure, and transit.
General Plan Policy 2-2.2:	Encourage a compact, rather than a scattered, development pattern for new development proposals, particularly in Areas of Change.
General Plan Policy 2-2.3:	Maintain close land use/transportation relationships to promote multi-modal transportation and discourage travel by automobile in all private development, capital improvement projects, and area plans.
General Plan Policy 2-3.1:	Ensure that residential developments, including subdivisions and neighborhoods, are designed to foster livability, maintain local and historic character of neighborhoods, and offer diverse housing types to satisfy a wide range of needs and retain local character.
General Plan Policy 2-3.2:	Ensure that residential developments achieve the density potential of the project site and include a variety of housing types with a full range of affordability, in accordance with General Plan Land Use Diagram (General Plan Figure 2-6).

Measure 1 Performance Standards			
Performance Standard	2030	2045	2050
New multifamily units designated through deed restrictions as affordable – City Limits (cumulative)	480 (1% of City-wide housing units)	1,140 (2% of City-wide housing units)	1,690 (2% of City-wide housing units)
New multifamily units designated through deed restrictions as affordable – External Planning Area (cumulative)	30	80	110
Percentage increase in residential density (City limits)	10%	30%	30%
Percentage increase in job density (City Limits)	10%	20%	20%

Measure 1 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
Residential and nonresidential new development	Long-term	Development fees, General Fund, grant funding
Responsible and Supporting City Departments		Supporting Community Partners
Planning & Economic Development, Housing & Community Services, Parking, and Transportation and Public Works		Sonoma County, developers, Sonoma County Regional Climate Protection Authority

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.

Measure 2: Improve the frequency, coverage, and effectiveness of local and regional transit and rail networks.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
10,160	13,980	16,030

Implementing Programs:

Municipal Programs:

2.1. Continue to implement and periodically update Transit Master Plans such as Reimagining CityBus and the Short-Range Transit Plan, and work with MTC and other agencies on regional transit- supporting initiatives. (General Plan Action 3-3.13)

2.2. Improve the reliability, efficiency, frequency, travel time, comfort, operating hours (including during nights and weekends), and safety of transit service to meet or exceed performance standards of the most recent Santa Rosa CityBus Short Range Transit Plan and improve transit service along corridors where increased densities exist or are planned, with a goal to maximize convenience and ridership across Sonoma County bus service providers. Encourage Sonoma County Transit and SMART to regularly conduct similar efforts. (Supported by General Plan Actions 3-1.4, 3-3.15, and 3-3.20)

2.3. Explore ways to ensure that transit hubs in the city, especially the Transit Mall, Downtown SMART Station, and North SMART Station, are active, safe, and efficiently accessed by local transit. (General Plan Action 3-3.21)

2.4. Identify strategies to increase residents' access, especially in low-income areas, to transit hubs, jobs, and areas with goods and services, such as by enhancing existing transit hubs, constructing new transit hubs, and/or providing new first/last mile services. (General Plan Action 3-3.27)

2.5. Maintain and enhance local transit and paratransit services to ensure that these services meet the needs of persons with access and functional needs.

2.6. Identify first/last mile challenges citywide and work with transit and rideshare companies to provide solutions. (General Plan Action 3-3.10)

2.7. Improve transit corridors to increase efficiency and reliability of bus transit, including transit signal prioritization, queue jumps, and/or designation of bus rapid transit lanes or transit only lanes on routes subject to congestion, especially during peak commute periods.

2.8. Identify and analyze high-commute-trip corridors and improve them by ensuring that they are designed for multimodal travel and with an increased focus on safety by working with regional partners to identify locations for park-and-ride lots adjacent to primary travel corridors to the city in conjunction with transit hubs and high frequency transit service.

2.9. Expand the CityBus Unlimited Pass program to a multi-operator unlimited pass.

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.

2.10. Ensure that public transit service in Santa Rosa meets the needs of community members living in Equity Priority Areas.

2.11. Reduce the cost of transit, especially for low-income individuals, by expanding the unlimited Pass Program that serves students through grade 12, SRJC students, City employees, paratransit users, and veterans. (General Plan Action 3-3.24)

2.12. Evaluate local transit services to identify and rectify accessibility barriers. (General Plan Action 3-3.23)

2.13. Coordinate plans for transit system changes and expansions with local land use planning to ensure consistency. (General Plan Action 3-3.18)

2.14. Work with regional partners to support SMART efforts to increase ridership and expand service by, at a minimum, implementing the following actions:

a. Preserve options for future SMART rail stations by zoning land in proximity to the potential station sites for higher-residential densities and/or mixed-use development. (General Plan Action 3-3.28)

b. Support efforts to promote SMART for commuting and tourism and to provide and maintain convenient and accessible routes to transit, including shared-use paths. (General Plan Action 3-3.29)

Regulatory Programs:

2.15. Establish standards that require new development to provide transit improvements to meet demand from the project, including, but not limited to:

a. Direct, paved pedestrian access to transit stops.

b. Bus turnouts and weather-protected shelters.

c. Bus-ready travel lanes. (General Plan Action 3-3.14)

d. Park-n-rides

e. Real-time information displays

Education, Outreach, and Coordination Programs:

2.16. Provide information on funding opportunities and other incentives designed to encourage developers of sites in Transit Priority Areas and Priority Development Areas to integrate transit-supportive components, such as unlimited pass programs, transit-serving pedestrian infrastructure, and/or transit subsidies, as appropriate. (General Plan Action 3-1.14)

2.17. Work with private and public sector partners on “safe ride home” transit programs and advertising campaigns targeting wine industry tourists or anyone under the influence of alcohol. (General Plan Action 3-3.19)

2.18. Encourage ridership on public transit systems through marketing and promotional efforts and incentives. (General Plan Action 3-3.9)

2.19. Work with Sonoma County Transportation Authority (SCTA) and local transit operators to explore financial incentives, reduced fares for public transportation, and a subregional or countywide universal basic mobility program. (General Plan Action 3-3.26)

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.
2.20. Work with local and regional transportation agencies to coordinate multimodal connections throughout the city, including timed transfers connecting different transit routes and future rail service, bicycle parking and lockers at transit centers, and transit stops at park-and-ride lots. Integrate the provision of passenger information, real-time arrival, fare structures, and service planning. (General Plan Actions 3-3.16 and 3-3.22). 2.21. Work with regional transit providers (Golden Gate Transit, Sonoma County Transit, SMART, Mendocino Transit, Amtrak, and Greyhound) to improve regional connections and service, especially to regional employment and recreation hubs.
Supportive General Plan Policies:
General Plan Policy 3-3.3: Encourage transit ridership to reduce GHG emissions and provide convenient and efficient public transportation to workplaces, shopping, and other destinations. General Plan Policy 3-3.4: Provide convenient, efficient transit routes to major employment, education, recreation, community, and shopping centers throughout the city, SMART stations, and shopping centers. General Plan Policy 3-3.5: Work with SCTA and MTC to promote Safe Routes to Transit projects and programs and submit applications for funding of local Safe Routes to Transit projects and programs. General Plan Policy 3-3.6: Ensure that the transit system serves all members of the community equitably, especially in Equity Priority Areas.

Measure 2 Performance Standards			
Performance Standard	2030	2045	2050
Percentage increase in transit network coverage – City Limits and External Planning Area to follow increase density/development	10%	10%	10%
Percentage increase in transit network revenue hours – City Limits and External Planning Area	10%	25%	30%
Percentage of routes on which frequency is increased	25%	40%	50%
Percentage increase in transit frequency on routes on which frequency is increased	10%	35%	40%
Percentage of transit routes that receive supportive treatments (transit-only lanes, transit signal prioritization, bulb-outs at transit stops, etc.) – City Limits and External Planning Area	20%	40%	50%

Measure 2 Performance Standards			
Percentage of riders receiving discount from base transit fare (averaged across community) – City Limits and External Planning Area	55%	60%	65%

Measure 2 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development, Municipal	Medium-term	Capital improvement funds, development fees, General Fund, grant funding, transit revenue
Responsible and Supporting City Departments	Supporting Community Partners	
Transportation and Public Works	SMART, Sonoma County Transit, Sonoma County Transportation Authority, MTC, Golden Gate Transit, Mendocino Transit, Amtrak, Greyhound, Transportation Network Companies, Sonoma County Regional Climate Protection Authority	

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.

Measure 3: Develop and expand transportation demand management (TDM) programs to reduce VMT and dependence on single-occupancy vehicle trips.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
570	1,000	1,070

Implementing Programs:

Regulatory Programs:

3.1. Continue to require transit-supportive TDM measures for new development, including CityBus / Sonoma County Transit / SMART pass products. (General Plan Action 3-3.12)

Municipal Programs:

3.2. Implement a TDM program for City employees—potentially in partnership with other local governments, public agencies, and transit providers—and promote the program as a model for larger local employers. (General Plan Action 3-3.2)

3.3. Implement initiatives and incentives to reduce GHG emissions associated with City employee commutes.

Education, Outreach, and Coordination Programs:

3.4. Continue to promote Sonoma Commute Rewards and work with County partners to continually enhance this program.

3.5. Work with SCTA to support the development of a Transportation Management Association for employment centers in Santa Rosa.

3.6. Work with local employers and existing residential and commercial development to expand TDM programs and related efforts to help meet employee transportation needs through modes that reduce VMT from single-occupancy automobile for trips less than 5 miles, such as:

a. Unlimited access to transit service (CityBus, Sonoma County Transit, and SMART).
b. Pay for increased transit frequency to facility.
c. Paid incentives to active transportation and micromobility users, including a transportation allowance and/or secure onsite bicycle parking, lockers and similar supportive facilities, showers, and other facilities that support bicycle commuting to and from work.
d. Programs and incentives to expand carpooling, vanpooling, and car sharing.
e. Trip reduction incentive programs.

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.
f. Staggered work shifts, flex time (e.g., 9/80 work schedule), and telecommuting. g. Paid-parking disincentives for single-occupant vehicles and/or parking cash-out incentives. (General Plan Action 3-3.1) 3.7. Track the city's mode split and progress towards reducing single-occupancy vehicle use. (General Plan Action 3-1.6)
Supportive General Plan Policies:
General Plan Policy 3-1.2: Promote a citywide mode shift away from single occupancy vehicles to support ambitious VMT and GHG reduction goals. General Plan Policy 3-1.3: Promote land use, development, and transportation demand management (TDM) strategies that reduce VMT and dependence on single-occupancy vehicle trips.

Measure 3 Performance Standards			
Performance Standard	2030	2045	2050
Businesses in TDM programs – City Limits	1,420	2,430	2,590
Businesses in TDM programs – External Planning Area	90	150	160

Measure 3 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing nonresidential development, Municipal	Medium-term	Capital improvement funds, development fees, General Fund, grant funding, transit revenue
Responsible and Supporting City Departments		Supporting Community Partners
Transportation and Public Works, Planning & Economic Development, Water, Human Resources		Sonoma County Transit, SMART, local employers, Sonoma County Regional Climate Protection Authority

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.		
Measure 4: Enhance active transportation and micro-mobility systems. 		
GHG Emissions Savings ($MTCO_2e$):		
2030	2045	2050
1,580	2,810	3,290
Implementing Programs:		

Municipal Programs:

4.1. Establish specific and trackable mode shift goals and conduct regular assessments of mode share to track progress towards reducing single-occupancy vehicle use. (Supported by General Plan Action 3-1.6)

4.2. Develop a process that invests in and prioritizes non-automobile modes of transportation in capital improvement projects to reduce VMT and GHGs, prioritizing, in order:
   a. Active transportation modes, including walking, bicycling, and rolling.
   b. Public transportation, including inter-city and regional systems.
   c. Other shared vehicles such as carpool, vanpool, and rideshare / transportation network companies. (General Plan Action 3-1.5)

4.3. Prioritize addressing active transportation deficiencies in Equity Priority Areas. (General Plan Action 3-2.18)

4.4. Identify and analyze high-commute-trip corridors and improve them by:
   a. Preparing and implementing corridor plans.
   b. Developing Park-n-Ride lots to encourage mixed-mode commuting.

4.5. Implement traffic-calming techniques on local streets that experience high-speed or cut-through traffic to improve neighborhood livability by:
   a. Narrow streets.
   b. Add curb extensions.
   c. Add on-street parking.
   d. Add chicanes, chokers, or diverters.
   e. Rough-pave crosswalks.
   f. Add rumble strips.
   g. Add planted islands. (Supported by General Plan Action 3-2.31)

4.6. Improve connections in the active transportation network to ensure that all who choose to walk, roll, or ride have adequate access to public transportation amenities, especially in Equity Priority Areas and Areas of Change. (General Plan Action 3-2.4)

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.

4.7. Support efforts to acquire local, regional, State, and federal funding for transportation improvements. (General Plan Action 3-2.8)

4.8. Support pedestrians and bicyclists by incorporating their needs and interests into regular planning activities for all City projects including, at a minimum, any project on the Capital Improvements Project list. (General Plan Action 3-2.11)

4.9. Ensure that there are no physical barriers to bicyclists or pedestrians as they cross high traffic roadways at intersections of Class I or Class IV facilities through improvements such as crosswalks and beacon lights. (General Plan Action 3-2.13)

4.10. Continue to provide streetlights, landscaping, seating, shade, and other streetscape improvements in the public right-of-way. (Supported by General Plan Action 3-2.5)

4.11. Ensure that the needs of seniors, children, people with disabilities, and those using strollers are addressed through sufficient and continuous sidewalks, crosswalks, and reasonable crossing distances. (General Plan Action 3-2.15)

4.12. Support Safe Routes to Schools programs to ensure all students can safely travel to and from school using any mode of transportation, with emphasis on active modes. (General Plan Action 3-2.17)

4.13. Inventory and map the city's existing active transportation network and add new facilities to the map as they are completed. (General Plan Action 3-2.1)

4.14. Prioritize bicycle and pedestrian pathways in areas that connect to, or enhance, regional active transportation facilities such as the Joe Rodota Trail and Santa Rosa Creek Trail. (General Plan 3-2.21)

4.15. Identify and prioritize funding for missing linkages in the existing street and trail bike network.

4.16. Continue to maintain a Bicycle Friendly Community designation through the League of American Bicyclists.

4.17. Improve the City's Bicycle Friendly Community designation from Silver to Platinum status no later than 2030.

4.18. Continue to work on establishing bicycle and scooter share pilot programs with regional partners. Emphasize an equitable pricing structure and access to community members in Disadvantaged Communities and Equity Priority Areas. Ensure safety for pedestrians and other street users.

4.19. Identify opportunities to improve pedestrian, bicycle, micromobility (such as bicycle or scooter share), and bus transit connections between existing transit stations, to SMART stations, and to future mobility hubs. (General Plan Action 3-3.17)

4.20. Regularly identify areas with narrow, damaged, or missing sidewalks. Make timely improvements to impacted areas with a focus on sidewalks that impact schools and transit access.

4.21. Continue to upgrade curb ramps and other pedestrian infrastructure in compliance with the Americans with Disabilities Act. (General Plan Action 3-2.16)

4.22. Integrate shared-use paths along creek corridors, railroad rights-of-way, and include them in park master planning and design (General Plan Action 3-2.22)

Regulatory Programs:

4.23. Implement and update the City's Active Transportation Plan, as appropriate, recognizing that:

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.

a. The Active Transportation Plan will create a blueprint for the City to construct a low-stress active transportation network for all ages and abilities.
b. The Active Transportation Plan will prioritize separating network users in time and space to increase user safety and comfort.
c. Each update of the Active Transportation Plan will result in a General Plan Amendment and will therefore become policy and action incorporated into the General Plan. (General Plan Action 3-2.9)

4.24. Update the Zoning Code to discourage cul-de-sac design and require any new developments with cul-de-sacs or other limited street connectivity layouts to provide enhanced connectivity for pedestrians and bicyclists to sites adjacent to or behind the new developments. (General Plan Action 3-1.11)
4.25. Update City design standards to ensure that safe, appropriate infrastructure is included in new development projects by default as appropriate.
4.26. Continue to identify and designate passenger-loading areas in commercial, office, and mixed-use areas and school zones while also ensuring that loading and unloading activities do not interfere with flow and access to bicycle lanes.
4.27. Require new development to provide direct, paved pedestrian access to transit stops. (Supported by General Plan Action 3-3.14)
4.28. Work with developers to ensure new development improves multimodal transportation infrastructure in front of, and adjacent to the development, with effective connections to existing infrastructure or the means to accommodate future connections. (General Plan Action 3-1.12)
4.29. Use the Urban Streets Design Guide and the Urban Bikeways Design Guide created by the National Association of City Transportation Officials (NACTO) as guides to update City Street Design and Construction Standards and implement a low-stress network for all ages and abilities, specifically through protected and separated bicycle lanes. (General Plan Action 3-2.10)
4.30. Work with developers in the beginning phases of project conception to install Class I and Class IV bicycle lanes, wherever feasible. (General Plan Action 3-1.13)

Education, Outreach, and Coordination Programs:

4.31. Work with local businesses and the League of American Bicyclists to encourage more businesses in Santa Rosa to pursue a Bicycle Friendly Business (BFB℠) designation.
4.32. Work with regional and local partners to provide bicycle safety training to community members, including drivers.
4.33. Promote available tax credits and other incentives available to residents for the purchase of bicycles, including electric-assist bicycles. Consider establishing additional incentive programs as needed, especially for low-income community members and those without reliable access to personal vehicles.

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.	
Supportive General Plan Policies:	
General Plan Policy 3-1.2:	Promote a citywide mode shift away from single occupancy vehicles to support ambitious VMT and GHG reduction goals.
General Plan Policy 3-2.2:	Continue to expand and improve the active transportation network toward completing a safe, continuous, convenient, and attractive network of designated routes that connect all neighborhoods and that is equitably accessible for all ages and abilities.
General Plan Policy 3-2.5:	Address traffic volumes and speeds in neighborhoods in order to reduce cut-through traffic and promote use of existing low stress streets for active transportation travel.

Measure 4 Performance Standards			
Performance Standard	2030	2045	2050
Total sidewalk network length (miles) – City Limits and External Planning Area	650 (15% increase from 2019)	730 (30% increase from 2019)	760 (35% increase from 2019)
Total bike network length (miles) – City Limits (cumulative)	130 (20% increase from 2019)	148 (35% increase from 2019)	154 (40% increase from 2019)

Measure 4 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing nonresidential development, municipal	Medium-term	Capital improvement funds, development fees, General Fund, grant funding
Responsible and Supporting City Departments	Supporting Community Partners	
Transportation and Public Works, Planning & Economic Development, Police	Sonoma County, micro-mobility companies, schools, bike and pedestrian advocacy organizations, senior service providers, Sonoma County Regional Climate Protection Authority	

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.

Measure 5: Accelerate the adoption of zero-emission light-duty and heavy-duty vehicles.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
47,280	233,450	240,700

Implementing Programs:

Municipal Programs:

5.1. Expand installation and operation of electric vehicle charging stations on City properties, including curbside in areas of the community where other options are limited. (General Plan Action 3-6.37)

5.2. Require all new EV chargers installed by the City to have bi-directional charging capabilities. Encourage private property owners to select EV chargers with bi-directional charging capabilities when installing EV chargers on their properties. (General Plan Action 3-7.20)

5.3. Budget for clean fuels and zero-emission vehicles in the City's long-range capital expenditure plans to transition the existing fleet of gasoline- and diesel-powered vehicles, and work to make the City's fleet among the cleanest in the North Bay by:

a. Purchasing zero-emission vehicles whenever possible that meet or exceed requirements under the California Advanced Clean Fleets Regulation. If zero-emission vehicles are not available, purchase plug-in hybrids or other vehicle types to minimize emissions.

b. Using biodiesel and pollution-reducing fuel additives in the City's diesel fuel vehicles. (General Plan Action 3-6.38)

5.4. Assess options and launch a zero-emission vehicle car-sharing program with widespread distribution, including in Disadvantaged Communities and Equity Priority Areas.

5.5. Continue implementation of the Citywide Electric Vehicle Master Plan and CityBus' Zero Emissions Rollout Plan.

5.6. Assess the effectiveness of the City's environmentally sensitive preferred purchasing and green fleet conversion programs and update the programs, as needed, to support the City's GHG reduction goals. (General Plan Action 3-7.10)

Regulatory Programs:

5.7. Require all new development to be electric vehicle charging ready at a minimum. Explore opportunities to amend the City's municipal codes to require new development to install electric vehicle charging infrastructure beyond the minimum State requirements. (General Plan Action 3-6.33)

5.8. Review and amend the City's Building Code and Zoning Code to facilitate the installation of electric vehicle charging infrastructure. (General Plan Action 3-6.35)

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.
5.9. Explore improvements to the Building and Safety Code and Zoning Code that establish stricter requirements for installing electric vehicle charging infrastructure, including requiring new and significantly renovated large commercial and logistic facilities to install charging and hydrogen fueling equipment for heavy-duty vehicles. 5.10. Update the City's Building Code and Zoning Code, as necessary, to require existing gas stations and automobile-serving uses, including car washes and car repair establishments, to install electric vehicle charging infrastructure when such uses are subject to building or land use permits for site renovations. 5.11. Explore efforts to require charging or clean fuel stations on private property, including hydrogen and sustainably sourced biofuels. (General Plan Action 3-6.36) Education, Outreach, and Coordination Programs: 5.12. Widely publicize and distribute information about available zero-emission vehicle incentive programs. Evaluate options to provide or support additional incentive programs, especially for low-income community members.
Supporting General Plan Policies:
General Plan Policy 3-6.9: Achieve and maintain ambient air quality standards.

Measure 5 Performance Standards			
Performance Standard	2030	2045	2050
Number of community's light-duty vehicle fleet converted from conventional fuel to electric – City limit and External Planning Area	27,440	132,320	135,830
Number of community's heavy-duty vehicle fleet converted from conventional fuel to electric – City limit and External Planning Area	500	2,560	2,920
Number of community's heavy-duty vehicle fleet converted to hydrogen – City limit and External Planning Area	500	4,260	5,010

Measure 5 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development, Municipal	Medium-term	Capital improvement funds, development fees, General Fund, grant funding, incentives
Responsible and Supporting City Departments	Supporting Community Partners	
Transportation and Public Works, Police, Fire Department, Planning & Economic Development	Large commercial facilities, PG&E, automotive services, Sonoma County Regional Climate Protection Authority	

Objective: Decrease community-wide vehicles miles traveled (VMT) and increase the use of zero-emission vehicles and equipment.		
Measure 6: Transition to zero-emission motorized equipment, including construction and landscaping. 		
GHG Emissions Savings ($MTCO_2e$):		
2030	2045	2050
12,330	29,900	36,540
Implementing Programs:		
Regulatory Programs: 6.1. Explore a ban on the sale and use of diesel and gasoline-powered landscaping equipment. 6.2. Require the use of hybrid or zero-emission construction equipment for new development projects as a condition of approval. Education, Outreach, and Coordination Programs: 6.3. Publicize available incentives and other financial resources to support transitioning landscaping, construction, and other off-road equipment to zero-emission models. Consider establishing additional incentives, as needed, especially for low-income community members.		
Supportive General Plan Policies:		
General Plan Policy 3-6.9: Achieve and maintain ambient air quality standards.		

Measure 6 Performance Standards			
Performance Standard	2030	2045	2050
Percentage landscaping equipment converted to electric – City Limits and Ext. Planning Area	50%	95%	95%
Percentage construction equipment converted to electric – City Limits and Ext. Planning Area	40%	70%	75%
Percentage other equipment converted to electric – City Limits and Ext. Planning Area	15%	35%	45%

Measure 6 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development, Municipal	Short-term	Development fees, General Fund, grant funding, incentives
Responsible and Supporting City Departments	Supporting Community Partners	
Transportation and Public Works, Planning & Economic Development	Landscaping and construction companies, Sonoma County Regional Climate Protection Authority	

Objective: Reduce community-wide energy use and transition to carbon-free energy sources.

Homes, businesses, government facilities, and community-based organizations all rely on energy to power their daily activities. As Santa Rosa continues to grow, the community's energy needs will likely increase. It is imperative that the City make buildings more energy efficient and replace the burning of fossil fuels with electricity created through renewable sources, such as solar and wind.

Both the City and State have already taken significant steps to accelerate building electrification. Since 2019, the City of Santa Rosa has implemented a reach code requiring that all new residential construction of three stories or less be all electric The 2022 State Building Code, including the Energy Efficiency Code and CALGreen, include requirements for partial electrification, electric-readiness, more aggressive electric vehicle charging requirements, efficiency improvements and opportunities for energy storage, among other requirements. During each triennial State building code cycle, cities and counties may adopt local ordinances (reach codes) that exceed minimum state requirements and accelerate decarbonization.

In March 2023, the Bay Area Air Quality Management District (BAAQMD) adopted a regulation to replace natural-gas-powered space heaters and water heaters with electrical models when the natural gas-powered units reach the end of their operational life. This regulation will take effect in 2027 or 2031 for water heaters (depending on the capacity of the unit) and in 2029 for space heaters. This regulation will accelerate the transition of natural gas appliances to electric appliances in existing homes and nonresidential buildings, which will result in a higher adoption rate of these technologies.

Effective January 1, 2020, State legislation requires new single-family and multifamily buildings up to three stories in height to include solar panels. As of January 2023, many new businesses and larger multifamily buildings are also required to install solar and battery storage systems. While these requirements for solar and battery storage systems may increase the up-front cost of new construction, they are expected to result in long-term cost savings in the form of reduced monthly electricity bills, ultimately paying for themselves. In addition to cost savings, the installation of solar systems results in community benefits in the form of increased energy resilience, improved air quality, and job creation. While installation of a battery storage system does not by itself reduce GHG emissions, it is still recommended as a measure to increase community-wide energy resilience.

The State's Renewables Portfolio Standard (RPS) requires increases in renewable and carbon-free electricity supplies. RPS requires all electricity providers in the state to obtain at least 60 percent of their electricity from eligible renewable resources by the end of 2030 and all their electricity from carbon-free resources by the end of 2045. GHG savings from RPS are reported in Table 11. Santa Rosa's electric supply is already largely renewable. Approximately 86 percent of Santa Rosa's residential electricity and 90 percent of its nonresidential energy (excluding direct access electricity) comes from Sonoma Clean Power. Subscribers to Sonoma Clean Power can choose from two tiers, CleanStart and Evergreen, which provide 48 percent and 100 percent renewable electricity, respectively.

Reducing the burning of fossil fuels within the built environment comes with several community benefits, including cleaner air, increased resilience to the effects of climate change, reduced costs to residents and building owners, and a stronger local economy. This GHG Reduction Strategy builds on the actions already taken on the local and state level via the following measures:

- Measure 7: Reduce community-wide energy use, increase energy efficiency, and advance electrification in existing buildings, including municipal buildings.
- Measure 8: Transition to carbon neutral new buildings.

- Measure 9: Increase local renewable energy generation and the use of renewable, carbon free, and distributed energy systems, including energy storage, throughout the city.

Supportive General Plan Goal:

General Plan Goal 3-7: Strive to achieve net carbon neutrality no later than 2045.

Objective: Reduce community-wide energy use and transition to carbon-free energy sources.

Measure 7: Reduce community-wide energy use, increase energy efficiency, and advance electrification in existing buildings, including municipal buildings.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
29,630	171,190	179,850

Implementing Programs:

Municipal Programs:

7.1. Require regular energy audits of existing City-owned and operated structures, identifying levels of existing energy use and potential conservation and efficiency measures. (General Plan Action 3-7.5)

7.2. Develop a capital project list and funding strategy to complete energy-efficiency projects for City-owned and operated structures and adjust the list annually to add new projects as needed. (General Plan Action 3-7.6)

7.3. Retrofit existing City facilities to be zero net energy. (General Plan Action 3-7.23)

7.4. Continue to enhance the City's ability to optimize energy use, minimize energy costs, prepare for emergencies, and power provider outages, protect public health, sustain natural resources, and reduce municipal GHG emissions. (General Plan Action 3-7.25)

Regulatory Programs:

7.5. Amend the building or energy code to incentivize building owners to upgrade residential appliances, including water and space heaters, to increase energy efficiency and reduce GHG emissions. (General Plan Action 3-7.22)

7.6. Evaluate the feasibility of requiring replacement of gas-fueled appliances in existing homes and businesses during major retrofits or at time of sale.

Education, Outreach, and Coordination Programs

7.7. Encourage energy audits and energy-efficient retrofits of buildings throughout the city. (Supported by General Plan Action 3-7.7)

7.8. Use education and incentives to promote and sustain energy-conserving design and practices. (General Plan Action 3-7.11)

7.9. Widely promote and encourage participation in local, regional, and State programs that provide financial incentives for energy-efficiency improvements in existing buildings, including programs offered through BayREN (Bay Area Regional Energy Network), Sonoma Clean Power, Sonoma County Energy Independence Program, and other groups.

Objective: Reduce community-wide energy use and transition to carbon-free energy sources.

Measure 7: Reduce community-wide energy use, increase energy efficiency, and advance electrification in existing buildings, including municipal buildings.

7.10. Prioritize funding to support conversion of natural gas fueled appliances to carbon free appliances in existing buildings for renters, low-income homeowners, and persons living in Equity Priority Areas.

7.11. Support Bay Area Air Quality Management District enforcement and education activities related to Bay Area Air Quality Management District requirements to replace water and space heaters with zero-NO_2 models beginning in 2027.

7.12. In partnership with Sonoma Clean Power and other appropriate organizations, continue to provide educational materials about available incentives and the benefits of retrofitting existing buildings to be all-electric.

7.13. Continue to provide information on the cost-savings potential and other benefits of energy audits and energy-efficient retrofits to encourage their preparation for buildings throughout the city. (General Plan Action 3-7.7)

7.14. Distribute educational material about energy-efficiency retrofit benefits and opportunities on the City's website and through social media, at City facilities, and during in-person events. Work with community partners to secure funding to provide free or low-cost home energy audits for low-income homeowners and tenants.

7.15. Encourage regional utilities to establish bulk buying programs to lower the cost of energy-efficient appliances for community members.

Supportive General Plan Policies:

General Plan Policy 3-7.2:	Reduce energy use and increase energy efficiency in existing and new commercial, industrial, and public structures.
General Plan Policy 3-7.4:	Reduce the use of fossil fuels as an energy source in new and existing buildings.
General Plan Policy 3-7.5:	Continue the City's role as a leader in sustainability and climate action.

Measure 7 Performance Standards			
Performance Standard	2030	2045	2050
Number of existing homes receiving efficiency retrofits - City Limits	10,270	27,380	30,800
Number of existing businesses receiving efficiency retrofits - City Limits	540	1,880	2,150
Number of existing homes receiving efficiency retrofits – External Planning Area	700	1,860	2,090
Number of existing businesses receiving efficiency retrofits – External Planning Area	30	110	130
Number of residential HVAC conversions – City Limits	10,760	51,110	51,110
Number of residential water heater conversions – City Limits	7,100	67,480	67,480
Number of residential clothes drying conversions – City Limits	7,100	35,520	42,620
Number of residential cooktop conversions – City Limits	3,550	39,070	46,170
Number of nonresidential HVAC conversions – City Limits	200	3,020	3,830
Number of nonresidential water heater conversions – City Limits	400	3,830	3,830
Number of nonresidential cooktop conversions – City Limits	400	1,610	2,010
Number of residential HVAC conversions – External Planning Area	730	3,470	3,470
Number of residential water heater conversions – External Planning Area	480	4,580	4,580
Number of residential clothes drying conversions – External Planning Area	480	2,410	2,890
Number of residential cooktop conversions – External Planning Area	240	2,650	3,130
Number of nonresidential HVAC conversions – External Planning Area	10	180	230
Number of nonresidential water heater conversions – External Planning Area	20	230	230
Number of nonresidential cooktop conversions – External Planning Area	20	100	120

Measure 7 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development, Municipal	Medium-term	Development fees, General Fund, grant funding, incentives
Responsible and Supporting City Departments	Supporting Community Partners	
Planning & Economic Development, Transportation and Public Works	BayREN, Sonoma Clean Power, Sonoma County Energy Independence Program, PG&E, regional utilities, solar installers, developers, contractors, Sonoma County Regional Climate Protection Authority	

Objective: Reduce community-wide energy use and transition to carbon-free energy sources.

Measure 8: Transition to carbon neutral new buildings.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
1,650	7,890	9,080

Implementing Programs:

Municipal Programs:

8.1. Develop new City facilities to be zero net energy. (General Plan Action 3-7.23)

Regulatory Programs:

8.2. Evaluate and adopt changes to the building code or other municipal codes and policies to require new nonresidential and residential buildings to achieve high performance energy efficiency and to minimize GHG emissions through adoption and implementation of new codes that do not mandate a specific energy efficiency technology but rather offer various options for achieving the desired energy performance levels and GHG emissions reductions (including but not limited to all electric appliances). (Supported by General Plan Action 3-7.21)

8.3. Guide project applicants toward site planning, solar orientation, cool roofs, and landscaping that decrease summer cooling and winter heating needs. (General Plan Action 3-7.8)

Education, Outreach, and Coordination Programs:

8.4. In partnership with Sonoma Clean Power and other appropriate organizations, continue to provide educational materials about available incentives and the benefits of constructing new buildings or retrofitting existing buildings to be all-electric.

8.5. Identify incentives to encourage new buildings to exceed State energy efficiency requirements and/or meet or exceed the U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) Program or equivalent standards. (General Plan Action 3-7.9)

8.6. Engage the local developer and trade communities in planning and promoting the City's electrification initiatives and incentives.

8.7. As needs and opportunities arise, plan for decommissioning or reusing fossil fuel facilities that are no longer needed to meet community energy needs, in a manner that protects human and environmental health and is consistent with federal, state, and local regulations and authorities.

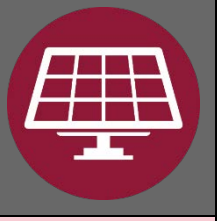
Objective: Reduce community-wide energy use and transition to carbon-free energy sources.	
Supportive General Plan Policies:	
General Plan Policy 3-7.3:	Increase the use of renewable, carbon free, and distributed energy resources throughout the city.
General Plan Policy 3-7.4:	Reduce the use of fossil fuels as an energy source in new and existing buildings.
General Plan Policy 3-7.5:	Continue the City's role as a leader in sustainability and climate action.

Measure 8 Performance Standards			
Performance Standard	2030	2045	2050
Number of new performance-based reach compliant residential units	8,120	19,190	22,890
Number of new performance-based reach compliant commercial buildings	350	820	980
Residential HVAC conversions - City Limits	430	4,880	5,820
Residential water heater conversions - City Limits	430	4,880	5,820
Commercial HVAC conversions - City Limits	10	250	380
Commercial water heater conversions - City Limits	10	250	380
Residential HVAC conversions - External Planning Area	30	330	390
Residential water heater conversions - External Planning Area	40	230	270
Commercial HVAC conversions - External Planning Area	Less than 10	Less than 10	Less than 10
Commercial water heater conversions - External Planning Area	Less than 10	Less than 10	Less than 10

Measure 8 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development	Medium-term	Development fees, General Fund, outside grant funding, incentives
Responsible and Supporting City Departments	Supporting Community Partners	
Planning & Economic Development, Housing & Community Services, Transportation and Public Works, Water	Bay Area Air Quality Management District, Sonoma Clean Power, PG&E, developers, contractors, Sonoma County Regional Climate Protection Authority	

Objective: Reduce community-wide energy use and transition to carbon-free energy sources.

Measure 9: Increase local renewable energy generation and the use of renewable, carbon free, and distributed energy systems, including energy storage, throughout the city.



GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
70	0	0

Implementing Programs:

Municipal Programs:

9.1. Implement the recommendations of the City's Energy Efficiency, Renewables, and Microgrid Feasibility Study, prioritizing the installation of solar, battery, and microgrid systems and lighting improvements at Municipal Service Center North and additional review of funding options available for heating, ventilation, and air conditioning (HVAC) improvements at City facilities.

9.2. Continue using 100 percent renewable energy for all City buildings. (General Plan Action 3-7.27)

9.3. Continue to participate in utility-sponsored renewable energy programs that allow the city to receive a significant portion of energy from renewable sources. (General Plan Action 3-7.15)

9.4. Continue to evaluate the feasibility of installing mid-size renewable energy generation projects at City facilities.

9.5. Participate in State and local efforts to develop appropriate policies and review procedures for the installation of photovoltaic solar and other forms of distributed energy generation. (General Plan Action 3-7.14)

9.6. Support State and utility efforts to improve grid resilience and capacity. (General Plan Action 3-7.19)

Regulatory Programs:

9.7. Revise any existing codes and policies that constrain or prohibit the installation of environmentally acceptable forms of distributed energy generation. (General Plan Action 3-7.12)

9.8. Explore requiring existing buildings to install solar energy and battery systems at times of major retrofits.

9.9. Explore requiring all new and significantly renovated buildings to install energy storage systems or to be pre-wired for these systems, especially new or renovated buildings with solar energy installations, municipal buildings that provide essential community services, and buildings in areas of elevated wildfire hazards or with an increased risk of being subject to Public Safety Power Shutoff events.

Objective: Reduce community-wide energy use and transition to carbon-free energy sources.

Education, Outreach, and Coordination Programs:

9.10. Encourage participation in financial incentive programs that increase the installation of solar energy generation and battery energy storage systems. Continue to publicize the availability of these incentive programs to community members.

9.11. Identify incentives and other means to encourage new and existing buildings to include battery energy storage systems, especially buildings with solar energy installations and municipal buildings that provide essential community services. (General Plan Action 3-7.13)

9.12. Support the development of local-serving renewable energy projects that expand the availability of local renewable energy, provide sustainable local jobs, and support local and regional housing, economic development, and sustainability goals and initiatives. (General Plan Action 3-7.17)

9.13. Encourage the establishment of neighborhood renewable energy microgrids to support resilience, with an emphasis on improving energy resilience for critical facilities, key community services, and in Equity Priority Areas. (Supported by General Plan Action 3-7.18)

9.14. Seek and identify resources to assist low-income homeowners and small business owners with identifying financing options for installation of rooftop solar energy systems, energy storage, and electrification of existing buildings. (General Plan Action 3-7.16)

Supporting General Plan Policies:

General Plan Policy 3-7.3:	Increase the use of renewable, carbon free, and distributed energy resources throughout the city.
General Plan Policy 3-7.4:	Reduce the use of fossil fuels as an energy source in new and existing buildings.
General Plan Policy 3-7.5:	Continue the City's role as a leader in sustainability and climate action.

Measure 9 Performance Standards

Performance Standard	2030	2045	2050
Residential solar systems installed – City Limits	2,130	3,550	5,680
Residential solar systems installed – External Planning Area	140	240	390
Nonresidential solar systems installed – City Limits	50	160	270
Nonresidential solar systems installed – External Planning Area	Less than 10	10	20

Measure 9 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development, Municipal	Medium-term	Development fees, General Fund, grant funding, incentives
Responsible and Supporting City Departments	Supporting Community Partners	
Planning & Economic Development, Transportation and Public Works, Water	Solar installers, developers, PG&E, Sonoma Clean Power, contractors, utilities, Sonoma County Regional Climate Protection Authority	

Objective: Achieve a zero-waste future for Santa Rosa.

Waste generates GHG emissions as it decomposes in landfills. Organic waste is an especially significant producer of methane and carbon dioxide emissions. However, if recovered properly, these materials can avoid landfills and live on as precursors to new material goods.

The most effective way to reduce waste is to reduce the production of materials that will end up in landfills, an approach that not only reduces waste but also reduces the energy, emissions, and material demands of production. Once a material or object has been produced, it is important to find opportunities for that material to be reused.

The State of California has long recognized the importance of compost and recycling programs. Most recently, SB 1383, which went into effect at the beginning of 2022, aims to reduce organics waste disposed in landfills by 75 percent (from 2014 levels) by 2025. The legislation also aims to recover 20 percent of edible food and redirect it to food-insecure Californians. SB 1383 requires residents and businesses to sort food scraps, yard debris, and food-soiled paper into an organic waste stream. It also requires waste customers to subscribe to an organic waste collection service.

Efforts to divert waste away from landfills and into composting and recycling programs reduce emissions and help make valuable recycled materials available to the broader community. The City has already taken significant steps to reduce the amount of waste sent to landfills. In January 2020, the City approved the Zero Waste Master Plan, which aims to reduce landfill disposal to less than one pound per person per day of franchised waste and achieve at least 75 percent diversion of franchised waste from landfill disposal by 2030. Zero Waste Master Plan Strategies include development of a Reusable and Compostable Foodware Ordinance, which was passed in 2021 (as the Zero Waste Food Ware Ordinance). The Zero Waste Master Plan also includes strategies to expand recycling and composting programs, update the City's Construction and Demolition Ordinance, and provide education and engagement to help community members reduce waste. These efforts have resulted in over 800 multi-family buildings, businesses, and schools starting composting programs; a 12 percent decline in tonnage of waste send to landfills since 2018; and an overall 98 percent compliance rate with SB 1383.

The GHG Reduction Strategy helps further reduce community waste reduction through the following measures:

- Measure 10: Reduce the amount of recyclable and compostable material sent to landfills.
- Measure 11: Reduce total waste generation.

Transporting waste also releases GHG emissions. Measures 10 and 11 only address emissions from the decomposition of waste. Measures 1 and 5, which promote compact development and the adoption of electric heavy-duty vehicles, respectively, would both help reduce emissions from the transportation of waste.

Supportive General Plan Goals:

General Plan Goal 3-6:	Use nature- and science-based strategies to preserve and create environments that provide ecosystem benefits.
General Plan Goal 3-7:	Strive to achieve net carbon neutrality no later than 2045.
General Plan Goal 5-9:	Provide adequate and high-quality city services for water, wastewater, recycled water, stormwater, and solid waste.

Objective: Achieve a zero-waste future for Santa Rosa.

Measure 10: Reduce the amount of recyclable and compostable material sent to landfills.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
6,500	10,150	10,530

Implementing Programs:

Municipal Programs:

10.1. Work to increase local diversion rates above state minimums for all waste types, including for organics and construction and demolition waste.
10.2. Increase capacity for data collection and monitoring of waste disposal and diversion rates.
10.3. Work with local waste haulers to ensure that they are fulfilling their franchise agreement and continuing to provide annual diversion rate reporting.
10.4. Identify locations that can support small-scale community compost locations.
10.5. Ensure beneficial use of compost made from organics collected from residents and businesses. (General Plan Action 3-6.30)
10.6. Implement the most current Energy Optimization Plans for water and wastewater.
10.7. Continue to identify and implement beneficial reuses of byproducts of the City's wastewater treatment processes.
10.8. Explore innovative opportunities for the use of biodigester gas.
10.9. Pursue long-term strategies and regional solutions for wastewater biosolids handling and application.

Regulatory Programs:

10.10. Require that new development and proposed renovations requiring a building permit have sufficient and appropriate room to store waste bins, including for organic waste.
10.11. Amend the composting ordinance to advance compost infrastructure and support soil carbon sequestration activities. (General Plan Action 3-6.29)

Education, Outreach, and Coordination Programs:

10.12. Continue public education programs about waste reduction, including recycling, composting, yard waste, wood waste, and household hazardous waste. (General Plan Action 5-9.34)
10.13. Engage commercial entities such as restaurants and landscaping businesses that produce compostable material in the City's composting programs.

Objective: Achieve a zero-waste future for Santa Rosa.
10.14. Work with multifamily and commercial building owners and occupants to increase awareness of correct composting practices and increase access to adequate composting services. 10.15. Increase the types of materials that can be recycled and composted in Santa Rosa, as the market allows. 10.16. Work with Zero Waste Sonoma to increase diversion of construction and demolition debris, including by adopting the County's Model Construction and Demolition Ordinance.
Supportive General Plan Policy:
General Plan Policy 5-9.5: Meet the city's solid waste disposal needs while maximizing opportunities for waste reduction and recycling.

Measure 10 Performance Standards			
Performance Standard	2030	2045	2050
Tons of compostables diverted from municipal solid waste – City Limits	2,780	3,140	3,260
Tons of recyclables diverted from municipal solid waste – City Limits	22,220	30,400	31,550
Tons of compostables diverted from municipal solid waste – External Planning Area	180	210	210
Tons of recyclables diverted from municipal solid waste – External Planning Area	1,460	2,000	2,080
Tons of construction and demolition debris diverted from landfills – Combined City Limits and External Planning Area	13,200	14,030	14,030

Measure 10 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development, Municipal	Medium-term	General Fund, grant funding, waste hauling franchise fees
Responsible and Supporting City Departments	Supporting Community Partners	
Transportation and Public Works, Water	Multifamily and commercial building owners, restaurants, landscaping companies, Recology, Sonoma County Regional Climate Protection Authority, Zero Waste Sonoma	

Objective: Achieve a zero-waste future for Santa Rosa.

Measure 11: Reduce total waste generation.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
1,950	3,770	4,890

Implementing Programs:

Municipal Programs:

11.1. Continue to implement and update the City's Zero Waste Master Plan and Program. (General Plan Action 5-9.33)
11.2. Assess the effectiveness of the City's environmentally sensitive preferred purchasing and green fleet conversion programs and update the programs, as needed, to support the City's GHG reduction goals. (General Plan Action 3-7.10)
11.3. Provide more frequent and accessible opportunities to dispose of non-recyclable waste.
11.4. Identify ways to go beyond State guidance to encourage sustainable deconstruction of buildings.
11.1. Provide and maintain public drinking fountains and bottle fillers in high traffic and outdoor recreation areas to reduce demand for bottled water. (General Plan Action 5-9.38)

Regulatory Programs:

11.2. Continue to enforce the City's Zero Waste Food Ware Ordinance and share information and resources with food vendors to help facilitate compliance. (General Plan Action 5-9.35)
11.1. Continue to enforce the City's Environmentally Preferable Purchasing policies and identify opportunities to reduce use of single-use plastics in municipal operations and at City events. (General Plan Action 5-9.36)

Education, Outreach, and Coordination Programs:

11.2. Establish and support existing sharing, exchange, and reuse programs, including fix-it clinics, swap events, and second-hand markets.

Supportive General Plan Policy:

General Plan Policy 5-9.5: Meet the city's solid waste disposal needs while maximizing opportunities for waste reduction and recycling.

Measure 11 Performance Standards			
Performance Standard	2030	2045	2050
Tons of municipal solid waste reduced – City Limits	7,880	16,680	21,630
Tons of municipal waste reduced – External Planning Area	520	1,100	1,420

Measure 11 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development, Municipal	Short-term	General Fund, grant funding, waste hauling franchise fees
Responsible and Supporting City Departments	Supporting Community Partners	
Transportation and Public Works	Recology, Sonoma County Regional Climate Protection Authority, Zero Waste Sonoma	

Objective: Use water efficiently and enhance drought resilience.

Increasing water-use efficiency and reducing overall water use lowers GHG emissions by reducing the energy needed to transport, heat, and process water. In addition to saving energy, water conservation and efficiency protects one of California's most precious resources and helps Santa Rosa become more resilient to drought and water shortage. In addition, reducing water use in individual homes and businesses can reduce water costs.

The City's existing recycled water infrastructure represents a significant step towards community water conservation and resilience. The GHG Reduction Strategy helps Santa Rosa further reduce water use through the following measures:

- Measure 12: Improve indoor and outdoor water-use efficiency.
- Measure 13: Expand water catchment and reuse opportunities.

Supportive General Plan Goal:

General Plan Goal 5-9: Provide adequate and high-quality city services for water, wastewater, recycled water, stormwater, and solid waste.

Objective: Use water efficiently and enhance drought resilience.

Measure 12: Improve indoor and outdoor water-use efficiency.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
Less than 10	10	10

Implementing Programs:

Municipal Programs:

12.1. Regularly monitor water quality to maintain high levels of water quality for human consumption and for other life systems in the region. (General Plan Action 5-9.12)

12.2. Continue to comply with statewide regulations for long-term urban water use efficiency. (General Plan Action 5-9.14)

12.3. Continue to provide financial incentives for water-use efficiency improvements and look for opportunities to increase the value of incentives and the types of programs with available incentives.

12.4. Ensure that water-efficiency rebates are available and encouraged for rental properties.

Objective: Use water efficiently and enhance drought resilience.

Regulatory Programs:

12.5. Require new development projects to provide water-efficient landscaping in accordance with the City's Water Efficient Landscape Ordinance. (General Plan Action 5-9.13)

12.6. Regularly review and update the Water Efficient Landscape Ordinance, as needed.

12.7. Work with property owners to incorporate sustainable, energy-efficient, water-efficient, and environmentally regenerative features into facilities, landscapes, and structures.

12.8. In an ongoing manner, review landscaping codes to improve consistency of water-use efficiency and fire-resistance landscaping regulations and the Hazardous Vegetation and Fuels Reduction Ordinance.

Education, Outreach, and Coordination Programs:

12.9. Promote water efficiency through public education, incentives, rebates, technical assistance, customer programs, and information about indoor and outdoor water use efficiency measures. (General Plan Action 5-9.15)

12.10. Provide information and explore incentive opportunities to encourage property owners to install catchment, graywater systems, and other water recycling systems; remove paving; and install low-impact development features, such as permeable pavers, bioswales, and other green infrastructure components. (General Plan Action 5-9.16)

Supportive General Plan Policies:

General Plan Policy 5-9.1:	Ensure water quality, water service delivery, and wastewater treatment are sufficient to meet the needs of current and future residents.
General Plan Policy 5-9.2:	Maintain water quality and encourage Santa Rosa Water customers to save water.
General Plan Policy 5-9.3:	Ensure that water distribution lines are adequate for existing and future populations.

Measure 12 Performance Standards			
Performance Standard	2030	2045	2050
Residential units receiving WaterSmart Checkups (water efficiency audits) since 2024 - City Limits	560	1,970	2,430
Residential units built by 2019 receiving WaterSmart Checkups (water efficiency audits) since 2024 - City Limits	500	1,560	1,840
Residential units built after 2019 receiving WaterSmart Checkups (water efficiency audits) since 2024 - City Limits	60	410	590
Residential units receiving WaterSmart Checkups (water efficiency audits) since 2024– External Planning Area	40	130	170
Residential units built by 2019 receiving WaterSmart Checkups (water efficiency audits) since 2024- External Planning Area	40	100	130
Residential units built after 2019 receiving WaterSmart Checkups (water efficiency audits) since 2024- External Planning Area	Less than 10	30	40
New developments with water-efficient landscaping - City Limits	7,930	18,750	22,360
New developments with water-efficient landscaping - External Planning Area	540	1,270	1,510

Measure 12 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development	Medium-term	Development fees, General Fund, grant funding, incentives, Enterprise Fund
Responsible and Supporting City Departments		Supporting Community Partners
Water, Planning & Economic Development		Sonoma Clean Power, PG&E

Objective: Continue to use water efficiently and enhance drought resilience.

Measure 13: Expand water catchment and reuse opportunities.

GHG Emissions Savings ($MTCO_2e$):

Due to the City's already high rates of water reuse, this measure is not expected to result in any additional quantifiable GHG emission reductions.

Implementing Programs:

Municipal Programs:

13.1. Maintain water, wastewater, and recycled water system integrity and capacity by continuing to prioritize maintenance and preserve funding for maintenance, rehabilitation, and replacement of existing infrastructure. (General Plan Action 5-9.3)

13.2. Continue to evaluate the City's long-term water supply strategies, including development of new and enhanced sources of water supply and enhanced water-use efficiency programs. (Supported by General Plan Action 5-9.8)

13.3. Continue to improve stormwater management to increase infiltration, provide treatment, promote groundwater recharge, reduce flood risk, capture trash, and/or enhance the environment. (General Plan Action 5-9.28)

13.4. Evaluate stormwater capture and reuse consistent with goals of the Santa Rosa Citywide Creek Master Plan and the MS4 NPDES (National Pollutant Discharge Elimination System) permit to preserve natural conditions of waterways, minimize channelization of creeks, and protect water quality; identify, educate, label, and promote community awareness that storm drains flow untreated into creeks. (General Plan Action 5-9.30)

Regulatory Programs:

13.5. Implement mitigation measures to mimic the pre-development water balance through infiltration, evapotranspiration, and capture and reuse of stormwater. (General Plan Action 5-9.29)

13.6. Explore requiring graywater systems for new developments.

Education, Outreach, and Coordination Programs:

13.7. Provide information and explore incentive opportunities to encourage property owners to install catchment, graywater systems, and other water recycling systems; remove paving; and install low-impact development features, such as permeable pavers, bioswales, and other green infrastructure components. (General Plan Action 5-9.16)

Objective: Continue to use water efficiently and enhance drought resilience.	
Supportive General Plan Policies:	
General Plan Policy 5-9.2:	Maintain water quality and encourage Santa Rosa Water customers to save water.

Measure 13 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development	Medium-term	Capital improvement funds, General Fund, grant funding, incentives, Enterprise Fund
Responsible and Supporting City Departments		Supporting Community Partners
Water, Planning & Economic Development		Sonoma County Regional Climate Protection Authority

Objective: Enhance sustainable and carbon-free practices community-wide.

The measures presented herein will significantly reduce the amount of GHG emissions produced by the Santa Rosa community. However, they are not sufficient to achieve carbon neutrality. To make Santa Rosa truly carbon neutral, the community must nurture and maintain its natural ecosystems and agricultural lands. These natural features, when well cared for, not only absorb carbon but also provide opportunities for recreation, improve public health, help mitigate the effects of climate change hazards such as flooding and landslide, and help sustain flourishing and diverse natural communities.

While difficult to definitively measure, the carbon used in the production and delivery of everyday goods and services constitutes a significant contributor to global resource consumption, energy use, and carbon emissions. Addressing this distributed source of emissions means assessing complex and diverse systems of production and delivery that occur within Santa Rosa and ensuring that these activities are aligned with the City's sustainability objectives. Actions to reduce these emissions include attracting green businesses to Santa Rosa, using low-carbon building materials, and investing in local food systems. These activities have the additional benefits of supporting local economic activity, promoting public health, and increasing the resilience of the local food system.

Finally, the City of Santa Rosa intends to uphold its role as one of California's leaders in sustainability and resilience. This is an ambitious goal, requiring proactive and meaningful partnership between City agencies, community organizations, local service providers, and engaged citizens. The potential impacts of climate change must be considered across City departments and in all stages of the planning process, and both the City and community must make a sustained commitment to achieving deep carbon reductions.

The GHG Reduction Strategy meets these goals through the following measures:

- Measure 14: Increase local natural carbon sequestration opportunities.
- Measure 15: Reduce embedded carbon in goods and services used by the City and community members.
- Measure 16: Maximize opportunities for local food production.
- Measure 17: Integrate climate action across all City departments and programs.

Supportive General Plan Goals:

General Plan Goal 2-5:	Create a business-friendly, diverse, and sustainable economy through the attraction of new business, and the expansion, retention, and support of existing business.
General Plan Goal 3-5:	Protect, expand, maintain, and restore natural resources, open space, and agricultural land.
General Plan Goal 3-6:	Use nature- and science-based strategies to preserve and create environments that provide ecosystem benefits.
General Plan Goal 3-7:	Strive to achieve net carbon neutrality no later than 2045.
General Plan Goal 5-6:	Ensure Santa Rosa is a resilient city able to adapt to, recover from, and thrive under changing climate conditions.
General Plan Goal 6-6:	Ensure that all households and individuals have convenient, daily access to affordable, healthy food, including fresh produce.

Objective: Enhance sustainable and carbon-free practices community-wide.

Measure 14: Increase local natural carbon sequestration opportunities.

GHG Emissions Savings ($MTCO_2e$):

2030	2045	2050
3,880	13,250	16,310

Implementing Programs:

Municipal Programs:

14.1. Conduct a carbon sequestration feasibility study of City-owned open space, parks, agricultural lands, and other conservation lands, and implement the recommendations. This study should assess carbon storage potential by land use type and identify strategies to facilitate carbon sequestration. (General Plan Action 3-6.21)

14.2. Establish pilot programs, and consider providing incentives, for efforts to increase the carbon sequestration potential on local agricultural and open space land, including on City-owned parks.

14.3. Expand tree planting, maintain heritage trees, and replant street trees, when they are removed for safety or health reasons, and continue to maintain Santa Rosa's Tree City USA designation.

14.4. Increase the city's urban tree canopy, starting with Equity Priority Areas, and expand urban greening throughout the city to reduce the heat Island effect and support natural carbon sequestration. (General Plan Action 5-6.15)

14.5. Seek resources to conduct a city-wide tree canopy assessment to quantify how much of the City's land area is covered by trees, including streets with street tree canopy cover; identify the location of those trees; and identify opportunities to plant trees. (General Plan Action 5-6.16)

14.6. Update the Santa Rosa Street Tree list so that it is consistent with the list developed by the City's Water Use Efficiency Team and the Master Gardeners, and identify native, drought-tolerant, and low-water- use tree species that are appropriate for street landscaping. (General Plan Action 5-6.17)

14.7. Work with the Water Team and Master Gardeners to refine guidelines on specific tree species and management procedures that integrate carbon sequestration, ecosystems services, and biodiversity. (General Plan Action 5-6.18)

14.8. Where woody vegetation is appropriate, maximize planting of coast live oak and other native trees and shrubs in the public realm. (General Plan Action 5-6.19)

14.9. Work to complement the street tree network by increasing the number of street trees in the sidewalk and tree wells. (General Plan Action 5-6.20)

14.10. Preserve mature trees during infrastructure modifications using solutions to retain them such as bulb-outs, basin expansion, and sidewalk re-routing. (General Plan Action 5-6.21)

Objective: Enhance sustainable and carbon-free practices community-wide.

14.11. Seek resources to create and regularly update an Urban Greening Plan to increase the urban tree canopy, open spaces, and green roofs to reduce the heat island effect, giving priority to areas of the city with vulnerable populations. (General Plan Action 5-6.23)

14.12. Explore incentives for shading features such as large eaves and cantilevers on south and west facing walls to reduce air conditioning requirements and heat island effects that contribute to the entire community's reduced quality of life, but especially those living in high- density, low-income neighborhoods. (General Plan Action 5-6.24)

14.13. Continue to apply biosolid byproducts of the wastewater treatment process onto City-owned property, and to work with the Bay Area Biosolids Coalition to identify new local and regional opportunities for biosolids use and expansion of processing facilities.

14.14. Inventory wetlands, floodplains, marshlands, and adjacent lands that could potentially support climate adaptation (e.g., through flood management, filtration, or other beneficial ecosystem services) and mitigation (e.g., carbon sequestration). (General Plan Action 3-5.8)

14.15. Conduct carbon sequestration farming pilot projects and research as part of ongoing ecological restoration of degraded habitats. (General Plan Action 3-6.22)

14.16. Implement regenerative land management practices at the city scale to reduce GHG emissions and improve watershed and human health. (General Plan Action 3-6.26)

Regulatory Programs:

14.17. Require tree planting and other landscaping in all new development and redevelopment that supports other community benefits, such as shade for walking and biking, and include greening elements as a primary project scoring criteria for bicycle improvements. (General Plan Action 5-6.22)

14.18. Ensure that agricultural easements have standards for Best Management Practices and prioritize conservation of agricultural properties that use or agree to implement regenerative agriculture practices. (General Plan Action 3-6.28)

Education, Outreach, and Coordination Programs:

14.19. Promote regenerative agricultural techniques for local farmers and ranchers, in partnership with the Sonoma County Agricultural Preservation and Open Space District, the Sonoma County Resource Conservation District, regional agricultural groups, the UC (University of California) Cooperative Extension, and others.

14.20. Work with the County to support the implementation of forest management practices that protect existing carbon stocks by reducing the risk of catastrophic wildfire. At the same time, support activities such as mulching in place, prescribed fire, conservation burns, and off site uses, including compost and mulch production. (General Plan Action 3-6.23)

14.21. Work with regional partners on strategic land protection and stewardship actions that increase carbon sequestration, minimize conversion to land uses that have a lower capacity to sequester carbon, and preserve contiguous open space areas to better protect ecosystems that are under pressure from a changing climate, allowing greater mobility of species. (General Plan Action 3-6.24)

Objective: Enhance sustainable and carbon-free practices community-wide.	
Supportive General Plan Policies:	
General Plan Policy 3-5.3:	Conserve and protect creeks, wetlands, vernal pools, wildlife ecosystems, rare plant habitats, and waterways from development.
General Plan Policy 5-6.5:	Support the preservation and restoration of natural landscapes to reduce the heat island effect, improve air quality, and improve community health.
General Plan Policy 3-6.6:	Conserve agricultural land and soils.
General Plan Policy 3-6.8:	Capture and sequester more carbon in soils and plants.

Measure 14 Performance Standards			
Performance Standard	2030	2045	2050
Cumulative trees planted - City Limits	600	2,100	2,600
Cumulative trees planted – External Planning Area	100	350	430

Measure 14 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
Municipal	Medium-term	General Fund, grant funding, incentives
Responsible and Supporting City Departments	Supporting Community Partners	
Water, Recreation & Parks	Sonoma County, Sonoma County Agricultural Preservation and Open Space District, Sonoma County Resource Conservation District, North Coast Soil Hub, UC Extension, farmers and ranchers, community gardens, Sonoma County Regional Climate Protection Authority	

Objective: Enhance sustainable and carbon-free practices community-wide.

Measure 15: Reduce embedded carbon in goods and services used by the City and community members.

GHG Emissions Savings ($MTCO_2e$):

This measure does not result in quantifiable GHG emission reductions.

Implementing Programs:

Regulatory Programs:

15.1. Continue to update the Building Code, consistent with State law, to increase the use of low carbon construction materials. (General Plan Action 3-7.24)

Education, Outreach, and Coordination Programs:

15.2. Continue to promote Santa Rosa as the North Bay's premier location for clean/green technologies and entrepreneurial businesses that create new products and business models that will attract national and international interest. (General Plan Action 2-5.8)

15.3. Support the growth of green businesses in Santa Rosa that support a carbon-neutral economy. (General Plan Action 3-7.32) Emphasize businesses that use locally or regionally sourced materials, including upcycled materials, or conduct local and sustainable manufacturing activities.

15.4. Continue to promote "Buy Local" programs, in partnership with the Santa Rosa Metro Chamber of Commerce and other business organizations.

15.5. Continue to encourage businesses to participate in the Sonoma County Green Business Certification program.

Supportive General Plan Policies:

General Plan Policy 3-7.4:	Reduce the use of fossil fuels as an energy source in new and existing buildings.
General Plan Policy 3-7.5:	Continue the City's role as a leader in sustainability and climate action.

Measure 15 Implementation Details		
Applicability	**Timeframe of Implementation**	**Expected Funding Sources**
New development, Nonresidential	Short-term	General Fund, grant funding
Responsible and Supporting City Departments	**Supporting Community Partners**	
Planning & Economic Development	Sonoma County, Santa Rosa Metro Chamber of Commerce, local businesses, Sonoma County Regional Climate Protection Authority	

Objective: Enhance sustainable and carbon-free practices community-wide.

Measure 16: Maximize opportunities for local food production.

GHG Emissions Savings ($MTCO_2e$):

Implementing programs included under this measure are anticipated to help reduce community GHG emissions by reducing emissions associated with growth, processing, and transportation of food; by supporting soil-based carbon sequestration; and by reducing paved area. However, lack of both reliable data and a standardized protocol for quantifying emissions reductions from these activities at the time of preparation means that Measure 16 is classified as supportive.

Implementing Programs:

Municipal Programs:

16.1. Support retention of the city's existing community gardens and encourage development of new community gardens. (General Plan Action 6-6.6)

Regulatory Programs:

16.2. Consider updating the Zoning Code to allow urban agriculture where appropriate. (General Plan Action 6-6.8)

16.3. Consider developing an Urban Agriculture ordinance that includes strategies to increase access to healthy food—particularly in Equity Priority Areas and Healthy Food Priority Areas—and standards for operation and soil mitigation. (General Plan Action 6-6.9)

16.4. Explore the feasibility of enacting an Urban Agriculture Incentive Zone (per Government Code Section 51040) to allow landowners to receive tax incentives for putting land into agricultural use. (General Plan Action 6-6.10)

Education, Outreach, and Coordination Programs:

16.5. Support partner agencies in providing education about the nutritional, social, economic, and environmental benefits of urban farming and locally grown and ecologically sound foods; urban agriculture opportunities; food production safety; food literacy; cooking; and food waste reduction. (General Plan Action 6-6.14)

16.6. Support the creation of additional community gardens or other urban agriculture opportunities, particularly in Equity Priority Areas and Healthy Food Priority Areas. (General Plan Action 6-6.7)

16.7. Encourage private property owners and developers to provide opportunities for residential gardening and urban agriculture, and similar opportunities to food producers who are emerging, have limited resources, and/or are people of color. (General Plan Action 6-6.15)

Objective: Enhance sustainable and carbon-free practices community-wide.	
Supportive General Plan Policies:	
General Plan Policy 6-6.1:	Attract and support a range of healthy food retailers, particularly in Equity Priority Areas and Healthy Food Priority Areas, so that all residents have access to healthy foods within one half mile of where they live.
General Plan Policy 6-6.3:	Facilitate urban agriculture, farming, gardening, and local food production, especially in Equity Priority Areas and Healthy Food Priority Areas.

Measure 16 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
New and existing residential and nonresidential development	Medium-term	General Fund, grant funding
Responsible and Supporting City Departments	Supporting Community Partners	
Planning & Economic Development	Sonoma County, Sonoma County Agricultural Preservation and Open Space District, County Department of Health Services, schools, local farmers and community gardens, faith-based organizations, neighborhood organizations, homeowners' associations, multifamily building owners and managers, Sonoma County Regional Climate Protection Authority	

Objective: Enhance sustainable and carbon-free practices community-wide.

Measure 17: Integrate climate action across all City departments and programs.

GHG Emissions Savings ($MTCO_2e$):

This measure does not result in quantifiable GHG emission reductions on its own, but it is necessary to confirm the City's commitment to ongoing and accelerated reduction of GHG emissions from municipal and community-wide sources.

Implementing Programs:

Municipal Programs:

17.1. Consider the effects of climate change in updating or amending the General Plan, disaster planning, City projects, infrastructure planning, future policies, and City investments. (General Plan Action 3-7.1)

17.2. Integrate GHG emissions reduction and climate resilience into all municipal projects, policies, and procedures as applicable. (General Plan Action 3-7.28)

17.3. Ensure that implementation of the City's GHG Reduction Strategy considers the needs of and provides benefits to Disadvantaged Communities and Equity Priority Areas and that the program actively and meaningfully engages with residents and stakeholders in these areas.

17.4. Fund and implement the GHG emission reduction actions in the General Plan and GHG Reduction Strategy. (Supported by General Plan Action 3-7.2)

17.5. Continue to regularly monitor and report to the City Council and the community on climate action and GHG Reduction Strategy implementation progress. Regular monitoring and reporting should assess the City's progress toward achievement of the GHG reduction targets in the General Plan and Reduction Strategy and identify opportunities to update the Reduction Strategy when needed to ensure achievement of the City's targets.

17.6. Identify City staff with clear responsibilities for implementing the GHG Reduction Strategy, and ensure that staff have adequate authority, funding, time, and other resources and support for implementation.

- a. Designate a Climate Action Manager, or similar position within the city or in coordination with regional partners, to lead implementation of the City's GHG Reduction Strategy and climate policies and actions in the General Plan 2050.
- b. Designate and support a Climate Action Lead in each City department. (General Plan Action 3-7.30)
- c. Continue to support an Interdepartmental Climate Action Implementation Committee. (General Plan Action 3-7.31)
- d. Direct each City department to create a climate action work plan that demonstrates how the department will implement the climate and sustainability strategies in the General Plan and Reduction Strategy.

17.7. Work with the City's information technology department to implement and maintain a public-facing dashboard to track the City's progress in meeting its climate goals.

Objective: Enhance sustainable and carbon-free practices community-wide.
17.8. Continue regular inventories of community-wide and municipal GHG emissions, at least every five years, consistent with the GHG Reduction Strategy and this General Plan. (Supported by General Plan Action 3-7.3)
17.9. Enhance efforts to reduce GHG emissions in municipal operations after understanding the scope, effectiveness, and resource commitments of existing GHG reduction initiatives. General Plan Action 3-7.26)
17.11. Continue to implement existing clean energy and green practices such as capturing energy from digestion of wastewater solids and implementing energy efficient capital improvement projects such as the 2022 ultraviolent disinfection system upgrade at the Laguna Treatment Plant. (General Plan Action 3-7.29)
17.12. Explore opportunities to divest the City's resources from fossil fuel interests.
17.13. Advanced monitoring technology and protocols are emerging in the wastewater sector that promise to provide improved characterization of GHG emissions from specific wastewater processes. Santa Rosa Water will investigate utilizing these emerging technologies to better characterize site-specific GHG emissions at the Laguna Treatment Plant to better inform updates to the Municipal GHG inventory in the future.
Regulatory Programs:
17.14. Establish a policy to use carbon offsets, if needed, to meet the City's net carbon neutrality goals, after all feasible efforts have been made to reduce community-wide GHG emissions. Offsets shall be verifiable and trackable, located in California, and ideally be situated in Sonoma County or Santa Rosa and meaningfully benefit the community. Offsets shall not be used to allow for new or continued polluting activities and shall only be used as an option of last resort to address GHG emissions that cannot be reduced by any other feasible local action.
Education, Outreach, and Coordination Programs:
17.15. Provide public information to educate residents and businesses on the GHG Reduction Strategy and to support individual changes in energy and water use, transportation mode choices, material use, and waste reduction. (General Plan Action 3-7.4)
17.16. Continue to participate in collaborative partnerships with local, regional, and state agencies, businesses, and community groups to support implementation of the GHG Reduction Strategy.
17.17. Continue to participate in Sonoma County Regional Climate Protection Authority (RCPA) programs, activities, and planning efforts to reduce GHG emissions countywide. (General Plan Action 3-7.33)
Supportive General Plan Policies:
General Plan Policy 3-7.5: Continue the City's role as a leader in sustainability and climate action.

Measure 17 Implementation Details		
Applicability	Timeframe of Implementation	Expected Funding Sources
Municipal	Medium-term	General Fund, grant funding
Responsible and Supporting City Departments	Supporting Community Partners	
Planning & Economic Development	Sonoma County Regional Climate Protection Authority, local businesses, and community groups	

Conclusion: Progress to Targets

In total, implementation of the GHG Reduction Strategy is projected to reduce Santa Rosa's GHG emissions to 623,190 $MTCO_2e$ by 2030, 148,120 $MTCO_2e$ by 2045, and 116,200 $MTCO_2e$ by 2050, as shown in Table 14 and Figure 5. This will reduce 2030 emissions to 41 percent below 1990 levels and 2045 emissions to 86 percent below 1990 levels, allowing Santa Rosa to achieve its 2030 and 2045 GHG reduction targets and support California's goal of statewide net carbon neutrality.

The measures and implementation programs and their associated GHG emissions reductions detailed in this Reduction Strategy are achievable and feasible based on current and best available information. Successful implementation will also depend on leveraging grants and funding opportunities, partnerships with community-based organizations, local employers and businesses and academic institutions, collaboration with regional agencies and public agencies in Sonoma County, and ongoing education and outreach to community members and stakeholders. The City has a long history and successful track record of climate action and GHG emissions reductions through implementation of the CCAP and MCAP and regional initiatives. If the City has the financial and municipal resources to implement the measures at a higher level or faster rate, Santa Rosa's GHG emissions may decrease by a greater amount or quicker than shown here, bringing the community closer to net carbon neutrality.

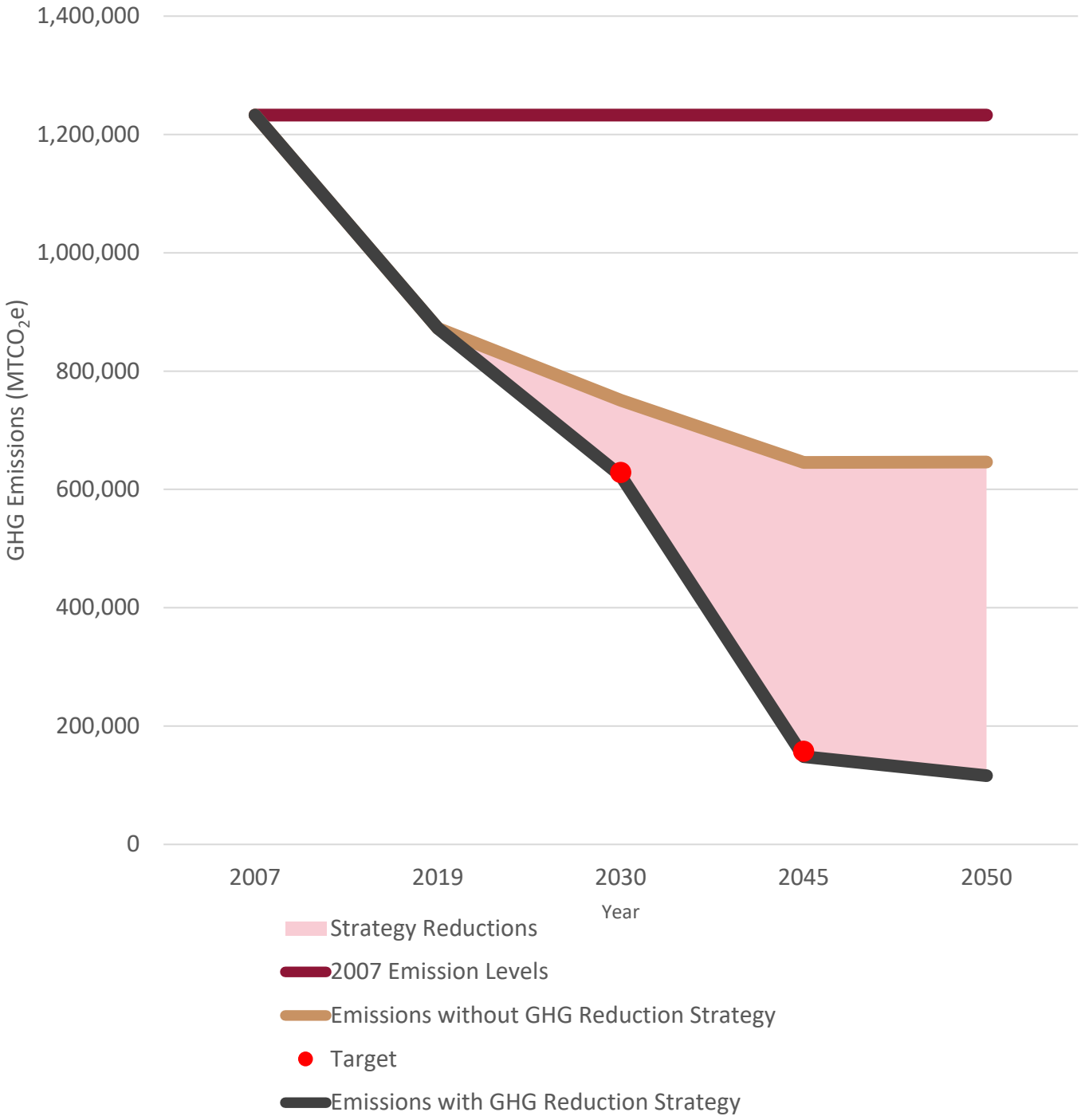
It is likely that new policies and regulations, technologies, personal and economic behaviors and preferences, and other factors will emerge in future years that will impact GHG emissions. These changes cannot be accurately forecasted in the Reduction Strategy, but they will support GHG emissions reductions beyond the levels identified here. Future updates to the Reduction Strategy will be able to better assess emerging trends and unexpected changes and include them as part of the City's GHG Reduction Strategy as appropriate, including being able to quantitatively present a path to net carbon neutrality. Future revisions to the Reduction Strategy may include more stringent GHG quantified reduction targets as they are feasible and appropriate.

Table 14. Santa Rosa City Limits GHG Emissions Reductions with the GHG Reduction Strategy, 2007 to 2050

State Emissions Reduction Measure	2007 Inventory $MTCO_2e$	2019 Inventory $MTCO_2e$	2030 Forecast $MTCO_2e$	2045 Forecast $MTCO_2e$	2050 Forecast $MTCO_2e$	Percentage Change 2007 to 2050
Forecast emissions with existing state and municipal actions	1,232,730	872,300	750,830	645,610	646,440	-48%
Emissions reductions in transportation	-	-	71,630	261,330	273,030	-
Emissions reductions in energy use	-	-	31,350	179,080	188,930	-
Emissions reductions in off-road equipment			12,330	29,900	36,540	
Emissions reductions in solid waste	-	-	8,450	13,920	15,420	-
Emissions reductions in water and wastewater	-	-	Less than 10	10	10	-
Emissions reductions in natural resources			3,880	13,250	16,310	
Emissions with GHG Reduction Strategy	1,232,730	872,300	623,190	148,120	116,200	-91%
State-mandated GHG emissions target	-	-	628,690	157,170	157,170	-
Target achieved?			Yes	Yes	Yes	

Notes: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

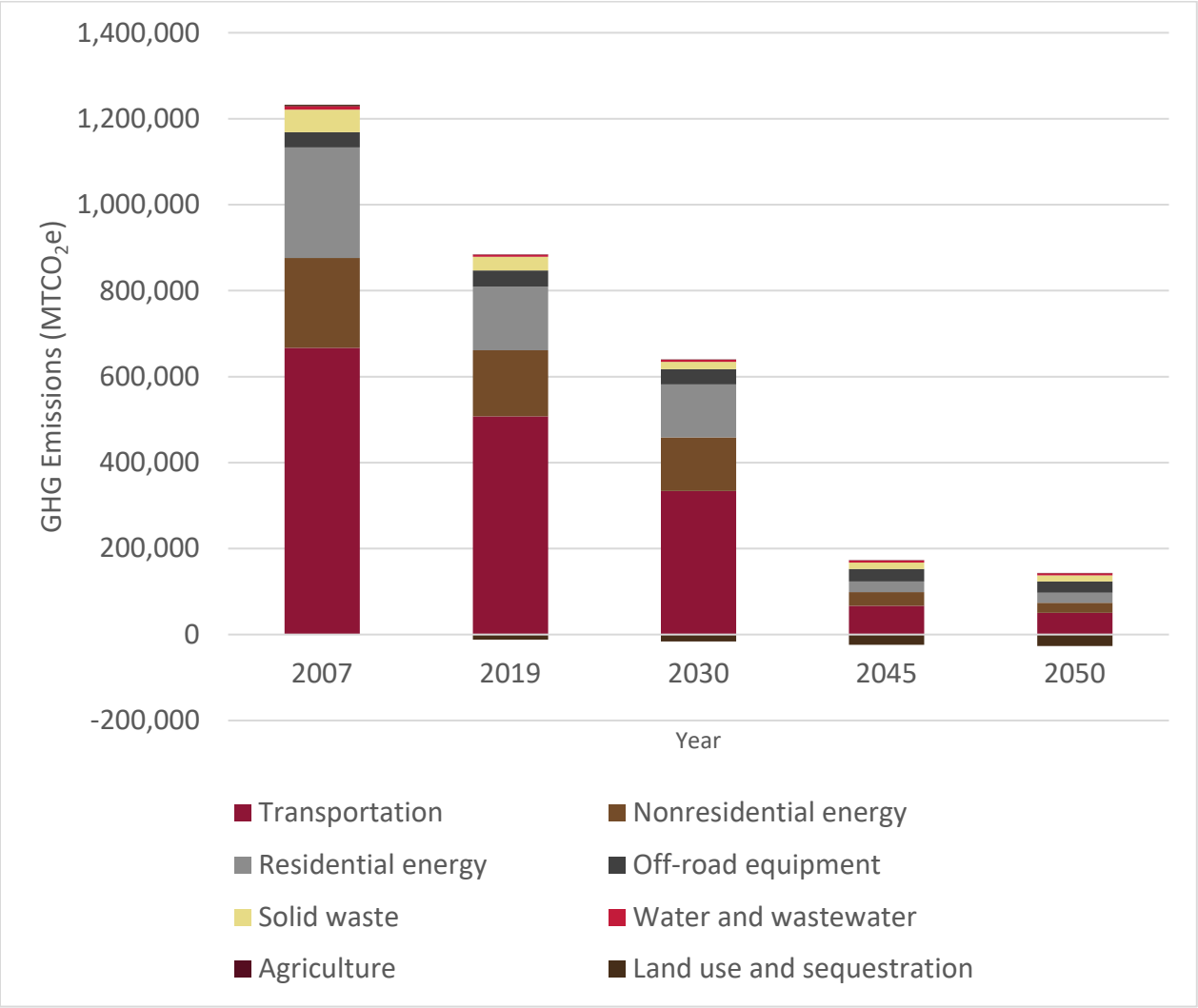
Figure 5. Santa Rosa Emissions Reductions with the GHG Reduction Strategy, 2007 to 2050



Notes: All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

With implementation of the Reduction Strategy, GHG emissions are projected to decrease 91 percent between 2007 and 2050. The largest percentage reductions are projected to occur in the land use and sequestration, residential energy, agricultural, and transportation sectors, as seen in Figure 6.

Figure 6. GHG Emissions by Sector in City Limits with the GHG Reduction Strategy, 2007 to 2050



The Reduction Strategy paves the way for a sustainable Santa Rosa by dramatically reducing natural gas use, solid waste, and VMT compared to the 2007 baseline. With implementation of the Reduction Strategy, transportation emissions are expected to decline by 92 percent between 2007 and 2050; nonresidential energy emissions are projected to decline by 91 percent, and residential energy emissions are projected to decline by 89 percent.

Appendix. Technical GHG Appendix

This appendix provides details for the technical details and findings from the Greenhouse Gas (GHG) Reduction Strategy quantification analysis. It also provides information on the data sources, assumptions, and performance metrics used to assess the potential for GHG savings from State and local existing and planned efforts, as well as from the measures within the GHG Reduction Strategy.

Technical Data for State Actions

The State of California has adopted and committed to implementing policies that reduce GHG emissions statewide, including in Santa Rosa. Many of these policies are laid out in the Climate Change Scoping Plan (Scoping Plan), a State document that outlines regulatory and market-based solutions to achieving California's GHG emission reduction goals. The Scoping Plan was first prepared in 2008, with successive updates in 2014, 2017, and 2022. These updates revised the State-level actions and identified additional opportunities for GHG emission reductions.

The Scoping Plan and related documents lay out several policies to reduce California's GHG emissions, although not all are directly applicable to Santa Rosa. The project team assessed Santa Rosa's GHG emissions, GHG emissions from the City's External Planning Area (EPA) and identified five State policies that are directly relevant to the community. This allows the GHG Reduction Strategy to provide "credit" to Santa Rosa for these policies. These State efforts are:

- The Renewables Portfolio Standard (RPS), which requires increases in renewable and carbon-free electricity supplies. RPS was first established in 2002 and has been amended multiple times, most recently by Senate Bill (SB) 1020 in 2022. It requires all electricity providers in the state to obtain at least 60 percent of their electricity from eligible renewable resources by the end of 2030 and all their electricity from carbon-free (although not necessarily eligible renewable) resources by the end of 2045. This policy reduces GHG emissions from electricity use, including the electricity used to transport and process water and wastewater, and the electricity used for electric vehicles.
- The Clean Car Standards, which require increased fuel efficiency of on-road vehicles and decreased carbon intensity of vehicle fuels. In 2002, California adopted Assembly Bill (AB) 1493, the New Passenger Motor Vehicle Greenhouse Gas Emission Standards, or Pavley standard. It required a reduction in tailpipe GHG emissions from new vehicles produced from 2009 to 2015. In 2012, the California Air Resources Board (CARB) adopted an extension of this policy, the Advanced Clean Car Standards, which requires more stringent reductions in tailpipe GHG emissions from vehicles produced from 2016 to 2025. In August 2022, CARB adopted another expansion of these standards, known as the Advanced Clean Cars II standards. This regulation requires that all new light-duty vehicles (e.g., passenger cars, small trucks, and sport-utility vehicles [SUVs]) sold in the state be zero-emission by 2035, with interim targets for new light-duty vehicle sales beginning in 2026. There are some limited exceptions for plug-in hybrid vehicles. CARB adopted similar rules for heavy-duty vehicles and state and local government fleets in 2020 (Advanced Clean Trucks) and 2023 (Advanced Clean Fleets).

- The updated Title 24 building energy-efficiency standards require new buildings to achieve increased energy-efficiency targets. California Code of Regulations, Title 24, Part 6 are California's energy-efficiency standards for new and renovated buildings, which are applied at the local level through the project review and building permit process. The standards are strengthened every three years, with the ultimate goal of making new buildings net-zero energy, meaning that they would generate as much energy as they use. The most recent set of Title 24 standards, known as the 2022 standards, went into effect on January 1, 2023. The 2022 Title 24 standards encourage efficient electric heat pumps, establish electric-ready requirements for new homes, expand solar photovoltaic and battery storage standards, and strengthen ventilation standards.
- The Short-Lived Climate Pollutant Reduction Strategy, also known as SB 1383, requires that communities divert 75 percent of organic waste (e.g., food scraps, grass, and plant trimmings) away from landfills and toward alternatives such as composting or energy generation. As a part of this requirement, all jurisdictions must offer curbside composting to single-family and small multifamily properties (less than five units). Larger multifamily properties and businesses must either participate in curbside composting or self-haul organic waste to a composting program or collection site. SB 1383 also includes requirements related to diverting surplus food to people in need, increasing the use of products made from recycled organics, and providing more detailed reporting statistics.

Overall, these existing policies are expected to reduce Santa Rosa's future GHG emissions. Without these policies in place, GHG emissions within the City Limits are expected to be 20 percent below 2007 levels by 2050. With these policies enacted, city-wide GHG absolute emissions are projected to be 47 percent below 2007 levels. Table A-1 shows the absolute reductions achieved by these policies.

Table A-1. Absolute GHG Emissions with Existing Actions within City Limits, 2007 to 2050

	2007 Inventory $MTCO_2e$	2019 Inventory $MTCO_2e$	2030 Forecast $MTCO_2e$	2045 Forecast $MTCO_2e$	2050 Forecast $MTCO_2e$	Percentage Change 2007 to 2050
Forecasted emissions without state actions	1,232,730	872,300	914,530	972,240	991,510	-20%
Reductions from RPS	-	-	-20,490	-83,050	-83,590	-
Reductions from Clean Car standards	-	-	-103,480	-192,900	-201,700	-
Reductions from Title 24	-	-	-7,490	-29,190	-37,970	-
SB 1383	-	-	-9,060	-10,210	-10,590	
Reductions from all state actions	-	-	-140,520	-315,350	-333,850	-
Emissions with state actions	1,232,730	872,300	774,010	656,890	657,660	-47%

Note: Values in this table have been rounded to the nearest 10. Totals in columns may not equal the sum of component rows.

$MTCO_2e$ = metric tons of carbon dioxide equivalent

Technical Data for Existing Local Actions

Since the City's 2012 Climate Action Plan (CCAP) was adopted, the City has continued to act in partnership with regional agencies. Existing activities that have been implemented since 2019, or have increased participation since 2019, can be credited for additional GHG emissions reductions if changes to activity data have been determined by the City. The CCAP includes an assessment of Santa Rosa's local GHG benefits from these efforts, allowing the community to receive "credit" for its efforts. These efforts include:

- Participating in Sonoma Clean Power to increase the renewable electricity supply to the community and allow for greater local control over electricity service.
- Increasing solar photovoltaic (PV) capacity.
- Launching scooter-share programs.
- Installing publicly available electric vehicle (EV) chargers.
- Customers installing graywater systems.
- Operating the Cash for Grass program.
- Operating the WaterSmart Checkup program.
- Installing new and expanding existing bike lanes.
- Requiring new residential development of three stories or less to be carbon neutral.

Existing Local Action 1: Sonoma Clean Power.

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$) – City Limits	10,810	0	0
GHG reduction ($MTCO_2e$) – EPA	650	0	0

Key Assumptions

	2030	2045	2050
Proportion of Sonoma Clean Power electricity that is renewable	100%	100%	100%
PG&E emissions factor (MTCO2e/kWh)	0.000022	0.000000	0.000000

Performance Targets

	2030	2045	2050
Proportion of Sonoma Clean Power electricity that is renewable	100%	100%	100%

Sources

Sonoma Clean Power. 2022. "Standard LSE Plan." https://sonomacleanpower.org/uploads/documents/soma_public_v1.pdf.

Existing Local Action 2: Solar Installations.

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$) – City Limits	150	0	0

Key Assumptions

	2030	2045	2050
Number of residential installations as of 2019	4,521	4,521	4,521
Number of nonresidential installations as of 2019	82	82	82

Performance Targets

	2030	2045	2050
Electricity generated from solar (kWh)	54,958,280	54,958,280	54,958,280

Sources

Energy Solutions. "Distributed Generation Interconnection Program Data." 2023. https://www.californiadgstats.ca.gov/downloads/.

PVWatts. "PVWatts Calculator." https://pvwatts.nrel.gov/pvwatts.php.

Existing Local Action 3: Scooter Share.

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$)	Less than 10	Less than 10	Less than 10

Key Assumptions

	2030	2045	2050
Total scooter trips per year as of 2023	10,965	10,965	10,965
Vehicle to scooter substitution rate	38.5%	38.5%	38.5%
Average vehicle trip length (miles)	5.4	5.4	5.4

Performance Targets

	2030	2045	2050
Vehicle VMT avoided	6,130	6,530	6,670

Sources

Wilson, T. Personal communication. Jun 15, 2023.

Existing Local Action 4: Public EV Chargers.

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$)	6,720	5,750	5,690

Key Assumptions

	2030	2045	2050
Number of public EV chargers as of 2023	162	162	162
kWh use per charging station	52,010	52,010	52,010
Electric VMT provided by each charging station	158,590	158,590	158,590

Performance Targets

	2030	2045	2050
Newly electric VMT	25,691,990	25,691,990	25,691,990
Increase in kWh use	8,425,660	8,425,660	8,425,660

Sources

Alternative Fuels Data Center. "Electric Vehicle Charger Selection Guide." 2018. https://afdc.energy.gov/files/u/publication/EV_Charger_Selection_Guide_2018-01-112.pdf.

Wilson, T. Personal communication. Jun 15, 2023.

Existing Local Action 5: Graywater Systems.

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$)	Less than 10	Less than 10	Less than 10

Key Assumptions

	2030	2045	2050
Residents in homes with graywater systems as of 2023	18	18	18
Gallons of water used per day per occupant - bathroom	25	25	25
Gallons of water used per day per occupant - laundry	15	15	15

Performance Targets

	2030	2045	2050
Reduction in water use (gallons)	10,560	10,560	10,560
Reduction in electricity use (kWh)	30	30	30

Sources

Kobayashi, Y., Ashbolt, N.J., Davies, E.G.R., Liu, Y. 2020. "Life cycle assessment of decentralized greywater treatment systems with reuse at different scales in cold regions." *Environment International* (134). https://www.sciencedirect.com/science/article/pii/S0160412019318707#s0220.

Meads, S. Personal communication.

Existing Local Action 6: Cash for Grass Program.

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$)	Less than 10	Less than 10	Less than 10

Key Assumptions

	2030	2045	2050
Square feet of turf removed as of 2023	557,514	557,514	557,514

Performance Targets

	2030	2045	2050
Reduction in water use (gallons)	8,710,600	8,710,600	8,710,600
Reduction in electricity use (kWh)	12,290	12,290	12,290

Sources

Meads, S. Personal communication.

Model Water Efficient Landscape Ordinance (2023).

Existing Local Action 7: WaterSmart Checkup Program.

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$)	Less than 10	Less than 10	Less than 10

Key Assumptions

	2030	2045	2050
Percentage of water use occurring indoors	40%	40%	40%

Performance Targets

	2030	2045	2050
Reduction in water use (gallons)	1,290,600	1,290,600	1,290,600
Reduction in electricity use (kWh)	2,690	2,580	2,540

Sources

Nordlie, C. Personal communication.

Existing Local Action 8: Bike Lane Expansion.

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$)	10	10	10

Key Assumptions

	2030	2045	2050
Miles of bike lanes prior to 2020	104.6	104.6	104.6
Total miles of bike lanes including new and planned miles as of 2023	109.8	109.8	109.8

Performance Targets

	2030	2045	2050
Total miles of bike lanes including new and planned miles as of 2023	109.8	109.8	109.8
Reduction in VMT	25,010	26,660	27,210

Sources

American Community Survey. 2021. B08006: Sex of Workers by Means of Transportation to Work. https://data.census.gov/table/ACSDT5Y2021.B08006?q=B08006&g=160XX00US0670098.

Caltrans. 2021. *California Public Road Data*. https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/california-public-road-data/prd-2021.pdf.

City of Santa Rosa. 2019. *Bicycle & Pedestrian Master Plan*. https://www.srcity.org/DocumentCenter/View/24312/Bicycle-and-Pedestrian-Master-Plan-Update-2018-final-version_PRINT.

Existing Local Action 9: Carbon Neutral New Construction.[13]

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$)	5,490	5,520	5,520

Key Assumptions

	2030	2045	2050
Percentage of new residential units in buildings three stories or less	86%	86%	86%
New residential units in buildings three stories or less	2,800	2,800	2,800

Performance Targets

	2030	2045	2050
Reduction in natural gas use (therms)	1,036,420	1,036,420	1,036,420
Increase in electricity use (kWh)	11,543,480	11,543,480	11,543,480

Sources

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). ND. "ASHRAE Technical FAQ."

California Air Pollution Control Officers Association. 2021. "Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity." https://www.caleemod.com/documents/handbook/full_handbook.pdf

California Energy Commission. 2020. "2019 Residential Appliance Saturation Study." https://www.energy.ca.gov/data-reports/surveys/2019-residential-appliance-saturation-study

California Energy Commission. 2006. "2006 California Commercial End-Use Survey (CEUS)." https://www.energy.ca.gov/data-reports/surveys/california-commercial-end-use-survey/2006-california-commercial-end-use-survey

Greenblatt, JB., 2015. "Modeling California policy impacts on greenhouse gas emissions." https://eta-publications.lbl.gov/sites/default/files/lbnl-7008e.pdf

U.S. Census. 2021: ACS 5-Year Estimates Detailed Tables. "B25024: Units in Structure." https://data.census.gov/table?t=Units+and+Stories+in+Structure&g=160XX00US0670098&tid=ACSDT5Y2021.B25024

[13] The City has suspended its enforcement of Ordinance 2022-015 because of a decision on January 2, 2024, by the U.S. Court of Appeals 9th Circuit that invalidated a City of Berkeley ordinance that prohibited natural gas infrastructure in new buildings, precluding cities and counties from adopting ordinances that prohibit the installation of gas plumbing in buildings. The City is currently evaluating options for a replacement reach code that will achieve similar objectives for energy efficiency and GHG emissions reductions in a manner that is consistent with the recent court decision. The GHG reductions beyond 2024 reflect the annual benefits of all-electric buildings built during implementation of the 2019 and 2022 reach codes through June 30, 2024.

U.S. Census. 2021: ACS 5-Year Estimates Detailed Tables. "B25040: House Heating Fuel." https://data.census.gov/table?q=b25040&g=160XX00US0670098&tid=ACSDT5Y2021.B25040

Collectively, all existing and planned activities (state, regional, and local) are projected to reduce the City of Santa Rosa's 2045 GHG emissions approximately 48 percent below 2007 levels. Table A-2 shows the projected GHG emission reductions from these existing and planned local activities. Benefits from local and regional efforts are only shown if they will reduce GHG emissions beyond the level achieved by State efforts.

Table A-2. Santa Rosa City Limits Projected GHG Emission Reductions from Existing and Planned Local and Regional Activities, 2007 to 2050

	2007 Inventory $MTCO_2e$	2019 Inventory $MTCO_2e$	2030 Forecast $MTCO_2e$	2045 Forecast $MTCO_2e$	2050 Forecast $MTCO_2e$	Percentage Change 2007 to 2050
Forecasted emissions with State actions	1,232,730	872,300	774,010	656,890	657,660	-47%
Increases in Sonoma Clean Power participation	-	-	-10,810	0	0	-
Renewable energy installations	-	-	-150	0	0	-
Scooter-share programs	-	-	Less than 10	Less than 10	Less than 10	-
New public EV chargers	-	-	-6,720	-5,750	-5,690	-
New graywater systems	-	-	Less than 10	Less than 10	Less than 10	-
Cash for Grass program	-	-	Less than 10	Less than 10	Less than 10	-
WaterSmart Checkup program			Less than 10	Less than 10	Less than 10	
New and expanded bike lanes	-	-	-10	-10	-10	-
Carbon neutral new residential construction	-	-	-5,490	-5,520	-5,520	-
Reductions from all local and regional actions	-	-	-23,180	-11,280	-11,220	-
Forecasted emissions with all existing and planned actions	1,232,730	872,300	750,830	645,610	646,440	-48%

Note: Values in this table have been rounded to the nearest 10. Totals in columns may not equal the sum of component rows.

Technical Data for GHG Reduction Measures

This section discusses the data sources, methods, and assumptions for the quantification of the GHG-reduction measures included in the Santa Rosa 2023 GHG Reduction Strategy. In addition to the sources presented here, these calculations also rely on the GHG inventory and forecast. The quantification calculations also rely on emission factors

that reflect the reductions already achieved by the existing actions discussed in the previous section. Table A-3 shows these emission factors.

Table A-3. Emission Factors with Existing Actions, 2019 to 2050

Activity Type	Units	2019	2030	2045	2050
Electricity (PG&E)	MTCO2e/kWh	0.000027	0.000025	0.000000	0.000000
Electricity (SCP – Evergreen)	MTCO2e/kWh	0.000018	0.000000	0.000000	0.000000
Electricity (SCP – CleanStart)	MTCO2e/kWh	0.000019	0.000000	0.000000	0.000000
Electricity (direct access)	MTCO2e/kWh	0.000419	0.000300	0.000000	0.000000
Electricity (PG&E and SCP)	MTCO2e/kWh	0.000020	0.000003	0.000000	0.000000
Natural gas	MTCO2e/Therms	0.005324	0.005324	0.005324	0.005324
Passenger vehicle transportation	MTCO2e/VMT	0.000347	0.000262	0.000224	0.000222
Commercial vehicle transportation	MTCO2e/VMT	0.001124	0.001019	0.0006751	0.000630
Solid waste (MSW)	MTCO2e/Tons	0.277890	0.277920	0.277900	0.277920

kWh = kilowatt-hour; $MTCO_2e$ = metric tons of carbon dioxide equivalent; VMT = vehicle miles traveled.

For each strategy, this appendix discusses the following items for both the City limits and EPA.

- The savings in activity data (e.g., kilowatt- hours [kWh] of electricity or tons of solid waste) in 2030, 2045, and 2050 resulting from implementing the strategy as described. A negative value indicates an increase in activity data.
- The decreases in GHG emissions in 2030, 2045, and 2050 resulting from implementing the strategy as described.
- The assumptions made about the strategy's performance, such as the level of community participation required to achieve the specified reductions by 2030, 2045, and 2050.
- The performance targets, which are quantifiable metrics about the projected level of success the strategy must meet to achieve the specified reductions by 2030, 2045, and 2050.
- Sources: Key studies, analyses, and other sources of data used to inform the quantification. This does not include the GHG inventory, forecast, or other technical analyses prepared as part of the GHG Reduction Strategy.

Measure 1: Locate and design new development to minimize vehicle dependence.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	12,040	10,090	11,940
GHG reduction (MTCO2e) – EPA	1,700	1,470	1,610

Key Assumptions

Key Assumptions	2030	2045	2050
Percentage of new multifamily units dedicated through deed restrictions as affordable	20%	15%	15%
Percentage reduction in residential parking supply relative to demand	10%	20%	25%
Average percentage increase in public parking price	10%	15%	20%
Percentage of vehicle miles traveled (VMT) that takes place in area with priced parking	10%	20%	25%

Performance Targets

Performance Targets	2030	2045	2050
New multifamily units dedicated through deed restrictions as affordable - City limits	480	1,140	1,690
New multifamily units dedicated through deed restrictions as affordable - EPA	30	80	110
Percentage increase in residential density – City Limits	10%	30%	30%
Percentage increase in job density – City limits	10%	20%	20%

Sources

California Air Pollution Control Officers Association. 2021. "Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity." https://www.caleemod.com/documents/handbook/full_handbook.pdf

City of Santa Rosa. 2023. "Affordable Housing Complexes." https://www.srcity.org/DocumentCenter/View/29876/City-of-Santa-Rosa-Affordable-Housing-Complexes-2023?bidId=

Sonoma County Transportation Authority. 2020. "Sonoma County Travel Behavior Study." https://scta.ca.gov/wp-content/uploads/2020/02/Sonoma_TBS_2-7-2020_web.pdf

Measure 2: Improve the frequency, coverage, and effectiveness of local and regional transit and rail networks.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	10,160	13,980	16,030
GHG reduction (MTCO2e) – EPA	700	950	1,090

Key Assumptions

Key Assumptions	2030	2045	2050
Percentage increase in transit network coverage	10%	10%	10%

Key Assumptions	2030	2045	2050
Percentage increase in transit network hours	10%	25%	30%
Percentage of routes on which frequency is increased	25%	40%	50%
Percentage increase in transit frequency on routes on which frequency is increased	10%	35%	40%
Percentage of transit routes that receive supportive treatments	20%	40%	50%
Percentage reduction in transit fares (averaged across community)	25%	30%	30%
Percentage of transit routes receiving reduced fares	100%	100%	100%
Percentage of riders receiving discount from base transit fare	55%	60%	65%

Performance Targets

Performance Targets	2030	2045	2050
Percentage increase in transit network coverage	10%	10%	10%
Percentage increase in transit network hours	10%	25%	30%
Percentage of routes on which frequency is increased	25%	40%	50%
Percentage increase in transit frequency on routes on which frequency is increased	10%	35%	40%
Percentage of transit routes that receive supportive treatments	20%	40%	50%
Percentage reduction in transit fares (averaged across community)	25%	30%	30%
Percentage of transit routes receiving reduced fares	100%	100%	100%
Percentage of riders receiving discount from base transit fare	55%	60%	65%

Sources

California Air Pollution Control Officers Association. 2021. "Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity." https://www.caleemod.com/documents/handbook/full_handbook.pdf

Sonoma County Transportation Authority. 2021. "Moving Forward 2050: Sonoma County Comprehensive Transportation Plan." https://scta.ca.gov/wp-content/uploads/2021/09/SCTA-CTP21_v8.pdf

Measure 3: Develop and expand transportation demand management (TDM) programs to reduce VMT and dependence on single-occupancy vehicle trips.

GHG Savings

	2030	2045	2050
GHG reduction ($MTCO_2e$) – City Limits	570	1,000	1,070

	2030	2045	2050
GHG reduction ($MTCO_2e$) – EPA	40	90	90

Key Assumptions

Key Assumptions	2030	2045	2050
Percentage employees eligible for TDM programs	20%	30%	30%

Performance Targets

Performance Targets	2030	2045	2050
Businesses in TDM programs – City Limits	1,420	2,430	2,590
Businesses in TDM programs – EPA	90	150	160

Sources

California Air Pollution Control Officers Association. 2021. "Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity." https://www.caleemod.com/documents/handbook/full_handbook.pdf

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Measure 4: Enhance active transportation and micro-mobility systems.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	1,580	2,810	3,290
GHG reduction (MTCO2e) – EPA	100	180	210

Key Assumptions

Key Assumptions	2030	2045	2050
Percentage increase in community sidewalk length	15%	30%	35%
Percentage increase in bike network length	20%	35%	40%

Performance Targets

Performance Targets	2030	2045	2050
Total community sidewalk length (miles)	650	730	760
Total bike network length (miles)	132	148	154

Sources

California Air Pollution Control Officers Association. 2021. "Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity." https://www.caleemod.com/documents/handbook/full_handbook.pdf

Measure 5: Accelerate the adoption of zero-emission light-duty and heavy-duty vehicles.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	47,280	233,450	240,700
GHG reduction (MTCO2e) – EPA	3,220	15,430	15,720

Key Assumptions

Key Assumptions	2030	2045	2050
Percentage of community's light-duty vehicle fleet converted from conventional fuel to electric	20%	90%	92%
Percentage of heavy-duty vehicles converted from conventional fuel to electric	5%	30%	35%
Percentage of heavy-duty vehicles converted from conventional fuel to hydrogen	5%	50%	60%

Performance Targets

Performance Targets	2030	2045	2050
Number of community's light-duty vehicle fleet converted from conventional fuel to electric (City Limits and EPA)	27,440	132,320	135,830
Number of community's heavy duty vehicle fleet converted from conventional fuel to electric	500	2,560	2,920
Number of community's heavy-duty vehicle fleet converted to hydrogen	500	4,260	5,010

Sources

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Measure 6: Transition to zero-emission motorized equipment, including construction and landscaping equipment.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	12,330	29,900	36,540

	2030	2045	2050
GHG reduction (MTCO2e) – EPA	910	2,220	2,730

Key Assumptions

Key Assumptions	2030	2045	2050
Percentage of landscaping equipment converted to electric	50%	95%	95%
Percentage of construction equipment converted to electric	40%	70%	75%
Percentage of other equipment converted to electric	15%	35%	45%

Performance Targets

Performance Targets	2030	2045	2050
Percentage of landscaping equipment converted to electric	50%	95%	95%
Percentage of construction equipment converted to electric	40%	70%	75%
Percentage of other equipment converted to electric	15%	35%	45%

Sources

California Air Pollution Control Officers Association. 2021. "Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity." https://www.caleemod.com/documents/handbook/full_handbook.pdf

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Measure 7: Reduce community-wide energy use, increase energy efficiency, and advance electrification in existing buildings, including municipal buildings.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	29,630	171,190	179,850
GHG reduction (MTCO2e) – EPA	1,950	11,180	11,710

Key Assumptions

Key Assumptions	2030	2045	2050
Existing residential buildings receiving standard efficiency retrofits	15%	40%	45%
Existing nonresidential buildings receiving standard efficiency retrofits	10%	35%	40%

Key Assumptions	2030	2045	2050
Existing residential gas space heaters converted	20%	95%	95%
Existing residential gas water heaters converted	10%	95%	95%
Existing residential cooktops converted	5%	55%	65%
Existing residential dryers converted	10%	50%	60%
Existing commercial gas rangers converted	10%	40%	50%
Existing commercial gas space heaters converted	5%	75%	95%
Existing commercial gas water heaters converted	10%	95%	95%
Existing commercial buildings eligible for electrification retrofits	75%	75%	75%

Performance Targets

Performance Targets	2030	2045	2050
Number of existing homes receiving efficiency retrofits – City Limits	10,270	27,380	30,800
Number of existing businesses receiving efficiency retrofits – City Limits	540	1,880	2,150
Number of existing homes receiving efficiency retrofits – EPA	700	1,860	2,090
Number of existing businesses receiving efficiency retrofits – EPA	30	110	130
Number of residential HVAC conversions - City Limits	10,760	51,110	51,110
Number of residential water heater conversions – City Limits	7,100	67,480	67,480
Number of residential clothes drying conversions – City Limits	7,100	35,520	42,620
Number of residential cooktop conversions – City Limits	3,550	39,070	46,170
Number of nonresidential HVAC conversions – City Limits	200	3,020	3,830
Number of nonresidential water heater conversions – City Limits	400	3,830	3,830
Number of nonresidential cooktop conversions – City Limits	400	1,610	2,010
Number of residential HVAC conversions - EPA	730	3,470	3,470
Number of residential water heater conversions – EPA	480	4,580	4,580
Number of residential clothes drying conversions – EPA	480	2,410	2,890
Number of residential cooktop conversions – EPA	240	2,650	3,130
Number of nonresidential HVAC conversions – EPA	10	180	230
Number of nonresidential water heater conversions – EPA	20	230	230
Number of nonresidential cooktop conversions – EPA	20	100	120

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Measure 8: Transition to carbon neutral new buildings.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	1,650	7,890	9,080
GHG reduction (MTCO2e) – EPA	80	1,050	1,150

Key Assumptions

Key Assumptions	2030	2045	2050
Cumulative percentage of new residential construction influenced by performance-based reach code (once implemented)	95%	95%	95%
Cumulative percentage of new eligible nonresidential construction influenced by performance-based reach code (once implemented)	95%	95%	95%
Cumulative percentage of new nonresidential buildings eligible for performance-based reach code:	54%	54%	54%
Year performance-based reach code is first implemented	2025	2025	2025
New mixed-fuel residential buildings electrifying space heaters	20%	95%	95%
New mixed-fuel residential buildings electrifying water heaters	10%	95%	95%
New mixed-fuel residential buildings electrifying cooktops	5%	55%	65%
New mixed-fuel residential buildings electrifying clothes dryers	10%	50%	60%
New mixed-fuel nonresidential buildings electrifying cooktops	10%	40%	50%
Proportion of new residential units are in buildings of 3+ stories	14%	14%	14%
New mixed-fuel nonresidential buildings electrifying space heaters	5%	75%	95%
New mixed-fuel nonresidential buildings electrifying water heaters	10%	95%	95%
Percentage of nonresidential buildings covered by performance-based reach code	75%	75%	75%
Proportion of new residential buildings that are multifamily	30%	40%	50%

Performance Targets

Performance Targets	2030	2045	2050
Number of new performance-based reach-compliant residential units	8,120	19,190	22,890
Number of new performance-based reach-compliant commercial buildings	350	820	980
Residential HVAC conversions - City Limits	430	4,880	5,820

Performance Targets	2030	2045	2050
Residential water heater conversions - City Limits	430	4,880	5,820
Commercial HVAC conversions - City Limits	10	250	380
Commercial water heater conversions - City Limits	10	250	380
Residential HVAC conversions - EPA	30	330	390
Residential water heater conversions - EPA	40	230	270
Commercial HVAC conversions - EPA	Less than 10	Less than 10	Less than 10
Commercial water heater conversions - EPA	Less than 10	Less than 10	Less than 10

Sources

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Measure 9: Increase local renewable energy generation and the use of renewable, carbon free, and distributed energy systems, including energy storage, throughout the city.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	70	Less than 10	Less than 10
GHG reduction (MTCO2e) – EPA	Less than 10	Less than 10	Less than 10

Key Assumptions

Key Assumptions	2030	2045	2050
Proportion of existing residential units with solar systems installed – City limits	3%	5%	8%
Proportion of existing residential units with solar systems installed – EPA	3%	5%	8%
Existing commercial units with solar systems installed – City limits	1%	3%	5%
Existing commercial units with solar systems installed – EPA	1%	3%	5%

Performance Targets

Performance Targets	2030	2045	2050
Residential solar systems installed – City Limits	2,130	3,550	5,680
Residential solar systems installed – EPA	140	240	390
Commercial solar systems installed – City Limits	50	160	270
Commercial solar systems installed – EPA	Less than 10	10	20

Sources

California Air Pollution Control Officers Association. 2021. “Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity.” https://www.caleemod.com/documents/handbook/full_handbook.pdf

Measure 10: Reduce the amount of recyclable and compostable material sent to landfills.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	6,500	10,150	10,530
GHG reduction (MTCO2e) – EPA	430	670	690

Key Assumptions

Key Assumptions	2030	2045	2050
Percentage of compostables diverted from municipal solid waste (MSW)	85%	85%	85%
Percentage of recyclables diverted from MSW	70%	85%	85%
Percentage of construction and demolition debris diverted from MSW	80%	85%	85%

Performance Targets

Performance Targets	2030	2045	2050
Tons of compostables diverted from MSW – City Limits	2,780	3,140	3,260
Tons of recyclables diverted from MSW – City Limits	22,220	30,400	31,550
Tons of compostables diverted from MSW – EPA	180	210	210
Tons of recyclables diverted from MSW – EPA	1,460	2,000	2,080
Tons of construction and demolition debris diverted from landfills – Combined City limits and External Planning Area	13,200	14,030	14,030

Sources

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Measure 11: Reduce total waste generation.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	1,950	3,770	4,890
GHG reduction (MTCO2e) – EPA	130	70	340

Key Assumptions

Key Assumptions	2030	2045	2050
Percentage reduction in MSW generated	10%	20%	25%

Performance Targets

Performance Targets	2030	2045	2050
Tons of MSW reduced – City Limits	7,880	16,680	21,630
Tons of MSW reduced – EPA	520	1,100	1,420

Sources

California Air Resources Board. ND. "Landfill Methane Regulation." https://ww2.arb.ca.gov/our-work/programs/landfill-methane-regulation.

Measure 12: Improve indoor and outdoor water efficiency.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	Less than 10	10	10
GHG reduction (MTCO2e) – EPA	Less than 10	Less than 10	Less than 10

Key Assumptions

Key Assumptions	2030	2045	2050
Percentage of housing units receiving WaterSmart Checkups	1%	2%	3%
Percentage of housing units receiving WaterSmart Checkups that existed in 2019	90%	79%	76%
Percentage of new development with all water-efficient landscaping (as required by the WELO)	95%	95%	95%

Performance Targets

Performance Targets	2030	2045	2050
Residential units receiving WaterSmart Checkups - City limits	560	1,970	2,430
Residential units built by 2019 receiving WaterSmart Checkups - City limits	500	1,560	1,840

Performance Targets	2030	2045	2050
Residential units built after 2019 receiving WaterSmart Checkups - City limits	60	410	590
Residential units receiving WaterSmart Checkups - EPA	40	130	170
Residential units built by 2019 receiving WaterSmart Checkups - EPA	40	100	130
Residential units built after 2019 receiving WaterSmart Checkups - EPA	Less than 10	30	40
New developments with water-efficient landscaping - City Limits	7,930	18,750	22,360
New developments with water-efficient landscaping - EPA	540	1,270	1,510

Sources

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Measure 14: Increase natural carbon sequestration opportunities in Santa Rosa.

GHG Savings

	2030	2045	2050
GHG reduction (MTCO2e) – City Limits	3,880	13,250	16,310
GHG reduction (MTCO2e) – EPA	670	2,220	2,710

Key Assumptions

Key Assumptions	2030	2045	2050
Trees planted per year (City Limits)	100	100	100
Percentage of agricultural land with improved sequestration potential	10%	25%	30%

Performance Targets

Performance Targets	2030	2045	2050
Cumulative trees planted – City Limits	600	2,100	2,600
Cumulative trees planted – EPA	100	350	430

Sources

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