
APPENDIX B: AIR QUALITY AND GREENHOUSE GAS EMISSIONS DATA



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1. GREENHOUSE GAS BACKGROUND

1.1 GREENHOUSE REGULATORY SETTING

Transportation Sector Specific Regulations

Advanced Clean Trucks

In March 2021, CARB approved the Advanced Clean Trucks (ACT) regulation to accelerate the transition to zero-emission Class 2b and Class 8 medium- and heavy-duty trucks through manufacturer sales requirements. The regulation has two components including a manufacturer sales requirement, and a reporting requirement:

- **ZE Truck Sales:** Manufacturers who certify Class 2b through 8 chassis or complete vehicles with combustion engines are required to sell ZE trucks as an increasing percentage of their annual California sales from 2024 to 2035. By 2035, ZE truck/chassis sales need to be 55 percent of Class 2b – 3 truck sales, 75 percent of Class 4 – 8 straight truck sales, and 40 percent of truck tractor sales.
- **Company and Fleet Reporting:** Large employers including retailers, manufacturers, brokers and others would be required to report information about shipments and shuttle services. Fleet owners, with 50 or more trucks, would be required to report about their existing fleet operations. This information would help identify future strategies to ensure that fleets purchase available ZE trucks and place them in service where suitable to meet their needs.

The ACT regulation was granted a separate waiver in 2023 by the Biden administration. On May 22, 2025, the U.S. Senate voted to revoke the waiver granted by the Biden administration for California's ACT rule through House Joint (H.J.) Resolution 87. On June 12, 2025, President Trump formally nullified California's ACT rule. California currently has no authority to implement ACT.

Advanced Clean Fleets

CARB adopted the Advanced Clean Fleets (ACF) regulation in April 2023, requiring the use of ZEVs for targeted fleets and that manufacturers only produce ZEV trucks starting in 2036. The ACF regulation was adopted to complement the recently adopted ACT regulation to help advance the introduction of ZE technology into California's trucks and bus fleets. By 2050, the ACF regulation is expected to introduce 1,690,000 ZEVs into the California fleet and result in \$26.5 billion in statewide health benefits from improved air quality. This regulation will help contribute to the goals set by EO N-79-20 (described further below) and will help achieve

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emission reductions outlined in the State Implementation Plan, SB 350, AB 32, SB 32, and AB 32. The regulation has four components including a manufacturer sales mandate, drayage fleets requirements, high priority and federal fleets phase-in, and State and local agency procurement requirements.

On January 13, 2025, CARB withdrew their requests for the federal CAA waiver from the US EPA needed to support the ACF regulation. In addition, on September 25, 2025, CARB repealed the ACF drayage truck requirements (13 CCR § 2014) and the high priority and federal fleet requirements (13 CCR § 2015 through 2015.6). California currently has no authority to implement ACF.

Omnibus Regulation

CARB adopted the Heavy-Duty Low NO_x Omnibus Regulation rule in September 2021, and amended in December 2023, to reduce nitrogen oxide (NO_x) and particulate matter (PM) emissions from new medium- and heavy-duty engines and vehicles beginning in 2024 model year (MY). The lower NO_x standards for 2024 through 2026 MY engines represent a 75 percent reduction of the 2010 MY standard and the lower PM standards represents a 50 percent reduction compared to the 2010 MY standard. The regulation was amended in 2023 to provide engine manufacturers with additional flexibility, and to prevent product availability issues for the 2024 through 2026 MY period (CARB 2025).

On May 22, 2025, the U.S. Senate voted to disapprove the USEPA's waiver authorizing California's Heavy-Duty Low NO_x regulation through House Joint (H.J.) Resolution 89. The resolution was signed into law on June 12, 2025, formally nullifying the USEPA waiver under the Congressional Review Act. As a result, California currently has no authority to implement or enforce the Heavy-Duty Low NO_x rule.

Assembly Bill 1493

California vehicle GHG emission standards were enacted under AB 1493 (Pavley I). Pavley I is a clean-car standard that reduces GHG emissions from new passenger vehicles (light-duty auto to medium-duty vehicles) from 2009 through 2016 and is anticipated to reduce GHG emissions from new passenger vehicles by 30 percent in 2016. California implements the Pavley I standards through a waiver granted to California by the USEPA. In 2012, the USEPA issued a Final Rulemaking that sets even more stringent fuel economy and GHG emissions standards for model years 2017 through 2025 light-duty vehicles. (See also the discussion on the update to the Corporate Average Fuel Economy standards at the beginning of this Section 5.5.2 under "Federal.") In January 2012, CARB approved the Advanced Clean Cars program (formerly known as Pavley II) for model years 2017 through 2025. The program combines the control of smog, soot, and GHGs with requirements for greater numbers of ZE vehicles into a single package of

standards. Under California’s Advanced Clean Car program, by 2025 new automobiles will emit 34 percent less GHG emissions and 75 percent less smog-forming emissions.

Executive Order S-01-07

On January 18, 2007, the state set a new LCFS for transportation fuels sold in the state. Executive Order S-01-07 sets a declining standard for GHG emissions measured in CO₂e gram per unit of fuel energy sold in California. The LCFS required a reduction of 2.5 percent in the carbon intensity of California’s transportation fuels by 2015 and a reduction of at least 10 percent by 2020. The standard applies to refiners, blenders, producers, and importers of transportation fuels, and uses market-based mechanisms to allow these providers to choose how they reduce emissions during the “fuel cycle” using the most economically feasible methods.

Executive Order B-16-2012

On March 23, 2012, the state identified that CARB, the California Energy Commission (CEC), the Public Utilities Commission, and other relevant agencies worked with the Plug-in Electric Vehicle Collaborative and the California Fuel Cell Partnership to establish benchmarks to accommodate ZE vehicles in major metropolitan areas, including infrastructure to support them (e.g., electric vehicle charging stations). The executive order also directed the number of ZE vehicles in California’s state vehicle fleet to increase through the normal course of fleet replacement so that at least 10 percent of fleet purchases of light-duty vehicles are ZE by 2015 and at least 25 percent by 2020. The executive order also establishes a target for the transportation sector of reducing GHG emissions to 80 percent below 1990 levels.

Executive Order N-79-20

On September 23, 2020, Governor Newsom signed Executive Order N-79-20, whose goal is that 100 percent of in-state sales of new passenger cars and trucks will be ZE by 2035. Additionally, the fleet goals for trucks are that 100 percent of drayage trucks are ZE by 2035, and 100 percent of medium- and heavy-duty vehicles in the state are ZE by 2045, where feasible. The Executive Order’s goal for the State is to transition to 100 percent ZE off-road vehicles and equipment by 2035, where feasible.

Renewables Portfolio: Carbon Neutrality Regulations

Senate Bills 1078, 107, and X1-2 and Executive Order S-14-08

A major component of California’s Renewable Energy Program is the renewables portfolio standard established under Senate Bills 1078 (Sher) and 107 (Simitian). Under the RPS, certain retail sellers of electricity were required to increase the amount of renewable energy each year by at least 1 percent in order to reach at least 20 percent by December 30, 2010. Executive

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Order S-14-08, signed in November 2008, expanded the state’s renewable energy standard to 33 percent renewable power by 2020. This standard was adopted by the legislature in 2011 (SB X1-2). Renewable sources of electricity include wind, small hydropower, solar, geothermal, biomass, and biogas. The increase in renewable sources for electricity production will decrease indirect GHG emissions from development projects because electricity production from renewable sources is generally considered carbon neutral.

Senate Bill 350

Senate Bill 350 (de Leon) was signed into law September 2015 and establishes tiered increases to the RPS—40 percent by 2024, 45 percent by 2027, and 50 percent by 2030. SB 350 also set a new goal to double the energy-efficiency savings in electricity and natural gas through energy efficiency and conservation measures.

Senate Bill 100

On September 10, 2018, Governor Brown signed SB 100. Under SB 100, the RPS for public-owned facilities and retail sellers consist of 44 percent renewable energy by 2024, 52 percent by 2027, and 60 percent by 2030. SB 100 also established a new RPS requirement of 50 percent by 2026. Furthermore, the bill establishes an overall state policy that eligible renewable energy resources and zero-carbon resources supply 100 percent of all retail sales of electricity to California end-use customers and 100 percent of electricity procured to serve all state agencies by December 31, 2045. Under the bill, the state cannot increase carbon emissions elsewhere in the western grid or allow resource shuffling to achieve the 100 percent carbon-free electricity target.

Senate Bill 1020

SB 1020 was signed into law on September 16, 2022. It requires renewable energy and zero-carbon resources to supply 90 percent of all retail electricity sales by 2035 and 95 percent by 2040. Additionally, SB 1020 requires all State agencies to procure 100 percent of electricity from renewable energy and zero-carbon resources by 2035.

Energy Efficiency Regulations

California Building Energy Code: Energy Efficiency Standards

Energy conservation standards for new residential and non-residential buildings were adopted by the California Energy Resources Conservation and Development Commission (now the CEC) in June 1977 and most recently revised in 2024 (California Code of Regulations [CCR] Title 24, Part 6). Title 24 Part 6 requires the design of building shells and building components to conserve energy. The standards are updated periodically to allow for consideration and possible incorporation of new energy efficiency technologies and methods.

In 2024, the CEC adopted the 2025 Building Energy Efficiency Standards, which were subsequently approved by the California Building Standards Commission. The 2025 standards become effective and replace the existing 2022 standards on January 1, 2026. The 2025 standards would require mixed-fuel single-family homes to be electric-ready to accommodate replacement of gas appliances with electric appliances. In addition, the new standards also include prescriptive photovoltaic system and battery requirements for high-rise, multifamily buildings (i.e., more than three stories) and noncommercial buildings such as hotels, offices, medical offices, restaurants, retail stores, schools, warehouses, theaters, and convention centers.¹ The Building Energy and Efficiency Standards and CALGreen undergo a triennial update with a goal to achieve zero net energy for new buildings by 2030.

California Building Code: Green Building Standards (CALGreen)

On July 17, 2008, the California Building Standards Commission adopted the nation’s first green building standards. The California Green Building Standards Code (24 CCR, Part 11, known as “CALGreen”) established planning and design standards for sustainable site development, energy efficiency (in excess of the California Energy Code requirements), water conservation, material conservation, and internal air contaminants.² The mandatory provisions of CALGreen became effective January 1, 2011, and were most recently updated in 2024 (2025 CALGreen update). The 2025 CALGreen update becomes effective on January 1, 2026, and provides updates to the residential and non-residential voluntary measures.

2006 Appliance Efficiency Regulations

The 2006 Appliance Efficiency Regulations (20 CCR §§ 1601–1608) were adopted by the CEC on October 11, 2006, and approved by the California Office of Administrative Law on December 14, 2006. The regulations include standards for both federally regulated appliances and non–federally regulated appliances. Though these regulations are now often viewed as “business as usual,” they exceed the standards imposed by all other states, and they reduce GHG emissions by reducing energy demand.

Solid Waste Diversion Regulations

AB 939: Integrated Waste Management Act of 1989

California’s Integrated Waste Management Act of 1989 (AB 939, Public Resources Code §§ 40050 et seq.) set a requirement for cities and counties throughout the state to divert 50 percent of all solid waste from landfills by January 1, 2000, through source reduction, recycling, and composting. In 2008, the requirements were modified to reflect a per capita requirement

¹ California Energy Commission, 2021, Amendments to the Building Energy Efficiency Standards (2022 Energy Code) Draft Environmental Report. CEC-400-2021-077-D.

² The green building standards became mandatory in the 2010 edition of the code.

rather than tonnage. To help achieve this, the act requires that each city and county prepare and submit a source reduction and recycling element. AB 939 also established the goal for all California counties to provide at least 15 years of ongoing landfill capacity.

AB 341

AB 341 (Chapter 476, Statutes of 2011) increased the statewide goal for waste diversion to 75 percent by 2020 and requires recycling of waste from commercial and multifamily residential land uses. Section 5.408 of CALGreen also requires that at least 65 percent of the nonhazardous construction and demolition waste from nonresidential construction operations be recycled and/or salvaged for reuse.

AB 1327

The California Solid Waste Reuse and Recycling Access Act (AB 1327, Public Resources Code §§ 42900 et seq.) requires areas to be set aside for collecting and loading recyclable materials in development projects. The act required the California Integrated Waste Management Board to develop a model ordinance for adoption by any local agency requiring adequate areas for collection and loading of recyclable materials as part of development projects. Local agencies are required to adopt the model or an ordinance of their own.

AB 1826

In October of 2014, Governor Brown signed AB 1826 requiring businesses to recycle their organic waste on and after April 1, 2016, depending on the amount of waste they generate per week. This law also requires that on and after January 1, 2016, local jurisdictions across the state implement an organic waste recycling program to divert organic waste generated by businesses and multifamily residential dwellings with five or more units. Organic waste means food waste, green waste, landscape and pruning waste, nonhazardous wood waste, and food-soiled paper waste that is mixed with food waste.

Water Efficiency Regulations

SBX7-7

The 20x2020 Water Conservation Plan was issued by the Department of Water Resources (DWR) in 2010 pursuant to Senate Bill 7, which was adopted during the 7th Extraordinary Session of 2009–2010 and therefore dubbed “SBX7-7.” SBX7-7 mandated urban water conservation and authorized the DWR to prepare a plan implementing urban water conservation requirements (20x2020 Water Conservation Plan). In addition, it required agricultural water providers to prepare agricultural water management plans, measure water deliveries to customers, and implement other efficiency measures. SBX7-7 required urban water providers to adopt a water conservation target of 20 percent reduction in urban per capita water use by 2020 compared to 2005 baseline use.

AB 1881: Water Conservation in Landscaping Act

The Water Conservation in Landscaping Act of 2006 (AB 1881) requires local agencies to adopt the updated DWR model ordinance or an equivalent. AB 1881 also requires the CEC to consult with the DWR to adopt, by regulation, performance standards and labeling requirements for landscape irrigation equipment, including irrigation controllers, moisture sensors, emission devices, and valves to reduce the wasteful, uneconomic, inefficient, or unnecessary consumption of energy or water.

Short-Lived Climate Pollutant Reduction Strategy

Senate Bill 1383

On September 19, 2016, the Governor signed SB 1383 to supplement the GHG reduction strategies in the Scoping Plan to consider short-lived climate pollutants, including black carbon and CH₄. Black carbon is the light-absorbing component of fine particulate matter produced during the incomplete combustion of fuels. SB 1383 required the state board, no later than January 1, 2018, to approve and begin implementing a comprehensive strategy to reduce emissions of short-lived climate pollutants to achieve a reduction in methane by 40 percent, hydrofluorocarbon gases by 40 percent, and anthropogenic black carbon by 50 percent below 2013 levels by 2030. The bill also established targets for reducing organic waste in landfills. On March 14, 2017, CARB adopted the Short-Lived Climate Pollutant Reduction Strategy, which identifies the state's approach to reducing anthropogenic and biogenic sources of short-lived climate pollutants. Anthropogenic sources of black carbon include on- and off-road transportation, residential wood burning, fuel combustion (charbroiling), and industrial processes. According to CARB, ambient levels of black carbon in California are 90 percent lower than in the early 1960s, despite the tripling of diesel fuel use (CARB 2017). In-use on-road rules were expected to reduce black carbon emissions from on-road sources by 80 percent between 2000 and 2020. Bay Area Air District is one of the air districts that requires air pollution control technologies for chain-driven broilers, which reduces particulate emissions from these charbroilers by over 80 percent (CARB 2017). Additionally, Bay Area Air District Regulation 6, Rule 3 limits installation of new wood-burning devices, including fireplaces, USEPA-certified wood stoves, or pellet-fueled devices in new construction.

1.2 REFERENCES

California Air Resources Board (CARB). 2017, March 14. Final Proposed Short-Lived Climate Pollutant Reduction Strategy. https://ww2.arb.ca.gov/sites/default/files/2018-12/final_slcp_report%20Final%202017.pdf.

CARB. Heavy-Duty Omnibus Regulation Fact Sheet. <https://ww2.arb.ca.gov/our-work/programs/heavy-duty-low-nox/heavy-duty-omnibus-regulation-fact-sheet>.

Land Use Statistics: Livermore General Plan

	Existing Conditions (2023)	Proposed General Plan (2045)	Change from Existing	Growth Factor
EIR Study Area				
Housing Units	33,030	49,640	16,610	1.50
Population	87,930	131,750	43,820	1.50
Employment	57,220	63,330	6,110	1.11
Service Population (SP)	145,150	195,080	49,930	1.34
Non-Residential SF	32,636,470	38,309,100	5,672,630	1.17

Notes:

1. United States Census Bureau 2023; Esri 2024; numbers are rounded from original source.
2. Service Population = Population and Employment.

AQMP Consistency Analysis: Livermore General Plan

Comparison of the Change in Population and VMT (O-D Method)

Category	Existing Conditions (2023)	Proposed General Plan (2045)	Change from Existing Conditions	
			Change	Percent
EIR Study Area				
Population	87,930	131,750	43,820	50%
Employment	57,220	63,330	6,110	11%
Service Population (SP)	145,150	195,080	49,930	34%
VMT per Day	2,235,816	2,872,190	636,374	28%
VMT/SP	15.40	14.72	-0.68	-4%

Note: Origin-Destination (O-D) Methodology is not the same methodology for SB 743, which considers only commute-trip VMT. Modeling of vehicle miles traveled (VMT) provided by Kittelson is based on Alameda Countywide Transportation Model. VMT from passenger vehicles and trucks that have an origin or destination in the City 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).

Criteria Air Pollutant Emissions Inventory and Forecast: EIR Study Area

Existing Conditions (2023)

Phase	Criteria Air Pollutant Emissions (lbs/day)				Criteria Air Pollutant Emissions (tons/year)			
	VOC	NO _x	PM ₁₀	PM _{2.5}	VOC	NO _x	PM ₁₀	PM _{2.5}
Transportation ¹	117	1,714	23	46	20	297	4	8
Energy ²	29	498	40	40	5	91	7	7
Offroad Equipment ³	405	297	10	7	74	54	2	1
Consumer Product ⁴	1,363				249			
Total	1,913	2,509	73	93	348	442	13	16

Existing in Year 2045

Phase	Criteria Air Pollutant Emissions (lbs/day)				Criteria Air Pollutant Emissions (tons/year)			
	VOC	NO _x	PM ₁₀	PM _{2.5}	VOC	NO _x	PM ₁₀	PM _{2.5}
Transportation ¹	37	1,114	216	76	6	193	38	13
Energy ²	29	498	40	40	5	91	7	7
Offroad Equipment ³	405	297	10	7	74	54	2	1
Consumer Products ⁴	1,363				249			
Total	1,834	1,908	266	123	334	338	47	22

Proposed General Plan (2045)

Phase	Criteria Air Pollutant Emissions (lbs/day)				Criteria Air Pollutant Emissions (tons/year)			
	VOC	NO _x	PM ₁₀	PM _{2.5}	VOC	NO _x	PM ₁₀	PM _{2.5}
Transportation ¹	54	1,242	255	89	9	216	44	16
Energy ²	40	695	55	55	7	127	10	10
Offroad Equipment ³	150	275	7	4	27	50	1	1
Consumer Products ⁴	2,233				408			
Total	2,477	2,212	317	149	452	393	56	26

NET CHANGE from 2045 No Project Conditions (Scenario 2)

Phase	Net Change Criteria Air Pollutant Emissions (lbs/day)				Net Change Criteria Air Pollutant Emissions (tons/year)			
	VOC	NO _x	PM ₁₀	PM _{2.5}	VOC	NO _x	PM ₁₀	PM _{2.5}
Transportation ¹	17	129	39	13	3	22	7	2
Energy ²	11	197	16	16	2	36	3	3
Offroad Equipment ³	-255	-22	-4	-4	-47	-4	-1	-1
Consumer Products ⁴	870				159			
Total	643	304	51	25	117	54	9	5
Air District Threshold	0	0	0	0	0	0	0	0
Exceeds Threshold	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

NET CHANGE from Existing Conditions (Scenario 1)

Phase	Net Change Criteria Air Pollutant Emissions (lbs/day)				Net Change Criteria Air Pollutant Emissions (tons/day)			
	VOC	NO _x	PM ₁₀	PM _{2.5}	VOC	NO _x	PM ₁₀	PM _{2.5}
Transportation ¹	-63	-472	232	44	-11	-82	40	8
Energy ²	11	197	16	16	2	36	3	3
Offroad Equipment ³	-255	-22	-4	-4	-47	-4	-1	-1
Consumer Products ⁴	870				159			
Total	564	-296	245	56	103	-50	43	10
Air District Threshold	0	0	0	0	0	0	0	0
Exceeds Threshold	Yes	No	Yes	Yes	Yes	No	Yes	Yes

Notes:

¹ Source: Kittelson, 2025; EMFAC2021 Version 1.0.2 Emissions Database with Adjusted Factors (Alameda (SF) Sub-Area)

² Sources: PG&E and Ava Energy 2025 and 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 EIR Study Area.

³ Source: Off-Road Web Query (v.1.1.0) Emissions Inventory

⁴ Source: CalEEMod User's Guide

Community GHG Emissions Inventory and Forecast: Livermore General Plan

Category	Existing Conditions (2023)		Proposed General Plan (2045)		Net Change from Existing Conditions	
	EIR Study Area	%	EIR Study Area	%	TOTAL	%
Building Electricity	75,550	11%	3,599	1%	-71,951	-95%
Building Natural Gas	102,851	15%	143,928	21%	41,077	40%
On-Road Transportation	446,668	64%	437,675	63%	-8,993	-2%
Off-Road Vehicles and Equipment	11,045	2%	11,210	2%	165	1%
Solid Waste/Landfills	24,659	4%	33,141	5%	8,482	34%
Refrigerants	39,631	6%	59,381	9%	19,750	50%
Water Use	1,685	0%	88	0%	-1,598	-95%
Wastewater Treatment	1,078	0%	815	0%	-264	-24%
Total Community Emissions	703,167	100%	689,836	100%	-13,331	-2%
Service Population (SP)	145,150	NA	195,080	NA	49,930	34%
MTCO ₂ e/SP	4.8	NA	3.5	NA	-1.3	-27%
2022 CAP 2045 Per Capita Goal	0 MTCO ₂ e/SP					
Per Capita Goal Achieved?	Does Not Achieve Per Capita Goal					

Notes: Emissions may not total to 100 percent due to rounding. Based on GWPs in the IPCC Fifth Assessment Report (AR5).

The emissions inventory and forecast is based on activity data for the City of Livermore. 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 AB 32 and SB 32 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 they 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.

Excludes GHG emissions natural gas use from Permitted Sources within the EIR Study Area.

Energy Data Requests

Weighted Average

PG&E		Total Usage (KWH) by Rate Category					
Rate of Category	2019	2020	2021	2022	2023	Average (2019-2023)	PG&E Proportion
Non-Residential (Commercial) ¹	3,519,039	3,123,679	2,800,873	1,568,532	1,552,819	2,512,988.40	0.01
Residential	24,907,966	23,792,343	21,411,411	20,234,587	18,665,754	21,802,412.20	0.12
Total PG&E Proportion							0.13

Source: Pacific Gas & Electric Company (PG&E). 2024, August 15. Community Wide GHG Inventory Report for Livermore (2005 to 2023).

Notes:

¹ Non-Residential category includes commercial land uses. May include permitted sources if there are major industries within the EIR Study Area. Data based on service territory.

² Lawrence Livermore National Laboratory and Sandia National Laboratory Usage is excluded.

Ava Energy		Total Usage (KWH) by Rate Category					
Rate of Category	2019	2020	2021	2022	2023	Average (2019-2023)	Ava Energy Proportion
Non-Residential (Commercial & Industrial)	225,450,619	215,489,329	219,031,025	211,168,199	205,335,235	215,294,881.40	0.99
Residential	165,860,320	186,968,047	168,031,666	161,824,675	150,838,891	166,704,719.86	0.88
Total Ava Energy Proportion							1.87

Source: Ava Energy. 2025, April 3. Annual Electricity Usage Report.

Notes:

¹ Lawrence Livermore National Laboratory and Sandia National Laboratory Usage is excluded.

PG&E Total Annual Usage (Therms) ¹						Average (2019-2023)
Category	2019	2020	2021	2022	2023	
Commercial	5,755,260	5,152,447	5,386,816	6,181,777	6,096,414	5,704,364
Residential	13,244,793	13,209,651	12,927,848	13,167,148	13,690,070	13,248,679
Total Therms	19,000,053	18,362,098	18,314,664	19,348,925	19,786,484	18,953,043

Source: Pacific Gas & Electric Company (PG&E). 2024, August 15. Community Wide GHG Inventory Report for Livermore (2005 to 2023).

Notes:

¹ May exclude natural gas use from Industrial (Permitted) Sources within the EIR Study Area. Data based on service territory.

GHG Emissions from Energy

Natural Gas Emission Factors

All Years	lbs/MMBTU	lbs/MMBTU	lbs/MMBTU	lbs/MMBTU
	CO ₂	CH ₄	N ₂ O	CO ₂ e
	117	0.0104	0.0002	117.3
All Years	MT/Therm	MT/Therm	MT/Therm	MT/Therm
	CO ₂	CH ₄	N ₂ O	CO ₂ e
	0.00531	4.72E-07	9.07E-09	0.005

Source: California Air Pollution Control Officer's Association (CAPCOA). 2022, April. California Emissions Estimator Model (CalEEMod) User's Guide Version 2022.1. <https://www.caleemod.com/user-guide>. Table G-4, Natural Gas Emissions Factors (pounds per MMBTU).

PG&E

Year	Intensity factor			CO ₂ e
	CO ₂ lbs/MWH ¹	CH ₄ lbs/MWH ²	N ₂ O lbs/MWH ²	lbs/MWh
2023	203.983	0.033	0.004	206.0
2045	203.983	0.033	0.004	206.0
	CO ₂ MTons/MWH ¹	CH ₄ MTons/MWH ²	N ₂ O MTons/MWH ²	MTons/MWh
2023	0.093	1.50E-05	1.81E-06	0.093
2045	0.093	1.50E-05	1.81E-06	0.093

Source: California Air Pollution Control Officer's Association (CAPCOA). 2022, April. California Emissions Estimator Model (CalEEMod) User's Guide Version 2022.1. <https://www.caleemod.com/user-guide>. Table G-3, Electric Utility Greenhouse Gas Emissions Factors.

Notes:

In 2018, SB 100 (de León, 2018) was signed into law, which again increases the RPS to 60% by 2030 and encourages the state's electricity to come from carbon-free resources by 2050.

Ava Energy				Carbon Intensity
Year	Intensity factor			CO ₂ e
	CO ₂ lbs/MWH ¹	CH ₄ lbs/MWH ²	N ₂ O lbs/MWH ²	lbs/MWh
2023	<i>Only CO₂e provided</i>	<i>Only CO₂e provided</i>	<i>Only CO₂e provided</i>	370.0
2045	<i>Only CO₂e provided</i>	<i>Only CO₂e provided</i>	<i>Only CO₂e provided</i>	0.000
	CO ₂ MTons/MWH ¹	CH ₄ MTons/MWH ²	N ₂ O MTons/MWH ²	MTons/MWh
2023	<i>Only CO₂e provided</i>	<i>Only CO₂e provided</i>	<i>Only CO₂e provided</i>	0.168
2045	<i>Only CO₂e provided</i>	<i>Only CO₂e provided</i>	<i>Only CO₂e provided</i>	0.000

Source: Ava Community Energy, 2023, 2023 Power Content Label, <https://www.energy.ca.gov/filebrowser/download/7230>.
East Bay Community Energy Staff Report Item 12, 2023, <https://avaenergy.org/wp-content/uploads/2023/09/12.-Item-12-Emissions-Overview-Informational-Itemv1.pdf>

Notes:

For the 2045 scenario, Ava Energy's carbon intensity factor was assumed to be zero, reflecting an assumption that Ava Energy achieves and maintains its stated goal of 100 percent carbon-free energy supply by 2030.

Weighted Average				
Year	Intensity factor			CO ₂ e
	CO ₂ lbs/MWH	CH ₄ lbs/MWH	N ₂ O lbs/MWH	lbs/MWh
2023	NA	NA	NA	359.568
2045	NA	NA	NA	13.099
	CO ₂ MTons/MWH	CH ₄ MTons/MWH	N ₂ O MTons/MWH	MTons/MWh
2023	NA	NA	NA	0.163
2045	NA	NA	NA	0.006

Notes:

Weighted average calculated based on proportion of annual electricity usage data for PG&E vs Ava Energy.

Forecast Methodology	Existing Conditions (2023)	Proposed General Plan (2045)
Residential - Dwelling Units		
EIR Study Area	33,030	49,640
Nonresidential - SF		
EIR Study Area	32,636,470	38,309,100

Existing Energy Use EIR Study Area	PG&E and Ava Energy	PG&E
	MWH/YR 2023	Therms 2023
Residential	188,507	13,248,679
Non-Residential	274,709	6,078,121
Total	463,216	19,326,800

Notes:

Non-Residential includes estimated energy use calculated for Lawrence Livermore National Laboratory and Sandia National Laboratory.

Per Capita	
MWH per Housing Unit per year 5.71	Therms per Housing Unit per year 401
MWH per SF per year 0.01	Therms per SF per year 0.2

Notes:

Per capita based on existing dwelling units for residential energy usage and existing nonresidential square footage for nonresidential energy.

Electricity EIR Study Area	Existing Conditions (2023)	Proposed General Plan (2045)
	MWH	
Residential	188,507	283,303
Nonresidential	274,709	322,457
Total	463,216	605,760

Electricity EIR Study Area	MTCO _{2e}	
	Residential	30,745
Nonresidential	44,805	1,916
Total Electricity	75,550	3,599

Electricity EIR Study Area	kWh	
	Residential	188,507,132
Nonresidential	274,709,282	322,457,219
Total	463,216,414	605,760,096

Notes

Forecasted emissions are based on the weighted carbon intensity.

Natural Gas EIR Study Area	Existing Conditions (2023)	Proposed General Plan (2045)
	Therms	
Residential	13,248,679	19,911,124
Nonresidential	6,078,121	7,134,575
Total	19,326,800	27,045,699

Natural Gas EIR Study Area	MTCO _{2e}	
	Residential	70,505
Nonresidential	32,346	37,968
Total Natural Gas	102,851	143,928

Criteria Air Pollutants from Natural Gas

Rate	lbs/MBTU					
	ROG	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}
Natural Gas						
Residential	0.0054	0.0922	0.0392	0.0006	0.0075	0.0075
Non-Residential	0.0054	0.0980	0.0824	0.0006	0.0075	0.0075

Source: California Air Pollution Control Officer's Association (CAPCOA). 2022, April. California Emissions Estimator Model (CalEEMod) User's Guide Version 2022.1. <https://www.caleemod.com/user-guide>. Table G-4, Natural Gas Emissions Factors (pounds per MMBTU).

EIR Study Area	Existing Conditions (2023)	Proposed General Plan (2045)
	Therms	
Residential	13,248,679	19,911,124
Nonresidential	6,078,121	7,134,575
Total	19,326,800	27,045,699

EIR Study Area

Natural Gas	Existing Conditions (2023)					
	lbs/day					
	ROG	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}
Residential	20	335	142	2	27	27
Nonresidential	9	163	137	1	12	12
TOTAL	29	498	280	3	40	40

Natural Gas	Proposed General Plan (2045)					
	bs/day					
	ROG	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}
Residential	29	503	214	3	41	41
Nonresidential	11	192	161	1	15	15
TOTAL	40	695	375	4	55	55

Energy from National Laboratories

Land Use Subtype	EDFZ	Electricity (kWh per unit per year)			Natural Gas (kBtu per unit per year)		
		Total	Title 24	Non-Title 24	Total	Title 24	Non-Title 24
Research and Development	1	21,169	13,750	7,419	23,750	18,692	5,058

Source: California Air Pollution Control Officer's Association (CAPCOA). 2022, April. California Emissions Estimator Model (CalEEMod) User's Guide Version 2022.1. <https://www.caleemod.com/user-guide>. Table G-28, Annual Energy Use by Land Use Subtype and EDFZ.

Lawrence Livermore National Laboratory (LLNL)

Square Footage: 6,700,000

Unit: 6700

	kWh	MWH
Electricity Use (kWh) ¹	49,704,115	49,704
	kBtu	Therms
Natural Gas Use (kBtu) ¹	33,888,809	326,482

Source: Lawrence Livermore National Laboratory (LLNL), Lab at a Glance, <https://www.llnl.gov/sites/www/files/2024-11/llnl-at-a-glance.pdf>.

Sandia National Laboratory

Square Footage: 970,179

Unit: 970

	kWh	MWH
Electricity Use (kWh) ¹	7,197,297	7,197
	kBtu	Therms
Natural Gas Use (kBtu) ¹	4,907,196	47,275

Source: Sandia National Laboratories, Facts & Figures. <https://www.sandia.gov/about/facts-figures/>.

Area Sources - Consumer Products

Residential Consumer Product Use

$$\text{Emissions} = \text{EF} \times \text{Building Area}$$

$$\text{EF} = 2.14\text{E-}05 \text{ lbs/sqft/day}$$

Source: California Air Pollution Control Officer's Association (CAPCOA). 2022, April. California Emissions Estimator Model (CalEEMod) User's Guide Version 2022.1. <https://www.caleemod.com/user-guide>. Appendix D3 - Consumer Products Use.

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	0.60%	2,448	15
2010 to 2019	7.70%	2,524	194
2000 to 2009	11.30%	2,404	272
1990 to 1999	15.90%	2,116	337
1980 to 1989	11.40%	1,819	207
1979 or earlier	53.20%	1,699	904
Total	100%		1,929

Source:

a. United States Census Bureau, Selected Housing Characteristics, City of Livermore, 2023. Table DP04. American Community Survey 5-Year Estimates, Year structure built.

<https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2023/>

b. United States Department of Commerce, 2016 Characteristics of New Housing.

Completed, Median and Average Square Feet by Location. <https://www.census.gov/construction/chars/pdf/c25ann2016.pdf>.

	Existing Conditions (2023)	Proposed General Plan (2045)
EIR Study Area		
Housing Units	33,030	49,640
Residential SQFT	63,700,968	104,353,943
lbs VOC per day	1,363	2,233
tons VOC per day	249	408

Area Sources

Source: Off-Road Web Query (v.1.1.0 and v. 1.1.2) Emissions Inventory.

OFFROAD Estimate based on:

Agricultural Equipment	Based on the percentage of agricultural acreage within the City and SOI compared to the County of Alameda (2023 Alameda County Crop Report).
Construction Equipment	Based on the percentage of housing permits in Livermore and SOI compared to the Alameda County (HUD, year 2023).
Light Commercial and Industrial Equipment	Based on the percentage of employment in Livermore and SOI compared to Alameda County (US Census, year 2023).
Lawn & Garden	Based on the percentage of housing units in Livermore and SOI compared to Alameda County (US Census, year 2023).

Sources:

Farmland Acreage

2023 Alameda County Crop. <https://www.acgov.org/cda/awm/documents/2023cropreport.pdf>.
Farmland of Local Importance classified in the EIR Study Area

EIR Study Area	
Existing Farmland acreage:	1,474
Proposed GP Farmland acreage:	833
Net Difference	-43%

Construction (Housing Permits)

Source: Housing and Urban Development (HUD). SOCDS Building Permits Database for years 2019-2023.

Housing Units

Source: American Community Survey, Data Profiles (US Census, year 2023).

Employment

Source: LED Extraction Tool, (US Census, year 2023).

Existing Conditions (2023)	ROG Exhaust	NO _x Exhaust	CO Exhaust	SO ₂ Exhaust	PM ₁₀ Exhaust	PM _{2.5} Exhaust	CO ₂
EIR Study Area	lbs/day						MT/yr
Agricultural	0.65	2	10	0	0	0	59
Construction Equipment	7	25	140	0	2	2	688
Lawn & Garden	231	29	2,701	0	3	2	1,417
Light Commercial / Industrial Equipment	167	241	8,126	0	5	3	8,882
EIR Study Area	405	297	10,977	1	10	7	11,045

Proposed General Plan (2045)	ROG Exhaust	NO _x Exhaust	CO Exhaust	SO ₂ Exhaust	PM ₁₀ Exhaust	PM _{2.5} Exhaust	CO ₂
EIR Study Area	Forecast Adjusted for: lbs/day						MT/yr
Agricultural	Based on reduction in in the EIR Study Area	0.14	0	2	0	0	27
Construction Equipment	Similar to historic	6	13	156	0	2	703
Lawn & Garden	Proportional to housing growth	65	7	165	0	1	218
Light Commercial / Industrial Equipment	Proportional to employment growth	79	255	6,276	0	4	10,263
EIR Study Area		150	275	6,600	0	7	11,210

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.0) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>.

Model Output: Off-Road Web Query (v1.1.0) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2023

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query 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	CO2_tpd	CO2e_MTY
Alameda	2023	Agricultural - Agricultural Tractors	Aggregate	Aggregate	Gasoline	28.62772641	6.57E-06	5.26E-06	7.79E-05	7.89E-09	1.42E-07	1.3E-07	0.000883	2.92E-01
Alameda	2023	Agricultural - Agricultural Tractors	Aggregate	Aggregate	Diesel	433667.7005	0.015893	0.090062	0.078663	0.000122	0.005626	0.005176	13.33264	4.41E+03
Alameda	2023	Agricultural - ATVs	Aggregate	Aggregate	Gasoline	14554.13663	0.003254	0.001723	0.038104	4.01E-06	0.000118	0.000109	0.449077	1.49E+02
Alameda	2023	Agricultural - ATVs	Aggregate	Aggregate	Diesel	7831.194947	0.000225	0.001472	0.001608	2.2E-06	5.83E-05	5.37E-05	0.240762	7.97E+01
Alameda	2023	Agricultural - ATVs	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Agricultural - Bale Wagons (Self Propelled)	Aggregate	Aggregate	Diesel	1347.308303	3.55E-05	0.000308	0.000239	3.78E-07	1.49E-05	1.37E-05	0.041422	1.37E+01
Alameda	2023	Agricultural - Balers (Self Propelled)	Aggregate	Aggregate	Diesel	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Agricultural - Combine Harvesters	Aggregate	Aggregate	Diesel	22678.17453	0.000432	0.00375	0.00267	6.37E-06	0.000166	0.000152	0.697216	2.31E+02
Alameda	2023	Agricultural - Construction Equipment	Aggregate	Aggregate	Diesel	8239.666149	0.000199	0.001785	0.001428	2.31E-06	8.42E-05	7.75E-05	0.25332	8.39E+01
Alameda	2023	Agricultural - Cotton Pickers	Aggregate	Aggregate	Diesel	356.2024872	6.46E-06	5.86E-05	4.39E-05	1E-07	2.43E-06	2.23E-06	0.010951	3.63E+00
Alameda	2023	Agricultural - Forage & Silage Harvesters	Aggregate	Aggregate	Diesel	740.5553002	1.71E-05	0.000169	0.000116	2.08E-07	7.02E-06	6.46E-06	0.022768	7.54E+00
Alameda	2023	Agricultural - Forklifts	Aggregate	Aggregate	Diesel	6539.181632	0.000238	0.001515	0.001324	1.83E-06	9.15E-05	8.42E-05	0.20104	6.66E+01
Alameda	2023	Agricultural - Hay Squeeze/Stack retriever	Aggregate	Aggregate	Diesel	489.5463081	1.03E-05	8.94E-05	5.55E-05	1.37E-07	4.05E-06	3.73E-06	0.015051	4.98E+00
Alameda	2023	Agricultural - Misc - 2-Wheel Tractors	Aggregate	Aggregate	Gasoline	922.8	0.000486	0.000317	0.014676	2.37E-07	0.000148	0.000111	5.4E-06	1.79E-03
Alameda	2023	Agricultural - Misc - Hydro Power Units	Aggregate	Aggregate	Gasoline	653.6	0.000337	0.00022	0.01041	1.66E-07	0.000115	8.68E-05	3.76E-06	1.25E-03
Alameda	2023	Agricultural - Misc - Hydro Power Units	Aggregate	Aggregate	Diesel	2.371	7.35E-06	4.64E-05	2.8E-05	6.91E-10	1.58E-06	1.19E-06	1.08E-06	3.58E-04
Alameda	2023	Agricultural - Misc - Mowers	Aggregate	Aggregate	Gasoline	804	0.000433	0.000284	0.01276	2.06E-07	0.000148	0.000112	4.57E-06	1.51E-03
Alameda	2023	Agricultural - Misc - Other	Aggregate	Aggregate	Gasoline	45.08	2.43E-05	1.48E-05	0.000715	1.16E-08	6.36E-06	4.8E-06	2.59E-07	8.56E-05
Alameda	2023	Agricultural - Misc - Other	Aggregate	Aggregate	Diesel	2.563	7.96E-06	5.03E-05	3.03E-05	7.47E-10	1.71E-06	1.29E-06	1.17E-06	3.88E-04
Alameda	2023	Agricultural - Misc - Sprayers	Aggregate	Aggregate	Gasoline	1491.8	0.000862	0.000454	0.02358	3.87E-07	0.000213	0.000161	8.2E-06	2.71E-03
Alameda	2023	Agricultural - Misc - Sprayers	Aggregate	Aggregate	Diesel	0.81	2.73E-06	1.68E-05	9.07E-06	2.36E-10	6.25E-07	4.72E-07	3.79E-07	1.25E-04
Alameda	2023	Agricultural - Misc - Tillers	Aggregate	Aggregate	Gasoline	18240	0.00654	0.00346	0.296615	4.74E-06	2.14E-05	1.62E-05	0.000106	3.50E-02
Alameda	2023	Agricultural - Misc - Tillers	Aggregate	Aggregate	Diesel	0.0335	7.83E-08	5.5E-07	4.61E-07	9.78E-12	1.94E-08	1.46E-08	1.33E-08	4.40E-06
Alameda	2023	Agricultural - Nut Harvester	Aggregate	Aggregate	Diesel	9912.070456	0.00038	0.002284	0.00194	2.78E-06	0.000142	0.000131	0.304736	1.01E+02
Alameda	2023	Agricultural - Other Harvesters	Aggregate	Aggregate	Diesel	8768.509657	0.000221	0.001725	0.001256	2.46E-06	9.45E-05	8.7E-05	0.269578	8.93E+01
Alameda	2023	Agricultural - Sprayers/Spray rigs	Aggregate	Aggregate	Diesel	20960.70864	0.000657	0.00491	0.003722	5.88E-06	0.000282	0.00026	0.644414	2.13E+02
Alameda	2023	Agricultural - Swathers/Windrowers/Hay Conditioners	Aggregate	Aggregate	Diesel	3127.828641	9.98E-05	0.00067	0.000618	8.77E-07	4.63E-05	4.26E-05	0.096162	3.18E+01
TOTAL AGRICULTURAL OFFROAD						561404.47	0.03	0.12	0.49	0.00	0.01	0.01	16.58	5.49E+03
ESTIMATED Livermore (g/yr; tpd; MTY)						5996.45	0.00	0.00	0.01	0.00	0.00	0.00	0.18	59
ESTIMATED Livermore (lbs/day)							1	2	10.482	0.0	0.2	0	354	

AGRICULTURAL ACREAGE: https://www.acgov.org/cda/awm/documents/2023cropreport.pdf .	Existing
Farmland Acreage in Alameda County	138,000
Farmland Acreage in Livermore	1,474
Percent in the EIR Study Area	1.07%

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.0) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>.

Model Output: Off-Road Web Query (v1.1.0) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2023

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

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	CO2_tpd	CO2e_MTY
Alameda	2023	Construction and Mining - Bore/Drill Rigs	Aggregate	Aggregate	Diesel	95194.75212	0.002204	0.016454	0.0113	2.78E-05	0.000883	0.000812	2.929504	9.70E+02
Alameda	2023	Construction and Mining - Bucket	Aggregate	Aggregate	Diesel	2282.731997	3.62E-05	0.000223	0.000253	6.65E-07	1.26E-05	1.16E-05	0.070248	2.33E+01
Alameda	2023	Construction and Mining - Compactor	Aggregate	Aggregate	Diesel	3701.697477	4.68E-05	0.00033	0.00047	1.08E-06	1.37E-05	1.26E-05	0.113915	3.77E+01
Alameda	2023	Construction and Mining - Concrete Mixer	Aggregate	Aggregate	Diesel	341.6855487	4.16E-06	3.43E-05	4.02E-05	9.96E-08	1.14E-06	1.05E-06	0.010515	3.48E+00
Alameda	2023	Construction and Mining - Concrete Pump	Aggregate	Aggregate	Diesel	3421.505547	5.69E-05	0.000438	0.000423	9.97E-07	1.77E-05	1.63E-05	0.105293	3.49E+01
Alameda	2023	Construction and Mining - Crane less than 35ton	Aggregate	Aggregate	Diesel	1668.505753	3.41E-05	0.000306	0.000288	4.86E-07	1.67E-05	1.54E-05	0.051346	1.70E+01
Alameda	2023	Construction and Mining - Cranes	Aggregate	Aggregate	Diesel	81968.16439	0.001617	0.01385	0.009341	2.39E-05	0.000774	0.000712	2.522472	8.35E+02
Alameda	2023	Construction and Mining - Crawler Tractors	Aggregate	Aggregate	Diesel	245151.3999	0.005528	0.042394	0.031508	7.15E-05	0.002457	0.00226	7.54424	2.50E+03
Alameda	2023	Construction and Mining - Crushing/Processing Equipment	Aggregate	Aggregate	Diesel	13476.80101	0.000119	0.000708	0.001189	3.93E-06	3.03E-05	2.79E-05	0.414732	1.37E+02
Alameda	2023	Construction and Mining - Excavators	Aggregate	Aggregate	Diesel	785258.4599	0.01338	0.094134	0.095295	0.000229	0.004467	0.00411	24.16539	8.00E+03
Alameda	2023	Construction and Mining - Graders	Aggregate	Aggregate	Diesel	111357.9771	0.002477	0.019396	0.011278	3.25E-05	0.001129	0.001039	3.426908	1.13E+03
Alameda	2023	Construction and Mining - Hopper Tractor Trailer	Aggregate	Aggregate	Diesel	227.7345065	1.86E-06	6.67E-06	1.38E-05	6.64E-08	3.64E-07	3.35E-07	0.007008	2.32E+00
Alameda	2023	Construction and Mining - Misc - Asphalt Pavers	Aggregate	Aggregate	Gasoline	8274.3	0.001439	0.001148	0.054723	2.07E-06	0.000494	0.000374	0.128212	4.25E+01
Alameda	2023	Construction and Mining - Misc - Bore/Drill Rigs	Aggregate	Aggregate	Gasoline	5216.25	0.000391	0.00048	0.015068	1.3E-06	0.000139	0.000106	0.113426	3.76E+01
Alameda	2023	Construction and Mining - Misc - Bore/Drill Rigs	Aggregate	Aggregate	Diesel	32.07	0.000104	0.000653	0.00038	9.36E-09	2.21E-05	1.67E-05	1.52E-06	5.03E-04
Alameda	2023	Construction and Mining - Misc - Cement And Mortar Mixers	Aggregate	Aggregate	Gasoline	34942	0.018775	0.011124	0.554424	9.05E-06	0.004849	0.003658	2.01E-05	6.67E-03
Alameda	2023	Construction and Mining - Misc - Cement And Mortar Mixers	Aggregate	Aggregate	Diesel	47.24	0.000127	0.000798	0.000619	1.38E-08	2.81E-05	2.12E-05	1.91E-06	6.31E-04
Alameda	2023	Construction and Mining - Misc - Concrete/Industrial Saws	Aggregate	Aggregate	Gasoline	42252.75	0.014906	0.010323	0.492264	1.09E-05	0.005487	0.004152	0.302745	1.00E+02
Alameda	2023	Construction and Mining - Misc - Concrete/Industrial Saws	Aggregate	Aggregate	Diesel	1844.87	6.62E-05	0.000482	0.000484	7.14E-07	1.68E-05	1.49E-05	0.056557	1.87E+01
Alameda	2023	Construction and Mining - Misc - Cranes	Aggregate	Aggregate	Gasoline	4263.2	0.000127	0.000309	0.007028	1.02E-06	7.02E-06	5.31E-06	0.10083	3.34E+01
Alameda	2023	Construction and Mining - Misc - Crushing/Proc. Equipment	Aggregate	Aggregate	Gasoline	218	0.000101	0.000067	0.003498	5.54E-08	4.09E-05	3.08E-05	1.26E-07	4.17E-05
Alameda	2023	Construction and Mining - Misc - Dumpers/Tenders	Aggregate	Aggregate	Gasoline	3565.15	0.001967	0.00126	0.052357	9.18E-07	0.000537	0.000406	0.006556	2.17E+00
Alameda	2023	Construction and Mining - Misc - Dumpers/Tenders	Aggregate	Aggregate	Diesel	3.8	1.28E-05	8.09E-05	4.37E-05	1.11E-09	2.72E-06	2.06E-06	1.87E-07	6.19E-05
Alameda	2023	Construction and Mining - Misc - Excavators	Aggregate	Aggregate	Diesel	27.2	9.15E-05	0.000578	0.000312	7.94E-09	1.95E-05	1.47E-05	1.34E-06	4.44E-04
Alameda	2023	Construction and Mining - Misc - Other	Aggregate	Aggregate	Gasoline	6471.45	6.04E-05	0.000211	0.005667	1.61E-06	1.16E-05	8.77E-06	0.161862	5.36E+01
Alameda	2023	Construction and Mining - Misc - Other	Aggregate	Aggregate	Diesel	101	0.00027	0.001691	0.001333	2.94E-08	5.91E-05	4.47E-05	4.06E-06	1.34E-03
Alameda	2023	Construction and Mining - Misc - Pavers	Aggregate	Aggregate	Diesel	7.17	2.41E-05	0.000152	8.24E-05	2.09E-09	5.15E-06	3.89E-06	3.52E-07	1.17E-04
Alameda	2023	Construction and Mining - Misc - Paving Equipment	Aggregate	Aggregate	Gasoline	64165.45	0.031861	0.02091	0.950576	1.65E-05	0.009518	0.007191	0.11556	3.83E+01
Alameda	2023	Construction and Mining - Misc - Paving Equipment	Aggregate	Aggregate	Diesel	12.2	4.09E-05	0.000259	0.00014	3.55E-09	8.69E-06	6.57E-06	5.97E-07	1.98E-04
Alameda	2023	Construction and Mining - Misc - Plate Compactors	Aggregate	Aggregate	Gasoline	23598	0.013189	0.008119	0.373674	6.08E-06	0.003224	0.002434	1.37E-05	4.55E-03
Alameda	2023	Construction and Mining - Misc - Plate Compactors	Aggregate	Aggregate	Diesel	34	0.000087	0.000545	0.000456	9.91E-09	1.92E-05	1.45E-05	1.31E-06	4.34E-04
Alameda	2023	Construction and Mining - Misc - Rollers	Aggregate	Aggregate	Gasoline	28595.3	0.006812	0.005311	0.236921	6.94E-06	0.002295	0.001734	0.363956	1.21E+02
Alameda	2023	Construction and Mining - Misc - Rollers	Aggregate	Aggregate	Diesel	208.1	0.000601	0.00378	0.002628	6.07E-08	0.00013	9.85E-05	8.95E-06	2.96E-03
Alameda	2023	Construction and Mining - Misc - Rough Terrain Forklifts	Aggregate	Aggregate	Gasoline	29966.5	0.0008	0.002211	0.037802	7.13E-06	5.09E-05	3.85E-05	0.729819	2.42E+02
Alameda	2023	Construction and Mining - Misc - Rubber Tired Loaders	Aggregate	Aggregate	Gasoline	15903.05	0.000456	0.001133	0.024509	3.74E-06	2.65E-05	2E-05	0.379773	1.26E+02
Alameda	2023	Construction and Mining - Misc - Rubber Tired Loaders	Aggregate	Aggregate	Diesel	4.78	1.61E-05	0.000102	5.49E-05	1.39E-09	3.42E-06	2.58E-06	2.35E-07	7.78E-05
Alameda	2023	Construction and Mining - Misc - Signal Boards	Aggregate	Aggregate	Gasoline	669.8	0.00032	0.000223	0.010718	1.71E-07	0.000124	9.37E-05	3.98E-07	1.32E-04
Alameda	2023	Construction and Mining - Misc - Signal Boards	Aggregate	Aggregate	Diesel	1337.65	0.001381	0.008671	0.007313	4.7E-07	0.000305	0.000231	0.02482	8.22E+00
Alameda	2023	Construction and Mining - Misc - Skid Steer Loaders	Aggregate	Aggregate	Gasoline	60750.55	0.010148	0.007417	0.340017	1.56E-05	0.00327	0.002483	1.042362	3.45E+02
Alameda	2023	Construction and Mining - Misc - Skid Steer Loaders	Aggregate	Aggregate	Diesel	1410	0.00475	0.03	0.0162	4.11E-07	0.00103	0.000779	6.91E-05	2.29E-02
Alameda	2023	Construction and Mining - Misc - Surfacing Equipment	Aggregate	Aggregate	Gasoline	28760	0.017306	0.011884	0.451625	7.35E-06	0.005013	0.003791	1.67E-05	5.53E-03
Alameda	2023	Construction and Mining - Misc - Tampers/Rammers	Aggregate	Aggregate	Gasoline	3692	0.001548	0.001173	0.05936	9.6E-07	0.000841	0.000636	2.6E-06	8.62E-04
Alameda	2023	Construction and Mining - Misc - Tractors/Loaders/Backhoes	Aggregate	Aggregate	Gasoline	10201.75	0.000195	0.000531	0.01501	2.37E-06	1.71E-05	1.29E-05	0.245316	8.12E+01
Alameda	2023	Construction and Mining - Misc - Tractors/Loaders/Backhoes	Aggregate	Aggregate	Diesel	130	0.000437	0.00276	0.00149	3.79E-08	9.28E-05	7.02E-05	6.38E-06	2.11E-03
Alameda	2023	Construction and Mining - Misc - Trenchers	Aggregate	Aggregate	Gasoline	52130	0.011993	0.009228	0.430045	1.31E-05	0.004174	0.003147	0.668298	2.21E+02
Alameda	2023	Construction and Mining - Misc - Trenchers	Aggregate	Aggregate	Diesel	174.8	0.00055	0.003472	0.002105	5.11E-08	0.000118	8.91E-05	8.1E-06	2.68E-03
Alameda	2023	Construction and Mining - Nurse Rig Other	Aggregate	Aggregate	Diesel	20.22562067	5.23E-07	3.52E-06	4.19E-06	5.9E-09	3.37E-07	3.1E-07	0.000622	2.06E-01
Alameda	2023	Construction and Mining - Off-Highway Tractors	Aggregate	Aggregate	Diesel	140185.6903	0.00339	0.019155	0.020439	4.09E-05	0.001171	0.001077	4.314046	1.43E+03

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.0) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>.

Model Output: Off-Road Web Query (v1.1.0) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2023

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

Alameda	2023 Construction and Mining - Off-Highway Trucks	Aggregate	Aggregate	Diesel	333941.6285	0.006275	0.048602	0.029537	9.73E-05	0.00226	0.002079	10.27665	3.40E+03
Alameda	2023 Construction and Mining - Other Construction Equipment	Aggregate	Aggregate	Diesel	159186.2846	0.003261	0.025577	0.01947	4.64E-05	0.001372	0.001263	4.898767	1.62E+03
Alameda	2023 Construction and Mining - Other Material Handling Equipment	Aggregate	Aggregate	Diesel	49561.98059	0.00088	0.00668	0.005388	1.44E-05	0.000349	0.000321	1.52521	5.05E+02
Alameda	2023 Construction and Mining - Pavers	Aggregate	Aggregate	Diesel	50243.04406	0.001035	0.007076	0.006574	1.46E-05	0.000384	0.000353	1.546169	5.12E+02
Alameda	2023 Construction and Mining - Paving Equipment	Aggregate	Aggregate	Diesel	55831.81012	0.000902	0.005943	0.006725	1.63E-05	0.000319	0.000294	1.718157	5.69E+02
Alameda	2023 Construction and Mining - Rollers	Aggregate	Aggregate	Diesel	131370.4427	0.003481	0.021499	0.024861	3.83E-05	0.001266	0.001165	4.042768	1.34E+03
Alameda	2023 Construction and Mining - Rough Terrain Forklifts	Aggregate	Aggregate	Diesel	164586.1012	0.00252	0.02033	0.029956	4.8E-05	0.000925	0.000851	5.06494	1.68E+03
Alameda	2023 Construction and Mining - Rubber Tired Dozers	Aggregate	Aggregate	Diesel	29941.87107	0.001054	0.008216	0.006675	8.73E-06	0.00052	0.000478	0.921425	3.05E+02
Alameda	2023 Construction and Mining - Rubber Tired Loaders	Aggregate	Aggregate	Diesel	571271.602	0.011157	0.076928	0.063486	0.000167	0.004219	0.003882	17.5802	5.82E+03
Alameda	2023 Construction and Mining - Scrapers	Aggregate	Aggregate	Diesel	298175.8304	0.010387	0.088249	0.067237	8.69E-05	0.005345	0.004917	9.176003	3.04E+03
Alameda	2023 Construction and Mining - Skid Steer Loaders	Aggregate	Aggregate	Diesel	271516.5118	0.005582	0.044534	0.050969	7.92E-05	0.001987	0.001828	8.355595	2.77E+03
Alameda	2023 Construction and Mining - Spray Truck	Aggregate	Aggregate	Diesel	3273.905697	6.93E-05	0.000469	0.000486	9.54E-07	2.83E-05	2.6E-05	0.100751	3.34E+01
Alameda	2023 Construction and Mining - Spreader Tractor Trailer	Aggregate	Aggregate	Diesel	409.8906759	7.58E-06	5.9E-05	2.95E-05	1.19E-07	2.31E-06	2.12E-06	0.012614	4.18E+00
Alameda	2023 Construction and Mining - Spreader Truck	Aggregate	Aggregate	Diesel	2586.497631	3.97E-05	0.000232	0.000277	7.54E-07	1.44E-05	1.32E-05	0.079596	2.64E+01
Alameda	2023 Construction and Mining - Surfacing Equipment	Aggregate	Aggregate	Diesel	26556.5657	0.00048	0.003469	0.002597	7.74E-06	0.000184	0.000169	0.817246	2.71E+02
Alameda	2023 Construction and Mining - Tank Truck	Aggregate	Aggregate	Diesel	5691.896753	8.7E-05	0.000513	0.000396	1.66E-06	2.52E-05	2.32E-05	0.175161	5.80E+01
Alameda	2023 Construction and Mining - Tanker Truck Trailer	Aggregate	Aggregate	Diesel	438.1024906	6.4E-06	3.42E-05	6.1E-05	1.28E-07	1.7E-06	1.57E-06	0.013482	4.46E+00
Alameda	2023 Construction and Mining - Telescopic Handler	Aggregate	Aggregate	Diesel	11434.78223	0.000112	0.00116	0.001894	3.33E-06	3.6E-05	3.31E-05	0.351892	1.17E+02
Alameda	2023 Construction and Mining - Tractors/Loaders/Backhoes	Aggregate	Aggregate	Diesel	759213.8652	0.017911	0.118347	0.128334	0.000221	0.007398	0.006806	23.3639	7.74E+03
Alameda	2023 Construction and Mining - Trenchers	Aggregate	Aggregate	Diesel	26170.00834	0.000874	0.005506	0.004312	7.63E-06	0.000338	0.000311	0.805351	2.67E+02
Alameda	2023 Construction and Mining - Vacuum Truck	Aggregate	Aggregate	Diesel	8502.778875	0.000172	0.001204	0.000926	2.48E-06	6.05E-05	5.57E-05	0.261663	8.66E+01
Alameda	2023 Construction and Mining - Water Truck	Aggregate	Aggregate	Diesel	25255.26507	0.000532	0.003862	0.002283	7.36E-06	0.00021	0.000193	0.7772	2.57E+02
TOTAL CONSTRUCTION OFFROAD					4.90E+06	2.37E-01	8.43E-01	4.78E+00	1.41E-03	8.02E-02	6.69E-02	1.42E+02	4.70E+04
ESTIMATED Livermore (g/yr; tpd; MTY)					71,649	3.46E-03	1.23E-02	7.00E-02	2.06E-05	1.17E-03	9.78E-04	2.08E+00	688
ESTIMATED Livermore (lbs/day)						7	25	140	0	2	2		

TOTAL HOUSING PERMITS: https://socds.huduser.gov/permits/						
	2019	2020	2021	2022	2023	Average
Alameda County	6,402	4,120	5,025	5,070	2,884	4,700
Housing permits in Livermore	102	99	36	38	41	69
Percent in the EIR Study Area	1.6%	2.4%	0.7%	0.7%	1.4%	1.5%

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.0) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>.

Model Output: Off-Road Web Query (v1.1.0) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2023

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

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	CO2_tpd	CO2e_MTY
Alameda	2023	Lawn and Garden - Misc - Chainsaws	Aggregate	Aggregate	Gasoline	354507.6637	0.396764	0.013012	1.179946	9.07E-05	0.004957	0.003752	6.279877	2.08E+03
Alameda	2023	Lawn and Garden - Misc - Chainsaws	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Lawn and Garden - Misc - Chainsaws Preempt	Aggregate	Aggregate	Gasoline	209658.3888	0.3594	0.012558	0.635394	5.36E-05	0.002674	0.00202	3.381472	1.12E+03
Alameda	2023	Lawn and Garden - Misc - Chainsaws Preempt	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Lawn and Garden - Misc - Chippers/Stump Grinders	Aggregate	Aggregate	Gasoline	3946.869946	0.000596	0.000203	0.027885	1.02E-06	1.22E-06	9.2E-07	0.05998	1.99E+01
Alameda	2023	Lawn and Garden - Misc - Chippers/Stump Grinders	Aggregate	Aggregate	Diesel	218.403262	8.04E-06	5.08E-05	2.74E-05	6.37E-08	1.71E-06	1.29E-06	0.00666	2.21E+00
Alameda	2023	Lawn and Garden - Misc - Chippers/Stump Grinders	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Lawn and Garden - Misc - Lawn Mowers	Aggregate	Aggregate	Gasoline	866936.0066	0.115467	0.066626	5.460031	0.000232	0.00149	0.001123	14.26459	4.72E+03
Alameda	2023	Lawn and Garden - Misc - Lawn Mowers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Lawn and Garden - Misc - Leaf Blowers/Vacuums	Aggregate	Aggregate	Gasoline	916998.0285	0.667573	0.023225	3.382233	0.000234	0.009776	0.007373	16.96468	5.62E+03
Alameda	2023	Lawn and Garden - Misc - Leaf Blowers/Vacuums	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Lawn and Garden - Misc - Other	Aggregate	Aggregate	Gasoline	19130.94028	0.002275	0.000898	0.13082	4.95E-06	6.69E-06	5.06E-06	0.299434	9.91E+01
Alameda	2023	Lawn and Garden - Misc - Other	Aggregate	Aggregate	Diesel	109.3239378	3.53E-06	2.44E-05	1.94E-05	3.19E-08	8.53E-07	6.45E-07	0.003329	1.10E+00
Alameda	2023	Lawn and Garden - Misc - Rear Engine Riding Mowers	Aggregate	Aggregate	Gasoline	1507193.514	0.203008	0.100877	11.16446	0.000386	0.000909	0.000687	22.16445	7.34E+03
Alameda	2023	Lawn and Garden - Misc - Rear Engine Riding Mowers	Aggregate	Aggregate	Diesel	87784.86565	0.003103	0.020185	0.012495	2.56E-05	0.000685	0.000518	2.67693	8.86E+02
Alameda	2023	Lawn and Garden - Misc - Rear Engine Riding Mowers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Lawn and Garden - Misc - Snowblowers	Aggregate	Aggregate	Gasoline	4170.127304	0.000492	0.000227	0.032857	1.12E-06	1.41E-06	1.07E-06	0.058407	1.93E+01
Alameda	2023	Lawn and Garden - Misc - Snowblowers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Lawn and Garden - Misc - Tillers	Aggregate	Aggregate	Gasoline	17422.3421	0.00546	0.000853	0.104609	4.64E-06	1.12E-05	8.49E-06	0.28377	9.40E+01
Alameda	2023	Lawn and Garden - Misc - Tillers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Lawn and Garden - Misc - Trimmers/Edgers/Brush Cutters	Aggregate	Aggregate	Gasoline	684160.8188	0.425112	0.025923	2.601457	0.000175	0.003698	0.002801	12.78633	4.23E+03
Alameda	2023	Lawn and Garden - Misc - Trimmers/Edgers/Brush Cutters	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Lawn and Garden - Misc - Wood Splitters	Aggregate	Aggregate	Gasoline	157267.1597	0.023098	0.010516	1.053413	4.08E-05	0.000107	8.08E-05	2.481409	8.22E+02
TOTAL LAWN & GARDEN						4.83E+06	2.20E+00	2.75E-01	2.58E+01	1.25E-03	2.43E-02	1.84E-02	8.17E+01	2.71E+04
ESTIMATED Livermore (g/yr; tpd; MTY)						252,913	1.15E-01	1.44E-02	1.35E+00	6.54E-05	1.27E-03	9.62E-04	4.28E+00	1,417
ESTIMATED Livermore (lbs/day)							231	29	2,701	0	3	2	8,558	

HOUSING UNITS: https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/		Existing
Housing Units in Alameda County		630,726
Housing Units in Livermore		33,030
Percent in the EIR Study Area		5.2%

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.0) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>.

Model Output: Off-Road Web Query (v1.1.0) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2023

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

Light Commercial and Industrial

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	CO2_tpd	CO2e_MTY
Alameda	2023	Light Commercial - Misc - Air Compressors	Aggregate	Aggregate	Gasoline	1488749.956	0.166727	0.101981	10.14224	0.000377	0.000714	0.00054	23.32241	7.72E+03
Alameda	2023	Light Commercial - Misc - Air Compressors	Aggregate	Aggregate	Diesel	51670.10429	0.001627	0.010781	0.012778	1.96E-05	0.000402	0.000365	1.587707	5.26E+02
Alameda	2023	Light Commercial - Misc - Air Compressors	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Light Commercial - Misc - Gas Compressors	Aggregate	Aggregate	Nat Gas	660635.4	0	0.037666	0.441172	0	0	0	12.03147	3.98E+03
Alameda	2023	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Gasoline	2461032.233	0.522905	0.194623	15.26213	0.000638	0.001675	0.001265	40.06343	1.33E+04
Alameda	2023	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Diesel	225665.3907	0.006102	0.047506	0.040847	7.85E-05	0.001658	0.001385	6.912676	2.29E+03
Alameda	2023	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Nat Gas	21243	0	0.001219	0.010999	0	0	0	0.392431	1.30E+02
Alameda	2023	Light Commercial - Misc - Pressure Washers	Aggregate	Aggregate	Gasoline	1012731.504	0.127363	0.054254	7.467496	0.000258	0.000269	0.000203	14.97688	4.96E+03
Alameda	2023	Light Commercial - Misc - Pressure Washers	Aggregate	Aggregate	Diesel	1154.391526	2.74E-05	0.00024	0.000199	3.99E-07	7.95E-06	6.53E-06	0.035323	1.17E+01
Alameda	2023	Light Commercial - Misc - Pressure Washers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Light Commercial - Misc - Pumps	Aggregate	Aggregate	Gasoline	351517.9198	0.033834	0.018116	1.564851	8.93E-05	0.000325	0.000246	6.790038	2.25E+03
Alameda	2023	Light Commercial - Misc - Pumps	Aggregate	Aggregate	Diesel	125474.8558	0.003615	0.026403	0.023957	4.41E-05	0.000942	0.000794	3.843699	1.27E+03
Alameda	2023	Light Commercial - Misc - Pumps	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Light Commercial - Misc - Welders	Aggregate	Aggregate	Gasoline	683109.9764	0.078428	0.041054	4.359788	0.000174	0.000533	0.000403	11.1235	3.68E+03
Alameda	2023	Light Commercial - Misc - Welders	Aggregate	Aggregate	Diesel	262940.6435	0.007927	0.054653	0.059078	9.77E-05	0.002018	0.001794	8.072255	2.67E+03
Alameda	2023	Light Commercial - Misc - Welders	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2023	Industrial - Aerial Lifts	Aggregate	Aggregate	Diesel	120524.6928	0.001788	0.019159	0.021729	3.51E-05	0.000668	0.000614	3.709003	1.23E+03
Alameda	2023	Industrial - Boom	Aggregate	Aggregate	Diesel	120715.9164	0.001733	0.019003	0.022345	3.52E-05	0.00046	0.000423	3.714887	1.23E+03
Alameda	2023	Industrial - Forklifts	Aggregate	Aggregate	Diesel	533230.9727	0.01057	0.079908	0.097222	0.000155	0.004126	0.003796	16.40954	5.43E+03
Alameda	2023	Industrial - Garbage Refuse	Aggregate	Aggregate	Diesel	5799.156959	6.38E-05	0.000419	0.000372	1.69E-06	1.64E-05	1.5E-05	0.178462	5.91E+01
Alameda	2023	Industrial - Garbage Transfer	Aggregate	Aggregate	Diesel	1057.67099	1.07E-05	5.6E-05	6.56E-05	3.08E-07	2.58E-06	2.37E-06	0.032549	1.08E+01
Alameda	2023	Industrial - Misc - Aerial Lifts	Aggregate	Aggregate	Gasoline	87697.85	0.007558	0.006711	0.270914	2.23E-05	0.002012	0.00152	1.869374	6.19E+02
Alameda	2023	Industrial - Misc - Aerial Lifts	Aggregate	Aggregate	Diesel	132.9	0.000403	0.002547	0.001632	3.88E-08	9.02E-05	6.81E-05	5.94E-06	1.97E-03
Alameda	2023	Industrial - Misc - Aerial Lifts	Aggregate	Aggregate	Nat Gas	1483.6	9.51E-05	0.00074	0.026934	5.75E-08	7.25E-05	5.47E-05	2.37E-06	7.85E-04
Alameda	2023	Industrial - Misc - Forklifts	Aggregate	Aggregate	Gasoline	2749189.2	0.061454	0.274509	6.831609	0.000618	0.004301	0.003249	61.67231	2.04E+04
Alameda	2023	Industrial - Misc - Forklifts	Aggregate	Aggregate	Nat Gas	5445400.9	1.76E-05	0.431093	3.994448	6.33E-09	0.008773	6.54E-06	98.55052	3.26E+04
Alameda	2023	Industrial - Misc - Other General Industrial Equipment	Aggregate	Aggregate	Gasoline	47725.55	0.003216	0.004059	0.256583	1.2E-05	6.74E-05	5.09E-05	0.850822	2.82E+02
Alameda	2023	Industrial - Misc - Other General Industrial Equipment	Aggregate	Aggregate	Diesel	102.1	0.00031	0.002014	0.001253	2.98E-08	6.86E-05	5.18E-05	4.71E-06	1.56E-03
Alameda	2023	Industrial - Misc - Other Material Handling Equipment	Aggregate	Aggregate	Gasoline	20513	0.000414	0.00201	0.023931	4.89E-06	3.51E-05	2.65E-05	0.50362	1.67E+02
Alameda	2023	Industrial - Misc - Sweepers/Scrubbers	Aggregate	Aggregate	Gasoline	156515.3	0.004284	0.011333	0.366834	3.98E-05	0.00025	0.000189	3.547515	1.17E+03
Alameda	2023	Industrial - Misc - Sweepers/Scrubbers	Aggregate	Aggregate	Diesel	27.6	7.92E-05	0.000523	0.00035	8.04E-09	1.79E-05	1.36E-05	1.23E-06	4.08E-04
Alameda	2023	Industrial - Mower	Aggregate	Aggregate	Diesel	65713.96378	0.001655	0.012007	0.013602	1.92E-05	0.00055	0.000506	2.022268	6.70E+02
Alameda	2023	Industrial - Other General Industrial Equipment	Aggregate	Aggregate	Diesel	160793.7652	0.004279	0.028311	0.02376	4.69E-05	0.001626	0.001496	4.948235	1.64E+03
Alameda	2023	Industrial - Other Truck	Aggregate	Aggregate	Diesel	97197.28999	0.001533	0.009705	0.008322	2.83E-05	0.000476	0.000438	2.99113	9.90E+02
Alameda	2023	Industrial - Railcars or Track Cars	Aggregate	Aggregate	Diesel	7510.317819	0.000109	0.000696	0.000852	2.19E-06	3.47E-05	3.19E-05	0.231121	7.65E+01
Alameda	2023	Industrial - Sweepers/Scrubbers	Aggregate	Aggregate	Diesel	31321.20739	0.000882	0.005811	0.005753	9.13E-06	0.000348	0.000321	0.963873	3.19E+02
Alameda	2023	Industrial - Tow Tractor	Aggregate	Aggregate	Diesel	202.4932667	3.84E-06	4.3E-05	1.26E-05	5.9E-08	1.4E-06	1.29E-06	0.006231	2.06E+00
Alameda	2023	Industrial - Yard Goat	Aggregate	Aggregate	Diesel	258773.2178	0.004467	0.025164	0.038546	7.54E-05	0.001285	0.001183	7.963435	2.64E+03
TOTAL LIGHT COMMERCIAL + INDUSTRIAL OFFROAD						1.73E+07	1.05E+00	1.52E+00	5.14E+01	2.88E-03	3.38E-02	2.11E-02	3.39E+02	1.12E+05
ESTIMATED Livermore (g/yr; tpd; MTY)						1.36E+06	8.33E-02	1.21E-01	4.06E+00	2.28E-04	2.67E-03	1.66E-03	2.68E+01	8,882
ESTIMATED Livermore (lbs/day)							167	241	8,126	0	5	3	53,649	

EMPLOYMENT: http://lehd.ces.census.gov/	Existing
Employment in Alameda County	723,799
Employment in Livermore	57,220
Percent in the EIR Study Area	7.91%

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.2) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>

Model Output: Off-Road Web Query (v1.1.2) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2045

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query 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	CO2_tpd	CO2e_MTY
Alameda	2045	Agricultural - Agricultural Tractors	Aggregate	Aggregate	Gasoline	22.40116449	3.57E-06	2.11E-06	4.51E-05	6.21E-09	1.13E-07	1.04E-07	0.000691	2.29E-01
Alameda	2045	Agricultural - Agricultural Tractors	Aggregate	Aggregate	Diesel	350236.6048	0.005938	0.028128	0.053918	9.83E-05	0.001376	0.001266	10.76764	3.57E+03
Alameda	2045	Agricultural - ATVs	Aggregate	Aggregate	Gasoline	13163.91004	0.001894	0.001049	0.027177	3.65E-06	9.76E-05	8.98E-05	0.406181	1.34E+02
Alameda	2045	Agricultural - ATVs	Aggregate	Aggregate	Diesel	7254.205242	9.94E-05	0.001124	0.001371	2.04E-06	1.61E-05	1.48E-05	0.223023	7.38E+01
Alameda	2045	Agricultural - ATVs	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Agricultural - Bale Wagons (Self Propelled)	Aggregate	Aggregate	Diesel	914.9901196	1.03E-05	4.75E-05	0.00015	2.57E-07	2.51E-06	2.31E-06	0.02813	9.31E+00
Alameda	2045	Agricultural - Balers (Self Propelled)	Aggregate	Aggregate	Diesel	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Agricultural - Combine Harvesters	Aggregate	Aggregate	Diesel	16369.08796	0.00015	0.000593	0.001042	4.6E-06	2.85E-05	2.62E-05	0.50325	1.67E+02
Alameda	2045	Agricultural - Construction Equipment	Aggregate	Aggregate	Diesel	6169.983674	5.17E-05	0.000195	0.000985	1.73E-06	1.08E-05	9.97E-06	0.189689	6.28E+01
Alameda	2045	Agricultural - Cotton Pickers	Aggregate	Aggregate	Diesel	267.8701837	2.21E-06	9.02E-06	1.56E-05	7.53E-08	3.92E-07	3.6E-07	0.008235	2.73E+00
Alameda	2045	Agricultural - Forage & Silage Harvesters	Aggregate	Aggregate	Diesel	614.5448738	6.69E-06	4.29E-05	4.23E-05	1.73E-07	1.63E-06	1.5E-06	0.018894	6.26E+00
Alameda	2045	Agricultural - Forklifts	Aggregate	Aggregate	Diesel	5082.865826	7.28E-05	0.000589	0.000941	1.43E-06	1.5E-05	1.38E-05	0.156267	5.17E+01
Alameda	2045	Agricultural - Hay Squeeze/Stack retriever	Aggregate	Aggregate	Diesel	360.4180335	3.14E-06	1.33E-05	3.3E-05	1.01E-07	5.98E-07	5.51E-07	0.011081	3.67E+00
Alameda	2045	Agricultural - Misc - 2-Wheel Tractors	Aggregate	Aggregate	Gasoline	1167.8	0.000614	0.000402	0.018586	3E-07	0.000186	0.000141	6.84E-06	2.26E-03
Alameda	2045	Agricultural - Misc - Hydro Power Units	Aggregate	Aggregate	Gasoline	837.2	0.000431	0.000282	0.013332	2.13E-07	0.000147	0.000111	4.81E-06	1.59E-03
Alameda	2045	Agricultural - Misc - Hydro Power Units	Aggregate	Aggregate	Diesel	2.188	6.79E-06	4.28E-05	2.59E-05	6.38E-10	1.46E-06	1.1E-06	9.98E-07	3.30E-04
Alameda	2045	Agricultural - Misc - Mowers	Aggregate	Aggregate	Gasoline	1016	0.000549	0.000359	0.01614	2.6E-07	0.000187	0.000141	5.78E-06	1.91E-03
Alameda	2045	Agricultural - Misc - Other	Aggregate	Aggregate	Gasoline	56.5	3.03E-05	1.84E-05	0.000898	1.45E-08	7.94E-06	6E-06	3.24E-07	1.07E-04
Alameda	2045	Agricultural - Misc - Other	Aggregate	Aggregate	Diesel	2.493	7.75E-06	4.89E-05	2.94E-05	7.27E-10	1.66E-06	1.25E-06	1.14E-06	3.77E-04
Alameda	2045	Agricultural - Misc - Sprayers	Aggregate	Aggregate	Gasoline	1844.6	0.001019	0.000599	0.02922	4.74E-07	0.000269	0.000203	1.03E-05	3.42E-03
Alameda	2045	Agricultural - Misc - Sprayers	Aggregate	Aggregate	Diesel	0.716	2.38E-06	1.5E-05	8.11E-06	2.09E-10	5.05E-07	3.82E-07	3.47E-07	1.15E-04
Alameda	2045	Agricultural - Misc - Tillers	Aggregate	Aggregate	Gasoline	410	0.000157	9.24E-05	0.00666	1.07E-07	2.42E-07	1.83E-07	2.4E-06	7.95E-04
Alameda	2045	Agricultural - Misc - Tillers	Aggregate	Aggregate	Diesel	0.0298	6.97E-08	4.9E-07	4.1E-07	8.71E-12	1.72E-08	1.3E-08	1.18E-08	3.91E-06
Alameda	2045	Agricultural - Nut Harvester	Aggregate	Aggregate	Diesel	9504.491402	0.000138	0.000781	0.001682	2.67E-06	4.02E-05	3.7E-05	0.292205	9.68E+01
Alameda	2045	Agricultural - Other Harvesters	Aggregate	Aggregate	Diesel	6796.300806	7.18E-05	0.000326	0.00089	1.91E-06	1.8E-05	1.65E-05	0.208945	6.92E+01
Alameda	2045	Agricultural - Sprayers/Spray rigs	Aggregate	Aggregate	Diesel	16532.98665	0.000259	0.001864	0.002421	4.64E-06	6.08E-05	5.59E-05	0.508289	1.68E+02
Alameda	2045	Agricultural - Swathers/Windrowers/Hay Conditioners	Aggregate	Aggregate	Diesel	2252.281478	2.61E-05	0.000119	0.000413	6.33E-07	7.85E-06	7.22E-06	0.069244	2.29E+01
TOTAL AGRICULTURAL OFFROAD						440880.47	0.01	0.04	0.18	0.00	0.00	0.00	13.39	4.43E+03
ESTIMATED Livermore (g/yr; tpd; MTY)						4709.11	0.00	0.00	0.00	0.00	0.00	0.00	0.14	47
ESTIMATED Livermore (lbs/day)							0	1	3.760	0.0	0.1	0	286	

AGRICULTURAL ACREAGE: https://www.acgov.org/cda/awm/documents/2023cropreport.pdf .	Existing
Farmland Acreage in Alameda County	138,000
Farmland Acreage in Livermore	1,474
Percent in the EIR Study Area	1.07%

Note: Proportion of farmland acreage in the City assumed to remain the same as existing conditions.

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.2) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>

Model Output: Off-Road Web Query (v1.1.2) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2045

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

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	CO2_tpd	CO2e_MTY
Alameda	2045	Construction and Mining - Bore/Drill Rigs	Aggregate	Aggregate	Diesel	95633.55517	0.00037	0.004414	0.000931	2.86E-05	9.3E-05	8.55E-05	3.018362	9.99E+02
Alameda	2045	Construction and Mining - Bucket	Aggregate	Aggregate	Diesel	2180.273319	8.03E-06	0.000118	2.12E-05	6.52E-07	2.01E-06	1.85E-06	0.068813	2.28E+01
Alameda	2045	Construction and Mining - Compactor	Aggregate	Aggregate	Diesel	3552.94222	1.19E-05	0.000187	3.6E-05	1.06E-06	3.14E-06	2.89E-06	0.112137	3.71E+01
Alameda	2045	Construction and Mining - Concrete Mixer	Aggregate	Aggregate	Diesel	330.7608367	1.21E-06	2.5E-05	3.61E-06	9.89E-08	3.25E-07	2.99E-07	0.010439	3.46E+00
Alameda	2045	Construction and Mining - Concrete Pump	Aggregate	Aggregate	Diesel	3347.015233	1.04E-05	0.000121	2.87E-05	1E-06	2.6E-06	2.4E-06	0.105638	3.50E+01
Alameda	2045	Construction and Mining - Crane less than 35ton	Aggregate	Aggregate	Diesel	1627.141021	4.29E-06	0.000102	1.96E-05	4.86E-07	1.48E-06	1.36E-06	0.051355	1.70E+01
Alameda	2045	Construction and Mining - Cranes	Aggregate	Aggregate	Diesel	83239.59558	0.000191	0.002994	0.000657	2.49E-05	6.59E-05	6.06E-05	2.627187	8.70E+02
Alameda	2045	Construction and Mining - Crawler Tractors	Aggregate	Aggregate	Diesel	248413.2695	0.000804	0.010158	0.002187	7.43E-05	0.000219	0.000202	7.840356	2.60E+03
Alameda	2045	Construction and Mining - Crushing/Processing Equipment	Aggregate	Aggregate	Diesel	12672.25693	3.91E-05	0.000588	9.9E-05	3.79E-06	1.04E-05	9.53E-06	0.399959	1.32E+02
Alameda	2045	Construction and Mining - Excavators	Aggregate	Aggregate	Diesel	762251.3687	0.002903	0.048093	0.007537	0.000228	0.000716	0.000659	24.05798	7.97E+03
Alameda	2045	Construction and Mining - Graders	Aggregate	Aggregate	Diesel	112321.6526	0.000334	0.004	0.00093	3.36E-05	9.23E-05	8.49E-05	3.545067	1.17E+03
Alameda	2045	Construction and Mining - Hopper Tractor Trailer	Aggregate	Aggregate	Diesel	215.1075375	7.17E-07	7.1E-06	2.02E-06	6.43E-08	1.74E-07	1.6E-07	0.006789	2.25E+00
Alameda	2045	Construction and Mining - Misc - Asphalt Pavers	Aggregate	Aggregate	Gasoline	8943.6	0.001726	0.00127	0.065649	2.24E-06	0.000618	0.000467	0.128212	4.25E+01
Alameda	2045	Construction and Mining - Misc - Bore/Drill Rigs	Aggregate	Aggregate	Gasoline	5348.15	0.000427	0.000372	0.017065	1.34E-06	0.000165	0.000125	0.113426	3.76E+01
Alameda	2045	Construction and Mining - Misc - Bore/Drill Rigs	Aggregate	Aggregate	Diesel	39.57	0.000128	0.000805	0.000468	1.15E-08	2.73E-05	2.06E-05	1.87E-06	6.18E-04
Alameda	2045	Construction and Mining - Misc - Cement And Mortar Mixers	Aggregate	Aggregate	Gasoline	44944	0.02348	0.014718	0.714485	1.16E-05	0.006309	0.004767	2.62E-05	8.68E-03
Alameda	2045	Construction and Mining - Misc - Cement And Mortar Mixers	Aggregate	Aggregate	Diesel	58.09	0.000156	0.000981	0.000761	1.7E-08	3.42E-05	2.58E-05	2.35E-06	7.77E-04
Alameda	2045	Construction and Mining - Misc - Concrete/Industrial Saws	Aggregate	Aggregate	Gasoline	51206.75	0.019286	0.013263	0.63445	1.31E-05	0.007128	0.005371	0.30275	1.00E+02
Alameda	2045	Construction and Mining - Misc - Concrete/Industrial Saws	Aggregate	Aggregate	Diesel	2254.37	5.69E-05	0.000492	0.000566	8.77E-07	6.05E-06	4.86E-06	0.069125	2.29E+01
Alameda	2045	Construction and Mining - Misc - Cranes	Aggregate	Aggregate	Gasoline	4241.3	8.61E-05	0.000192	0.00727	1.02E-06	7.02E-06	5.31E-06	0.10083	3.34E+01
Alameda	2045	Construction and Mining - Misc - Crushing/Proc. Equipment	Aggregate	Aggregate	Gasoline	271	0.000125	0.000083	0.004346	6.88E-08	5.08E-05	3.83E-05	1.57E-07	5.19E-05
Alameda	2045	Construction and Mining - Misc - Dumpers/Tenders	Aggregate	Aggregate	Gasoline	4538.2	0.002541	0.001652	0.067799	1.17E-06	0.000697	0.000527	0.006557	2.17E+00
Alameda	2045	Construction and Mining - Misc - Dumpers/Tenders	Aggregate	Aggregate	Diesel	4.7	1.58E-05	9.99E-05	5.39E-05	1.37E-09	3.36E-06	2.54E-06	2.31E-07	7.65E-05
Alameda	2045	Construction and Mining - Misc - Excavators	Aggregate	Aggregate	Diesel	33.5	0.000113	0.000712	0.000384	9.77E-09	2.39E-05	1.81E-05	1.64E-06	5.43E-04
Alameda	2045	Construction and Mining - Misc - Other	Aggregate	Aggregate	Gasoline	6464.15	6.04E-05	0.000211	0.005667	1.61E-06	1.16E-05	8.77E-06	0.161862	5.36E+01
Alameda	2045	Construction and Mining - Misc - Other	Aggregate	Aggregate	Diesel	125.9	0.000337	0.00212	0.001655	3.68E-08	7.38E-05	5.58E-05	5.07E-06	1.68E-03
Alameda	2045	Construction and Mining - Misc - Pavers	Aggregate	Aggregate	Diesel	8.91	3E-05	0.000189	0.000102	2.6E-09	6.37E-06	4.81E-06	4.37E-07	1.45E-04
Alameda	2045	Construction and Mining - Misc - Paving Equipment	Aggregate	Aggregate	Gasoline	82129.1	0.041602	0.027282	1.234306	2.11E-05	0.012371	0.009347	0.115571	3.83E+01
Alameda	2045	Construction and Mining - Misc - Paving Equipment	Aggregate	Aggregate	Diesel	14.6	4.92E-05	0.000311	0.000168	4.26E-09	1.04E-05	7.89E-06	7.17E-07	2.37E-04
Alameda	2045	Construction and Mining - Misc - Plate Compactors	Aggregate	Aggregate	Gasoline	30694	0.017268	0.010628	0.486575	7.93E-06	0.004201	0.003182	1.79E-05	5.93E-03
Alameda	2045	Construction and Mining - Misc - Plate Compactors	Aggregate	Aggregate	Diesel	41.8	0.000107	0.00067	0.000561	1.22E-08	2.36E-05	1.78E-05	1.62E-06	5.36E-04
Alameda	2045	Construction and Mining - Misc - Rollers	Aggregate	Aggregate	Gasoline	32523.15	0.008461	0.006105	0.300222	7.92E-06	0.002984	0.002254	0.363958	1.21E+02
Alameda	2045	Construction and Mining - Misc - Rollers	Aggregate	Aggregate	Diesel	251	0.000725	0.00457	0.00317	7.32E-08	0.000157	0.000119	1.08E-05	3.57E-03
Alameda	2045	Construction and Mining - Misc - Rough Terrain Forklifts	Aggregate	Aggregate	Gasoline	29915.4	0.000511	0.001329	0.038143	7.13E-06	5.09E-05	3.85E-05	0.729819	2.42E+02
Alameda	2045	Construction and Mining - Misc - Rubber Tired Loaders	Aggregate	Aggregate	Gasoline	15906.7	0.000309	0.000764	0.025019	3.74E-06	2.65E-05	2E-05	0.379773	1.26E+02
Alameda	2045	Construction and Mining - Misc - Rubber Tired Loaders	Aggregate	Aggregate	Diesel	5.96	2.01E-05	0.000127	6.85E-05	1.74E-09	4.26E-06	3.22E-06	2.93E-07	9.70E-05
Alameda	2045	Construction and Mining - Misc - Signal Boards	Aggregate	Aggregate	Gasoline	872	0.000415	0.000291	0.013968	2.23E-07	0.000162	0.000122	5.18E-07	1.72E-04
Alameda	2045	Construction and Mining - Misc - Signal Boards	Aggregate	Aggregate	Diesel	1649.45	0.001686	0.01066	0.008985	5.77E-07	0.000369	0.000279	0.03066	1.02E+01
Alameda	2045	Construction and Mining - Misc - Skid Steer Loaders	Aggregate	Aggregate	Gasoline	65224.75	0.012474	0.008875	0.41089	1.68E-05	0.004079	0.00309	1.042365	3.45E+02
Alameda	2045	Construction and Mining - Misc - Skid Steer Loaders	Aggregate	Aggregate	Diesel	1650	0.00556	0.0351	0.019	4.82E-07	0.00118	0.000892	8.11E-05	2.69E-02
Alameda	2045	Construction and Mining - Misc - Surfacing Equipment	Aggregate	Aggregate	Gasoline	37306	0.022478	0.015428	0.588051	9.56E-06	0.006547	0.004951	2.17E-05	7.20E-03
Alameda	2045	Construction and Mining - Misc - Tampers/Rammers	Aggregate	Aggregate	Gasoline	4796	0.002016	0.001526	0.07734	1.25E-06	0.001095	0.000828	3.38E-06	1.12E-03
Alameda	2045	Construction and Mining - Misc - Tractors/Loaders/Backhoes	Aggregate	Aggregate	Gasoline	10201.75	0.000194	0.000526	0.015014	2.37E-06	1.71E-05	1.29E-05	0.245316	8.12E+01
Alameda	2045	Construction and Mining - Misc - Tractors/Loaders/Backhoes	Aggregate	Aggregate	Diesel	161	0.000541	0.00342	0.00185	4.69E-08	0.000115	8.68E-05	7.89E-06	2.61E-03
Alameda	2045	Construction and Mining - Misc - Trenchers	Aggregate	Aggregate	Gasoline	59189	0.015091	0.010789	0.543678	1.48E-05	0.005446	0.004105	0.668302	2.21E+02
Alameda	2045	Construction and Mining - Misc - Trenchers	Aggregate	Aggregate	Diesel	185.8	0.000586	0.003695	0.002243	5.43E-08	0.000126	9.49E-05	8.62E-06	2.85E-03
Alameda	2045	Construction and Mining - Nurse Rig Other	Aggregate	Aggregate	Diesel	19.83307062	8.38E-08	1.05E-06	4.46E-07	5.93E-09	3.42E-08	3.15E-08	0.000626	2.07E-01
Alameda	2045	Construction and Mining - Off-Highway Tractors	Aggregate	Aggregate	Diesel	138720.0684	0.00059	0.008424	0.001552	4.15E-05	0.000143	0.000132	4.378247	1.45E+03

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.2) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>

Model Output: Off-Road Web Query (v1.1.2) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2045

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

Alameda	2045 Construction and Mining - Off-Highway Trucks	Aggregate	Aggregate	Diesel	335115.0612	0.001286	0.020056	0.002754	0.0001	0.000343	0.000316	10.57682	3.50E+03
Alameda	2045 Construction and Mining - Other Construction Equipment	Aggregate	Aggregate	Diesel	159496.7491	0.000566	0.009549	0.001588	4.77E-05	0.000157	0.000144	5.033996	1.67E+03
Alameda	2045 Construction and Mining - Other Material Handling Equipment	Aggregate	Aggregate	Diesel	48333.29194	0.00017	0.002723	0.00047	1.45E-05	4.72E-05	4.34E-05	1.525483	5.05E+02
Alameda	2045 Construction and Mining - Pavers	Aggregate	Aggregate	Diesel	48849.4406	0.000198	0.003036	0.000591	1.46E-05	5.38E-05	4.95E-05	1.541774	5.11E+02
Alameda	2045 Construction and Mining - Paving Equipment	Aggregate	Aggregate	Diesel	54427.76803	0.000184	0.002796	0.000532	1.63E-05	4.99E-05	4.59E-05	1.717835	5.69E+02
Alameda	2045 Construction and Mining - Rollers	Aggregate	Aggregate	Diesel	128991.5191	0.00055	0.011376	0.001771	3.86E-05	0.000147	0.000136	4.071197	1.35E+03
Alameda	2045 Construction and Mining - Rough Terrain Forklifts	Aggregate	Aggregate	Diesel	159437.3634	0.000541	0.010883	0.00208	4.77E-05	0.000151	0.000139	5.032121	1.67E+03
Alameda	2045 Construction and Mining - Rubber Tired Dozers	Aggregate	Aggregate	Diesel	33992.34674	0.00011	0.001252	0.000245	1.02E-05	2.66E-05	2.45E-05	1.072858	3.55E+02
Alameda	2045 Construction and Mining - Rubber Tired Loaders	Aggregate	Aggregate	Diesel	568014.8747	0.001883	0.021777	0.004866	0.00017	0.000475	0.000437	17.92754	5.94E+03
Alameda	2045 Construction and Mining - Scrapers	Aggregate	Aggregate	Diesel	344658.0565	0.000936	0.009679	0.002208	0.000103	0.000238	0.000219	10.87801	3.60E+03
Alameda	2045 Construction and Mining - Skid Steer Loaders	Aggregate	Aggregate	Diesel	260541.702	0.001393	0.040523	0.004076	7.79E-05	0.000314	0.000288	8.223151	2.72E+03
Alameda	2045 Construction and Mining - Spray Truck	Aggregate	Aggregate	Diesel	3170.490066	1.35E-05	0.000212	3.38E-05	9.48E-07	3.39E-06	3.12E-06	0.100066	3.31E+01
Alameda	2045 Construction and Mining - Spreader Tractor Trailer	Aggregate	Aggregate	Diesel	406.2898545	1.23E-06	1.51E-05	2.68E-06	1.21E-07	2.76E-07	2.54E-07	0.012823	4.25E+00
Alameda	2045 Construction and Mining - Spreader Truck	Aggregate	Aggregate	Diesel	2520.289879	8.09E-06	8.45E-05	2.23E-05	7.54E-07	2.05E-06	1.89E-06	0.079545	2.63E+01
Alameda	2045 Construction and Mining - Surfacing Equipment	Aggregate	Aggregate	Diesel	26550.91885	8.52E-05	0.001257	0.00022	7.94E-06	2.41E-05	2.22E-05	0.837993	2.77E+02
Alameda	2045 Construction and Mining - Tank Truck	Aggregate	Aggregate	Diesel	5375.162291	1.9E-05	0.000178	4.37E-05	1.61E-06	4.69E-06	4.31E-06	0.169649	5.62E+01
Alameda	2045 Construction and Mining - Tanker Truck Trailer	Aggregate	Aggregate	Diesel	408.9318134	1.49E-06	2.35E-05	3.76E-06	1.22E-07	3.43E-07	3.16E-07	0.012907	4.27E+00
Alameda	2045 Construction and Mining - Telescopic Handler	Aggregate	Aggregate	Diesel	10839.92322	3.46E-05	0.000905	0.000129	3.24E-06	9.49E-06	8.73E-06	0.342127	1.13E+02
Alameda	2045 Construction and Mining - Tractors/Loaders/Backhoes	Aggregate	Aggregate	Diesel	743063.3009	0.00286	0.050359	0.009305	0.000222	0.000784	0.000722	23.45237	7.77E+03
Alameda	2045 Construction and Mining - Trenchers	Aggregate	Aggregate	Diesel	25620.05577	0.000147	0.003232	0.000401	7.66E-06	3.95E-05	3.64E-05	0.808614	2.68E+02
Alameda	2045 Construction and Mining - Vacuum Truck	Aggregate	Aggregate	Diesel	8346.823744	3.19E-05	0.000363	9.85E-05	2.5E-06	8.73E-06	8.04E-06	0.26344	8.72E+01
Alameda	2045 Construction and Mining - Water Truck	Aggregate	Aggregate	Diesel	25400.29785	8.63E-05	0.000933	0.000194	7.59E-06	2.12E-05	1.95E-05	0.801678	2.65E+02
TOTAL CONSTRUCTION OFFROAD					4.96E+06	1.95E-01	4.50E-01	5.34E+00	1.46E-03	5.84E-02	4.48E-02	1.45E+02	4.81E+04
ESTIMATED Livermore (g/yr; tpd; MTY)					72,540	2.85E-03	6.58E-03	7.80E-02	2.14E-05	8.54E-04	6.55E-04	2.12E+00	703
ESTIMATED Livermore (lbs/day)						6	13	156	0	2	1		

TOTAL HOUSING PERMITS: https://socds.huduser.gov/permits/						
	2019	2020	2021	2022	2023	Average
Alameda County	6,402	4,120	5,025	5,070	2,884	4,700
Housing permits in Livermore	102	99	36	38	41	69
Percent in the EIR Study Area	1.6%	2.4%	0.7%	0.7%	1.4%	1.5%

Note: Proportion of housing permits in the City assumed to remain the same as existing conditions.

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.2) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>

Model Output: Off-Road Web Query (v1.1.2) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2045

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

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	CO2_tpd	CO2e_MTY
Alameda	2045	Lawn and Garden - Misc - Chainsaws	Aggregate	Aggregate	Gasoline	2958.84457	0.00369	0.000123	0.00962	7.64E-07	4.09E-05	3.09E-05	0.051502	1.71E+01
Alameda	2045	Lawn and Garden - Misc - Chainsaws	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Lawn and Garden - Misc - Chainsaws Preempt	Aggregate	Aggregate	Gasoline	227849.816	0.398589	0.013993	0.683264	5.82E-05	0.002907	0.002196	3.658499	1.21E+03
Alameda	2045	Lawn and Garden - Misc - Chainsaws Preempt	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Lawn and Garden - Misc - Chippers/Stump Grinders	Aggregate	Aggregate	Gasoline	4403.813893	0.000677	0.000225	0.0312	1.14E-06	1.06E-06	8.02E-07	0.06673	2.21E+01
Alameda	2045	Lawn and Garden - Misc - Chippers/Stump Grinders	Aggregate	Aggregate	Diesel	273.9390309	1.01E-05	6.37E-05	3.44E-05	7.99E-08	2.14E-06	1.62E-06	0.00836	2.77E+00
Alameda	2045	Lawn and Garden - Misc - Chippers/Stump Grinders	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Lawn and Garden - Misc - Lawn Mowers	Aggregate	Aggregate	Gasoline	4493.104028	0.000677	0.000406	0.028529	1.75E-06	1.62E-06	1.22E-06	0.073204	2.42E+01
Alameda	2045	Lawn and Garden - Misc - Lawn Mowers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Lawn and Garden - Misc - Leaf Blowers/Vacuums	Aggregate	Aggregate	Gasoline	10.27316928	8.61E-06	2.76E-07	3.73E-05	2.64E-09	1.08E-07	8.14E-08	0.000187	6.20E-02
Alameda	2045	Lawn and Garden - Misc - Leaf Blowers/Vacuums	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Lawn and Garden - Misc - Other	Aggregate	Aggregate	Gasoline	241.5392392	3.17E-05	1.22E-05	0.001652	6.41E-08	5.67E-08	4.28E-08	0.003771	1.25E+00
Alameda	2045	Lawn and Garden - Misc - Other	Aggregate	Aggregate	Diesel	139.304057	4.49E-06	3.11E-05	2.48E-05	4.06E-08	1.09E-06	8.21E-07	0.004245	1.41E+00
Alameda	2045	Lawn and Garden - Misc - Rear Engine Riding Mowers	Aggregate	Aggregate	Gasoline	47819.85536	0.003784	0.001882	0.203027	1.22E-05	5.73E-06	4.33E-06	0.949972	3.15E+02
Alameda	2045	Lawn and Garden - Misc - Rear Engine Riding Mowers	Aggregate	Aggregate	Diesel	109881.5204	0.003882	0.0252	0.015651	3.21E-05	0.00086	0.000649	3.350853	1.11E+03
Alameda	2045	Lawn and Garden - Misc - Rear Engine Riding Mowers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Lawn and Garden - Misc - Snowblowers	Aggregate	Aggregate	Gasoline	11.81412354	1.41E-06	6.28E-07	9.36E-05	3.45E-09	2.72E-09	2.06E-09	0.000165	5.46E-02
Alameda	2045	Lawn and Garden - Misc - Snowblowers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Lawn and Garden - Misc - Tillers	Aggregate	Aggregate	Gasoline	63.06786538	2.56E-05	3.52E-06	0.000376	1.74E-08	3.43E-08	2.59E-08	0.001012	3.35E-01
Alameda	2045	Lawn and Garden - Misc - Tillers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Lawn and Garden - Misc - Trimmers/Edgers/Brush Cutters	Aggregate	Aggregate	Gasoline	1.486374673	1.06E-06	6.2E-08	5.58E-06	3.82E-10	7.93E-09	5.99E-09	2.74E-05	9.07E-03
Alameda	2045	Lawn and Garden - Misc - Trimmers/Edgers/Brush Cutters	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Lawn and Garden - Misc - Wood Splitters	Aggregate	Aggregate	Gasoline	11634.13539	0.001505	0.000715	0.077398	3.02E-06	2.88E-06	2.18E-06	0.18515	6.13E+01
TOTAL LAWN & GARDEN						4.10E+05	4.13E-01	4.27E-02	1.05E+00	1.09E-04	3.82E-03	2.89E-03	8.35E+00	2.77E+03
ESTIMATED Livermore (g/yr; tpd; MTY)						21,460	2.16E-02	2.23E-03	5.50E-02	5.72E-06	2.00E-04	1.51E-04	4.37E-01	145
ESTIMATED Livermore (lbs/day)							43	4	110	0	0	0	875	

HOUSING UNITS: https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/		Existing
Housing Units in Alameda County		630,726
Housing Units in Livermore		33,030
Percent in the EIR Study Area		5.2%

Note: Proportion of housing units in the City assumed to remain the same as existing conditions.

Alameda County Off-Road Web Query

Source: Off-Road Web Query (v.1.1.2) Emissions Inventory. <https://arb.ca.gov/emfac/offroad/emissions-inventory/74ad73338c83c79842a92caace8a54dd881ab498>

Model Output: Off-Road Web Query (v1.1.2) Emissions Inventory

Region Type: County

Region: Alameda

Calendar Year: 2045

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: Off-Road Web Query Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

Light Commercial and Industrial

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	CO2_tpd	CO2e_MTY
Alameda	2045	Light Commercial - Misc - Air Compressors	Aggregate	Aggregate	Gasoline	1830786.238	0.199149	0.117765	12.47975	0.000463	0.000791	0.000598	28.68897	9.50E+03
Alameda	2045	Light Commercial - Misc - Air Compressors	Aggregate	Aggregate	Diesel	63859.40761	0.001324	0.010855	0.015157	2.44E-05	8.28E-05	7.12E-05	1.962282	6.50E+02
Alameda	2045	Light Commercial - Misc - Air Compressors	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Light Commercial - Misc - Gas Compressors	Aggregate	Aggregate	Nat Gas	829718	0	0.047306	0.554084	0	0	0	15.11078	5.00E+03
Alameda	2045	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Gasoline	441589.2357	0.011183	0.026391	0.855768	0.000118	0.000694	0.000524	10.29451	3.41E+03
Alameda	2045	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Diesel	267235.0843	0.005465	0.04889	0.046849	9.4E-05	0.000907	0.000704	8.189224	2.71E+03
Alameda	2045	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Light Commercial - Misc - Generator Sets	Aggregate	Aggregate	Nat Gas	26670.55	0	0.001236	0.013816	0	0	0	0.492869	1.63E+02
Alameda	2045	Light Commercial - Misc - Pressure Washers	Aggregate	Aggregate	Gasoline	3269.187724	0.00011	0.000136	0.009647	9.12E-07	4.49E-06	3.39E-06	0.071281	2.36E+01
Alameda	2045	Light Commercial - Misc - Pressure Washers	Aggregate	Aggregate	Diesel	1364.359089	2.52E-05	0.000248	0.000228	4.76E-07	4.92E-06	3.79E-06	0.041831	1.39E+01
Alameda	2045	Light Commercial - Misc - Pressure Washers	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Light Commercial - Misc - Pumps	Aggregate	Aggregate	Gasoline	439462.0039	0.035651	0.020416	1.979528	0.000112	0.000384	0.00029	8.475194	2.81E+03
Alameda	2045	Light Commercial - Misc - Pumps	Aggregate	Aggregate	Diesel	149181.7734	0.003151	0.027062	0.027523	5.29E-05	0.000477	0.000372	4.571864	1.51E+03
Alameda	2045	Light Commercial - Misc - Pumps	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Light Commercial - Misc - Welders	Aggregate	Aggregate	Gasoline	842751.6998	0.08922	0.043705	5.400675	0.000215	0.000504	0.000381	13.71502	4.54E+03
Alameda	2045	Light Commercial - Misc - Welders	Aggregate	Aggregate	Diesel	321348.9535	0.006425	0.055327	0.06936	0.00012	0.000583	0.000477	9.867447	3.27E+03
Alameda	2045	Light Commercial - Misc - Welders	Aggregate	Aggregate	Electric	0	0	0	0	0	0	0	0	0.00E+00
Alameda	2045	Industrial - Aerial Lifts	Aggregate	Aggregate	Diesel	117064.543	0.00049	0.021207	0.001721	3.5E-05	0.000124	0.000114	3.694761	1.22E+03
Alameda	2045	Industrial - Boom	Aggregate	Aggregate	Diesel	115836.1285	0.000646	0.023994	0.001609	3.46E-05	0.000125	0.000115	3.65599	1.21E+03
Alameda	2045	Industrial - Forklifts	Aggregate	Aggregate	Diesel	520690.8825	0.001617	0.047075	0.00653	0.000156	0.000479	0.00044	16.43391	5.44E+03
Alameda	2045	Industrial - Garbage Refuse	Aggregate	Aggregate	Diesel	5598.646639	1.88E-05	0.00028	4.25E-05	1.67E-06	4.81E-06	4.43E-06	0.176703	5.85E+01
Alameda	2045	Industrial - Garbage Transfer	Aggregate	Aggregate	Diesel	1008.618368	3.07E-06	2.76E-05	6.46E-06	3.02E-07	7.21E-07	6.63E-07	0.031834	1.05E+01
Alameda	2045	Industrial - Misc - Aerial Lifts	Aggregate	Aggregate	Gasoline	110992.25	0.010015	0.008758	0.353435	2.82E-05	0.002676	0.002022	2.347819	7.77E+02
Alameda	2045	Industrial - Misc - Aerial Lifts	Aggregate	Aggregate	Diesel	171	0.000518	0.003263	0.002103	4.99E-08	0.000111	8.42E-05	7.65E-06	2.53E-03
Alameda	2045	Industrial - Misc - Aerial Lifts	Aggregate	Aggregate	Nat Gas	1950.6	0.000126	0.000974	0.035437	7.58E-08	9.55E-05	7.22E-05	3.12E-06	1.03E-03
Alameda	2045	Industrial - Misc - Forklifts	Aggregate	Aggregate	Gasoline	3452323.3	0.077108	0.344661	8.572189	0.000776	0.005401	0.004081	77.4566	2.56E+04
Alameda	2045	Industrial - Misc - Forklifts	Aggregate	Aggregate	Nat Gas	6838995.3	2.2E-05	0.541274	5.015647	7.86E-09	0.011018	8.12E-06	123.7734	4.10E+04
Alameda	2045	Industrial - Misc - Other General Industrial Equipment	Aggregate	Aggregate	Gasoline	46595.9	0.001013	0.003541	0.101088	1.17E-05	7.43E-05	5.61E-05	1.068512	3.54E+02
Alameda	2045	Industrial - Misc - Other General Industrial Equipment	Aggregate	Aggregate	Diesel	136.7	0.000415	0.002698	0.001679	3.99E-08	9.19E-05	6.94E-05	6.31E-06	2.09E-03
Alameda	2045	Industrial - Misc - Other Material Handling Equipment	Aggregate	Aggregate	Gasoline	25739.8	0.000351	0.002121	0.029531	6.14E-06	4.41E-05	3.33E-05	0.632515	2.09E+02
Alameda	2045	Industrial - Misc - Sweepers/Scrubbers	Aggregate	Aggregate	Gasoline	185956.55	0.003307	0.013159	0.284025	4.73E-05	0.000309	0.000234	4.455409	1.48E+03
Alameda	2045	Industrial - Misc - Sweepers/Scrubbers	Aggregate	Aggregate	Diesel	36.1	0.000104	0.000685	0.000459	1.05E-08	2.35E-05	1.78E-05	1.61E-06	5.34E-04
Alameda	2045	Industrial - Mower	Aggregate	Aggregate	Diesel	62669.39555	0.000467	0.012938	0.001175	1.87E-05	0.000105	9.65E-05	1.977955	6.55E+02
Alameda	2045	Industrial - Other General Industrial Equipment	Aggregate	Aggregate	Diesel	160486.5446	0.000699	0.014023	0.00204	4.8E-05	0.000192	0.000177	5.065235	1.68E+03
Alameda	2045	Industrial - Other Truck	Aggregate	Aggregate	Diesel	93619.21947	0.000377	0.004343	0.00091	2.8E-05	9.78E-05	8.99E-05	2.954786	9.78E+02
Alameda	2045	Industrial - Railcars or Track Cars	Aggregate	Aggregate	Diesel	7154.472107	2.41E-05	0.000321	6.62E-05	2.14E-06	6.58E-06	6.05E-06	0.225808	7.48E+01
Alameda	2045	Industrial - Sweepers/Scrubbers	Aggregate	Aggregate	Diesel	30527.23077	0.000162	0.004448	0.000528	9.13E-06	4.35E-05	4E-05	0.963493	3.19E+02
Alameda	2045	Industrial - Tow Tractor	Aggregate	Aggregate	Diesel	205.7366942	6.12E-07	5.5E-06	1.25E-06	6.15E-08	1.4E-07	1.29E-07	0.006493	2.15E+00
Alameda	2045	Industrial - Yard Goat	Aggregate	Aggregate	Diesel	247777.0794	0.000902	0.008768	0.002762	7.41E-05	0.000227	0.000209	7.820277	2.59E+03
TOTAL LIGHT COMMERCIAL + INDUSTRIAL OFFROAD						1.72E+07	4.50E-01	1.46E+00	3.59E+01	2.48E-03	2.57E-02	1.14E-02	3.54E+02	1.17E+05
ESTIMATED Livermore (g/yr; tpd; MTY)						1.36E+06	3.56E-02	1.15E-01	2.84E+00	1.96E-04	2.03E-03	9.01E-04	2.80E+01	9,272
ESTIMATED Livermore (lbs/day)							71	231	5,671	0	4	2	56,006	

EMPLOYMENT: http://lehd.ces.census.gov/	Existing
Employment in Alameda County	723,799
Employment in Livermore	57,220
Percent in the EIR Study Area	7.91%

Note: Proportion of employment in the City assumed to remain the same as existing conditions.

Solid Waste Disposal: EIR Study Area

Annual Year	EIR Study Area
Republic/Vasco Road Landfill 2023	80,048

Scenario	Service Population	Increase from Existing
Existing Conditions (2023)	145,150	NA
Proposed General Plan (2045)	195,080	34%

Source: CalRecycle. RDRS Report 1: Overall Jurisdiction Tons for Disposal and Disposal Related Uses <https://www2.calrecycle.ca.gov/RecyclingDisposalReporting/Reports/OverallJurisdictionTonsForDisposal>

Landfill Emission Tool (version 1.09.24.2021) CH₄ Model Results.

	Existing Conditions (2023)				Proposed General Plan (2045)
	CH ₄ Tons	MTCO ₂ e w/LFG Capture 2023 TOTAL	2025 Disposal (AR5 GWPs)* 2023 TOTAL		MTCO ₂ e w/LFG Capture 2045 TOTAL
Year 1	431	98	130		175
Year 2	2,966	673	897		1,205
Year 3 (PEAK)	3,275	743	990		1,331
Year 4	3,153	715	954		1,282
Year 5	3,036	688	918		1,234
Year 6	2,923	663	884		1,188
Year 7	2,814	638	851		1,143
Year 8	2,709	614	819		1,101
Year 9	2,608	591	789		1,060
Year 10	2,510	569	759		1,020
Year 11	2,417	548	731		982
Year 12	2,327	528	704		946
Year 13	2,240	508	677		910
Year 14	2,156	489	652		876
Year 15	2,076	471	628		844
Year 16	1,999	453	604		812
Year 17	1,924	436	582		782
Year 18	1,852	420	560		753
Year 19	1,783	404	539		725
Year 20	1,717	389	519		698
Year 21	1,653	375	500		672
Year 22	1,591	361	481		647
Year 23	1,532	347	463		623
Year 24	1,475	334	446		599
Year 25	1,420	322	429		577
Year 26	1,367	310	413		555
Year 27	1,316	298	398		535
Year 28	1,267	287	383		515
Year 29	1,219	277	369		496
Year 30	1,174	266	355		477
Year 31	1,130	256	342		459
Year 32	1,088	247	329		442
Year 33	1,048	238	317		426
Year 34	1,008	229	305		410
Year 35	971	220	294		395
Year 36	935	212	283		380
Year 37	900	204	272		366
Year 38	866	196	262		352
Year 39	834	189	252		339
Year 40	803	182	243		326
Year 41	773	175	234		314
Year 42	744	169	225		302
Year 43	716	162	217		291
Year 44	690	156	209		280
Year 45	664	151	201		270
Year 46	639	145	193		260
Year 47	615	140	186		250
Year 48	592	134	179		241
Year 49	570	129	172		232
Year 50	549	125	166		223
Year 51	529	120	160		215
Year 52	509	115	154		207
Year 53	490	111	148		199
Year 54	472	107	143		192
Year 55	454	103	137		185
Year 56	437	99	132		178
Year 57	421	95	127		171
Year 58	405	92	123		165
Year 59	390	88	118		159
Year 60	375	85	114		153
Total	81,545	18,494	24,659		33,141

LFG capture Efficiency 0.75

AR5 CH₄ GWP 28

SAR CH₄ GWP* 21

Tons to metric Tons 0.9071847

Source: Landfill Emissions Tool (Version 1.09.24.2021) and data from CalRecycle. <https://ww2.arb.ca.gov/resources/documents/carbs-landfill-gas-tool?keywords=2025>. Biogenic CO₂ emissions are not included.

Notes:

¹ Waste generation based on three year average waste commitment for Livermore obtained from CalRecycle.

² Significant CH₄ production typically begins one or two years after waste disposal in a landfill and continues for 10 to 60 years or longer. Consequently, the highest CH₄ emissions from waste disposal in a given year are reported.

³ Decomposition based on an average annual rainfall of 17 inches per year average (anaerobic decomposition factor (k) of 0.02) for the Livermore Landfill.

⁴ The Landfill Gas Estimator only includes the landfill gas (LFG) capture in the landfill gas heat output and therefore the reduction and emissions from landfill gas capture are calculated separately. Assumes 75 percent of fugitive GHG emissions are captured within the landfill's Landfill Gas Capture System with a landfill gas capture efficiency of 75 percent. The Landfill gas capture efficiency is based on the CARB's Local Government Operations Protocol (LGOP), Version 1.3.

Water and Wastewater Calculations: EIR Study Area

Indoor Water Demand	Existing Conditions (2023)	Proposed General Plan (2045)
Million Gallons Per Day (MGD)	5.74	8.19
Indoor Factor Gallons Per Day Per Capita (GPDPC)	62	59
Gallons Per Day (GD)	5,738,100	8,191,501
Million Gallons Per Year (MGY) TOTAL	2,094	2,990
Wastewater Water Demand	Existing Conditions (2023)	Proposed General Plan (2045)
Gallons Per Year (GY)	2,094,406,500	2,989,897,865
GD	5,738,100	8,191,501
Acre Feet Per Year (AFY)	6,427	9,176
MGY TOTAL	2,094	2,990

Note:

Based on indoor factor of 62 gallons/day/capita for existing conditions and 59 gallons/day/capita for proposed General Plan 2045. Assumes indoor water demand is 100 percent of the wastewater demand.

Direct Emissions from Wastewater Treatment

Wastewater Treatment Type	BIOGENIC CO₂ MT/Gallon	CH₄ MT/Gallon	N₂O MT/Gallon	Non-Biogenic CO₂e MT/Gallon
Aerobic	3.90E-07	1.34E-09	8.52E-10	2.63E-07
Anaerobic (Facultative Lagoons)	3.90E-07	4.01E-07	8.52E-10	1.15E-05
Septic	0.00E+00	2.50E-07	8.52E-10	7.23E-06

Source: California Air Pollution Control Officer's Association (CAPCOA). 2022, April. California Emissions Estimator Model (CalEEMod) User's Guide Version 2022.1. <https://www.caleemod.com/user-guide>. Table G-35, Annual Wastewater Treatment Direct Emission Factors (short ton per gallon)

Aerobic	Existing Conditions (2023)	Proposed General Plan (2045)
Non-Biogenic CO₂e TOTAL =	551	787

Water and Wastewater Calculations: EIR Study Area

Energy for Water Conveyance, Treatment, Distribution, and Wastewater Treatment

Location	Supply (Water Conveyance)	Water Treatment	Water Distribution	Total Water	Wastewater Treatment
see Tab G-33					
		kWhr/million gallons			
South Coast	3,044	725	1,537	5,306	1,501
San Francisco Bay	1,182	754	2,998	4,934	1,542
Central Coast	1,577	754	1,537	3,868	1,542
Tulare Lake	1,506	748	166	2,420	1,519
North Coast	620	754	1,537	2,911	1,542
San Joaquin River	827	748	166	1,741	1,519
Colorado River	2,304	748	166	3,218	1,519
Sacramento River	698	748	166	1,612	1,519
South Lahontan	1,953	748	1,537	4,238	1,519
North Lahontan	541	748	166	1,455	1,519

Source: California Air Pollution Control Officer's Association (CAPCOA). 2022, April. California Emissions Estimator Model (CalEEMod) User's Guide Version 2022.1. <https://www.caleemod.com/user-guide>. Table G-32, Water Energy Intensity Factors by Hydrologic Region and Process (kWh per million gallon).

Weighted Average				
Year	Intensity factor			CO ₂ e
	CO ₂ lbs/MWH	CH ₄ lbs/MWH	N ₂ O lbs/MWH	lbs/MWH
2023	NA	NA	NA	359.568
2045	NA	NA	NA	13.099
	CO ₂ MTons/MWH	CH ₄ MTons/MWH	N ₂ O MTons/MWH	MTons/MWH
2023	NA	NA	NA	0.163
2045	NA	NA	NA	0.006

Notes:

Weighted average calculated based on proportion of annual electricity usage data for PG&E vs Ava Energy.

GHG Emissions from Energy Associated with Water/Wastewater

EIR Study Area	Existing Conditions (2023)	Proposed General Plan (2045)
Energy Associated with Water Use		Mwh
Subtotal Water Use	10,334	14,752
Subtotal Wastewater Generation	3,230	4,610
Total Water/Wastewater	13,563	19,363

GHG Emissions from Energy Associated with Water Use/Wastewater Generation	Existing Conditions (2023)	Proposed General Plan (2045)
		MTCO₂e
Subtotal Water Use	1,685	88
Subtotal Wastewater Generation	527	27
Total Water/Wastewater	2,212	115

Total GHGs

GHG Emissions from Water/Wastewater Use	Existing Conditions (2023)	Proposed General Plan (2045)
		MTCO₂e
Subtotal Water Use	1,685	88
Subtotal Wastewater Generation	1,078	815
Total Water/Wastewater	2,764	902

Refrigerants

2021 Statewide Refrigerant Use (AR5)

Main Sector	Activity Subset	GHGs	Year 2021		GHGs		Year 2021	
			MTCO ₂ e (AR4 GWPs)	AR4 GWPs	Metric Ton	AR5 GWPs	MTCO ₂ e (AR5 GWPs)	AR5 GWPs
Commercial	Refrigeration and Air Conditioning	HFC-32	516,335.82	675	764.94	677	517,865.70	
Commercial	Refrigeration and Air Conditioning	HFC-152a	15,218,721.87	124	0.12	138	16,936,964.66	
Commercial	Refrigeration and Air Conditioning	HFC-143a	1,942,719.24	4,470	434.61	4,800	2,086,141.47	
Commercial	Refrigeration and Air Conditioning	HFC-134a	2,208,681.84	1,430	1,544.53	1,300	2,007,892.58	
Commercial	Refrigeration and Air Conditioning	HFC-125	4,395,645.63	3,500	1,255.90	3,170	3,981,199.04	
Commercial	Refrigeration and Air Conditioning	HFC-236fa	49,838.74	9,810	5.08	8,060	40,948.04	
Industrial	Refrigeration and Air Conditioning	HFC-125	575,082.52	3,500	164.31	3,170	520,860.45	
Industrial	Refrigeration and Air Conditioning	HFC-236fa	14,886.90	9,810	1.52	8,060	12,231.23	
Industrial	Refrigeration and Air Conditioning	HFC-134a	968,367.78	1,430	677.18	1,300	880,334.35	
Industrial	Refrigeration and Air Conditioning	HFC-32	57,870.73	675	85.73	675	57,870.73	
Industrial	Refrigeration and Air Conditioning	HFC-143a	301,517.84	4,470	67.45	4,800	323,777.55	
Industrial	Refrigeration and Air Conditioning	HFC-152a	10,103,327.3	124	0.08	138	11,244,025.54	
Residential	Refrigeration and Air Conditioning	HFC-125	3,426,121.59	3,500	978.89	3,170	3,103,087.27	
Residential	Refrigeration and Air Conditioning	HFC-134a	120,534.71	1,430	84.29	1,300	109,577.01	
Residential	Refrigeration and Air Conditioning	HFC-32	658,967.08	675	976.25	675	658,967.08	
Transportation	Refrigeration and Air Conditioning	HFC-125	161,190.70	3,500	46.05	3,170	145,992.72	
Transportation	Refrigeration and Air Conditioning	HFC-32	185,283,134.1	675	0.27	675	185,283,134.1	
Transportation	Refrigeration and Air Conditioning	HFC-134a	3,385,055.63	1,430	2,367.17	1,300	3,077,323.30	
Transportation	Refrigeration and Air Conditioning	HFC-143a	240,778.13	4,470	53.87	4,800	258,553.70	
							Total	17,782,836
							US Census 2021 California Population	People 39,455,353
							MT/person	0.45

	Existing Conditions (2023)	Proposed General Plan (2045)
Population	87,930	131,750
MTCO₂e	39,631	59,381

Notes:

AR4=Intergovernmental Panel on Climate Change Fourth Assessment Report

AR5=Intergovernmental Panel on Climate Change Fifth Assessment Report

GWP=Global warming potential

Source:

CARB. Greenhouse Gas Emissions Inventory Query Tool for years 2000 to 2021 (2023 Edition) - Query Results. Main Activity: Use of substitutes for ozone depleting substances Activity Subset: Refrigeration and Air Conditioning. AR 4. <https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0>.

Greenhouse Gas Protocol. Global Warming Potential Values. Global warming potential (GWP) values relative to CO₂. AR5. https://ghgprotocol.org/sites/default/files/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf.

U.S. Census Bureau. Table DP05 2021: ACS 5-Year Demographics and Housing Estimates. <https://data.census.gov/table/ACSDP5YSPT2021.DP05?g=040XX00US06>.

Daily Vehicles Miles Traveled (VMT): Livermore General Plan

Source: Kittelson and Associates, 2025. Based on the Alameda Countywide Transportation Model.

Scenario	EIR Study Area	Type of Trips			Percent Fleet Mix	Total Daily VMT	Total with RTAC	Service Population	VMT/SP	VMT/SP w RTAC
		IX	XI	II						
Existing Conditions (2023)	Total	1,827,692	1,805,216	419,362		4,052,270	2,235,816	145,150	27.9	15.4
	Auto	1,676,291	1,656,292	311,149	74.2%	3,643,733				
	MHDT	88,557	87,177	104,910	25.0%	280,644				
	HHDT	62,844	61,746	3,303	0.8%	127,893				
Proposed General Plan (2045)	EIR Study Area	2,322,939	2,299,712	560,864		5,183,515	2,872,190	195,080	26.6	14.7
	Auto	2,146,684	2,127,282	437,155	77.9%					
	MHDT	110,205	108,005	120,249	21.4%					
	HHDT	66,051	64,425	3,460	0.6%					

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) provided by Kittelson is based on Alameda Countywide Transportation Model. VMT from passenger vehicles and trucks that have an origin or destination in the City 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 City (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 City (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 City. 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.

Transportation Emissions

Source: EMFAC2021 V 1.0.2, Web Database - Emissions Rates with Adjusted Factors. Alameda (SF) Sub Area.

Based on the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) Global Warming Potentials (GWPs)

Note: MTons = metric tons; CO₂e = carbon dioxide-equivalent.

Criteria Air Pollutant Emissions							
		lbs/day					
		ROG	NOx	CO	SOx	PM10	PM2.5
Existing Conditions (2023)							
	EIR Study Area	117	1,714	3,601	27	23	46
Existing in Year 2045							
	EIR Study Area	37	1,114	1,886	22	216	76
Proposed General Plan (2045)							
	EIR Study Area	54	1,242	2,507	26	255	89
	Change from Existing Land Uses (2045 Emission Rates)	17	129	621	4	39	13
	Change from Existing Conditions (2023-2045)	-63	-472	-1,095	-1	232	44

		tons/year					
		ROG	NOx	CO	SOx	PM10	PM2.5
Existing Conditions (2023)							
	EIR Study Area	20	297	625	5	4	8
Existing in Year 2045							
	EIR Study Area	6	193	327	4	38	13
Proposed General Plan (2045)							
	EIR Study Area	9	216	435	5	44	16
	Change from Existing Land Uses (2045 Emission Rates)	3	22	108	1	7	2
	Change from Existing Conditions (2023-2045)	-11	-82	-190	0	40	8

Notes:

1

lbs to Tons 2000

GHG EMISSIONS

		Mtons/year			
		CO ₂	CH ₄	N ₂ O	CO ₂ e
Existing Conditions (2023)					
EIR Study Area		436,821	5	37	446,668
Existing in Year 2045					
EIR Study Area		358,544	4	32	367,009
Proposed General Plan (2045)					
EIR Study Area		428,223	4	35	437,675
Change from Existing Land Uses (2045 Emission Rates)		69,680	1	4	70,666
Change from Existing Conditions (2023-2045)		-8,597	-1	-1	-8,993

Notes:

¹ MTons = metric tons; CO₂e = carbon dioxide-equivalent.

Mobile Criteria Air Pollutants: Existing Conditions (2023)

Source: EMFAC2021 Version 1.0.2 web database. Emission Rates with Adjusted Factors. Alameda (SF) Sub-Area

		Fleet Mix		
		Auto and LHDT	MHDT	HHDT
Kittelson		74%	25%	1%
EMFAC Default		94%	2%	5%

EIR Study Area Daily VMT	2,235,816	lbs/day
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Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent for Livermore	ROG	NOx	CO	SOx	PM10	PM2.5
All Other Buses	Diesel	0.04%	0.01%	0.04	0.63	0.12	0.00	0.01	0.00
All Other Buses	Natural Gas	0.00%	0.00%	0.00	0.00	0.01	0.00	0.00	0.00
LDA	Gasoline	46.53%	36.87%	18.77	88.47	1380.69	5.08	2.42	14.54
LDA	Diesel	0.16%	0.12%	0.21	1.65	2.25	0.01	0.14	0.05
LDA	Electricity	4.10%	3.25%	0.00	0.00	0.00	0.00	0.00	1.28
LDA	Plug-in Hybrid	1.42%	1.12%	0.08	0.18	11.59	0.08	0.04	0.44
LDT1	Gasoline	4.13%	3.27%	4.52	21.47	224.23	0.53	0.31	1.29
LDT1	Diesel	0.00%	0.00%	0.01	0.06	0.06	0.00	0.01	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	0.03	0.00	0.00	0.00
LDT2	Gasoline	22.03%	17.46%	10.02	63.37	716.69	2.97	1.18	6.89
LDT2	Diesel	0.08%	0.06%	0.04	0.17	0.42	0.01	0.02	0.02
LDT2	Electricity	0.08%	0.06%	0.00	0.00	0.00	0.00	0.00	0.02
LDT2	Plug-in Hybrid	0.17%	0.13%	0.01	0.02	1.29	0.01	0.00	0.05
LHD1	Gasoline	1.65%	1.31%	3.13	12.68	80.35	0.57	0.11	0.52
LHD1	Diesel	0.82%	0.65%	5.97	57.99	16.82	0.19	1.30	0.38
LHD2	Gasoline	0.23%	0.18%	0.31	1.68	8.76	0.09	0.01	0.07
LHD2	Diesel	0.35%	0.28%	2.36	19.10	6.11	0.10	0.50	0.17
MCY	Gasoline	0.35%	0.28%	16.31	8.49	191.66	0.03	0.03	0.05
MDV	Gasoline	11.27%	8.93%	7.86	49.20	437.59	1.84	0.61	3.52
MDV	Diesel	0.17%	0.13%	0.08	0.44	1.34	0.03	0.04	0.05
MDV	Plug-in Hybrid	0.09%	0.07%	0.00	0.01	0.72	0.00	0.00	0.03
MH	Gasoline	0.04%	0.61%	2.49	15.08	62.42	0.58	0.06	0.36
MH	Diesel	0.02%	0.24%	1.48	50.55	4.94	0.12	1.25	0.19
Motor Coach	Diesel	0.02%	0.00%	0.00	0.35	0.02	0.00	0.01	0.00
OBUS	Gasoline	0.08%	0.01%	0.04	0.29	0.93	0.01	0.00	0.01
PTO	Diesel	0.06%	0.01%	0.01	1.37	0.12	0.01	0.00	0.00
SBUS	Gasoline	0.01%	0.00%	0.01	0.06	0.18	0.00	0.00	0.00
SBUS	Diesel	0.02%	0.00%	0.01	0.43	0.02	0.00	0.00	0.00
SBUS	Natural Gas	0.00%	0.00%	0.00	0.01	0.15	0.00	0.00	0.00
T6 CAIRP Class 4	Diesel	0.00%	0.01%	0.01	0.27	0.02	0.01	0.01	0.01
T6 CAIRP Class 5	Diesel	0.00%	0.02%	0.01	0.32	0.03	0.01	0.01	0.01
T6 CAIRP Class 6	Diesel	0.00%	0.04%	0.02	0.82	0.08	0.02	0.02	0.02
T6 CAIRP Class 7	Diesel	0.02%	0.26%	0.08	5.72	0.42	0.13	0.09	0.15
T6 Instate Delivery Class 4	Diesel	0.08%	1.24%	3.63	82.86	12.50	0.69	1.46	0.73
T6 Instate Delivery Class 4	Natural Gas	0.00%	0.00%	0.00	0.02	0.69	0.00	0.00	0.00
T6 Instate Delivery Class 5	Diesel	0.06%	0.93%	1.19	40.92	5.15	0.51	0.48	0.55
T6 Instate Delivery Class 5	Natural Gas	0.00%	0.00%	0.00	0.01	0.37	0.00	0.00	0.00
T6 Instate Delivery Class 6	Diesel	0.22%	3.32%	4.39	143.83	18.72	1.84	1.79	1.97
T6 Instate Delivery Class 6	Natural Gas	0.00%	0.01%	0.00	0.04	1.04	0.00	0.00	0.00
T6 Instate Delivery Class 7	Diesel	0.08%	1.18%	0.51	44.11	4.26	0.66	0.16	0.70
T6 Instate Delivery Class 7	Natural Gas	0.00%	0.03%	0.02	0.30	5.28	0.00	0.00	0.02
T6 Instate Other Class 4	Diesel	0.10%	1.52%	4.86	117.86	15.61	0.81	2.39	0.90
T6 Instate Other Class 4	Natural Gas	0.00%	0.00%	0.00	0.02	0.46	0.00	0.00	0.00
T6 Instate Other Class 5	Diesel	0.23%	3.49%	2.26	110.62	11.54	1.88	1.21	2.07
T6 Instate Other Class 5	Natural Gas	0.00%	0.01%	0.00	0.05	1.00	0.00	0.00	0.00
T6 Instate Other Class 6	Diesel	0.23%	3.51%	5.44	168.94	20.41	1.87	2.77	2.08
T6 Instate Other Class 6	Natural Gas	0.00%	0.01%	0.00	0.04	0.85	0.00	0.00	0.00
T6 Instate Other Class 7	Diesel	0.14%	2.14%	1.08	85.07	7.00	1.13	0.59	1.27
T6 Instate Other Class 7	Natural Gas	0.00%	0.06%	0.02	0.46	7.76	0.00	0.00	0.03
T6 Instate Tractor Class 6	Diesel	0.00%	0.02%	0.03	0.89	0.12	0.01	0.02	0.01
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	0.08%	1.19%	0.52	45.31	3.69	0.60	0.30	0.70
T6 Instate Tractor Class 7	Natural Gas	0.00%	0.03%	0.01	0.25	4.12	0.00	0.00	0.02
T6 OOS Class 4	Diesel	0.00%	0.01%	0.00	0.16	0.02	0.00	0.00	0.00
T6 OOS Class 5	Diesel	0.00%	0.01%	0.00	0.18	0.01	0.00	0.00	0.00
T6 OOS Class 6	Diesel	0.00%	0.02%	0.01	0.49	0.05	0.01	0.01	0.01
T6 OOS Class 7	Diesel	0.01%	0.16%	0.05	3.57	0.26	0.08	0.06	0.09

T6 Public Class 4	Diesel	0.01%	0.14%	0.59	47.64	1.34	0.08	0.24	0.08
T6 Public Class 4	Natural Gas	0.00%	0.00%	0.00	0.01	0.50	0.00	0.00	0.00
T6 Public Class 5	Diesel	0.02%	0.32%	0.67	44.03	1.98	0.19	0.22	0.19
T6 Public Class 5	Natural Gas	0.00%	0.03%	0.02	0.16	4.17	0.00	0.00	0.02
T6 Public Class 6	Diesel	0.02%	0.23%	0.77	54.25	1.90	0.13	0.32	0.14
T6 Public Class 6	Natural Gas	0.00%	0.02%	0.01	0.09	3.31	0.00	0.00	0.01
T6 Public Class 7	Diesel	0.04%	0.68%	2.49	163.36	5.85	0.39	1.12	0.40
T6 Public Class 7	Natural Gas	0.00%	0.04%	0.02	0.17	5.98	0.00	0.00	0.02
T6 Utility Class 5	Diesel	0.02%	0.29%	0.12	7.87	0.78	0.15	0.05	0.17
T6 Utility Class 5	Natural Gas	0.00%	0.00%	0.00	0.04	0.56	0.00	0.00	0.00
T6 Utility Class 6	Diesel	0.00%	0.06%	0.02	1.51	0.15	0.03	0.01	0.03
T6 Utility Class 6	Natural Gas	0.00%	0.00%	0.00	0.01	0.11	0.00	0.00	0.00
T6 Utility Class 7	Diesel	0.01%	0.08%	0.02	1.73	0.18	0.04	0.01	0.05
T6 Utility Class 7	Natural Gas	0.00%	0.00%	0.00	0.02	0.21	0.00	0.00	0.00
T6TS	Gasoline	0.20%	3.05%	13.22	82.98	277.83	2.70	0.21	1.80
T7 CAIRP Class 8	Diesel	0.95%	0.16%	0.11	12.81	0.51	0.12	0.26	0.28
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	1.12%	0.19%	0.12	14.15	0.51	0.14	0.29	0.33
T7 NOOS Class 8	Diesel	0.41%	0.07%	0.05	5.58	0.22	0.05	0.11	0.12
T7 Other Port Class 8	Diesel	0.09%	0.01%	0.01	1.25	0.08	0.01	0.01	0.03
T7 POAK Class 8	Diesel	0.31%	0.05%	0.03	4.64	0.30	0.04	0.05	0.09
T7 POAK Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.01	0.00	0.00	0.00
T7 Public Class 8	Diesel	0.09%	0.02%	0.08	5.72	0.27	0.01	0.03	0.03
T7 Public Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.03	0.00	0.00	0.00

T7 Single Concrete/Transit Mix	Diesel	0.03%	0.00%	0.00	0.23	0.01	0.00	0.00	0.01
T7 Single Concrete/Transit Mix	Natural Gas	0.00%	0.00%	0.00	0.00	0.08	0.00	0.00	0.00
T7 Single Dump Class 8	Diesel	0.11%	0.02%	0.01	1.36	0.09	0.01	0.02	0.03
T7 Single Dump Class 8	Natural Gas	0.01%	0.00%	0.00	0.02	0.41	0.00	0.00	0.00
T7 Single Other Class 8	Diesel	0.13%	0.02%	0.01	1.40	0.09	0.02	0.02	0.04
T7 Single Other Class 8	Natural Gas	0.01%	0.00%	0.00	0.02	0.43	0.00	0.00	0.00
T7 SWCV Class 8	Diesel	0.04%	0.01%	0.01	2.66	0.02	0.01	0.01	0.01
T7 SWCV Class 8	Natural Gas	0.05%	0.01%	0.04	0.82	8.29	0.00	0.00	0.01
T7 Tractor Class 8	Diesel	0.78%	0.13%	0.10	10.76	0.56	0.09	0.15	0.23
T7 Tractor Class 8	Natural Gas	0.11%	0.02%	0.01	0.43	7.54	0.00	0.00	0.03
T7 Utility Class 8	Diesel	0.02%	0.00%	0.00	0.17	0.02	0.00	0.00	0.00
T7IS	Gasoline	0.00%	0.00%	0.01	0.06	0.65	0.00	0.00	0.00
UBUS	Gasoline	0.05%	0.01%	0.00	0.02	0.22	0.00	0.00	0.00
UBUS	Diesel	0.18%	0.03%	0.12	1.05	0.14	0.02	0.01	0.05
UBUS	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
UBUS	Natural Gas	0.02%	0.00%	0.01	0.01	5.10	0.00	0.00	0.00
Total		100.00%	100.00%	116.63	1713.93	3601.46	26.76	22.56	45.56

Mobile Greenhouse Gas Emissions: Existing Conditions (2023)

Source: EMFAC2021 Version 1.0.2 web database. Emission Rates with Adjusted Factors. Alameda (SF) Sub-Area

Adjusted 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.

		Fleet Mix		
		Auto and LHDT	MHDT	HHDT
Kittelson		74%	25%	1%
EMFAC Default		94%	2%	5%

				CO ₂	CH ₄	N ₂ O			
				AR5 GWP	AR5 GWP	AR5 GWP			
EIR Study Area Annual VMT				775,828,169	1	28	265		
Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent for Livermore	CO ₂	CH ₄	N ₂ O	CO ₂ e		
All Other Buses	Diesel	0.04%	0.01%	56.33	0.00	0.01	58.69		
All Other Buses	Natural Gas	0.00%	0.00%	0.36	0.00	0.00	0.39		
LDA	Gasoline	46.53%	36.87%	80,850.02	0.75	1.44	81,253.88		
LDA	Diesel	0.16%	0.12%	228.95	0.00	0.04	238.55		
LDA	Electricity	4.10%	3.25%	0.00	0.00	0.00	0.00		
LDA	Plug-in Hybrid	1.42%	1.12%	1,205.15	0.00	0.01	1,206.63		
LDT1	Gasoline	4.13%	3.27%	8,478.17	0.16	0.25	8,548.26		
LDT1	Diesel	0.00%	0.00%	2.36	0.00	0.00	2.46		
LDT1	Electricity	0.01%	0.01%	0.00	0.00	0.00	0.00		
LDT1	Plug-in Hybrid	0.00%	0.00%	3.42	0.00	0.00	3.42		
LDT2	Gasoline	22.03%	17.46%	47,321.23	0.40	0.84	47,555.92		
LDT2	Diesel	0.08%	0.06%	155.24	0.00	0.02	161.74		
LDT2	Electricity	0.08%	0.06%	0.00	0.00	0.00	0.00		
LDT2	Plug-in Hybrid	0.17%	0.13%	133.95	0.00	0.00	134.12		
LHD1	Gasoline	1.65%	1.31%	9,052.49	0.10	0.11	9,084.79		
LHD1	Diesel	0.82%	0.65%	3,208.58	0.04	0.51	3,343.76		
LHD2	Gasoline	0.23%	0.18%	1,408.46	0.01	0.02	1,412.83		
LHD2	Diesel	0.35%	0.28%	1,663.60	0.02	0.26	1,733.54		
MCY	Gasoline	0.35%	0.28%	413.02	0.38	0.09	447.55		
MDV	Gasoline	11.27%	8.93%	29,292.30	0.29	0.56	29,450.13		
MDV	Diesel	0.17%	0.13%	431.87	0.00	0.07	449.91		
MDV	Plug-in Hybrid	0.09%	0.07%	74.52	0.00	0.00	74.61		
MH	Gasoline	0.04%	0.61%	9,267.33	0.09	0.14	9,306.40		
MH	Diesel	0.02%	0.24%	2,037.43	0.01	0.32	2,122.80		
Motor Coach	Diesel	0.02%	0.00%	56.43	0.00	0.01	58.79		
OBUS	Gasoline	0.08%	0.01%	174.04	0.00	0.00	174.67		
PTO	Diesel	0.06%	0.01%	148.89	0.00	0.02	155.11		
SBUS	Gasoline	0.01%	0.00%	10.22	0.00	0.00	10.35		
SBUS	Diesel	0.02%	0.00%	33.58	0.00	0.01	34.98		
SBUS	Natural Gas	0.00%	0.00%	2.42	0.01	0.00	2.75		
T6 CAIRP Class 4	Diesel	0.00%	0.01%	100.80	0.00	0.02	105.01		
T6 CAIRP Class 5	Diesel	0.00%	0.02%	138.12	0.00	0.02	143.89		
T6 CAIRP Class 6	Diesel	0.00%	0.04%	355.18	0.00	0.06	370.01		
T6 CAIRP Class 7	Diesel	0.02%	0.26%	2,106.43	0.00	0.33	2,194.40		
T6 Instate Delivery Class 4	Diesel	0.08%	1.24%	11,399.35	0.03	1.80	11,876.02		
T6 Instate Delivery Class 4	Natural Gas	0.00%	0.00%	30.98	0.02	0.01	33.35		
T6 Instate Delivery Class 5	Diesel	0.06%	0.93%	8,527.62	0.01	1.34	8,883.90		
T6 Instate Delivery Class 5	Natural Gas	0.00%	0.00%	16.34	0.01	0.00	17.60		
T6 Instate Delivery Class 6	Diesel	0.22%	3.32%	30,567.31	0.03	4.82	31,844.42		
T6 Instate Delivery Class 6	Natural Gas	0.00%	0.01%	46.68	0.04	0.01	50.25		
T6 Instate Delivery Class 7	Diesel	0.08%	1.18%	10,930.08	0.00	1.72	11,386.53		
T6 Instate Delivery Class 7	Natural Gas	0.00%	0.03%	254.48	0.19	0.05	273.47		
T6 Instate Other Class 4	Diesel	0.10%	1.52%	13,480.62	0.04	2.12	14,044.44		
T6 Instate Other Class 4	Natural Gas	0.00%	0.00%	25.35	0.02	0.01	27.21		
T6 Instate Other Class 5	Diesel	0.23%	3.49%	31,187.00	0.02	4.91	32,489.55		
T6 Instate Other Class 5	Natural Gas	0.00%	0.01%	52.95	0.04	0.01	56.83		
T6 Instate Other Class 6	Diesel	0.23%	3.51%	31,088.26	0.04	4.90	32,387.34		
T6 Instate Other Class 6	Natural Gas	0.00%	0.01%	44.74	0.03	0.01	48.01		
T6 Instate Other Class 7	Diesel	0.14%	2.14%	18,709.87	0.01	2.95	19,491.25		
T6 Instate Other Class 7	Natural Gas	0.00%	0.06%	406.69	0.27	0.08	436.10		

Mobile Greenhouse Gas Emissions: Existing Conditions (2023)

Source: EMFAC2021 Version 1.0.2 web database. Emission Rates with Adjusted Factors. Alameda (SF) Sub-Area

Adjusted 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.

		Fleet Mix		
		Auto and LHDT	MHDT	HHDT
Kittelson		74%	25%	1%
EMFAC Default		94%	2%	5%

				CO ₂	CH ₄	N ₂ O	
				AR5 GWP	AR5 GWP	AR5 GWP	
EIR Study Area Annual VMT		775,828,169		1	28	265	
Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent for Livermore	CO ₂	CH ₄	N ₂ O	CO ₂ e
T6 Instate Tractor Class 6	Diesel	0.00%	0.02%	152.83	0.00	0.02	159.22
T6 Instate Tractor Class 6	Natural Gas	0.00%	0.00%	0.27	0.00	0.00	0.29
T6 Instate Tractor Class 7	Diesel	0.08%	1.19%	9,928.23	0.00	1.56	10,342.85
T6 Instate Tractor Class 7	Natural Gas	0.00%	0.03%	214.52	0.14	0.04	230.04
T6 OOS Class 4	Diesel	0.00%	0.01%	53.97	0.00	0.01	56.23
T6 OOS Class 5	Diesel	0.00%	0.01%	73.98	0.00	0.01	77.07
T6 OOS Class 6	Diesel	0.00%	0.02%	190.23	0.00	0.03	198.17
T6 OOS Class 7	Diesel	0.01%	0.16%	1,301.89	0.00	0.21	1,356.25
T6 Public Class 4	Diesel	0.01%	0.14%	1,312.23	0.00	0.21	1,367.14
T6 Public Class 4	Natural Gas	0.00%	0.00%	25.71	0.02	0.01	27.73
T6 Public Class 5	Diesel	0.02%	0.32%	3,081.38	0.00	0.49	3,210.17
T6 Public Class 5	Natural Gas	0.00%	0.03%	223.35	0.18	0.05	240.54
T6 Public Class 6	Diesel	0.02%	0.23%	2,186.06	0.01	0.34	2,277.49
T6 Public Class 6	Natural Gas	0.00%	0.02%	179.37	0.15	0.04	193.21
T6 Public Class 7	Diesel	0.04%	0.68%	6,518.66	0.02	1.03	6,791.33
T6 Public Class 7	Natural Gas	0.00%	0.04%	319.37	0.27	0.07	344.11
T6 Utility Class 5	Diesel	0.02%	0.29%	2,529.21	0.00	0.40	2,634.83
T6 Utility Class 5	Natural Gas	0.00%	0.00%	30.71	0.02	0.01	32.96
T6 Utility Class 6	Diesel	0.00%	0.06%	475.79	0.00	0.07	495.66
T6 Utility Class 6	Natural Gas	0.00%	0.00%	6.05	0.00	0.00	6.50
T6 Utility Class 7	Diesel	0.01%	0.08%	659.96	0.00	0.10	687.52
T6 Utility Class 7	Natural Gas	0.00%	0.00%	11.18	0.01	0.00	12.00
T6TS	Gasoline	0.20%	3.05%	42,996.25	0.42	0.62	43,171.42
T7 CAIRP Class 8	Diesel	0.95%	0.16%	1,926.09	0.00	0.30	2,006.53
T7 CAIRP Class 8	Natural Gas	0.00%	0.00%	3.13	0.00	0.00	3.37
T7 NNOOS Class 8	Diesel	1.12%	0.19%	2,264.00	0.00	0.36	2,358.55
T7 NOOS Class 8	Diesel	0.41%	0.07%	822.59	0.00	0.13	856.95
T7 Other Port Class 8	Diesel	0.09%	0.01%	190.19	0.00	0.03	198.13
T7 POAK Class 8	Diesel	0.31%	0.05%	669.60	0.00	0.11	697.56
T7 POAK Class 8	Natural Gas	0.00%	0.00%	0.20	0.00	0.00	0.22
T7 Public Class 8	Diesel	0.09%	0.02%	227.09	0.00	0.04	236.58
T7 Public Class 8	Natural Gas	0.00%	0.00%	0.93	0.00	0.00	1.01
T7 Single Concrete/Transit Mix	Diesel	0.03%	0.00%	54.41	0.00	0.01	56.68
T7 Single Concrete/Transit Mix	Natural Gas	0.00%	0.00%	2.48	0.00	0.00	2.68
T7 Single Dump Class 8	Diesel	0.11%	0.02%	231.04	0.00	0.04	240.69
T7 Single Dump Class 8	Natural Gas	0.01%	0.00%	11.16	0.01	0.00	12.02
T7 Single Other Class 8	Diesel	0.13%	0.02%	278.03	0.00	0.04	289.64
T7 Single Other Class 8	Natural Gas	0.01%	0.00%	12.71	0.01	0.00	13.70
T7 SWCV Class 8	Diesel	0.04%	0.01%	211.37	0.00	0.03	220.20
T7 SWCV Class 8	Natural Gas	0.05%	0.01%	100.06	0.26	0.02	112.73
T7 Tractor Class 8	Diesel	0.78%	0.13%	1,576.28	0.00	0.25	1,642.11
T7 Tractor Class 8	Natural Gas	0.11%	0.02%	163.32	0.14	0.03	175.94
T7 Utility Class 8	Diesel	0.02%	0.00%	34.45	0.00	0.01	35.89
T7IS	Gasoline	0.00%	0.00%	6.55	0.00	0.00	6.66
UBUS	Gasoline	0.05%	0.01%	63.43	0.00	0.00	63.52
UBUS	Diesel	0.18%	0.03%	293.57	0.00	0.05	305.85
UBUS	Electricity	0.00%	0.00%	0.00	0.00	0.00	0.00
UBUS	Natural Gas	0.02%	0.00%	27.64	0.07	0.01	31.19
Total				436820.76	4.80	36.65	446667.72

Source: EMFAC2021 (v1.0.2) Emission Rates with Adjusted Factors

Region Type: Sub-Area
 Region: Alameda (SF)
 Calendar Year: 2023
 Season: Annual

Vehicle Classification: EMFAC202x Categories

Units: miles/day for CVMT and EVMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HOTSOAK and RUNLOSS, g/vehicle/day for IDLEX and DIURN. PHEV calculated based on total VMT.

Vehicle Category	Model Year	Speed	Fuel	Standard Fuel Column	Population	VMT Total	g/mile															PM 2.5 Total Adjusted	CO2 RUNEX	CH4 RUNEX	N2O RUNEX	% of VMT
							ROG RUNEX	ROG RUNEX Adjusted	NOx RUNEX	NOx RUNEX Adjusted	CO RUNEX	SOx RUNEX	PM10 RUNEX	PM10 PMTW	PM10 PMBW	PM10 TOTAL	PM10 TOTAL Adjusted	PM2.5 RUNEX	PM2.5 PMTW	PM2.5 PMBW	PM 2.5 Total					
All Other Buses	Aggregate	Aggregate	Diesel	DSL	280,91817	16165.98	1.30E-01	1.30E-01	2.03E+00	2.03E+00	3.79E-01	1.10E-02	4.64E-02	1.20E-02	4.61E-02	1.05E-01	1.05E-01	4.44E-02	3.00E-03	1.61E-02	6.35E-02	6.35E-02	1.16E+03	6.05E-03	1.83E-01	0.04%
All Other Buses	Aggregate	Aggregate	Natural Gas	NG	1,767,4017	113.77	1.11E-02	1.11E-02	2.16E-01	2.16E-01	3.22E+00	0.00E+00	1.02E-03	1.20E-02	4.61E-02	5.92E-02	5.92E-02	9.38E-04	3.00E-03	1.61E-02	2.01E-02	2.01E-02	1.05E+03	7.76E-01	2.14E-01	0.00%
LDA	Aggregate	Aggregate	Gasoline	GAS	554013.66	20036783.06	1.03E-02	1.03E-02	4.87E-02	4.87E-02	7.60E-01	2.79E-03	1.33E-03	8.00E-03	6.93E-03	1.63E-02	1.63E-02	1.22E-03	2.00E-03	2.42E-03	5.65E-03	5.65E-03	2.83E+02	2.62E-03	5.05E-03	46.53%
LDA	Aggregate	Aggregate	Diesel	DSL	2383.836	66808.06	3.51E-02	3.51E-02	2.73E-01	2.73E-01	3.72E-01	2.27E-03	2.35E-02	8.00E-03	7.04E-03	3.85E-02	3.85E-02	2.24E-02	2.00E-03	2.46E-03	2.69E-02	2.69E-02	2.40E+02	1.63E-03	3.78E-02	0.16%
LDA	Aggregate	Aggregate	Electricity	ELEC	40729.04	1764778.78	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	2.00E-03	1.53E-03	3.53E-03	3.53E-03	0.00E+00	0.00E+00	0.00E+00	4.10%
LDA	Aggregate	Aggregate	Plug-in Hybrid	PHE	13516.124	611113.72	1.38E-03	1.38E-03	3.27E-03	3.27E-03	2.09E-01	1.37E-03	7.18E-04	8.00E-03	3.78E-03	1.25E-02	1.25E-02	6.61E-04	2.00E-03	1.32E-03	3.98E-03	3.98E-03	1.38E+02	4.36E-04	5.95E-04	1.42%
LDT1	Aggregate	Aggregate	Gasoline	GAS	53163.536	1776790.80	2.81E-02	2.81E-02	1.33E-01	1.33E-01	1.39E+00	3.30E-03	1.91E-03	8.00E-03	8.47E-03	1.84E-02	1.84E-02	1.76E-03	2.00E-03	2.96E-03	6.72E-03	6.72E-03	3.34E+02	6.32E-03	9.76E-03	41.3%
LDT1	Aggregate	Aggregate	Diesel	DSL	32,096,047	392.22	3.01E-01	3.01E-01	1.68E+00	1.68E+00	1.70E+00	3.99E-03	2.55E-01	8.00E-03	9.73E-03	2.72E-01	2.72E-01	2.44E-01	2.00E-03	3.41E-03	2.49E-01	2.49E-01	4.22E+02	1.40E-02	6.64E-02	0.00%
LDT1	Aggregate	Aggregate	Electricity	ELEC	123,806.29	4654.82	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	2.00E-03	1.54E-03	3.54E-03	3.54E-03	0.00E+00	0.00E+00	0.00E+00	0.01%
LDT1	Aggregate	Aggregate	Plug-in Hybrid	PHE	36,591,316	1912.74	1.25E-03	1.25E-03	2.96E-03	2.96E-03	1.90E-01	1.24E-03	4.24E-04	8.00E-03	3.82E-03	1.24E-02	1.24E-02	3.90E-04	2.00E-03	1.34E-03	3.73E-03	3.73E-03	1.25E+02	3.98E-04	5.44E-04	0.00%
LDT2	Aggregate	Aggregate	Gasoline	GAS	246364.52	9488897.95	1.16E-02	1.16E-02	7.36E-02	7.36E-02	8.33E-01	3.45E-03	1.37E-03	8.00E-03	8.15E-03	1.75E-02	1.75E-02	1.26E-03	2.00E-03	2.85E-03	6.11E-03	6.11E-03	3.49E+02	2.96E-03	6.22E-03	22.03%
LDT2	Aggregate	Aggregate	Diesel	DSL	848.13943	34133.24	1.42E-02	1.42E-02	5.62E-02	5.62E-02	1.37E-01	3.02E-03	5.87E-03	8.00E-03	8.11E-03	2.20E-02	2.20E-02	5.61E-03	2.00E-03	2.84E-03	1.05E-02	1.05E-02	3.19E+02	6.58E-04	5.02E-02	0.08%
LDT2	Aggregate	Aggregate	Electricity	ELEC	910.30372	32841.05	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	2.00E-03	1.52E-03	3.52E-03	3.52E-03	0.00E+00	0.00E+00	0.00E+00	0.08%
LDT2	Aggregate	Aggregate	Plug-in Hybrid	PHE	1432.9683	71864.96	1.30E-03	1.30E-03	3.09E-03	3.09E-03	1.98E-01	1.29E-03	5.50E-04	8.00E-03	3.81E-03	1.24E-02	1.24E-02	5.05E-04	2.00E-03	1.33E-03	3.84E-03	3.84E-03	1.31E+02	4.14E-04	5.67E-04	0.17%
LHD1	Aggregate	Aggregate	Gasoline	GAS	18928.505	709756.83	4.87E-02	4.87E-02	1.97E-01	1.97E-01	1.25E+00	8.83E-03	1.70E-03	8.00E-03	7.80E-02	8.77E-02	8.77E-02	1.56E-03	2.00E-03	2.73E-02	3.09E-02	3.09E-02	8.93E+02	9.65E-03	1.10E-02	1.65%
LHD1	Aggregate	Aggregate	Diesel	DSL	8925.7439	352807.82	1.86E-01	1.86E-01	1.81E+00	1.81E+00	5.65E-01	6.04E-03	4.06E-02	1.20E-02	7.80E-02	1.31E-01	1.31E-01	3.88E-02	3.00E-03	2.73E-02	6.91E-02	6.91E-02	6.37E+02	8.66E-03	1.00E-01	0.82%
LHD2	Aggregate	Aggregate	Gasoline	GAS	2690.8715	98114.74	3.43E-02	3.43E-02	1.89E-01	1.89E-01	9.94E-01	9.94E-03	1.52E-03	8.00E-03	9.10E-02	1.01E-01	1.01E-01	1.40E-03	2.00E-03	3.19E-02	3.52E-02	3.52E-02	1.01E+03	7.29E-03	1.10E-02	0.23%
LHD2	Aggregate	Aggregate	Diesel	DSL	3758.3147	152722.22	1.70E-01	1.70E-01	1.38E+00	1.38E+00	4.41E-01	7.23E-03	3.62E-02	1.20E-02	9.10E-02	1.39E-01	1.39E-01	3.46E-02	3.00E-03	3.19E-02	6.94E-02	6.94E-02	7.63E+02	7.90E-03	1.20E-01	0.35%
MCY	Aggregate	Aggregate	Gasoline	GAS	26178.521	151525.78	1.19E+00	1.19E+00	6.18E-01	6.18E-01	1.39E+01	1.89E-03	1.93E-03	4.00E-03	1.20E-02	1.79E-02	1.79E-02	1.81E-03	1.00E-03	4.20E-03	7.01E-03	7.01E-03	1.91E+02	1.77E-01	4.15E-02	0.35%
MDV	Aggregate	Aggregate	Gasoline	GAS	132134.97	4851445.22	1.79E-02	1.79E-02	1.12E-01	1.12E-01	9.94E-01	4.18E-03	1.39E-03	8.00E-03	8.28E-03	1.77E-02	1.77E-02	1.27E-03	2.00E-03	2.90E-03	6.17E-03	6.17E-03	4.23E+02	4.18E-03	8.16E-03	11.27%
MDV	Aggregate	Aggregate	Diesel	DSL	1855.5025	72688.76	1.22E-02	1.22E-02	6.69E-02	6.69E-02	2.04E-01	3.94E-03	6.19E-03	8.00E-03	8.26E-03	2.25E-02	2.25E-02	5.92E-03	2.00E-03	2.89E-03	1.08E-02	1.08E-02	4.16E+02	5.66E-04	6.56E-02	0.17%
MDV	Aggregate	Aggregate	Plug-in Hybrid	PHE	81.316774	38866.84	1.34E-03	1.34E-03	3.18E-03	3.18E-03	2.03E-01	1.33E-03	6.81E-04	8.00E-03	3.79E-03	1.25E-02	1.25E-02	6.26E-04	2.00E-03	1.33E-03	3.95E-03	3.95E-03	1.34E+02	4.25E-04	5.81E-04	0.09%
MH	Aggregate	Aggregate	Gasoline	GAS	1923.0369	17442.55	8.25E-02	8.25E-02	4.99E-01	4.99E-01	2.07E+00	1.93E-02	1.97E-03	1.20E-02	4.50E-02	5.90E-02	5.90E-02	1.81E-03	3.00E-03	1.58E-02	2.06E-02	2.06E-02	1.95E+03	1.84E-02	2.91E-02	0.04%
MH	Aggregate	Aggregate	Diesel	DSL	683.94585	6905.48	1.23E-01	1.23E-01	4.22E+00	4.22E+00	4.13E-01	1.03E-02	1.04E-01	1.60E-02	4.48E-02	1.65E-01	1.65E-01	9.96E-02	4.00E-03	1.57E-02	1.19E-01	1.19E-01	1.08E+03	5.74E-03	1.70E-01	0.02%
Motor Coach	Aggregate	Aggregate	Diesel	DSL	74.072554	10553.46	1.50E-02	1.50E-02	1.75E+00	1.75E+00	7.66E-02	1.69E-02	3.01E-02	1.20E-02	7.41E-02	1.16E-01	1.16E-01	2.88E-02	3.00E-03	2.59E-02	5.77E-02	5.77E-02	1.78E+03	6.96E-04	2.81E-01	0.02%
OBUS	Aggregate	Aggregate	Gasoline	GAS	636.50609	32464.46	6.77E-02	6.77E-02	4.63E-01	4.63E-01	1.50E+00	1.77E-02	1.01E-03	1.20E-02	4.48E-02	5.78E-02	5.78E-02	9.31E-04	3.00E-03	1.57E-02	1.96E-02	1.96E-02	1.79E+03	1.38E-02	2.30E-02	0.08%
PTO	Aggregate	Aggregate	Diesel	DSL	0	23823.24	2.22E-02	2.22E-02	3.01E+00	3.01E+00	2.61E-01	1.97E-02	4.76E-03	0.00E+00	0.00E+00	4.76E-03	4.76E-03	4.55E-03	0.00E+00	0.00E+00	4.55E-03	4.55E-03	2.08E+03	1.03E-03	3.28E-01	0.06%
SBUS	Aggregate	Aggregate	Gasoline	GAS	79.55306	4233.02	8.76E-02	8.76E-02	7.61E-01	7.61E-01	2.25E+00	7.95E-03	1.21E-03	8.00E-03	4.49E-02	5.41E-02	5.41E-02	1.12E-03	2.00E-03	1.57E-02	1.88E-02	1.88E-02	8.04E+02	1.79E-02	3.68E-02	0.01%
SBUS	Aggregate	Aggregate	Diesel	DSL	400.83528	9594.32	3.22E-02	3.22E-02	2.34E+00	2.34E+00	1.12E-01	1.10E-02	1.33E-02	1.20E-02	4.49E-02	7.02E-02	7.02E-02	1.27E-02	3.00E-03	1.57E-02	3.14E-02	3.14E-02	1.17E+03	1.50E-03	1.84E-01	0.02%
SBUS	Aggregate	Aggregate	Natural Gas	NG	24.87982	633.68	5.19E-02	5.20E-02	6.39E-01	6.39E-01	1.26E+01	0.00E+00	3.67E-03	1.20E-02	4.49E-02	6.06E-02	6.06E-02	3.38E-03	3.00E-03	1.57E-02	2.21E-02	2.21E-02	1.27E+03	3.64E+00	2.60E-01	0.00%
T6 CAIRP Class 4	Aggregate	Aggregate	Diesel	DSL	4.8893984	324.41	1.14E-02	1.14E-02	4.71E-01	4.71E-01	4.29E-02	1.08E-02	9.35E-03	1.20E-02	4.23E-02	6.37E-02	6.37E-02	8.94E-03	3.00E-03	1.48E-02	2.68E-02	2.68E-02	1.14E+03	5.30E-04	1.79E-01	0.00%
T6 CAIRP Class 5	Aggregate	Aggregate	Diesel	DSL	6.5638393	445.08	7.39E-03	7.39E-03	4.18E-01	4.18E-01	3.34E-02	1.08E-02	7.21E-03	1.20E-02	4.23E-02	6.15E-02	6.16E-02	6.90E-03	3.00E-03	1.48E-02	2.47E-02	2.47E-02	1.14E+03	3.43E-04	1.79E-01	0.00%
T6 CAIRP Class 6	Aggregate	Aggregate	Diesel	DSL	20.665275	1162.31	9.41E-03	9.41E-03	4.04E-01	4.04E-01	3.75E-02	1.06E-02	8.14E-03	1.20E-02	4.23E-02	6.24E-02	6.25E-02	7.78E-03	3.00E-03	1.48E-02	2.56E-02	2.56E-02	1.12E+03	4.37E-04	1.77E-01	0.00%
T6 CAIRP Class 7	Aggregate	Aggregate	Diesel	DSL	35.707512	7294.80	6.56E-03	6.56E-03	4.52E-01	4.53E-01	3.34E-02	1.00E-02	7.24E-03	1.20E-02	4.23E-02	6.										

Source: EMFAC2021 (v1.0.2) Emission Rates with

Region Type: Sub-Area
 Region: Alameda (SF)
 Calendar Year: 2023
 Season: Annual
 Vehicle Classification: EMFAC202x Categories
 Units: miles/day for CVMT and EVMT, trips/day for Trips, g/mile for RI

				lbs/Mile															1.000E-06
Vehicle Category	Model Year	Speed	Fuel	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	
All Other Buses	Aggregate	Aggregate	Diesel	2.871E-04	4.475E-03	8.365E-04	2.423E-05	1.023E-04	2.646E-05	1.017E-04	2.305E-04	9.787E-05	6.614E-06	3.560E-05	1.401E-04	2.558E+00	1.333E-05	4.031E-04	
All Other Buses	Aggregate	Aggregate	Natural Gas	2.444E-05	4.761E-04	7.091E-03	0.000E+00	2.248E-06	2.646E-05	1.017E-04	1.304E-04	2.067E-06	6.614E-06	3.560E-05	4.428E-05	2.312E+00	1.710E-03	4.713E-04	
LDA	Aggregate	Aggregate	Gasoline	2.277E-05	1.073E-04	1.675E-03	6.160E-06	2.935E-06	1.764E-05	1.527E-05	3.584E-05	2.698E-06	4.409E-06	5.345E-06	1.245E-05	6.231E-01	5.781E-06	1.113E-05	
LDA	Aggregate	Aggregate	Diesel	7.739E-05	6.012E-04	8.199E-04	5.014E-06	5.171E-05	1.764E-05	1.552E-05	8.487E-05	4.948E-05	4.409E-06	5.432E-06	5.932E-05	5.292E-01	3.595E-06	8.337E-05	
LDA	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.764E-05	9.648E-06	2.728E-05	0.000E+00	4.409E-06	3.377E-06	7.786E-06	0.000E+00	0.000E+00	0.000E+00	
LDA	Aggregate	Aggregate	Plug-in Hybrid	3.039E-06	7.203E-06	4.610E-04	3.010E-05	1.584E-06	1.764E-05	8.432E-06	2.756E-05	1.456E-06	4.409E-06	2.918E-06	8.783E-06	3.045E-01	9.620E-07	1.311E-06	
LDT1	Aggregate	Aggregate	Gasoline	6.187E-05	2.937E-04	3.067E-03	7.284E-06	4.21E-06	1.764E-05	1.866E-05	4.051E-05	3.875E-06	4.409E-06	6.532E-06	1.482E-05	7.368E-01	1.393E-05	2.152E-05	
LDT1	Aggregate	Aggregate	Diesel	6.636E-04	3.705E-03	3.738E-03	8.807E-06	5.615E-04	1.764E-05	2.145E-05	6.006E-04	5.372E-04	4.409E-06	7.507E-06	5.491E-04	9.294E-01	3.083E-05	1.464E-04	
LDT1	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.764E-05	9.692E-06	2.733E-05	0.000E+00	4.409E-06	3.392E-06	7.802E-06	0.000E+00	0.000E+00	0.000E+00	
LDT1	Aggregate	Aggregate	Plug-in Hybrid	2.755E-06	6.529E-06	4.185E-04	2.730E-06	9.343E-07	1.764E-05	8.432E-06	2.700E-05	8.590E-07	4.409E-06	2.951E-06	8.219E-06	2.762E-01	8.766E-07	1.200E-06	
LDT2	Aggregate	Aggregate	Gasoline	2.567E-05	1.623E-04	1.836E-03	7.613E-06	3.023E-06	1.764E-05	1.797E-05	3.863E-05	2.779E-06	4.409E-06	6.289E-06	1.348E-05	7.701E-01	6.534E-06	1.372E-05	
LDT2	Aggregate	Aggregate	Diesel	3.125E-05	1.239E-04	3.013E-04	6.655E-06	1.293E-05	1.764E-05	1.788E-05	4.845E-05	1.237E-05	4.409E-06	6.289E-06	2.304E-05	7.023E-01	1.452E-06	1.106E-04	
LDT2	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.764E-05	9.603E-06	2.724E-05	0.000E+00	4.409E-06	3.361E-06	7.770E-06	0.000E+00	0.000E+00	0.000E+00	
LDT2	Aggregate	Aggregate	Plug-in Hybrid	2.872E-06	6.806E-06	4.361E-04	2.845E-06	1.212E-06	1.764E-05	8.390E-06	2.724E-05	1.114E-06	4.409E-06	2.936E-06	8.460E-06	2.878E-01	9.137E-07	1.251E-06	
LHD1	Aggregate	Aggregate	Gasoline	1.073E-04	4.343E-04	2.752E-03	1.947E-05	3.751E-06	1.764E-05	1.720E-04	1.933E-04	3.449E-06	4.409E-06	6.019E-05	6.804E-05	1.969E+00	2.128E-05	2.427E-05	
LHD1	Aggregate	Aggregate	Diesel	4.111E-04	3.995E-03	1.159E-03	1.331E-05	8.949E-05	2.646E-05	1.720E-04	2.879E-04	8.562E-05	6.614E-06	6.019E-05	1.524E-04	1.404E+00	1.910E-05	2.213E-04	
LHD2	Aggregate	Aggregate	Gasoline	7.571E-05	4.163E-04	2.171E-03	2.191E-05	3.346E-06	1.764E-05	2.004E-04	2.216E-04	3.076E-06	4.409E-06	7.022E-05	7.770E-05	2.217E+00	1.608E-05	2.428E-05	
LHD2	Aggregate	Aggregate	Diesel	3.751E-04	3.039E-03	9.729E-04	1.594E-05	7.972E-05	2.646E-05	2.004E-04	3.068E-04	7.627E-05	6.614E-06	7.022E-05	1.531E-04	1.682E+00	1.742E-05	2.650E-04	
MCY	Aggregate	Aggregate	Gasoline	2.616E-03	1.361E-03	3.074E-02	4.161E-06	4.264E-06	8.818E-06	2.646E-05	3.954E-05	3.999E-06	4.409E-06	9.259E-06	1.546E-05	4.209E-01	3.898E-04	9.157E-05	
MDV	Aggregate	Aggregate	Gasoline	3.939E-05	2.465E-04	2.192E-03	9.217E-06	3.054E-06	1.764E-05	1.826E-05	3.895E-05	2.808E-06	4.409E-06	6.392E-06	1.361E-05	9.323E-01	9.221E-06	1.798E-05	
MDV	Aggregate	Aggregate	Diesel	2.686E-05	1.475E-04	4.490E-04	8.693E-06	1.365E-05	1.764E-05	1.821E-05	4.950E-05	1.305E-05	4.409E-06	6.375E-06	2.384E-05	9.174E-01	1.248E-06	1.445E-04	
MDV	Aggregate	Aggregate	Plug-in Hybrid	2.955E-06	7.002E-06	4.484E-04	2.927E-06	1.502E-06	1.764E-05	8.366E-06	2.750E-05	1.381E-06	4.409E-06	2.928E-06	8.718E-06	2.961E-01	9.378E-07	1.281E-06	
MH	Aggregate	Aggregate	Gasoline	1.819E-04	1.100E-03	4.554E-03	4.246E-05	4.336E-06	2.646E-05	9.925E-05	1.300E-04	3.986E-06	6.614E-06	3.474E-05	4.534E-05	4.295E+00	4.047E-05	6.406E-05	
MH	Aggregate	Aggregate	Diesel	2.722E-04	9.314E-03	9.098E-04	2.260E-05	2.295E-04	3.527E-05	9.873E-05	3.663E-04	2.196E-04	8.818E-06	3.456E-05	2.630E-04	2.385E+00	1.264E-05	3.758E-04	
Motor Coach	Aggregate	Aggregate	Diesel	3.302E-05	3.861E-03	1.688E-04	3.718E-05	6.626E-05	2.646E-05	1.634E-04	2.561E-04	6.340E-05	6.614E-06	5.178E-05	1.272E-04	3.926E+00	1.534E-06	6.186E-04	
OBUS	Aggregate	Aggregate	Gasoline	1.492E-04	1.022E-03	3.297E-03	3.891E-05	2.232E-06	2.646E-05	9.876E-05	1.275E-04	2.052E-06	6.614E-06	3.457E-05	4.323E-05	3.936E+00	3.050E-05	5.074E-05	
PTO	Aggregate	Aggregate	Diesel	4.887E-05	6.645E-03	5.761E-04	4.345E-05	1.049E-05	0.000E+00	0.000E+00	1.049E-05	0.000E+00	0.000E+00	0.000E+00	1.004E-05	4.589E+00	2.270E-06	7.230E-04	
SBUS	Aggregate	Aggregate	Gasoline	1.931E-04	1.678E-03	4.961E-03	1.752E-05	2.678E-06	1.764E-05	9.902E-05	1.193E-04	2.462E-06	4.409E-06	3.466E-05	4.153E-05	1.772E+00	3.952E-05	8.104E-05	
SBUS	Aggregate	Aggregate	Diesel	7.106E-05	5.156E-03	2.475E-04	2.433E-05	2.929E-05	2.646E-05	9.902E-05	1.548E-04	2.802E-05	6.614E-06	3.466E-05	6.930E-05	2.570E+00	3.301E-06	4.049E-04	
SBUS	Aggregate	Aggregate	Natural Gas	1.145E-04	1.409E-03	2.774E-02	0.000E+00	8.100E-06	2.646E-05	9.902E-05	1.336E-04	7.448E-06	6.614E-06	3.466E-05	4.874E-05	2.808E+00	8.014E-03	5.725E-04	
T6 CAIRP Class 4	Aggregate	Aggregate	Diesel	2.517E-05	1.040E-03	9.467E-05	2.378E-05	2.061E-05	2.646E-05	9.329E-05	1.404E-04	1.971E-05	6.614E-06	3.265E-05	5.901E-05	2.512E+00	1.169E-06	3.957E-04	
T6 CAIRP Class 5	Aggregate	Aggregate	Diesel	1.630E-05	9.215E-04	7.364E-05	2.375E-05	1.589E-05	2.646E-05	9.329E-05	1.357E-04	1.520E-05	6.614E-06	3.265E-05	5.449E-05	2.509E+00	7.569E-07	3.952E-04	
T6 CAIRP Class 6	Aggregate	Aggregate	Diesel	2.075E-05	8.932E-04	8.271E-05	2.339E-05	1.794E-05	2.646E-05	9.329E-05	1.378E-04	1.716E-05	6.614E-06	3.265E-05	5.649E-05	2.470E+00	9.632E-07	3.892E-04	
T6 CAIRP Class 7	Aggregate	Aggregate	Diesel	1.446E-05	9.983E-04	7.357E-05	2.210E-05	1.596E-05	2.646E-05	9.329E-05	1.358E-04	1.527E-05	6.614E-06	3.265E-05	5.457E-05	2.334E+00	6.714E-07	3.678E-04	
T6 Instate Delivery Class 4	Aggregate	Aggregate	Diesel	1.311E-04	2.988E-03	4.510E-04	2.474E-05	5.264E-05	2.646E-05	1.049E-04	1.840E-04	5.036E-05	6.614E-06	3.670E-05	9.369E-05	2.612E+00	6.087E-06	4.115E-04	
T6 Instate Delivery Class 4	Aggregate	Aggregate	Natural Gas	2.631E-05	2.719E-04	8.084E-03	0.000E+00	3.642E-06	2.646E-05	1.049E-04	1.351E-04	3.349E-06	6.614E-06	3.670E-05	4.670E-05	2.321E+00	1.839E-03	4.731E-04	
T6 Instate Delivery Class 5	Aggregate	Aggregate	Diesel	5.713E-05	1.968E-03	2.479E-04	2.468E-05	2.303E-05	2.646E-05	1.049E-04	1.544E-04	2.203E-05	6.614E-06	3.670E-05	6.536E-05	2.606E+00	2.653E-06	4.106E-04	
T6 Instate Delivery Class 5	Aggregate	Aggregate	Natural Gas	2.620E-05	2.844E-04	8.054E-03	0.000E+00	3.571E-06	2.646E-05	1.049E-04	1.350E-04	3.283E-06	6.614E-06	3.670E-05	4.663E-05	2.267E+00	1.832E-03	4.621E-04	
T6 Instate Delivery Class 6	Aggregate	Aggregate	Diesel	5.917E-05	1.936E-03	2.520E-04	2.476E-05	2.405E-05	2.646E-05	1.049E-04	1.554E-04	2.301E-05	6.614E-06	3.670E-05	6.634E-05	2.615E+00	2.748E-06	4.119E-04	
T6 Instate Delivery Class 6	Aggregate	Aggregate	Natural Gas	2.596E-05	3.124E-04	7.987E-03	0.000E+00	3.411E-06	2.646E-05	1.049E-04	1.348E-04	3.136E-06	6.614E-06	3.670E-05	4.649E-05	2.271E+00	1.815E-03	4.630E-04	
T6 Instate Delivery Class 7	Aggregate	Aggregate	Diesel	1.912E-05	1.668E-03	1.611E-04	2.486E-05	6.025E-06	2.646E-05	1.049E-04	1.374E-04	5.764E-06	6.614E-06	3.670E-05	4.908E-05	2.626E+00	8.882E-07	4.137E-04	
T6 Instate Delivery Class 7	Aggregate	Aggregate	Natural Gas	2.483E-05	4.423E-04	7.722E-03	0.000E+00	2.686E-06	2.646E-05	1.049E-04	1.340E-04	2.470E-06	6.614E-06	3.670E-05	4.579E-05	2.364E+00	1.737E-03	4.820E-04	
T6 Instate Other Class 4	Aggregate	Aggregate	Diesel	1.428E-04	3.462E-03	4.584E-04	2.382E-05	7.018E-05	2.646E-05	9.891E-05	1.956E-04	6.714E-05	6.614E-06	3.462E-05	1.084E-04	2.516E+00	6.633E-06	3.964E-04	
T6 Instate Other Class 4	Aggregate	Aggregate	Natural Gas	2.071E-05	2.259E-04	5.992E-03	0.000E+00	2.770E-06	2.646E-05	9.891E-05	1.282E-04	2.547E-06	6.614E-06	3.462E-05	4.379E-05	2.111E+00	1.449E-03	4.304E-04	
T6 Instate Other Class 5	Aggregate	Aggregate	Diesel	2.898E-05	1.416E-03	1.477E-04	2.402E-05	1.544E-05	2.646E-05	9.891E-05	1.408E-04	1.477E-05	6.614E-06	3.462E-05	5.601E-05	2.537E+00	1.346E-06	3.997E-04	
T6 Instate Other Class 5	Aggregate	Aggregate	Natural Gas	1.998E-05	2.911E-04	6.051E-03</													

Source: EMFAC2021 (v1.0.2) Emission Rates with

Region Type: Sub-Area
 Region: Alameda (SF)
 Calendar Year: 2023
 Season: Annual
 Vehicle Classification: EMFAC202x Categories
 Units: miles/day for CVMT and EVMT, trips/day for Trips, g/mile for RI

Vehicle Category	Model Year	Speed	Fuel	Mtons/Mile														
				ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PM8W	PM10_Total	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PM8W	PM2.5_Total	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
All Other Buses	Aggregate	Aggregate	Diesel	1.302E-07	2.030E-06	3.794E-07	1.099E-08	4.440E-08	1.200E-08	4.614E-08	1.045E-07	4.439E-08	3.000E-09	1.615E-08	6.354E-08	1.160E-03	6.048E-09	1.828E-07
All Other Buses	Aggregate	Aggregate	Natural Gas	1.108E-08	2.159E-07	3.216E-06	0.000E+00	1.020E-09	1.200E-08	4.614E-08	5.916E-08	9.378E-10	3.000E-09	1.615E-08	2.009E-08	1.049E-03	7.757E-07	2.138E-07
LDA	Aggregate	Aggregate	Gasoline	1.033E-08	4.868E-08	7.597E-07	2.794E-09	1.331E-09	8.000E-09	6.927E-09	1.626E-08	1.224E-09	2.000E-09	2.424E-09	5.648E-09	2.826E-04	2.622E-09	5.505E-09
LDA	Aggregate	Aggregate	Diesel	3.510E-08	2.727E-07	3.719E-07	2.274E-09	2.346E-08	8.000E-09	7.040E-09	3.850E-08	2.244E-08	2.000E-09	2.464E-09	2.691E-08	2.400E-04	1.630E-09	3.782E-08
LDA	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.000E-09	4.376E-09	1.238E-08	0.000E+00	2.000E-09	1.532E-09	3.532E-09	0.000E+00	0.000E+00	0.000E+00
LDA	Aggregate	Aggregate	Plug-in Hybrid	1.379E-09	3.267E-09	2.091E-07	1.366E-09	7.184E-10	1.200E-08	3.782E-09	1.250E-08	6.605E-10	2.000E-09	1.324E-09	3.984E-09	1.381E-04	4.364E-10	5.946E-10
LDT1	Aggregate	Aggregate	Gasoline	2.807E-08	1.332E-07	1.391E-06	3.304E-09	1.911E-09	8.000E-09	8.466E-09	1.838E-08	1.758E-09	2.000E-09	2.963E-09	6.720E-09	3.342E-04	6.316E-09	9.760E-09
LDT1	Aggregate	Aggregate	Diesel	3.010E-07	1.681E-06	1.695E-06	3.995E-09	2.547E-07	8.000E-09	9.730E-09	2.724E-07	2.437E-07	2.000E-09	3.405E-09	2.491E-07	4.216E-04	1.398E-08	6.642E-08
LDT1	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.000E-09	4.396E-09	1.240E-08	0.000E+00	2.000E-09	1.539E-09	3.539E-09	0.000E+00	0.000E+00	0.000E+00
LDT1	Aggregate	Aggregate	Plug-in Hybrid	1.250E-09	2.962E-09	1.898E-07	1.238E-09	4.238E-10	1.200E-08	3.825E-09	1.225E-08	3.897E-10	2.000E-09	1.339E-09	3.728E-09	1.253E-04	3.976E-10	5.443E-10
LDT2	Aggregate	Aggregate	Gasoline	1.165E-08	7.363E-08	8.327E-07	3.453E-09	1.371E-09	8.000E-09	8.151E-09	1.752E-08	1.261E-09	2.000E-09	2.853E-09	6.113E-09	3.493E-04	2.964E-09	6.224E-09
LDT2	Aggregate	Aggregate	Diesel	1.418E-08	5.621E-08	1.367E-07	3.019E-09	5.866E-09	8.000E-09	8.110E-09	2.198E-08	5.613E-09	2.000E-09	2.838E-09	1.045E-08	3.186E-04	6.585E-10	5.019E-08
LDT2	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.000E-09	4.356E-09	1.236E-08	0.000E+00	2.000E-09	1.525E-09	3.525E-09	0.000E+00	0.000E+00	0.000E+00
LDT2	Aggregate	Aggregate	Plug-in Hybrid	1.303E-09	3.087E-09	1.978E-07	1.291E-09	5.497E-10	1.200E-08	3.806E-09	1.236E-08	5.054E-10	2.000E-09	1.332E-09	3.373E-09	1.306E-04	4.145E-10	5.674E-10
LHD1	Aggregate	Aggregate	Gasoline	4.866E-08	1.970E-07	1.248E-06	8.832E-09	1.702E-09	8.000E-09	7.800E-08	8.770E-08	1.565E-09	2.000E-09	2.730E-08	3.086E-08	8.934E-04	9.654E-09	1.101E-08
LHD1	Aggregate	Aggregate	Diesel	1.865E-07	1.812E-06	5.256E-07	6.036E-09	4.059E-08	1.200E-08	7.800E-08	1.306E-07	3.884E-08	3.000E-09	2.730E-08	6.914E-08	6.370E-04	8.662E-09	1.004E-07
LHD2	Aggregate	Aggregate	Gasoline	3.434E-08	1.888E-07	9.848E-07	9.940E-09	1.518E-09	8.000E-09	9.100E-08	1.005E-07	1.395E-09	2.000E-09	3.185E-08	3.525E-08	1.005E-03	7.295E-09	1.101E-08
LHD2	Aggregate	Aggregate	Diesel	1.702E-07	1.379E-06	4.413E-07	7.230E-09	3.616E-08	1.200E-08	9.100E-08	1.392E-07	3.460E-08	3.000E-09	3.185E-08	6.945E-08	7.630E-04	7.903E-09	1.202E-07
MCY	Aggregate	Aggregate	Gasoline	1.187E-06	6.176E-07	1.394E-05	1.887E-09	1.934E-09	4.000E-09	1.200E-08	1.793E-08	1.813E-09	1.000E-09	4.200E-09	7.013E-09	1.909E-04	1.768E-07	4.153E-08
MDV	Aggregate	Aggregate	Gasoline	1.787E-08	1.118E-07	9.944E-07	4.181E-09	1.385E-09	8.000E-09	8.285E-09	1.767E-08	1.274E-09	2.000E-09	2.900E-09	6.173E-09	4.229E-04	4.183E-09	8.157E-09
MDV	Aggregate	Aggregate	Diesel	1.219E-08	6.690E-08	2.037E-07	3.943E-09	6.189E-09	8.000E-09	8.262E-09	2.245E-08	5.922E-09	2.000E-09	2.892E-09	1.081E-08	4.161E-04	5.660E-10	6.556E-08
MDV	Aggregate	Aggregate	Plug-in Hybrid	1.340E-09	3.176E-09	2.034E-07	1.328E-09	6.812E-10	8.000E-09	3.795E-09	1.248E-08	6.263E-10	2.000E-09	1.328E-09	3.955E-09	1.343E-04	4.254E-10	5.812E-10
MH	Aggregate	Aggregate	Gasoline	8.251E-08	4.988E-07	2.065E-06	1.926E-08	1.967E-09	1.200E-08	4.502E-08	5.898E-08	1.808E-09	3.000E-09	1.576E-08	2.056E-08	1.948E-03	1.836E-08	2.906E-08
MH	Aggregate	Aggregate	Diesel	1.235E-07	4.225E-06	4.127E-07	1.025E-08	1.041E-07	1.600E-08	4.479E-08	1.649E-07	9.962E-08	4.000E-09	1.567E-08	1.193E-07	1.082E-03	5.735E-09	1.704E-07
Motor Coach	Aggregate	Aggregate	Diesel	1.498E-08	1.751E-06	7.657E-08	1.686E-08	3.006E-08	1.200E-08	7.410E-08	1.162E-07	2.876E-08	3.000E-09	2.593E-08	5.771E-08	1.781E-03	6.956E-10	2.806E-07
OBUS	Aggregate	Aggregate	Gasoline	6.766E-08	4.634E-07	1.495E-06	1.765E-08	1.012E-09	1.200E-08	4.480E-08	5.781E-08	9.308E-10	3.000E-09	1.568E-08	1.961E-08	1.785E-03	1.384E-08	2.302E-08
PTO	Aggregate	Aggregate	Diesel	2.217E-08	3.014E-06	2.613E-07	1.971E-08	4.759E-09	0.000E+00	4.553E-09	4.760E-09	0.000E+00	0.000E+00	0.000E+00	4.554E-09	2.081E-03	1.029E-09	3.279E-07
SBUS	Aggregate	Aggregate	Gasoline	8.760E-08	7.613E-07	2.250E-06	7.947E-09	1.215E-09	8.000E-09	4.492E-08	5.413E-08	1.117E-09	2.000E-09	1.572E-08	1.884E-08	8.039E-04	1.793E-08	3.676E-08
SBUS	Aggregate	Aggregate	Diesel	3.223E-08	2.339E-06	1.123E-07	1.104E-08	1.328E-08	1.200E-08	4.492E-08	7.021E-08	1.271E-08	3.000E-09	1.572E-08	3.143E-08	1.166E-03	1.497E-09	1.836E-07
SBUS	Aggregate	Aggregate	Natural Gas	5.196E-08	6.392E-07	1.258E-05	0.000E+00	3.674E-09	1.200E-08	4.492E-08	6.062E-08	3.378E-09	3.000E-09	1.572E-08	2.211E-08	1.274E-03	3.635E-06	2.597E-07
T6 CAIRP Class 4	Aggregate	Aggregate	Diesel	1.142E-08	4.716E-07	4.294E-08	1.079E-08	9.347E-09	1.200E-08	4.231E-08	6.370E-08	8.943E-09	3.000E-09	1.481E-08	2.677E-08	1.139E-03	5.302E-10	1.795E-07
T6 CAIRP Class 5	Aggregate	Aggregate	Diesel	7.395E-09	4.180E-07	3.340E-08	1.078E-08	7.207E-09	1.200E-08	4.231E-08	6.155E-08	6.895E-09	3.000E-09	1.481E-08	2.472E-08	1.138E-03	3.433E-10	1.793E-07
T6 CAIRP Class 6	Aggregate	Aggregate	Diesel	9.413E-09	4.051E-07	3.751E-08	1.061E-08	8.136E-09	1.200E-08	4.231E-08	6.252E-08	7.784E-09	3.000E-09	1.481E-08	2.562E-08	1.120E-03	4.369E-10	1.765E-07
T6 CAIRP Class 7	Aggregate	Aggregate	Diesel	6.559E-09	4.528E-07	3.337E-08	1.003E-08	7.238E-09	1.200E-08	4.231E-08	6.159E-08	6.925E-09	3.000E-09	1.481E-08	2.475E-08	1.059E-03	3.045E-10	1.668E-07
T6 Instate Delivery Class 4	Aggregate	Aggregate	Diesel	5.945E-08	1.356E-06	2.046E-07	1.122E-08	2.388E-08	1.200E-08	4.756E-08	8.346E-08	2.284E-08	3.000E-09	1.665E-08	4.250E-08	1.185E-03	2.761E-09	1.867E-07
T6 Instate Delivery Class 5	Aggregate	Aggregate	Natural Gas	1.193E-08	1.234E-07	3.667E-06	0.000E+00	1.652E-09	1.200E-08	4.756E-08	6.127E-08	1.519E-09	3.000E-09	1.665E-08	2.118E-08	1.053E-03	8.343E-07	2.146E-07
T6 Instate Delivery Class 5	Aggregate	Aggregate	Diesel	2.591E-08	8.927E-07	1.125E-07	1.119E-08	1.045E-08	1.200E-08	4.756E-08	7.002E-08	9.993E-09	3.000E-09	1.665E-08	2.965E-08	1.182E-03	1.203E-09	1.862E-07
T6 Instate Delivery Class 6	Aggregate	Aggregate	Natural Gas	1.188E-08	1.290E-07	3.653E-06	0.000E+00	1.620E-09	1.200E-08	4.756E-08	6.123E-08	1.489E-09	3.000E-09	1.665E-08	2.115E-08	1.028E-03	8.309E-07	2.096E-07
T6 Instate Delivery Class 6	Aggregate	Aggregate	Diesel	2.684E-08	8.784E-07	1.143E-07	1.123E-08	1.091E-08	1.200E-08	4.756E-08	7.049E-08	1.044E-08	3.000E-09	1.665E-08	3.009E-08	1.186E-03	1.246E-09	1.868E-07
T6 Instate Delivery Class 6	Aggregate	Aggregate	Natural Gas	1.178E-08	1.417E-07	3.623E-06	0.000E+00	1.547E-09	1.200E-08	4.756E-08	6.117E-08	1.422E-09	3.000E-09	1.665E-08	2.109E-08	1.030E-03	8.232E-07	2.100E-07
T6 Instate Delivery Class 7	Aggregate	Aggregate	Diesel	8.675E-09	7.566E-07	7.306E-08	1.128E-08	2.733E-09	1.200E-08	4.756E-08	6.230E-08	2.615E-09	3.000E-09	1.665E-08	2.226E-08	1.191E-03	4.029E-10	1.877E-07
T6 Instate Delivery Class 7	Aggregate	Aggregate	Natural Gas	1.126E-08	2.006E-07	3.503E-06	0.000E+00	1.218E-09	1.200E-08	4.756E-08	6.079E-08	1.120E-09	3.000E-09	1.665E-08	2.077E-08	1.072E-03	7.880E-07	2.186E-07
T6 Instate Other Class 4	Aggregate	Aggregate	Diesel	6.478E-08	1.570E-06	2.079E-07	1.081E-08	3.183E-08	1.200E-08	4.486E-08	8.870E-08	3.045E-08	3.000E-09	1.570E-08	4.916E-08	1.141E-03	3.009E-09	1.798E-07
T6 Instate Other Class 4	Aggregate	Aggregate	Natural Gas	9.392E-09	1.025E-07	2.718E-06	0.000E+00	1.256E-09	1.200E-08	4.486E-08	5.813E-08	1.155E-09	3.000E-09	1.570E-08	1.986E-08	9.577E-04	6.572E-07	1.952E-07
T6 Instate Other Class 5	Aggregate	Aggregate	Diesel	1.314E-08	6.425E-07	6.701E-08	1.090E-08	7.003E-09	1.200E-08	4.486E-08	6.388E-08	6.700E-09	3.000E-09	1.570E-08	2.541E-08	1.151E-03	6.104E-10	1.813E-07
T6 Instate Other Class 5	Aggregate	Aggregate	Natural Gas	9.061E-09	1.321E-07	2.745E-06	0.000E											

Mobile Criteria Air Pollutants: Existing in Year 2045

Source: EMFAC2021 Version 1.0.2 web database. Emission Rates with Adjusted Factors. Alameda (SF) Sub-Area

		Fleet Mix		
		Auto and LHDT	MHDT	HHDT
Kittelson		74%	25%	1%
EMFAC Default		94%	1%	5%

EIR Study Area Daily VMT		2,235,816		lbs/day					
Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent for Livermore	ROG	NOx	CO	SOx	PM10	PM2.5
All Other Buses	Diesel	0.04%	0.01%	0.01	0.27	0.03	0.00	0.02	0.01
All Other Buses	Natural Gas	0.00%	0.00%	0.00	0.00	0.02	0.00	0.00	0.00
LDA	Gasoline	42.37%	33.52%	5.89	32.56	745.78	3.64	25.92	8.22
LDA	Diesel	0.03%	0.02%	0.01	0.02	0.14	0.00	0.02	0.01
LDA	Electricity	6.25%	4.95%	0.00	0.00	0.00	0.00	3.02	0.86
LDA	Plug-in Hybrid	2.03%	1.60%	0.11	0.21	13.56	0.09	0.96	0.28
LDT1	Gasoline	2.68%	2.12%	0.41	2.25	50.24	0.27	1.79	0.58
LDT1	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
LDT1	Electricity	0.09%	0.07%	0.00	0.00	0.00	0.00	0.04	0.01
LDT1	Plug-in Hybrid	0.06%	0.05%	0.00	0.01	0.43	0.00	0.03	0.01
LDT2	Gasoline	23.08%	18.26%	4.49	20.69	477.54	2.39	15.36	4.92
LDT2	Diesel	0.09%	0.07%	0.05	0.10	0.44	0.01	0.07	0.03
LDT2	Electricity	0.67%	0.53%	0.00	0.00	0.00	0.00	0.32	0.09
LDT2	Plug-in Hybrid	0.63%	0.50%	0.04	0.07	4.21	0.03	0.30	0.09
LHD1	Gasoline	0.97%	0.76%	0.25	1.15	22.35	0.28	5.93	2.07
LHD1	Diesel	0.61%	0.48%	4.20	8.13	5.24	0.14	4.38	1.88
LHD2	Gasoline	0.11%	0.09%	0.02	0.14	2.64	0.04	0.77	0.27
LHD2	Diesel	0.28%	0.22%	2.31	5.07	3.06	0.07	2.33	1.02
MCY	Gasoline	0.34%	0.27%	13.01	6.20	128.78	0.02	0.24	0.10
MDV	Gasoline	12.96%	10.25%	2.70	12.50	277.35	1.62	8.68	2.78
MDV	Diesel	0.14%	0.11%	0.03	0.05	0.76	0.02	0.10	0.03
MDV	Plug-in Hybrid	0.39%	0.31%	0.02	0.04	2.61	0.02	0.19	0.05
MH	Gasoline	0.04%	0.90%	0.02	8.83	6.98	0.85	2.60	0.89
MH	Diesel	0.02%	0.49%	0.08	59.96	5.69	0.25	2.00	0.98
Motor Coach	Diesel	0.02%	0.00%	0.01	0.26	0.01	0.00	0.02	0.01
OBUS	Gasoline	0.02%	0.00%	0.02	0.08	0.06	0.00	0.01	0.00
PTO	Diesel	0.03%	0.01%	0.04	1.33	0.05	0.00	0.00	0.00
SBUS	Gasoline	0.01%	0.00%	0.01	0.01	0.02	0.00	0.01	0.00
SBUS	Diesel	0.01%	0.00%	0.01	0.06	0.00	0.00	0.01	0.00
SBUS	Natural Gas	0.00%	0.00%	0.00	0.00	0.06	0.00	0.00	0.00
T6 CAIRP Class 4	Diesel	0.00%	0.01%	0.00	0.28	0.01	0.00	0.07	0.03
T6 CAIRP Class 5	Diesel	0.00%	0.01%	0.00	0.38	0.02	0.01	0.09	0.03
T6 CAIRP Class 6	Diesel	0.00%	0.03%	0.00	1.03	0.04	0.02	0.24	0.09
T6 CAIRP Class 7	Diesel	0.02%	0.38%	0.01	6.16	0.55	0.16	1.48	0.58
T6 Instate Delivery Class 4	Diesel	0.05%	1.16%	0.03	60.67	3.08	0.57	7.31	2.56
T6 Instate Delivery Class 4	Natural Gas	0.00%	0.02%	0.00	0.09	2.91	0.00	0.10	0.03
T6 Instate Delivery Class 5	Diesel	0.04%	0.87%	0.02	45.14	2.30	0.43	5.49	1.92
T6 Instate Delivery Class 5	Natural Gas	0.00%	0.01%	0.00	0.07	2.14	0.00	0.07	0.03
T6 Instate Delivery Class 6	Diesel	0.13%	3.12%	0.08	162.23	8.21	1.54	19.64	6.86
T6 Instate Delivery Class 6	Natural Gas	0.00%	0.04%	0.00	0.25	7.56	0.00	0.26	0.09
T6 Instate Delivery Class 7	Diesel	0.06%	1.50%	0.03	66.72	4.85	0.76	7.24	2.54
T6 Instate Delivery Class 7	Natural Gas	0.00%	0.03%	0.00	0.30	6.10	0.00	0.16	0.05
T6 Instate Other Class 4	Diesel	0.06%	1.38%	0.03	55.92	2.91	0.66	8.75	3.17
T6 Instate Other Class 4	Natural Gas	0.00%	0.02%	0.00	0.10	2.48	0.00	0.12	0.04
T6 Instate Other Class 5	Diesel	0.13%	3.18%	0.07	125.89	6.65	1.51	20.10	7.27
T6 Instate Other Class 5	Natural Gas	0.00%	0.04%	0.00	0.23	5.60	0.00	0.27	0.09
T6 Instate Other Class 6	Diesel	0.13%	3.20%	0.07	128.70	6.71	1.52	20.21	7.32
T6 Instate Other Class 6	Natural Gas	0.00%	0.04%	0.00	0.23	5.64	0.00	0.27	0.09
T6 Instate Other Class 7	Diesel	0.10%	2.48%	0.05	95.02	6.39	1.19	12.78	4.68
T6 Instate Other Class 7	Natural Gas	0.00%	0.05%	0.00	0.36	7.09	0.00	0.26	0.09
T6 Instate Tractor Class 6	Diesel	0.00%	0.02%	0.00	0.64	0.03	0.01	0.10	0.04
T6 Instate Tractor Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.03	0.00	0.00	0.00
T6 Instate Tractor Class 7	Diesel	0.08%	1.91%	0.03	55.08	4.75	0.83	7.01	2.58
T6 Instate Tractor Class 7	Natural Gas	0.00%	0.04%	0.00	0.21	5.33	0.00	0.14	0.05
T6 OOS Class 4	Diesel	0.00%	0.01%	0.00	0.13	0.02	0.01	0.03	0.01
T6 OOS Class 5	Diesel	0.00%	0.02%	0.00	0.18	0.02	0.01	0.05	0.02
T6 OOS Class 6	Diesel	0.00%	0.04%	0.00	0.46	0.06	0.02	0.13	0.05
T6 OOS Class 7	Diesel	0.01%	0.31%	0.00	3.52	0.44	0.12	0.92	0.36
T6 Public Class 4	Diesel	0.00%	0.11%	0.00	6.10	0.32	0.06	0.64	0.23
T6 Public Class 4	Natural Gas	0.00%	0.01%	0.00	0.04	1.19	0.00	0.04	0.01
T6 Public Class 5	Diesel	0.01%	0.29%	0.01	13.73	0.79	0.15	1.60	0.57
T6 Public Class 5	Natural Gas	0.00%	0.02%	0.00	0.14	3.47	0.00	0.12	0.04
T6 Public Class 6	Diesel	0.01%	0.21%	0.01	9.65	0.55	0.10	1.14	0.41

T6 Public Class 6	Natural Gas	0.00%	0.02%	0.00	0.10	2.63	0.00	0.09	0.03
T6 Public Class 7	Diesel	0.03%	0.65%	0.02	25.44	1.67	0.33	3.29	1.18
T6 Public Class 7	Natural Gas	0.00%	0.05%	0.00	0.24	7.31	0.00	0.24	0.08
T6 Utility Class 5	Diesel	0.01%	0.20%	0.00	7.25	0.35	0.09	1.42	0.50
T6 Utility Class 5	Natural Gas	0.00%	0.00%	0.00	0.01	0.23	0.00	0.01	0.00
T6 Utility Class 6	Diesel	0.00%	0.04%	0.00	1.35	0.07	0.02	0.27	0.10
T6 Utility Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.04	0.00	0.00	0.00
T6 Utility Class 7	Diesel	0.00%	0.05%	0.00	1.79	0.09	0.02	0.37	0.13
T6 Utility Class 7	Natural Gas	0.00%	0.00%	0.00	0.00	0.06	0.00	0.00	0.00
T6TS	Gasoline	0.08%	2.03%	0.07	19.77	18.50	1.53	12.29	4.22
T7 CAIRP Class 8	Diesel	1.02%	0.15%	0.73	14.63	0.29	0.09	1.44	0.65
T7 CAIRP Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.04	0.00	0.00	0.00
T7 NNOOS Class 8	Diesel	1.54%	0.23%	0.84	15.20	0.43	0.13	1.69	0.75
T7 NOOS Class 8	Diesel	0.56%	0.08%	0.32	5.68	0.16	0.05	0.62	0.28
T7 Other Port Class 8	Diesel	0.10%	0.01%	0.06	1.28	0.05	0.01	0.13	0.05
T7 POAK Class 8	Diesel	0.34%	0.05%	0.21	4.70	0.16	0.03	0.46	0.18
T7 POAK Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.03	0.00	0.00	0.00
T7 Public Class 8	Diesel	0.06%	0.01%	0.11	1.34	0.06	0.01	0.11	0.04
T7 Public Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.03	0.00	0.00	0.00
T7 Single Concrete/Transit Mix Class 8	Diesel	0.01%	0.00%	0.01	0.19	0.00	0.00	0.03	0.01
T7 Single Concrete/Transit Mix Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.02	0.00	0.00	0.00
T7 Single Dump Class 8	Diesel	0.06%	0.01%	0.05	0.96	0.02	0.01	0.11	0.04
T7 Single Dump Class 8	Natural Gas	0.00%	0.00%	0.00	0.01	0.12	0.00	0.01	0.00
T7 Single Other Class 8	Diesel	0.09%	0.01%	0.08	1.57	0.04	0.01	0.19	0.07
T7 Single Other Class 8	Natural Gas	0.01%	0.00%	0.01	0.01	0.18	0.00	0.01	0.00
T7 SWCV Class 8	Diesel	0.01%	0.00%	0.01	0.23	0.00	0.00	0.01	0.01
T7 SWCV Class 8	Natural Gas	0.05%	0.01%	0.04	0.15	3.91	0.00	0.15	0.05
T7 Tractor Class 8	Diesel	0.93%	0.14%	0.56	11.69	0.34	0.08	1.20	0.50
T7 Tractor Class 8	Natural Gas	0.08%	0.01%	0.07	0.13	2.41	0.00	0.09	0.03
T7 Utility Class 8	Diesel	0.01%	0.00%	0.01	0.15	0.01	0.00	0.02	0.01
T7IS	Gasoline	0.00%	0.00%	0.01	0.02	0.07	0.00	0.00	0.00
UBUS	Gasoline	0.04%	0.01%	0.01	0.00	0.18	0.00	0.03	0.01
UBUS	Diesel	0.00%	0.00%	0.01	0.00	0.00	0.00	0.00	0.00
UBUS	Electricity	0.18%	0.03%	0.00	0.00	0.00	0.00	0.11	0.04
UBUS	Natural Gas	0.00%	0.00%	0.01	0.00	0.00	0.00	0.00	0.00
Total		100.00%	100.00%	37.43	1113.51	1885.78	21.84	216.30	76.12

Mobile Greenhouse Gas Emissions: Existing in Year 2045

Source: EMFAC2021 Version 1.0.2 web database. Emission Rates with Adjusted Factors. Alameda (SF) Sub-Area

Adjusted 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.

		Fleet Mix		
		Auto and LHDT	MHDT	HHDT
Kittelson		74%	25%	1%
EMFAC Default		94%	1%	5%

		CO ₂	CH ₄	N ₂ O
		AR5 GWP	AR5 GWP	AR5 GWP
EIR Study Area Annual VMT	775,828,169	1	28	265

Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent for Livermore	CO ₂	CH ₄	N ₂ O	CO ₂ e
All Other Buses	Diesel	0.04%	0.01%	44.63	0.00	0.01	46.50
All Other Buses	Natural Gas	0.00%	0.00%	0.75	0.00	0.00	0.81
LDA	Gasoline	42.37%	33.52%	57,936.70	0.25	0.83	58,163.17
LDA	Diesel	0.03%	0.02%	28.57	0.00	0.00	29.77
LDA	Electricity	6.25%	4.95%	0.00	0.00	0.00	0.00
LDA	Plug-in Hybrid	2.03%	1.60%	1,400.22	0.00	0.01	1,401.81
LDT1	Gasoline	2.68%	2.12%	4,251.82	0.02	0.05	4,266.85
LDT1	Diesel	0.00%	0.00%	0.06	0.00	0.00	0.07
LDT1	Electricity	0.09%	0.07%	0.00	0.00	0.00	0.00
LDT1	Plug-in Hybrid	0.06%	0.05%	44.24	0.00	0.00	44.29
LDT2	Gasoline	23.08%	18.26%	38,022.14	0.18	0.49	38,156.56
LDT2	Diesel	0.09%	0.07%	135.01	0.00	0.02	140.65
LDT2	Electricity	0.67%	0.53%	0.00	0.00	0.00	0.00
LDT2	Plug-in Hybrid	0.63%	0.50%	435.24	0.00	0.00	435.73
LHD1	Gasoline	0.97%	0.76%	4,456.19	0.01	0.01	4,459.14
LHD1	Diesel	0.61%	0.48%	2,242.65	0.02	0.35	2,336.71
LHD2	Gasoline	0.11%	0.09%	584.31	0.00	0.00	584.73
LHD2	Diesel	0.28%	0.22%	1,224.54	0.01	0.19	1,275.91
MCY	Gasoline	0.34%	0.27%	388.00	0.27	0.07	415.19
MDV	Gasoline	12.96%	10.25%	25,863.06	0.11	0.28	25,940.80
MDV	Diesel	0.14%	0.11%	280.51	0.00	0.04	292.23
MDV	Plug-in Hybrid	0.39%	0.31%	269.25	0.00	0.00	269.56
MH	Gasoline	0.04%	0.90%	13,589.06	0.03	0.13	13,623.64
MH	Diesel	0.02%	0.49%	4,157.57	0.01	0.66	4,331.55
Motor Coach	Diesel	0.02%	0.00%	42.77	0.00	0.01	44.56
OBUS	Gasoline	0.02%	0.00%	29.30	0.00	0.00	29.38
PTO	Diesel	0.03%	0.01%	68.66	0.00	0.01	71.53
SBUS	Gasoline	0.01%	0.00%	9.61	0.00	0.00	9.64
SBUS	Diesel	0.01%	0.00%	14.36	0.00	0.00	14.96
SBUS	Natural Gas	0.00%	0.00%	1.11	0.00	0.00	1.25
T6 CAIRP Class 4	Diesel	0.00%	0.01%	72.97	0.00	0.01	76.02
T6 CAIRP Class 5	Diesel	0.00%	0.01%	100.35	0.00	0.02	104.54
T6 CAIRP Class 6	Diesel	0.00%	0.03%	260.35	0.00	0.04	271.23
T6 CAIRP Class 7	Diesel	0.02%	0.38%	2,634.18	0.00	0.42	2,744.18
T6 Instate Delivery Class 4	Diesel	0.05%	1.16%	9,496.49	0.00	1.50	9,893.05
T6 Instate Delivery Class 4	Natural Gas	0.00%	0.02%	120.87	0.10	0.02	130.34
T6 Instate Delivery Class 5	Diesel	0.04%	0.87%	7,132.69	0.00	1.12	7,430.54
T6 Instate Delivery Class 5	Natural Gas	0.00%	0.01%	88.46	0.08	0.02	95.39
T6 Instate Delivery Class 6	Diesel	0.13%	3.12%	25,520.16	0.01	4.02	26,585.84
T6 Instate Delivery Class 6	Natural Gas	0.00%	0.04%	313.20	0.27	0.06	337.74
T6 Instate Delivery Class 7	Diesel	0.06%	1.50%	12,696.50	0.00	2.00	13,226.71
T6 Instate Delivery Class 7	Natural Gas	0.00%	0.03%	272.12	0.22	0.06	292.92
T6 Instate Other Class 4	Diesel	0.06%	1.38%	10,905.59	0.00	1.72	11,360.98
T6 Instate Other Class 4	Natural Gas	0.00%	0.02%	128.10	0.10	0.03	137.87
T6 Instate Other Class 5	Diesel	0.13%	3.18%	25,079.58	0.01	3.95	26,126.85
T6 Instate Other Class 5	Natural Gas	0.00%	0.04%	289.54	0.23	0.06	311.63
T6 Instate Other Class 6	Diesel	0.13%	3.20%	25,218.56	0.01	3.97	26,271.63
T6 Instate Other Class 6	Natural Gas	0.00%	0.04%	291.25	0.23	0.06	313.47
T6 Instate Other Class 7	Diesel	0.10%	2.48%	19,852.45	0.01	3.13	20,681.48
T6 Instate Other Class 7	Natural Gas	0.00%	0.05%	368.09	0.27	0.08	395.63

Mobile Greenhouse Gas Emissions: Existing in Year 2045

Source: EMFAC2021 Version 1.0.2 web database. Emission Rates with Adjusted Factors. Alameda (SF) Sub-Area
 Adjusted 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.

		Fleet Mix		
		Auto and LHDT	MHDT	HHDT
Kittelson		74%	25%	1%
EMFAC Default		94%	1%	5%

		CO ₂	CH ₄	N ₂ O
		AR5 GWP	AR5 GWP	AR5 GWP
EIR Study Area Annual VMT	775,828,169	1	28	265

Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent for Livermore	CO ₂	CH ₄	N ₂ O	CO ₂ e
T6 Instate Tractor Class 6	Diesel	0.00%	0.02%	122.71	0.00	0.02	127.84
T6 Instate Tractor Class 6	Natural Gas	0.00%	0.00%	1.43	0.00	0.00	1.54
T6 Instate Tractor Class 7	Diesel	0.08%	1.91%	13,877.66	0.00	2.19	14,457.20
T6 Instate Tractor Class 7	Natural Gas	0.00%	0.04%	271.25	0.21	0.06	291.69
T6 OOS Class 4	Diesel	0.00%	0.01%	87.58	0.00	0.01	91.23
T6 OOS Class 5	Diesel	0.00%	0.02%	120.23	0.00	0.02	125.25
T6 OOS Class 6	Diesel	0.00%	0.04%	313.25	0.00	0.05	326.33
T6 OOS Class 7	Diesel	0.01%	0.31%	2,052.79	0.00	0.32	2,138.51
T6 Public Class 4	Diesel	0.00%	0.11%	966.73	0.00	0.15	1,007.10
T6 Public Class 4	Natural Gas	0.00%	0.01%	59.65	0.05	0.01	64.38
T6 Public Class 5	Diesel	0.01%	0.29%	2,451.45	0.00	0.39	2,553.84
T6 Public Class 5	Natural Gas	0.00%	0.02%	177.10	0.16	0.04	191.04
T6 Public Class 6	Diesel	0.01%	0.21%	1,739.21	0.00	0.27	1,811.84
T6 Public Class 6	Natural Gas	0.00%	0.02%	134.93	0.12	0.03	145.55
T6 Public Class 7	Diesel	0.03%	0.65%	5,453.88	0.00	0.86	5,681.65
T6 Public Class 7	Natural Gas	0.00%	0.05%	371.43	0.33	0.08	400.79
T6 Utility Class 5	Diesel	0.01%	0.20%	1,576.00	0.00	0.25	1,641.81
T6 Utility Class 5	Natural Gas	0.00%	0.00%	12.06	0.01	0.00	13.00
T6 Utility Class 6	Diesel	0.00%	0.04%	297.96	0.00	0.05	310.40
T6 Utility Class 6	Natural Gas	0.00%	0.00%	2.28	0.00	0.00	2.46
T6 Utility Class 7	Diesel	0.00%	0.05%	408.32	0.00	0.06	425.37
T6 Utility Class 7	Natural Gas	0.00%	0.00%	3.12	0.00	0.00	3.37
T6TS	Gasoline	0.08%	2.03%	24,382.95	0.05	0.11	24,413.68
T7 CAIRP Class 8	Diesel	1.02%	0.15%	1,522.51	0.00	0.24	1,586.09
T7 CAIRP Class 8	Natural Gas	0.00%	0.00%	2.23	0.00	0.00	2.41
T7 NNOOS Class 8	Diesel	1.54%	0.23%	2,209.17	0.00	0.35	2,301.43
T7 NOOS Class 8	Diesel	0.56%	0.08%	802.23	0.00	0.13	835.74
T7 Other Port Class 8	Diesel	0.10%	0.01%	155.27	0.00	0.02	161.75
T7 POAK Class 8	Diesel	0.34%	0.05%	542.56	0.00	0.09	565.21
T7 POAK Class 8	Natural Gas	0.00%	0.00%	1.03	0.00	0.00	1.12
T7 Public Class 8	Diesel	0.06%	0.01%	109.16	0.00	0.02	113.72
T7 Public Class 8	Natural Gas	0.00%	0.00%	0.75	0.00	0.00	0.82
T7 Single Concrete/Transit Mix	Diesel	0.01%	0.00%	17.83	0.00	0.00	18.57
T7 Single Concrete/Transit Mix	Natural Gas	0.00%	0.00%	0.85	0.00	0.00	0.92
T7 Single Dump Class 8	Diesel	0.06%	0.01%	97.64	0.00	0.02	101.72
T7 Single Dump Class 8	Natural Gas	0.00%	0.00%	4.69	0.00	0.00	5.06
T7 Single Other Class 8	Diesel	0.09%	0.01%	159.90	0.00	0.03	166.57
T7 Single Other Class 8	Natural Gas	0.01%	0.00%	7.59	0.01	0.00	8.20
T7 SWCV Class 8	Diesel	0.01%	0.00%	25.22	0.00	0.00	26.28
T7 SWCV Class 8	Natural Gas	0.05%	0.01%	75.66	0.04	0.02	80.86
T7 Tractor Class 8	Diesel	0.93%	0.14%	1,400.34	0.00	0.22	1,458.82
T7 Tractor Class 8	Natural Gas	0.08%	0.01%	102.93	0.10	0.02	111.21
T7 Utility Class 8	Diesel	0.01%	0.00%	16.10	0.00	0.00	16.78
T7IS	Gasoline	0.00%	0.00%	0.65	0.00	0.00	0.66
UBUS	Gasoline	0.04%	0.01%	40.58	0.00	0.00	40.62
UBUS	Diesel	0.00%	0.00%	2.19	0.00	0.00	2.29
UBUS	Electricity	0.18%	0.03%	0.00	0.00	0.00	0.00
UBUS	Natural Gas	0.00%	0.00%	1.07	0.00	0.00	1.13
Total		100.00%	100.00%	358,543.97	3.56	31.57	367,008.86

Mobile Criteria Air Pollutants: Proposed General Plan (2045)

Source: EMFAC2021 Version 1.0.2 web database. Emission Rates with Adjusted Factors. Alameda (SF) Sub-Area

		Fleet Mix		
		Auto and LHDT	MHDT	HHDT
Kittelson		78%	21%	1%
EMFAC Default		94%	1%	5%

EIR Study Area Daily VMT		2,872,190		lbs/day					
Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent for Livermore	ROG	NOx	CO	SOx	PM10	PM2.5
All Other Buses	Diesel	0.04%	0.00%	0.01	0.27	0.04	0.00	0.02	0.01
All Other Buses	Natural Gas	0.00%	0.00%	0.00	0.00	0.02	0.00	0.00	0.00
LDA	Gasoline	42.37%	35.22%	6.29	43.94	1,006.44	4.91	34.98	11.09
LDA	Diesel	0.03%	0.02%	0.01	0.03	0.19	0.00	0.02	0.01
LDA	Electricity	6.25%	5.20%	0.00	0.00	0.00	0.00	4.08	1.16
LDA	Plug-in Hybrid	2.03%	1.69%	0.12	0.29	18.30	0.12	1.30	0.38
LDT1	Gasoline	2.68%	2.23%	0.44	3.03	67.80	0.36	2.42	0.78
LDT1	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
LDT1	Electricity	0.09%	0.07%	0.00	0.00	0.00	0.00	0.06	0.02
LDT1	Plug-in Hybrid	0.06%	0.05%	0.00	0.01	0.58	0.00	0.04	0.01
LDT2	Gasoline	23.08%	19.18%	4.79	27.92	644.44	3.22	20.72	6.64
LDT2	Diesel	0.09%	0.07%	0.06	0.13	0.60	0.01	0.10	0.04
LDT2	Electricity	0.67%	0.56%	0.00	0.00	0.00	0.00	0.44	0.12
LDT2	Plug-in Hybrid	0.63%	0.52%	0.04	0.09	5.69	0.04	0.40	0.12
LHD1	Gasoline	0.97%	0.80%	0.26	1.55	30.16	0.38	8.00	2.79
LHD1	Diesel	0.61%	0.50%	4.48	10.97	7.07	0.18	5.91	2.54
LHD2	Gasoline	0.11%	0.09%	0.03	0.19	3.56	0.05	1.04	0.36
LHD2	Diesel	0.28%	0.24%	2.47	6.84	4.13	0.10	3.14	1.37
MCY	Gasoline	0.34%	0.28%	13.89	8.37	173.79	0.03	0.33	0.13
MDV	Gasoline	12.96%	10.77%	2.88	16.86	374.28	2.19	11.72	3.76
MDV	Diesel	0.14%	0.12%	0.03	0.07	1.03	0.02	0.13	0.04
MDV	Plug-in Hybrid	0.39%	0.32%	0.02	0.05	3.52	0.02	0.25	0.07
MH	Gasoline	0.04%	0.77%	0.56	9.72	7.68	0.94	2.86	0.98
MH	Diesel	0.02%	0.42%	2.17	66.01	6.27	0.28	2.20	1.08
Motor Coach	Diesel	0.02%	0.00%	0.00	0.27	0.01	0.00	0.02	0.01
OBUS	Gasoline	0.02%	0.00%	0.00	0.08	0.06	0.00	0.01	0.00
PTO	Diesel	0.03%	0.00%	0.01	1.34	0.05	0.00	0.00	0.00
SBUS	Gasoline	0.01%	0.00%	0.00	0.01	0.02	0.00	0.01	0.00
SBUS	Diesel	0.01%	0.00%	0.00	0.06	0.00	0.00	0.01	0.00
SBUS	Natural Gas	0.00%	0.00%	0.00	0.00	0.06	0.00	0.00	0.00
T6 CAIRP Class 4	Diesel	0.00%	0.01%	0.01	0.30	0.01	0.00	0.07	0.03
T6 CAIRP Class 5	Diesel	0.00%	0.01%	0.01	0.42	0.02	0.01	0.10	0.04
T6 CAIRP Class 6	Diesel	0.00%	0.03%	0.02	1.13	0.05	0.02	0.26	0.10
T6 CAIRP Class 7	Diesel	0.02%	0.32%	0.15	6.78	0.61	0.17	1.63	0.64
T6 Instate Delivery Class 4	Diesel	0.05%	1.00%	0.77	66.80	3.39	0.63	8.05	2.81
T6 Instate Delivery Class 4	Natural Gas	0.00%	0.01%	0.02	0.10	3.21	0.00	0.11	0.04
T6 Instate Delivery Class 5	Diesel	0.04%	0.75%	0.57	49.70	2.53	0.47	6.04	2.11
T6 Instate Delivery Class 5	Natural Gas	0.00%	0.01%	0.02	0.08	2.35	0.00	0.08	0.03
T6 Instate Delivery Class 6	Diesel	0.13%	2.68%	2.05	178.61	9.04	1.69	21.62	7.55
T6 Instate Delivery Class 6	Natural Gas	0.00%	0.03%	0.06	0.27	8.32	0.00	0.29	0.10
T6 Instate Delivery Class 7	Diesel	0.06%	1.29%	0.90	73.46	5.34	0.84	7.97	2.80
T6 Instate Delivery Class 7	Natural Gas	0.00%	0.03%	0.03	0.33	6.72	0.00	0.17	0.06
T6 Instate Other Class 4	Diesel	0.06%	1.19%	0.84	61.56	3.20	0.72	9.63	3.49
T6 Instate Other Class 4	Natural Gas	0.00%	0.02%	0.02	0.11	2.73	0.00	0.13	0.04
T6 Instate Other Class 5	Diesel	0.13%	2.72%	1.93	138.60	7.33	1.66	22.13	8.01
T6 Instate Other Class 5	Natural Gas	0.00%	0.04%	0.05	0.25	6.17	0.00	0.29	0.10
T6 Instate Other Class 6	Diesel	0.13%	2.74%	1.94	141.69	7.39	1.67	22.25	8.06
T6 Instate Other Class 6	Natural Gas	0.00%	0.04%	0.05	0.25	6.21	0.00	0.29	0.10
T6 Instate Other Class 7	Diesel	0.10%	2.13%	1.46	104.61	7.03	1.31	14.07	5.15
T6 Instate Other Class 7	Natural Gas	0.00%	0.05%	0.04	0.40	7.81	0.00	0.28	0.10
T6 Instate Tractor Class 6	Diesel	0.00%	0.01%	0.01	0.71	0.04	0.01	0.11	0.04
T6 Instate Tractor Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.03	0.00	0.00	0.00
T6 Instate Tractor Class 7	Diesel	0.08%	1.64%	0.81	60.64	5.22	0.92	7.72	2.84
T6 Instate Tractor Class 7	Natural Gas	0.00%	0.03%	0.03	0.23	5.87	0.00	0.15	0.05
T6 OOS Class 4	Diesel	0.00%	0.01%	0.00	0.14	0.02	0.01	0.04	0.01
T6 OOS Class 5	Diesel	0.00%	0.01%	0.00	0.20	0.02	0.01	0.05	0.02
T6 OOS Class 6	Diesel	0.00%	0.04%	0.01	0.50	0.06	0.02	0.14	0.05
T6 OOS Class 7	Diesel	0.01%	0.26%	0.09	3.87	0.48	0.14	1.01	0.39
T6 Public Class 4	Diesel	0.00%	0.10%	0.12	6.72	0.35	0.06	0.70	0.26
T6 Public Class 4	Natural Gas	0.00%	0.01%	0.01	0.04	1.31	0.00	0.05	0.02
T6 Public Class 5	Diesel	0.01%	0.25%	0.27	15.12	0.87	0.16	1.76	0.63
T6 Public Class 5	Natural Gas	0.00%	0.02%	0.03	0.15	3.82	0.00	0.14	0.05
T6 Public Class 6	Diesel	0.01%	0.18%	0.19	10.63	0.61	0.12	1.25	0.45
T6 Public Class 6	Natural Gas	0.00%	0.01%	0.02	0.11	2.89	0.00	0.10	0.04

T6 Public Class 7	Diesel	0.03%	0.56%	0.52	28.01	1.84	0.36	3.62	1.30
T6 Public Class 7	Natural Gas	0.00%	0.04%	0.05	0.26	8.05	0.00	0.26	0.09
T6 Utility Class 5	Diesel	0.01%	0.17%	0.13	7.98	0.39	0.10	1.57	0.55
T6 Utility Class 5	Natural Gas	0.00%	0.00%	0.00	0.01	0.25	0.00	0.01	0.00
T6 Utility Class 6	Diesel	0.00%	0.03%	0.02	1.48	0.07	0.02	0.30	0.10
T6 Utility Class 6	Natural Gas	0.00%	0.00%	0.00	0.00	0.05	0.00	0.00	0.00
T6 Utility Class 7	Diesel	0.00%	0.04%	0.03	1.97	0.10	0.03	0.41	0.15
T6 Utility Class 7	Natural Gas	0.00%	0.00%	0.00	0.00	0.07	0.00	0.00	0.00
T6TS	Gasoline	0.08%	1.74%	1.76	21.76	20.37	1.69	13.53	4.65
T7 CAIRP Class 8	Diesel	1.02%	0.12%	0.11	14.72	0.29	0.09	1.45	0.65
T7 CAIRP Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.04	0.00	0.00	0.00
T7 NNOOS Class 8	Diesel	1.54%	0.18%	0.13	15.29	0.43	0.13	1.70	0.76
T7 NOOS Class 8	Diesel	0.56%	0.07%	0.05	5.71	0.16	0.05	0.62	0.28
T7 Other Port Class 8	Diesel	0.10%	0.01%	0.01	1.29	0.05	0.01	0.13	0.05
T7 POAK Class 8	Diesel	0.34%	0.04%	0.03	4.73	0.16	0.03	0.46	0.18
T7 POAK Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.03	0.00	0.00	0.00
T7 Public Class 8	Diesel	0.06%	0.01%	0.02	1.35	0.06	0.01	0.11	0.04
T7 Public Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.03	0.00	0.00	0.00
T7 Single Concrete/Transit Mix Class 8	Diesel	0.01%	0.00%	0.00	0.20	0.00	0.00	0.03	0.01
T7 Single Concrete/Transit Mix Class 8	Natural Gas	0.00%	0.00%	0.00	0.00	0.02	0.00	0.00	0.00
T7 Single Dump Class 8	Diesel	0.06%	0.01%	0.01	0.97	0.02	0.01	0.11	0.04
T7 Single Dump Class 8	Natural Gas	0.00%	0.00%	0.00	0.01	0.12	0.00	0.01	0.00
T7 Single Other Class 8	Diesel	0.09%	0.01%	0.01	1.58	0.04	0.01	0.19	0.07
T7 Single Other Class 8	Natural Gas	0.01%	0.00%	0.00	0.01	0.18	0.00	0.01	0.00
T7 SWCV Class 8	Diesel	0.01%	0.00%	0.00	0.23	0.00	0.00	0.01	0.01
T7 SWCV Class 8	Natural Gas	0.05%	0.01%	0.01	0.15	3.94	0.00	0.15	0.05
T7 Tractor Class 8	Diesel	0.93%	0.11%	0.08	11.76	0.34	0.08	1.20	0.50
T7 Tractor Class 8	Natural Gas	0.08%	0.01%	0.01	0.13	2.42	0.00	0.09	0.03
T7 Utility Class 8	Diesel	0.01%	0.00%	0.00	0.15	0.01	0.00	0.02	0.01
T7IS	Gasoline	0.00%	0.00%	0.00	0.02	0.07	0.00	0.00	0.00
UBUS	Gasoline	0.04%	0.00%	0.00	0.00	0.18	0.00	0.03	0.01
UBUS	Diesel	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
UBUS	Electricity	0.18%	0.02%	0.00	0.00	0.00	0.00	0.11	0.04
UBUS	Natural Gas	0.00%	0.00%	0.00	0.00	0.00	0.00	0.00	0.00
Total		100.00%	100.00%	54.09	1242.42	2506.60	26.15	255.04	89.34

Mobile Greenhouse Gas Emissions: Proposed General Plan (2045)

Source: EMFAC2021 Version 1.0.2 web database. Emission Rates with Adjusted Factors. Alameda (SF) Sub-Area
 Adjusted 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.

		Fleet Mix		
		Auto and LHDT	MHDT	HHDT
Kittelson		78%	21%	1%
EMFAC Default		94%	1%	5%

		CO ₂	CH ₄	N ₂ O
		AR5 GWP	AR5 GWP	AR5 GWP
EIR Study Area Annual VMT	996,649,857	1	28	265

Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent for Livermore	CO ₂	CH ₄	N ₂ O	CO ₂ e
All Other Buses	Diesel	0.04%	0.00%	44.91	0.00	0.01	46.79
All Other Buses	Natural Gas	0.00%	0.00%	0.75	0.00	0.00	0.81
LDA	Gasoline	42.37%	35.22%	78,185.94	0.34	1.12	78,491.56
LDA	Diesel	0.03%	0.02%	38.56	0.00	0.01	40.17
LDA	Electricity	6.25%	5.20%	0.00	0.00	0.00	0.00
LDA	Plug-in Hybrid	2.03%	1.69%	1,889.61	0.01	0.01	1,891.75
LDT1	Gasoline	2.68%	2.23%	5,737.86	0.02	0.07	5,758.14
LDT1	Diesel	0.00%	0.00%	0.09	0.00	0.00	0.09
LDT1	Electricity	0.09%	0.07%	0.00	0.00	0.00	0.00
LDT1	Plug-in Hybrid	0.06%	0.05%	59.70	0.00	0.00	59.77
LDT2	Gasoline	23.08%	19.18%	51,311.11	0.25	0.66	51,492.51
LDT2	Diesel	0.09%	0.07%	182.19	0.00	0.03	189.81
LDT2	Electricity	0.67%	0.56%	0.00	0.00	0.00	0.00
LDT2	Plug-in Hybrid	0.63%	0.52%	587.35	0.00	0.00	588.02
LHD1	Gasoline	0.97%	0.80%	6,013.66	0.01	0.01	6,017.64
LHD1	Diesel	0.61%	0.50%	3,026.47	0.02	0.48	3,153.40
LHD2	Gasoline	0.11%	0.09%	788.54	0.00	0.00	789.10
LHD2	Diesel	0.28%	0.24%	1,652.52	0.01	0.26	1,721.84
MCY	Gasoline	0.34%	0.28%	523.61	0.37	0.10	560.30
MDV	Gasoline	12.96%	10.77%	34,902.36	0.15	0.38	35,007.28
MDV	Diesel	0.14%	0.12%	378.55	0.00	0.06	394.36
MDV	Plug-in Hybrid	0.39%	0.32%	363.36	0.00	0.00	363.77
MH	Gasoline	0.04%	0.77%	14,961.15	0.03	0.14	14,999.23
MH	Diesel	0.02%	0.42%	4,577.36	0.02	0.72	4,768.91
Motor Coach	Diesel	0.02%	0.00%	43.03	0.00	0.01	44.83
OBUS	Gasoline	0.02%	0.00%	29.48	0.00	0.00	29.56
PTO	Diesel	0.03%	0.00%	69.09	0.00	0.01	71.97
SBUS	Gasoline	0.01%	0.00%	9.67	0.00	0.00	9.70
SBUS	Diesel	0.01%	0.00%	14.45	0.00	0.00	15.06
SBUS	Natural Gas	0.00%	0.00%	1.12	0.00	0.00	1.26
T6 CAIRP Class 4	Diesel	0.00%	0.01%	80.34	0.00	0.01	83.70
T6 CAIRP Class 5	Diesel	0.00%	0.01%	110.48	0.00	0.02	115.10
T6 CAIRP Class 6	Diesel	0.00%	0.03%	286.64	0.00	0.05	298.61
T6 CAIRP Class 7	Diesel	0.02%	0.32%	2,900.16	0.00	0.46	3,021.26
T6 Instate Delivery Class 4	Diesel	0.05%	1.00%	10,455.36	0.00	1.65	10,891.96
T6 Instate Delivery Class 4	Natural Gas	0.00%	0.01%	133.08	0.12	0.03	143.50
T6 Instate Delivery Class 5	Diesel	0.04%	0.75%	7,852.88	0.00	1.24	8,180.80
T6 Instate Delivery Class 5	Natural Gas	0.00%	0.01%	97.39	0.08	0.02	105.02
T6 Instate Delivery Class 6	Diesel	0.13%	2.68%	28,096.94	0.01	4.43	29,270.22
T6 Instate Delivery Class 6	Natural Gas	0.00%	0.03%	344.83	0.30	0.07	371.84
T6 Instate Delivery Class 7	Diesel	0.06%	1.29%	13,978.47	0.00	2.20	14,562.21
T6 Instate Delivery Class 7	Natural Gas	0.00%	0.03%	299.60	0.24	0.06	322.50
T6 Instate Other Class 4	Diesel	0.06%	1.19%	12,006.73	0.00	1.89	12,508.10
T6 Instate Other Class 4	Natural Gas	0.00%	0.02%	141.03	0.11	0.03	151.79
T6 Instate Other Class 5	Diesel	0.13%	2.72%	27,611.88	0.01	4.35	28,764.89
T6 Instate Other Class 5	Natural Gas	0.00%	0.04%	318.77	0.25	0.06	343.09
T6 Instate Other Class 6	Diesel	0.13%	2.74%	27,764.89	0.01	4.37	28,924.29
T6 Instate Other Class 6	Natural Gas	0.00%	0.04%	320.66	0.25	0.07	345.12
T6 Instate Other Class 7	Diesel	0.10%	2.13%	21,856.96	0.01	3.44	22,769.70
T6 Instate Other Class 7	Natural Gas	0.00%	0.05%	405.26	0.30	0.08	435.57

Mobile Greenhouse Gas Emissions: Proposed General Plan (2045)

Source: EMFAC2021 Version 1.0.2 web database. Emission Rates with Adjusted Factors. Alameda (SF) Sub-Area
 Adjusted 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.

		Fleet Mix		
		Auto and LHDT	MHDT	HHDT
Kittelson		78%	21%	1%
EMFAC Default		94%	1%	5%

		CO ₂	CH ₄	N ₂ O
		AR5 GWP	AR5 GWP	AR5 GWP
EIR Study Area Annual VMT	996,649,857	1	28	265

Vehicle Type	Fuel Type	Percent of VMT	Adjusted Percent for Livermore	CO ₂	CH ₄	N ₂ O	CO ₂ e
T6 Instate Tractor Class 6	Diesel	0.00%	0.01%	135.10	0.00	0.02	140.74
T6 Instate Tractor Class 6	Natural Gas	0.00%	0.00%	1.58	0.00	0.00	1.70
T6 Instate Tractor Class 7	Diesel	0.08%	1.64%	15,278.90	0.01	2.41	15,916.95
T6 Instate Tractor Class 7	Natural Gas	0.00%	0.03%	298.64	0.23	0.06	321.14
T6 OOS Class 4	Diesel	0.00%	0.01%	96.42	0.00	0.02	100.44
T6 OOS Class 5	Diesel	0.00%	0.01%	132.37	0.00	0.02	137.90
T6 OOS Class 6	Diesel	0.00%	0.04%	344.88	0.00	0.05	359.28
T6 OOS Class 7	Diesel	0.01%	0.26%	2,260.06	0.00	0.36	2,354.44
T6 Public Class 4	Diesel	0.00%	0.10%	1,064.34	0.00	0.17	1,108.79
T6 Public Class 4	Natural Gas	0.00%	0.01%	65.67	0.06	0.01	70.88
T6 Public Class 5	Diesel	0.01%	0.25%	2,698.98	0.00	0.43	2,811.70
T6 Public Class 5	Natural Gas	0.00%	0.02%	194.98	0.17	0.04	210.33
T6 Public Class 6	Diesel	0.01%	0.18%	1,914.81	0.00	0.30	1,994.78
T6 Public Class 6	Natural Gas	0.00%	0.01%	148.55	0.13	0.03	160.25
T6 Public Class 7	Diesel	0.03%	0.56%	6,004.56	0.00	0.95	6,255.33
T6 Public Class 7	Natural Gas	0.00%	0.04%	408.94	0.37	0.08	441.25
T6 Utility Class 5	Diesel	0.01%	0.17%	1,735.13	0.00	0.27	1,807.59
T6 Utility Class 5	Natural Gas	0.00%	0.00%	13.28	0.01	0.00	14.32
T6 Utility Class 6	Diesel	0.00%	0.03%	328.04	0.00	0.05	341.74
T6 Utility Class 6	Natural Gas	0.00%	0.00%	2.51	0.00	0.00	2.71
T6 Utility Class 7	Diesel	0.00%	0.04%	449.55	0.00	0.07	468.32
T6 Utility Class 7	Natural Gas	0.00%	0.00%	3.44	0.00	0.00	3.71
T6TS	Gasoline	0.08%	1.74%	26,844.91	0.05	0.12	26,878.74
T7 CAIRP Class 8	Diesel	1.02%	0.12%	1,531.88	0.00	0.24	1,595.85
T7 CAIRP Class 8	Natural Gas	0.00%	0.00%	2.25	0.00	0.00	2.42
T7 NNOOS Class 8	Diesel	1.54%	0.18%	2,222.76	0.00	0.35	2,315.58
T7 NOOS Class 8	Diesel	0.56%	0.07%	807.17	0.00	0.13	840.88
T7 Other Port Class 8	Diesel	0.10%	0.01%	156.22	0.00	0.02	162.75
T7 POAK Class 8	Diesel	0.34%	0.04%	545.89	0.00	0.09	568.69
T7 POAK Class 8	Natural Gas	0.00%	0.00%	1.04	0.00	0.00	1.12
T7 Public Class 8	Diesel	0.06%	0.01%	109.83	0.00	0.02	114.41
T7 Public Class 8	Natural Gas	0.00%	0.00%	0.76	0.00	0.00	0.83
T7 Single Concrete/Transit Mix	Diesel	0.01%	0.00%	17.94	0.00	0.00	18.68
T7 Single Concrete/Transit Mix	Natural Gas	0.00%	0.00%	0.86	0.00	0.00	0.93
T7 Single Dump Class 8	Diesel	0.06%	0.01%	98.24	0.00	0.02	102.34
T7 Single Dump Class 8	Natural Gas	0.00%	0.00%	4.72	0.00	0.00	5.09
T7 Single Other Class 8	Diesel	0.09%	0.01%	160.88	0.00	0.03	167.60
T7 Single Other Class 8	Natural Gas	0.01%	0.00%	7.63	0.01	0.00	8.25
T7 SWCV Class 8	Diesel	0.01%	0.00%	25.38	0.00	0.00	26.44
T7 SWCV Class 8	Natural Gas	0.05%	0.01%	76.13	0.04	0.02	81.35
T7 Tractor Class 8	Diesel	0.93%	0.11%	1,408.95	0.00	0.22	1,467.79
T7 Tractor Class 8	Natural Gas	0.08%	0.01%	103.56	0.10	0.02	111.89
T7 Utility Class 8	Diesel	0.01%	0.00%	16.20	0.00	0.00	16.88
T7IS	Gasoline	0.00%	0.00%	0.65	0.00	0.00	0.67
UBUS	Gasoline	0.04%	0.00%	40.83	0.00	0.00	40.87
UBUS	Diesel	0.00%	0.00%	2.21	0.00	0.00	2.30
UBUS	Electricity	0.18%	0.02%	0.00	0.00	0.00	0.00
UBUS	Natural Gas	0.00%	0.00%	1.08	0.00	0.00	1.13
Total		100.00%	100.00%	428,223.49	4.12	35.23	437,674.71

Source: EMFAC2021 (v1.0.2) Emission Rates with Adjusted Factors

Region Type: Sub-Area

Region: Alameda (SF)

Calendar Year: 2045

Season: Annual

Vehicle Classification: EMFAC202x Categories

Units: miles/day for CVMT and EVMT, trips/day for Trips, g/mile for RUNEX, PM8W and PMTW, g/trip for STREX, HOTSOAK and RUNLOSS, g/vehicle/day for IDLEX and DIURN. PHEV calculated based on total VMT.

		g/mile																					2.205E-03				
Vehicle Category	Model Year	Speed	Fuel	Standard Fuel Column	Population	VMT Total	CO2_RUNEX	CO2_RUNEX Adjusted	NOx_RUNEX	NOx_RUNEX Adjusted	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	PM10_TOTAL Adjusted	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL	PM2.5_TOTAL Adjusted	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	% of VMT	
All Other Buses	Aggregate	Aggregate	Diesel	DSL	362.16211	18763.98	2.80E-02	2.80E-02	7.89E-01	9.51E-01	1.25E-01	9.58E-03	8.07E-03	1.20E-02	4.61E-02	6.62E-02	6.64E-02	7.72E-03	3.00E-03	1.61E-02	2.69E-02	2.70E-02	1.01E+03	1.30E-03	1.59E-01	0.04%	
All Other Buses	Aggregate	Aggregate	Natural Gas	NG	6.3784872	354.25	1.22E-02	1.22E-02	7.50E-02	7.50E-02	3.42E+00	0.00E+00	0.00E+00	1.20E-02	4.61E-02	5.99E-02	1.61E-03	3.00E-03	1.61E-02	2.08E-02	2.08E-02	8.96E+02	8.53E-01	1.83E-01	0.00%		
LDA	Aggregate	Aggregate	Gasoline	GAS	568315.23	21126512.64	2.82E-03	2.82E-03	1.97E-02	1.97E-02	4.51E-01	2.20E-03	5.00E-04	8.00E-03	7.19E-03	1.57E-02	1.57E-02	4.59E-04	2.00E-03	2.51E-03	4.97E-03	4.97E-03	2.23E+02	9.66E-04	3.18E-03	42.37%	
LDA	Aggregate	Aggregate	Diesel	DSL	389.66921	12747.48	4.86E-03	4.86E-03	2.08E-02	2.08E-02	1.40E-01	1.34E-03	8.00E-03	7.21E-03	1.66E-02	1.66E-02	1.28E-03	2.00E-03	2.52E-03	4.97E-03	4.97E-03	5.81E+03	1.82E+02	2.26E-04	2.87E-02	0.03%	
LDA	Aggregate	Aggregate	Electricity	ELEC	78907.206	3118700.77	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.25%
LDA	Aggregate	Aggregate	Plug-in Hybrid	PHE	26775.493	1011474.88	1.14E-03	1.14E-03	2.67E-03	2.67E-03	1.71E-01	1.11E-03	2.06E-04	8.00E-03	3.97E-03	1.22E-02	1.22E-02	1.09E+00	2.00E-03	1.39E-03	3.58E-03	3.58E-03	1.12E+02	3.46E-04	4.45E-04	2.03%	
LDT1	Aggregate	Aggregate	Gasoline	GAS	37260.647	1335973.85	3.12E-03	3.12E-03	2.15E-02	2.15E-02	4.81E-01	2.56E-03	5.48E-04	8.00E-03	8.62E-03	1.72E-02	1.72E-02	3.02E-03	2.00E-03	3.02E-03	5.52E-03	5.52E-03	2.59E+02	1.05E-03	3.34E-03	2.68%	
LDT1	Aggregate	Aggregate	Diesel	DSL	0.4104353	15.63	1.23E-02	1.23E-02	2.71E-02	2.71E-02	1.28E-01	3.18E-03	4.07E-03	8.00E-03	8.54E-03	2.06E-02	2.06E-02	5.03E-04	2.00E-03	2.99E-03	8.88E-03	8.88E-03	3.36E+02	5.71E-04	5.29E-02	0.00%	
LDT1	Aggregate	Aggregate	Electricity	ELEC	1067.401	43327.97	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.09%
LDT1	Aggregate	Aggregate	Plug-in Hybrid	PHE	813.67862	32072.15	1.14E-03	1.14E-03	2.66E-03	2.66E-03	1.71E-01	1.11E-03	1.97E-04	8.00E-03	3.97E-03	1.22E-02	1.22E-02	1.81E-04	2.00E-03	1.39E-03	3.57E-03	3.57E-03	1.12E+02	3.46E-04	4.46E-04	0.06%	
LDT2	Aggregate	Aggregate	Gasoline	GAS	307141.39	11507201.85	3.94E-03	3.94E-03	2.30E-02	2.30E-02	5.31E-01	2.65E-03	5.17E-04	8.00E-03	8.54E-03	1.71E-02	1.71E-02	4.76E-04	2.00E-03	2.99E-03	5.47E-03	5.47E-03	2.68E+02	1.29E-03	3.44E-03	23.08%	
LDT2	Aggregate	Aggregate	Diesel	DSL	1164.7387	43959.53	1.23E-02	1.23E-02	2.77E-02	2.77E-02	1.29E-01	2.36E-03	4.08E-03	8.00E-03	8.54E-03	2.06E-02	2.06E-02	3.91E-03	2.00E-03	2.99E-03	8.89E-03	8.89E-03	2.49E+02	5.72E-04	3.93E-02	0.09%	
LDT2	Aggregate	Aggregate	Electricity	ELEC	11862.536	333701.30	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.67%
LDT2	Aggregate	Aggregate	Plug-in Hybrid	PHE	8165.516	314950.66	1.14E-03	1.14E-03	2.67E-03	2.67E-03	1.71E-01	1.11E-03	2.01E-04	8.00E-03	3.97E-03	1.22E-02	1.22E-02	1.85E-04	2.00E-03	1.39E-03	3.57E-03	3.57E-03	1.12E+02	3.46E-04	4.45E-04	0.63%	
LHD1	Aggregate	Aggregate	Gasoline	GAS	13640.381	481496.71	4.11E-03	4.11E-03	5.15E-03	5.15E-03	2.03E-02	3.05E-02	5.93E-01	7.43E-03	8.00E-03	7.80E-02	1.75E-02	1.75E-02	2.73E-02	3.05E-02	3.05E-02	5.50E+02	7.52E+02	1.22E-03	1.75E-03	0.97%	
LHD1	Aggregate	Aggregate	Diesel	DSL	8519.8504	302634.77	8.73E-02	1.40E-01	2.51E-01	3.43E-01	2.21E-01	5.70E-03	1.84E-02	1.20E-02	7.80E-02	1.08E-01	1.85E-01	1.76E-02	3.00E-03	2.73E-02	4.79E-02	7.95E-02	6.02E+02	4.06E-03	9.48E-02	0.61%	
LHD2	Aggregate	Aggregate	Gasoline	GAS	1634.0567	56015.47	6.35E-03	6.35E-03	4.43E-02	4.43E-02	3.24E-02	6.03E-01	8.38E-03	8.00E-03	9.10E-02	1.00E-01	1.76E-01	1.57E-02	2.00E-03	3.19E-02	3.50E-02	6.16E+02	8.47E+02	1.11E-03	2.17E-03	0.11%	
LHD2	Aggregate	Aggregate	Diesel	DSL	4164.6202	141649.15	1.07E-01	1.65E-01	3.56E-01	4.57E-01	2.76E-01	6.65E-03	2.30E-02	1.20E-02	9.10E-02	1.26E-01	2.10E-01	2.20E-02	3.00E-03	3.19E-02	5.68E-02	9.17E+02	7.02E+02	4.97E-03	1.11E-01	0.28%	
MCY	Aggregate	Aggregate	Gasoline	GAS	30052.703	169956.17	7.47E-01	7.47E-01	4.67E-01	4.67E-01	9.69E+00	1.83E-03	1.25E-03	4.00E-03	1.20E-02	1.81E-02	1.20E-02	2.20E-02	1.00E-03	4.20E-03	7.20E-03	1.85E+02	1.30E-01	3.53E-02	0.34%		
MDV	Aggregate	Aggregate	Gasoline	GAS	177275.71	6462094.23	4.23E-03	4.23E-03	2.47E-02	2.47E-02	5.49E-01	3.21E-03	5.18E-04	8.00E-03	8.66E-03	1.72E-02	1.72E-02	4.76E-04	2.00E-03	3.03E-03	5.51E-03	5.51E-03	3.25E+02	1.36E-03	3.54E-03	12.96%	
MDV	Aggregate	Aggregate	Diesel	DSL	1944.0696	70143.35	4.33E-03	4.33E-03	9.97E-03	9.97E-03	3.43E-02	1.39E-03	3.08E-03	8.68E-03	1.76E-02	1.76E-02	1.76E-02	1.76E-02	3.04E-03	3.04E-03	5.92E-03	3.25E+02	2.01E-04	5.12E-02	0.14%		
MDV	Aggregate	Aggregate	Plug-in Hybrid	PHE	5177.1286	194809.03	1.14E-03	1.14E-03	2.67E-03	2.67E-03	1.71E-01	1.11E-03	2.03E-04	8.00E-03	3.98E-03	1.22E-02	1.22E-02	1.86E-04	2.00E-03	1.39E-03	3.58E-03	3.58E-03	1.12E+02	3.45E-04	4.43E-04	0.39%	
MH	Aggregate	Aggregate	Gasoline	GAS	1627.2349	18304.45	1.52E-02	1.52E-02	1.49E-01	1.49E-01	1.92E-01	1.92E-01	1.92E-01	1.92E-01	1.92E-01	1.92E-01	1.92E-01	1.92E-01	1.92E-01	1.92E-01	1.92E-01	1.92E-01	2.01E+02	1.94E+03	4.04E-03	1.83E-02	0.04%
MH	Aggregate	Aggregate	Diesel	DSL	995.04851	10008.55	8.12E-02	8.12E-02	2.47E+00	2.47E+00	2.35E-01	1.03E-02	2.15E-02	1.60E-02	4.48E-02	8.23E-02	8.23E-02	2.06E-02	4.00E-03	1.57E-02	4.02E+02	4.02E+02	1.09E+03	3.77E-03	1.71E-01	0.02%	
Motor Coach	Aggregate	Aggregate	Diesel	DSL	93.531081	11879.39	1.05E-02	1.05E-02	9.32E-01	9.32E-01	1.45E-02	3.89E-02	1.45E-02	1.20E-02	8.15E-02	1.17E-01	1.17E-01	2.26E-02	3.00E-03	2.85E-02	5.42E+02	5.42E+02	4.89E-04	2.41E-01	0.02%		
CRIS	Aggregate	Aggregate	Gasoline	GAS	254.09316	8019.90	2.44E-02	2.44E-02	2.67E-01	2.67E-01	6.94E-01	4.80E-01	1.54E-02	1.27E-03	1.20E-02	4.48E-02	5.81E-02	1.21E-01	1.16E-03	3.00E-03	1.57E-02	1.59E-02	4.15E+02	5.43E-03	1.58E-02	0.02%	
PFO	Aggregate	Aggregate	Diesel	DSL	0	16488.11	1.46E-02	2.60E-02	2.55E+00	5.33E+00	1.82E-01	1.66E-02	4.06E-03	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	3.88E-03	7.15E-03	1.75E+03	6.77E-04	0.03%
SBUS	Aggregate	Aggregate	Gasoline	GAS	107.70906	5718.66	8.63E-03	1.12E-02	9.00E-02	1.40E-01	1.87E-01	7.06E-03	1.25E-03	8.00E-03	4.49E-02	5.42E-02	7.74E-02	1.15E-03	2.00E-03	1.57E-02	1.89E-02	2.70E-02	7.15E+02	2.04E-03	9.29E-03	0.01%	
SBUS	Aggregate	Aggregate	Diesel	DSL	286.73432	5685.77	6.70E-03	1.03E-02	3.36E-01	6.86E-01	5.46E-02	1.02E-02	3.32E-03	1.20E-02	4.49E-02	6.02E-02	1.04E-01	3.18E-03	3.00E-03	1.57E-02	2.19E-02	3.74E-02	1.07E+03	3.11E-04	1.69E-01	0.01%	
SBUS	Aggregate	Aggregate	Natural Gas	NG	21.192033	408.25	4.20E-02	6.83E-02	3.88E-01	5.71E-01	9.32E+00	0.00E+00	0.00E+00	1.20E-02	4.49E-02	6.06E-02	1.04E-01	3.00E-03	1.57E-02	2.21E-02	3.79E-02	1.16E+03	2.94E+00	2.36E-01	0.00%		
T6 CAIRP Class 4	Aggregate	Aggregate	Diesel	DSL	27605.419	188.20	5.36E-03	1.26E-02	1.77E-01	6.05E-01	2.75E-02	9.62E-03	5.40E-03	1.20E-02	4.23E-02	5.97E-02	1.45E-01	5.16E-03	3.00E-03	1.48E-02	2.30E-02	5.58E-02	1.02E+03	2.49E-04	1.60E-01	0.00%	
T6 CAIRP Class 5	Aggregate	Aggregate	Diesel	DSL	3.3304273	258.70	5.37E-03	1.26E-02	1.79E-01	6.01E-01	2.75E-02	9.62E-03	5.41E-03	1.20E-02	4.23E-02	5.97E-02	1.44E-01	5.16E-03	3.00E-03	1.48E-02	2.30E-02	5.57E-02	1.02E+03	2.50E-04	1.60E-01	0.00%	
T6 CAIRP Class 6	Aggregate	Aggregate	Diesel	DSL	15.066293	672.23	5.35E-03	1.26E-02	1.78E-01	6.29E-01	2.74E-02	9.61E-03	5.42E-03	1.20E-02	4.23E-02	5.97E-02	1.45E-01	5.18E-03	3.00E-03	1.48E-02	2.30E-02	5.60E-02	1.01E+03	2.48E-04	1.60E-01	0.00%	
T6 CAIRP Class 7	Aggregate	Aggregate	Diesel	DSL	39.049012	7700.53	5.76E-03	7.48E-03	1.95E-01	3.30E-01	2.95E-02	8.49E-03	5.74E-03	1.20E-02	4.23E-02	6.01E-02	7.94E-02	5.18E-03	3.00E-03	1.48E-02	2.33E-02	3.09E-02	6.86E+02	2.68E-04	1.41E-01	0.02%	
T6 Instate Delivery Class 4	Aggregate	Aggregate	Diesel	DSL	725.03569	23674.29	6.10E-03	1.21E-02	3.63E-01	1.06E+00	5.36E-02	9.95E-03	1.92E-03	1.20E-02	4.76E-02	6.15E-02	1.27E-01	1.84E-03	3.00E-03	1.66E-02	2.15E-02	4.45E-02	1.05E+03	2.84E-04	1.66E-01	0.05%	
T6 Instate Delivery Class 4	Aggregate	Aggregate	Natural Gas	NG	9.5321331	314.74	1.25E-02	2.59E-02	6.05E-02	1.23E-01	3.82E+00	0.00E+00	0.00E+00	1.20E-02	4.76E-02	6.15E-02	1.30E-01	1.85E-03	3.00E-03	1.66E-02	2.15E-02	4.53E-02	1.01E+03	8.73E-01	2.05E-01	0.00%	
T6 Instate Delivery Class 5	Aggregate	Aggregate	Diesel	DSL	543.97227	17760.55	6.10E-03	1.21E-02	3.60E-01	1.05E+00	5.34E-02	9.96E-03	1.92E-03	1.20E-02	4.76E-02	6.15E-02	1.27E-01	1.85E-0									

Source: EMFAC2021 (v1.0.2) Emission Rates with Ac

Region Type: Sub-Area

Region: Alameda (SF)

Calendar Year: 2045

Season: Annual

Vehicle Classification: EMFAC202x Categories

Units: miles/day for CVMT and EVMT, trips/day for Trips, g/mile for RUNEX,

Vehicle Category	Model Year	Speed	Fuel	lbs/Mile														CO ₂ /Passenger+H		
				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	ACCI_RUNEX	CH4_RUNEX	N2O_RUNEX		
All Other Buses	Aggregate	Aggregate	Diesel	6.174E-05	2.097E-03	2.746E-04	2.112E-05	1.778E-05	2.646E-05	1.017E-04	1.463E-04	1.702E-05	6.614E-06	3.560E-05	5.933E-05	2.230E+00	2.868E-06	3.514E-04		
All Other Buses	Aggregate	Aggregate	Natural Gas	2.687E-05	1.654E-04	7.550E-03	0.000E+00	3.862E-06	2.646E-05	1.017E-04	1.320E-04	3.551E-06	6.614E-06	3.560E-05	4.576E-05	1.975E+00	1.881E-03	4.026E-04		
LDA	Aggregate	Aggregate	Gasoline	6.214E-06	4.344E-05	9.950E-04	4.855E-06	1.102E-06	1.764E-05	1.584E-05	3.458E-05	1.013E-06	4.409E-06	5.544E-06	1.097E-05	4.911E-01	1.219E-06	7.019E-06		
LDA	Aggregate	Aggregate	Diesel	1.070E-05	4.590E-05	3.082E-04	3.803E-06	2.959E-06	1.764E-05	1.590E-05	3.650E-05	2.831E-06	4.409E-06	5.566E-06	1.281E-05	4.014E-01	4.972E-07	6.324E-05		
LDA	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.764E-05	6.988E-06	2.732E-05	0.000E+00	4.409E-06	3.391E-06	7.800E-06	0.000E+00	0.000E+00	0.000E+00		
LDA	Aggregate	Aggregate	Plug-in Hybrid	2.522E-06	5.888E-06	3.778E-04	2.451E-06	4.532E-07	1.764E-05	8.751E-06	2.684E-05	4.167E-07	4.409E-06	3.063E-06	7.889E-06	2.479E-01	7.629E-07	9.817E-07		
LD1	Aggregate	Aggregate	Gasoline	6.881E-06	4.373E-05	1.060E-03	5.634E-06	1.207E-06	1.764E-05	1.889E-05	3.784E-05	1.110E-06	4.409E-06	6.648E-06	1.217E-05	5.699E-01	2.307E-06	7.361E-06		
LD1	Aggregate	Aggregate	Diesel	2.713E-05	5.976E-05	2.831E-04	7.017E-06	8.976E-06	1.764E-05	1.883E-05	4.544E-05	8.588E-06	4.409E-06	6.589E-06	1.959E-05	7.405E-01	1.260E-06	1.167E-04		
LD1	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.764E-05	9.688E-06	2.732E-05	0.000E+00	4.409E-06	3.391E-06	7.800E-06	0.000E+00	0.000E+00	0.000E+00		
LD1	Aggregate	Aggregate	Plug-in Hybrid	2.513E-06	5.867E-06	3.755E-04	2.442E-06	4.340E-07	1.764E-05	8.757E-06	2.683E-05	3.990E-07	4.409E-06	3.065E-06	7.873E-06	2.470E-01	7.624E-07	9.838E-07		
LD2	Aggregate	Aggregate	Gasoline	8.694E-06	5.068E-05	1.170E-03	5.850E-06	1.140E-06	1.764E-05	1.884E-05	3.761E-05	1.049E-06	4.409E-06	6.592E-06	1.205E-05	5.917E-01	2.852E-06	7.593E-06		
LD2	Aggregate	Aggregate	Diesel	2.717E-05	6.117E-05	2.834E-04	5.211E-06	9.004E-06	1.764E-05	1.882E-05	4.546E-05	8.615E-06	4.409E-06	6.586E-06	1.961E-05	5.500E-01	1.623E-06	8.655E-05		
LD2	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.764E-05	9.688E-06	2.732E-05	0.000E+00	4.409E-06	3.391E-06	7.800E-06	0.000E+00	0.000E+00	0.000E+00		
LD2	Aggregate	Aggregate	Plug-in Hybrid	2.517E-06	5.878E-06	3.772E-04	2.447E-06	4.430E-07	1.764E-05	8.756E-06	2.684E-05	4.073E-07	4.409E-06	3.065E-06	7.881E-06	2.475E-01	7.621E-07	9.811E-07		
LHD1	Aggregate	Aggregate	Gasoline	1.135E-05	6.731E-05	1.308E-03	1.638E-05	2.805E-06	1.764E-05	1.720E-04	3.472E-04	2.579E-06	4.409E-06	6.019E-05	1.212E-04	1.657E+00	2.699E-06	3.858E-06		
LHD1	Aggregate	Aggregate	Diesel	3.092E-04	7.572E-04	4.881E-04	1.257E-05	4.035E-05	2.646E-05	1.720E-04	4.080E-04	3.877E-05	6.614E-06	6.019E-05	1.753E-04	1.327E+00	8.941E-06	2.091E-04		
LHD2	Aggregate	Aggregate	Gasoline	9.776E-06	7.143E-05	1.329E-03	1.847E-05	2.759E-06	1.764E-05	2.006E-04	3.891E-04	2.537E-06	4.409E-06	7.022E-05	1.358E-04	1.868E+00	2.448E-06	4.794E-06		
LHD2	Aggregate	Aggregate	Diesel	3.637E-04	1.008E-03	6.091E-04	1.467E-05	5.067E-05	2.646E-05	2.006E-04	4.632E-04	4.848E-05	6.614E-06	7.022E-05	2.022E-04	1.548E+00	1.096E-05	2.439E-04		
MCY	Aggregate	Aggregate	Gasoline	1.707E-03	1.029E-03	2.136E-02	4.042E-06	4.737E-06	8.818E-06	2.646E-05	4.001E-05	4.417E-06	2.205E-06	9.259E-06	1.588E-05	4.088E-01	2.875E-04	7.775E-05		
MDV	Aggregate	Aggregate	Gasoline	9.317E-06	5.451E-05	1.210E-03	7.086E-06	1.142E-06	1.764E-05	1.909E-05	3.787E-05	1.050E-06	4.409E-06	6.681E-06	1.214E-05	7.167E-01	2.989E-06	7.815E-06		
MDV	Aggregate	Aggregate	Diesel	9.542E-06	2.198E-05	3.056E-04	6.786E-06	2.033E-06	1.764E-05	1.913E-05	3.880E-05	1.945E-06	4.409E-06	6.695E-06	1.305E-05	7.162E-01	4.432E-07	1.128E-04		
MDV	Aggregate	Aggregate	Plug-in Hybrid	2.518E-06	5.878E-06	3.772E-04	2.447E-06	4.470E-07	1.764E-05	8.756E-06	2.685E-05	4.110E-07	4.409E-06	3.068E-06	7.888E-06	2.475E-01	7.603E-07	9.766E-07		
MH	Aggregate	Aggregate	Gasoline	2.527E-05	4.383E-04	3.465E-04	4.239E-05	3.274E-06	2.646E-05	9.925E-05	1.290E-04	3.010E-06	6.614E-06	3.474E-05	4.436E-05	4.288E+00	8.898E-06	4.024E-05		
MH	Aggregate	Aggregate	Diesel	1.790E-04	5.446E-03	5.171E-04	2.273E-05	4.739E-05	3.527E-05	9.873E-05	1.814E-04	4.534E-05	8.818E-06	3.456E-05	8.872E-05	2.399E+00	8.314E-06	3.780E-04		
Motor Coach	Aggregate	Aggregate	Diesel	2.321E-05	3.277E-03	7.915E-05	3.197E-05	5.214E-05	2.646E-05	1.796E-04	2.632E-04	4.709E-05	6.614E-06	6.287E-05	1.244E-04	3.375E+00	1.078E-06	5.319E-04		
OBUS	Aggregate	Aggregate	Gasoline	6.481E-05	1.529E-03	1.059E-03	3.384E-05	2.793E-06	2.646E-05	9.876E-05	2.673E-04	2.568E-06	6.614E-06	3.457E-05	9.139E-05	3.425E+00	1.194E-05	3.492E-05		
PFO	Aggregate	Aggregate	Diesel	5.738E-05	1.176E-02	4.013E-04	3.653E-05	8.946E-06	0.000E+00	0.000E+00	1.647E-05	8.559E-06	0.000E+00	0.000E+00	1.574E-05	3.858E+00	1.492E-06	6.078E-04		
SBUS	Aggregate	Aggregate	Gasoline	2.465E-05	3.076E-04	4.124E-04	1.557E-05	2.764E-06	1.764E-05	9.902E-05	1.706E-04	2.541E-06	4.409E-06	3.466E-05	5.951E-05	1.575E+00	4.502E-06	2.047E-05		
SBUS	Aggregate	Aggregate	Diesel	2.266E-05	1.512E-03	1.204E-04	2.243E-05	7.329E-06	2.646E-05	9.902E-05	2.286E-04	7.012E-06	6.614E-06	3.466E-05	8.242E-05	2.369E+00	6.858E-07	3.732E-04		
SBUS	Aggregate	Aggregate	Natural Gas	1.507E-04	1.258E-03	2.056E-02	0.000E+00	8.100E-06	2.646E-05	9.902E-05	2.293E-04	7.448E-06	6.614E-06	3.466E-05	8.357E-05	2.552E+00	6.487E-03	5.202E-04		
T6 CAIRP Class 4	Aggregate	Aggregate	Diesel	2.769E-05	1.334E-03	6.058E-05	2.121E-05	1.190E-05	2.646E-05	9.329E-05	3.187E-04	1.139E-05	6.614E-06	3.265E-05	1.230E-04	2.239E+00	5.490E-07	3.528E-04		
T6 CAIRP Class 5	Aggregate	Aggregate	Diesel	2.768E-05	1.326E-03	6.068E-05	2.121E-05	1.193E-05	2.646E-05	9.329E-05	3.182E-04	1.141E-05	6.614E-06	3.265E-05	1.229E-04	2.240E+00	5.501E-07	3.530E-04		
T6 CAIRP Class 6	Aggregate	Aggregate	Diesel	2.772E-05	1.388E-03	6.044E-05	2.118E-05	1.194E-05	2.646E-05	9.329E-05	3.196E-04	1.142E-05	6.614E-06	3.265E-05	1.234E-04	2.237E+00	5.475E-07	3.524E-04		
T6 CAIRP Class 7	Aggregate	Aggregate	Diesel	1.649E-05	7.275E-04	6.511E-05	1.871E-05	1.265E-05	2.646E-05	9.329E-05	1.750E-04	1.211E-05	6.614E-06	3.265E-05	6.818E-05	1.976E+00	5.899E-07	3.113E-04		
T6 Instate Delivery Class 4	Aggregate	Aggregate	Diesel	2.668E-05	2.330E-03	1.181E-04	2.194E-05	4.235E-06	2.646E-05	1.049E-04	2.808E-04	4.052E-06	6.614E-06	3.670E-05	9.814E-05	2.317E+00	6.251E-07	3.650E-04		
T6 Instate Delivery Class 4	Aggregate	Aggregate	Natural Gas	5.719E-05	2.719E-04	8.414E-03	0.000E+00	4.437E-06	2.646E-05	1.049E-04	2.862E-04	4.080E-06	6.614E-06	3.670E-05	9.986E-05	2.218E+00	1.924E-03	4.522E-04		
T6 Instate Delivery Class 5	Aggregate	Aggregate	Diesel	2.664E-05	2.311E-03	1.177E-04	2.196E-05	4.226E-06	2.646E-05	1.049E-04	2.808E-04	4.043E-06	6.614E-06	3.670E-05	9.811E-05	2.319E+00	6.244E-07	3.654E-04		
T6 Instate Delivery Class 5	Aggregate	Aggregate	Natural Gas	5.765E-05	2.732E-04	8.415E-03	0.000E+00	4.440E-06	2.646E-05	1.049E-04	2.885E-04	4.083E-06	6.614E-06	3.670E-05	1.007E-04	2.215E+00	1.924E-03	4.515E-04		
T6 Instate Delivery Class 6	Aggregate	Aggregate	Diesel	2.665E-05	2.323E-03	1.176E-04	2.199E-05	4.233E-06	2.646E-05	1.049E-04	2.812E-04	4.050E-06	6.614E-06	3.670E-05	9.824E-05	2.322E+00	6.234E-07	3.658E-04		
T6 Instate Delivery Class 6	Aggregate	Aggregate	Natural Gas	5.772E-05	2.734E-04	8.415E-03	0.000E+00	4.440E-06	2.646E-05	1.049E-04	2.888E-04	4.082E-06	6.614E-06	3.670E-05	1.008E-04	2.215E+00	1.924E-03	4.515E-04		
T6 Instate Delivery Class 7	Aggregate	Aggregate	Diesel	2.450E-05	1.990E-03	1.447E-04	2.279E-05	5.144E-06	2.646E-05	1.049E-04	2.160E-04	4.922E-06	6.614E-06	3.670E-05	7.589E-05	2.406E+00	7.710E-07	3.791E-04		
T6 Instate Delivery Class 7	Aggregate	Aggregate	Natural Gas	4.001E-05	3.962E-04	8.082E-03	0.000E+00	3.594E-06	2.646E-05	1.049E-04	2.073E-04	3.305E-06	6.614E-06	3.670E-05	7.182E-05	2.289E+00	1.834E-03	4.667E-04		
T6 Instate Other Class 4	Aggregate	Aggregate	Diesel	2.458E-05	1.808E-03	9.400E-05	2.121E-05	1.293E-06	2.646E-05	9.891E-05	2.827E-04	6.630E-06	6.614E-06	3.462E-05	1.023E-04	2.240E+00	5.647E-07	3.529E-04		
T6 Instate Other Class 4	Aggregate	Aggregate	Natural Gas	4.631E-05	2.350E-04	5.890E-03	0.000E+00	3.431E-06	2.646E-05	9.891E-05	2.776E-04	3.155E-06	6.614E-06	3.462E-05	9.558E-05	1.936E+00	1.537E-03	3.946E-04		
T6 Instate Other Class 5	Aggregate	Aggregate	Diesel	2.461E-05	1.772E-03	9.365E-05	2.124E-05	1.294E-06	2.646E-05	9.891E-05	2.828E-04	6.608E-06	6							

Source: EMFAC2021 (v1.0.2) Emission Rates with Ac

Region Type: Sub-Area
 Region: Alameda (SF)
 Calendar Year: 2045
 Season: Annual

Vehicle Classification: EMFAC202x Categories
 Units: miles/day for CVMT and EVMT, trips/day for Trips, g/mile for RUNEX,

Vehicle Category	Model Year	Speed	Fuel	MTons/Mile													CO2/Pw/Day+			
				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	AACCI_RUNEX	CH4_RUNEX	N2O_RUNEX		
All Other Buses	Aggregate	Aggregate	Diesel	2.800E-08	9.513E-07	1.246E-07	9.580E-09	8.067E-09	1.200E-08	4.614E-08	6.635E-08	7.718E-09	3.000E-09	1.615E-08	2.700E-08	1.012E-03	1.301E-09	1.594E-07		
All Other Buses	Aggregate	Aggregate	Natural Gas	1.219E-08	7.501E-08	3.425E-06	0.000E+00	1.752E-09	1.200E-08	4.614E-08	5.989E-08	1.611E-09	3.000E-09	1.615E-08	2.076E-08	8.959E-04	8.530E-07	1.826E-07		
LDA	Aggregate	Aggregate	Gasoline	2.819E-09	1.970E-08	4.513E-07	2.202E-09	4.997E-10	8.000E-09	7.185E-09	1.568E-08	4.594E-10	2.000E-09	2.515E-09	4.974E-09	2.228E-04	9.655E-10	1.318E-09		
LDA	Aggregate	Aggregate	Diesel	4.856E-09	2.082E-08	1.398E-07	1.725E-09	1.342E-09	8.000E-09	7.214E-09	1.656E-08	1.284E-09	2.000E-09	2.525E-09	5.809E-09	1.821E-04	2.255E-10	2.869E-08		
LDA	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.000E-09	4.394E-09	1.239E-08	0.000E+00	2.000E-09	1.538E-09	3.538E-09	0.000E+00	0.000E+00	0.000E+00		
LDA	Aggregate	Aggregate	Plug-in Hybrid	1.144E-09	2.671E-09	1.714E-07	1.112E-09	2.056E-10	8.000E-09	3.969E-09	1.217E-08	1.890E-10	2.000E-09	1.389E-09	3.578E-09	1.125E-04	3.461E-10	4.453E-10		
LD11	Aggregate	Aggregate	Gasoline	3.121E-09	2.149E-08	4.808E-07	2.556E-09	5.475E-10	8.000E-09	8.616E-09	1.716E-08	5.034E-10	2.000E-09	3.016E-09	5.519E-09	2.585E-04	1.047E-09	3.339E-09		
LD11	Aggregate	Aggregate	Diesel	1.230E-08	2.711E-08	1.284E-07	3.183E-09	4.072E-09	8.000E-09	8.540E-09	2.061E-08	3.896E-09	2.000E-09	2.989E-09	8.884E-09	3.359E-04	5.715E-10	5.292E-08		
LD11	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.000E-09	4.394E-09	1.239E-08	0.000E+00	2.000E-09	1.538E-09	3.538E-09	0.000E+00	0.000E+00	0.000E+00		
LD11	Aggregate	Aggregate	Plug-in Hybrid	1.140E-09	2.661E-09	1.708E-07	1.108E-09	1.968E-10	8.000E-09	3.972E-09	1.217E-08	1.810E-10	2.000E-09	1.390E-09	3.571E-09	1.120E-04	3.458E-10	4.446E-10		
LD12	Aggregate	Aggregate	Gasoline	3.943E-09	2.299E-08	5.306E-07	2.653E-09	5.173E-10	8.000E-09	8.544E-09	1.706E-08	4.756E-10	2.000E-09	2.990E-09	5.466E-09	2.684E-04	1.294E-09	3.444E-09		
LD12	Aggregate	Aggregate	Diesel	1.232E-08	2.775E-08	1.285E-07	2.364E-09	4.084E-09	8.000E-09	8.535E-09	2.062E-08	3.908E-09	2.000E-09	2.987E-09	8.895E-09	2.495E-04	5.725E-10	3.930E-08		
LD12	Aggregate	Aggregate	Electricity	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.000E-09	4.394E-09	1.239E-08	0.000E+00	2.000E-09	1.538E-09	3.538E-09	0.000E+00	0.000E+00	0.000E+00		
LD12	Aggregate	Aggregate	Plug-in Hybrid	1.142E-09	2.666E-09	1.711E-07	1.110E-09	2.009E-10	8.000E-09	3.972E-09	1.217E-08	1.848E-10	2.000E-09	1.390E-09	3.575E-09	1.123E-04	3.457E-10	4.450E-10		
LHD1	Aggregate	Aggregate	Gasoline	5.149E-09	3.053E-08	5.935E-07	7.432E-09	1.272E-09	8.000E-09	7.800E-08	1.575E-07	1.170E-09	2.000E-09	2.730E-08	5.498E-08	7.518E-04	1.224E-09	1.750E-09		
LHD1	Aggregate	Aggregate	Diesel	1.403E-07	3.435E-07	2.214E-07	5.704E-09	1.838E-08	1.200E-08	7.800E-08	1.851E-07	1.759E-08	3.000E-09	2.730E-08	7.949E-08	6.020E-04	4.056E-09	9.484E-08		
LHD2	Aggregate	Aggregate	Gasoline	4.434E-09	3.240E-08	6.029E-07	8.377E-09	1.252E-09	8.000E-09	9.100E-08	1.765E-07	1.151E-09	2.000E-09	3.185E-08	6.162E-08	8.473E-04	1.111E-09	2.174E-09		
LHD2	Aggregate	Aggregate	Diesel	1.650E-07	4.572E-07	2.763E-07	6.654E-09	2.298E-08	1.200E-08	9.100E-08	2.101E-07	2.199E-08	3.000E-09	3.185E-08	9.171E-08	7.022E-04	4.973E-09	1.106E-07		
MCY	Aggregate	Aggregate	Gasoline	7.742E-07	4.668E-07	9.688E-06	1.833E-09	2.149E-09	4.000E-09	1.200E-08	1.815E-08	2.003E-09	1.000E-09	4.200E-09	7.203E-08	1.854E-04	1.304E-07	3.527E-08		
MDV	Aggregate	Aggregate	Gasoline	4.226E-09	2.473E-08	5.488E-07	3.214E-09	5.181E-10	8.000E-09	8.659E-09	1.718E-08	4.764E-10	2.000E-09	3.031E-09	5.507E-09	3.251E-04	1.356E-09	3.545E-09		
MDV	Aggregate	Aggregate	Diesel	4.328E-09	9.969E-09	1.386E-07	3.078E-09	9.219E-10	8.000E-09	8.676E-09	1.760E-08	8.821E-10	2.000E-09	3.037E-09	5.919E-09	3.249E-04	2.010E-10	5.118E-08		
MDV	Aggregate	Aggregate	Plug-in Hybrid	1.142E-09	2.666E-09	1.711E-07	1.110E-09	2.028E-10	8.000E-09	3.972E-09	1.218E-08	1.864E-10	2.000E-09	1.392E-09	3.578E-09	1.123E-04	3.449E-10	4.430E-10		
MH	Aggregate	Aggregate	Gasoline	1.146E-08	1.988E-07	1.572E-07	1.923E-08	1.485E-09	1.200E-08	4.502E-08	5.850E-08	1.365E-09	3.000E-09	1.576E-08	2.012E-08	1.945E-03	4.036E-09	1.825E-08		
MH	Aggregate	Aggregate	Diesel	8.119E-08	2.470E-06	2.346E-07	1.031E-08	2.150E-08	1.600E-08	4.479E-08	8.228E-08	2.057E-08	4.000E-09	1.567E-08	4.024E-08	1.088E-03	3.771E-09	1.715E-07		
Motor Coach	Aggregate	Aggregate	Diesel	1.053E-08	1.487E-06	3.590E-08	1.450E-08	2.366E-08	1.200E-08	8.177E-08	1.194E-07	2.264E-08	3.000E-09	2.852E-08	5.641E-08	1.531E-03	4.891E-10	2.136E-07		
OBUS	Aggregate	Aggregate	Gasoline	2.940E-08	6.937E-07	4.804E-07	1.536E-08	1.267E-09	1.200E-08	4.480E-08	1.212E-07	1.165E-09	3.000E-09	1.568E-08	4.145E-08	1.554E-03	5.427E-07	1.584E-08		
PFO	Aggregate	Aggregate	Diesel	2.603E-08	5.334E-06	1.820E-07	1.657E-08	4.058E-09	0.000E+00	0.000E+00	7.472E-09	3.882E-09	0.000E+00	0.000E+00	7.148E-09	1.750E-03	6.767E-10	2.575E-07		
SBUS	Aggregate	Aggregate	Gasoline	1.118E-08	1.395E-07	1.871E-07	7.064E-09	1.254E-09	8.000E-09	4.492E-08	7.740E-08	1.153E-09	2.000E-09	1.572E-08	2.699E-08	7.145E-04	2.042E-09	9.285E-09		
SBUS	Aggregate	Aggregate	Diesel	1.028E-08	6.857E-07	5.461E-08	1.017E-08	3.324E-09	1.200E-08	4.492E-08	1.037E-07	1.808E-09	3.000E-09	1.572E-08	3.739E-08	1.074E-03	3.111E-10	1.693E-07		
SBUS	Aggregate	Aggregate	Natural Gas	6.834E-08	5.707E-07	9.324E-06	0.000E+00	3.674E-09	1.200E-08	4.492E-08	1.040E-07	3.378E-09	3.000E-09	1.572E-08	3.791E-08	1.158E-03	2.943E-06	2.360E-07		
T6 CAIRP Class 4	Aggregate	Aggregate	Diesel	1.256E-08	6.051E-07	2.748E-08	9.619E-09	5.398E-09	1.200E-08	4.231E-08	1.446E-07	5.165E-09	3.000E-09	1.481E-08	5.581E-08	1.016E-03	2.490E-10	1.600E-07		
T6 CAIRP Class 5	Aggregate	Aggregate	Diesel	1.255E-08	6.014E-07	2.753E-08	9.623E-09	5.410E-09	1.200E-08	4.231E-08	1.443E-07	5.176E-09	3.000E-09	1.481E-08	5.573E-08	1.016E-03	2.495E-10	1.601E-07		
T6 CAIRP Class 6	Aggregate	Aggregate	Diesel	1.257E-08	6.295E-07	2.741E-08	9.608E-09	5.417E-09	1.200E-08	4.231E-08	1.450E-07	5.182E-09	3.000E-09	1.481E-08	5.595E-08	1.015E-03	2.483E-10	1.599E-07		
T6 CAIRP Class 7	Aggregate	Aggregate	Diesel	7.481E-09	3.300E-07	2.953E-08	8.486E-09	5.740E-09	1.200E-08	4.231E-08	7.938E-08	5.492E-09	3.000E-09	1.481E-08	3.093E-08	8.961E-04	2.676E-10	1.412E-07		
T6 Instate Delivery Class 4	Aggregate	Aggregate	Diesel	1.210E-08	1.057E-06	5.358E-08	9.951E-09	1.921E-09	1.200E-08	4.756E-08	1.274E-07	1.838E-09	3.000E-09	1.665E-08	4.52E-08	1.051E-03	2.835E-10	1.656E-07		
T6 Instate Delivery Class 4	Aggregate	Aggregate	Natural Gas	2.594E-08	1.233E-07	3.816E-06	0.000E+00	2.013E-09	1.200E-08	4.756E-08	1.298E-07	1.850E-09	3.000E-09	1.665E-08	4.430E-08	1.006E-03	8.726E-07	2.051E-07		
T6 Instate Delivery Class 5	Aggregate	Aggregate	Diesel	1.208E-08	1.048E-06	5.340E-08	9.963E-09	1.917E-09	1.200E-08	4.756E-08	1.273E-07	1.834E-09	3.000E-09	1.665E-08	4.450E-08	1.052E-03	2.832E-10	1.658E-07		
T6 Instate Delivery Class 5	Aggregate	Aggregate	Natural Gas	2.615E-08	1.239E-07	3.817E-06	0.000E+00	2.014E-09	1.200E-08	4.756E-08	1.308E-07	1.852E-09	3.000E-09	1.665E-08	4.566E-08	1.005E-03	8.728E-07	2.048E-07		
T6 Instate Delivery Class 6	Aggregate	Aggregate	Diesel	1.209E-08	1.054E-06	5.336E-08	9.973E-09	1.920E-09	1.200E-08	4.756E-08	1.275E-07	1.837E-09	3.000E-09	1.665E-08	4.456E-08	1.053E-03	2.828E-10	1.659E-07		
T6 Instate Delivery Class 6	Aggregate	Aggregate	Natural Gas	2.618E-08	1.240E-07	3.817E-06	0.000E+00	2.014E-09	1.200E-08	4.756E-08	1.310E-07	1.852E-09	3.000E-09	1.665E-08	4.572E-08	1.005E-03	8.727E-07	2.048E-07		
T6 Instate Delivery Class 7	Aggregate	Aggregate	Diesel	1.111E-08	9.028E-07	6.564E-08	1.034E-08	2.333E-09	1.200E-08	4.756E-08	9.797E-08	2.233E-09	3.000E-09	1.665E-08	3.441E-08	1.091E-03	3.497E-10	1.720E-07		
T6 Instate Delivery Class 7	Aggregate	Aggregate	Natural Gas	1.815E-08	1.797E-07	3.666E-06	0.000E+00	1.630E-09	1.200E-08	4.756E-08	9.405E-08	1.499E-09	3.000E-09	1.665E-08	3.258E-08	1.038E-03	8.319E-07	2.177E-07		
T6 Instate Other Class 4	Aggregate	Aggregate	Diesel	1.115E-08	8.199E-07	4.264E-08	9.620E-09	3.143E-09	1.200E-08	4.486E-08	1.282E-07	3.007E-09	3.000E-09	1.570E-08	4.642E-08	1.016E-03	2.562E-10	1.601E-07		
T6 Instate Other Class 4	Aggregate	Aggregate	Natural Gas	2.101E-08	1.066E-07	2.672E-06	0.000E+00	1.556E-09	1.200E-08	4.486E-08	1.259E-07	1.431E-09	3.000E-09	1.570E-08	4.335E-08	8.781E-04	6.972E-07	1.790E-07		
T6 Instate Other Class 5	Aggregate	Aggregate	Diesel	1.117E-08	8.037E-07	4.248E-08	9.632E-09	3.133E-09	1.200E-08	4.486E-08	1.283E-07	2.997E-09	3.000E-09	1.570E-08	4.644E-08	1.017E-03	2.566E-10	1.603E-07		
T6 Instate Other Class 5	Aggregate	Aggregate	Natural																	

Estimated Existing Electricity and Natural Gas Demand

Parameter	Electricity Usage (kWh/year) ^a	Natural Gas Usage (Therms) ^a
Residential	188,507,132	13,248,679
Nonresidential	274,709,282	6,078,121
Total	463,216,414	19,326,800
2023 Service Population ^b	145,150	
Per Service Population Consumption	3,191	133

Notes:

- a. Based on 5-year average electricity and natural gas usage data provided by PG&E and Ava Energy.
- b. Service population = residents + jobs.

Existing Operation-Related Annual Fuel Consumption

Gas (gal/year)	Diesel (gal/year)	Compressed Natural Gas (gal/year)	Electricity (kWh/year)
27,523,697	7,736,512	294,015	14,275,325

Year 2045 Forecast Electricity Consumption

Area	Electricity Usage, kWh per Year (Subtotal)		
	Existing Baseline	Year 2045 Forecast	Net Change
Nonresidential	274,709,282	322,457,219	47,747,937
Residential	188,507,132	283,302,877	94,795,745
Total	463,216,414	605,760,096	142,543,682
Service Population	145,150	195,080	49,930
Per Service Population Annual Consumption	3,191	3,105	-86

Notes: Electricity usage is provided by PG&E and Ava Energy. Residential and nonresidential energy forecasts are adjusted for increases in housing and non-residential square footage in the EIR Study Area and does not account for future building fuel switching.

Year 2045 Forecast Natural Gas Consumption

Area	Natural Gas Usage, Therms per Year ^a		
	Existing Baseline	Year 2045 Forecast	Net Change
Nonresidential	6,078,121	7,134,575	1,056,454
Residential	13,248,679	19,911,124	6,662,445
Total	19,326,800	27,045,699	7,718,899
Service Population	145,150	195,080	49,930
Per Service Population Annual Consumption	133	139	5

Notes: Residential and nonresidential energy forecasts are adjusted for increases in housing and employment, respectively, in the EIR Study Area and do not account for reductions in consumption due to compliance with energy efficiency from compliance with future Energy Code and CALGreen standards.

Operation-Related Annual Fuel Usage: Net Change from Existing

Fuel Type	Existing Baseline Year	Forecast Year 2045	Net Change
Gasoline			
VMT	678,437,121	836,871,853	158,434,733
Gallons	27,523,697	26,518,461	-1,005,236
Miles Per Gallon	24.65	31.56	7
Diesel			
VMT	57,474,773	73,378,798	15,904,026
Gallons	7,736,512	8,230,201	493,689
Miles Per Gallon	7.43	8.92	1
Compressed Natural Gas			
VMT	1,614,057	1,543,474	-70,583
Gallons	294,015	256,469	-37,545
Miles Per Gallon	5.49	6.02	1
Electricity			
VMT	38,302,219	84,855,732	46,553,513
kWh	14,275,325	30,357,216	16,081,891
Miles Per kWh	2.68	2.80	0
Total VMT	775,828,169	996,649,857	220,821,688
Service Population (SP)	145,150	195,080	49,930
VMT/SP	5,345	5,109	-236

Source: EMFAC 2021 (v.1.0.2)

Notes: Based on daily VMT provided by Kittelson and Associates. VMT per year based on a conversion of VMT x 347 days per year to account for less travel on weekends, consistent with CARB statewide GHG emissions inventory methodology (CARB, 2008).

Operation-Related Annual Vehicle Fuel/Energy Usage Summary

Existing Conditions (Year 2023)

Year	Gas			Diesel			CNG			Electricity		
	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	kWh	Miles/kWh
Existing Conditions	678,437,121	27,523,697	24.65	57,474,773	7,736,512	7.43	1,614,057	294,015	5.49	38,302,219	14,275,325	2.68
Total	678,437,121	27,523,697		57,474,773	7,736,512		1,614,057	294,015		38,302,219	14,275,325	

Proposed GP (Year 2045)

Year	Gas			Diesel			CNG			Electricity		
	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	kWh	Miles/kWh
Proposed GP 2045	836,871,853	26,518,461	31.56	73,378,798	8,230,201	8.92	1,543,474	256,469	6.02	84,855,732	30,357,216	2.80
Total	836,871,853	26,518,461		73,378,798	8,230,201		1,543,474	256,469		84,855,732	30,357,216	

Total Net Change

Year	Gas			Diesel			CNG			Electricity		
	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	Gallons	Miles/Gal	VMT	kWh	Miles/kWh
Change from Existing Conditions	158,434,733	-1,005,236	NA	15,904,026	493,689	NA	-70,583	-37,545	NA	46,553,513	16,081,891	NA

Notes

* VMT based on VMT data provided by Kittelson, 2025.

** Fuel consumption rates based on data obtained from EMFAC2021 Web Database, Version 1.0.2. <https://arb.ca.gov/emfac/emissions-inventory/61535b7f8dbfee32e07caa3792bbfa3e83abfed6>.

***VMT per year based on a conversion of VMT x 347 days per year to account for less travel on weekend, consistent with CARB statewide GHG emissions inventory methodology. California Air Resources Board. 2008, October. Climate Change Proposed Scoping Plan: A Framework for Change.

Existing Conditions (Year 2023): Annual City VMT

Vehicle type	Fleet percent	Annual VMT
LDA	52.24%	405,322,192
LDT1	4.13%	32,078,450
LDT2	22.30%	173,003,277
MDV	11.53%	89,486,681
LHD1	2.47%	19,158,849
LHD2	0.58%	4,522,781
MHD	1.60%	12,392,825
HHD	4.26%	33,019,354
OBUS	0.08%	585,359
UBUS	0.25%	1,913,123
MCY	0.35%	2,732,125
SBUS	0.03%	260,765
MH	0.06%	439,013
All Other Buses	0.04%	293,536
Motor Coach	0.02%	190,287
PTO	0.06%	429,551
	100%	775,828,169

Existing Conditions

Vehicle type	Gas percent	Diesel percent	CNG percent	Electricity percent
LDA	90.52%	0.30%	0.00%	9.19%
LDT1	99.92%	0.02%	0.00%	0.06%
LDT2	99.26%	0.36%	0.00%	0.39%
MDV	98.14%	1.46%	0.00%	0.40%
LHD1	66.80%	33.20%	0.00%	0.00%
LHD2	39.11%	60.89%	0.00%	0.00%
MHD	12.61%	86.38%	1.01%	0.00%
HHD	0.05%	95.92%	4.02%	0.00%
OBUS	54.75%	45.06%	0.19%	0.00%
UBUS	19.59%	71.64%	7.59%	1.17%
MCY	100.00%	0.00%	0.00%	0.00%
SBUS	29.27%	66.34%	4.38%	0.01%
MH	71.64%	28.36%	0.00%	0.00%
All Other Buses	0.00%	99.30%	0.70%	0.00%
Motor Coach	0.00%	100.00%	0.00%	0.00%
PTO	0.00%	100.00%	0.00%	0.00%

<< Equal to T6 (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)
 << Equal to T7 (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)
 << OBUS (<https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf>)

Vehicle type	VMT	Gasoline		Diesel		CNG		Electricity				
		mpg	Gallons	mpg	Gallons	mpg	Gallons	m/kWh	kWh			
LDA	366,883,630	29.49	12,441,753	42.31	28,471	0	0	37,233,961	2.67	13,920,350		
LDT1	32,052,793	24.86	1,289,220	7.072	24.09	0	0	18,585	3.31	5,613		
LDT2	171,714,870	23.90	7,184,637	615,448	31.88	19,306	0	0	672,959	3.31	203,254	
MDV	87,821,792	19.73	4,452,285	1,310,634	24.40	53,707	0	0	354,255	3.31	106,995	
LHD1	12,797,456	9.49	1,349,051	6,361,393	15.86	401,127	0	0	0	0.00	0	
LHD2	1,769,083	8.44	209,722	2,753,698	13.22	208,296	0	0	0	0.00	0	
MHD	1,562,199	4.65	335,678	10,705,392	8.41	1,272,556	125,235	7.12	17,597	0	0.00	
HHD	17,012	3.71	4,586	31,673,421	5.92	5,352,492	1,328,921	5.25	252,912	0	0.00	
OBUS	320,474	4.77	67,246	263,762	7.41	35,606	1,123	0	0	0	0.00	
UBUS	374,859	8.45	44,367	1,370,526	7.90	173,591	145,301	6.87	21,146	22,437	0.57	39,113
MCY	2,732,125	41.20	66,321	0	0.00	0	0	0	0	0	0.00	0
SBUS	76,325	10.04	7,600	172,993	8.09	21,385	11,426	5.49	2,081	21	0.95	0
MH	314,502	4.42	71,232	124,511	9.39	13,264	0	0	0	0	0.00	0
All Other Buses	0	0	0	291,485	8.67	33,624	2,051	7.35	279	0	0.00	0
Motor Coach	0	0	0	190,287	5.48	34,750	0	0	0	0	0.00	0
PTO	0	0	0	429,551	4.88	88,042	0	0	0	0	0.00	0
	678,437,121		27,523,697	57,474,773		7,736,512	1,614,057	294,015	38,302,219			14,275,325

Proposed GP (Year 2045): Annual City VMT

Vehicle type	Fleet percent	Annual VMT
LDA	52.24%	520,687,854
LDT1	4.13%	41,208,845
LDT2	22.30%	222,244,691
MDV	11.53%	114,957,011
LHD1	2.47%	24,611,976
LHD2	0.58%	5,810,087
MHD	1.60%	15,920,159
HHD	4.26%	42,417,556
OBUS	0.08%	751,968
UBUS	0.25%	2,457,650
MCY	0.35%	3,509,762
SBUS	0.03%	334,985
MH	0.06%	563,968
All Other Buses	0.04%	377,085
Motor Coach	0.02%	244,448
PTO	0.06%	551,813
	100%	996,649,857

Proposed Conditions

Vehicle type	Gas percent	Diesel percent	CNG percent	Electricity percent
LDA	85.24%	0.05%	0.00%	14.71%
LDT1	98.61%	0.00%	0.00%	1.39%
LDT2	98.06%	0.37%	0.00%	1.57%
MDV	97.24%	1.04%	0.00%	1.71%
LHD1	61.41%	38.59%	0.00%	0.00%
LHD2	28.34%	71.66%	0.00%	0.00%
MHD	8.61%	89.70%	1.68%	0.00%
HHD	0.01%	97.06%	2.93%	0.00%
OBUS	16.91%	64.60%	0.75%	17.75%
UBUS	18.48%	1.27%	0.51%	79.74%
MCY	100.00%	0.00%	0.00%	0.00%
SBUS	28.80%	28.64%	2.06%	40.50%
MH	64.65%	35.35%	0.00%	0.00%
All Other Buses	0.00%	98.15%	1.85%	0.00%
Motor Coach	0.00%	100.00%	0.00%	0.00%
PTO	0.00%	100.00%	0.00%	0.00%

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Vehicle type	Gasoline			Diesel			CNG			Electricity		
	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	mpg	Gallons	VMT	m/kWh	kWh
LDA	443,835,510	37.30	11,899,098	262,667	55.78	4,709	0	0	0	76,589,677	2.68	28,533,779
LDT1	40,635,539	32.25	1,259,843	471	30.23	16	0	0	0	572,836	3.31	173,013
LDT2	217,928,132	31.09	7,010,018	823,334	40.71	20,225	0	0	0	3,493,225	3.31	1,055,058
MDV	111,787,131	25.70	4,350,006	1,198,664	31.26	38,343	0	0	0	1,971,215	3.31	595,366
LHD1	15,113,008	11.25	1,343,585	9,498,968	16.78	566,077	0	0	0	0	0.00	0
LHD2	1,646,500	9.99	164,808	4,163,587	14.35	290,167	0	0	0	0	0.00	0
MHD	1,371,290	5.48	250,168	14,281,157	9.47	1,508,646	267,711	7.33	36,522	0	0.00	0
HHD	2,640	4.66	566	41,171,272	7.43	5,539,938	1,243,643	5.74	216,633	0	0.00	0
OBUS	127,139	5.44	23,391	485,773	8.55	56,819	5,616	0	0	133,440	0.00	0
UBUS	454,109	10.10	44,962	31,254	15.21	2,055	12,629	9.74	1,297	1,959,658	0.57	0
MCY	3,509,762	43.31	81,038	0	0.00	0	0	0	0	0	0.00	0
SBUS	96,486	11.29	8,543	95,931	8.67	11,066	6,888	5.73	1,202	135,679	0.95	0
MH	364,608	4.42	82,435	199,361	9.33	21,363	0	0	0	0	0.00	0
All Other Buses	0	0	0	370,097	9.94	37,246	6,987	8.56	816	0	0.00	0
Motor Coach	0	0	0	244,448	6.36	38,446	0	0	0	0	0.00	0
PTO	0	0	0	551,813	5.80	95,086	0	0	0	0	0.00	0
	836,871,853		26,518,461	73,378,798		8,230,201	1,543,474		256,469	84,855,732		30,357,216

EMFAC Fuel Usage: Year 2023

Vehicle type	GAS			DSL			NG			ELEC		
	VMT/day	Gallons/day	Miles/gallon	VMT/day	Gallons/day	Miles/gallon	VMT/day	Gallons/day	Miles/gallon	VMT/day	kWh/day	Miles/kWh
All other buses	0	0	0.00	16,166	1,865	8.67	114	15	7.35	0	0	0.00
LDA	20,347,651	690,029	29.49	66,808	1,579	42.31	0	0	0.00	2,065,024	772,033	2.67
LDT1	1,777,673	71,501	24.86	392	16	24.09	0	0	0.00	1,031	311	3.31
LDT2	9,523,440	398,466	23.90	34,133	1,071	31.88	0	0	0.00	37,323	11,273	3.31
LHD1	709,757	74,819	9.49	352,808	22,247	15.86	0	0	0.00	0	0	0.00
LHD2	98,115	11,631	8.44	152,722	11,552	13.22	0	0	0.00	0	0	0.00
MCY	151,526	3,678	41.20	0	0	0.00	0	0	0.00	0	0	0.00
MDV	4,870,665	246,927	19.73	72,689	2,979	24.40	0	0	0.00	19,647	5,934	3.31
MH	17,443	3,951	4.42	6,905	736	9.39	0	0	0.00	0	0	0.00
Motor coach	0	0	0.00	10,553	1,927	5.48	0	0	0.00	0	0	0.00
OBUS	32,464	6,812	4.77	0	0	0.00	0	0	0.00	0	0	0.00
PTO	0	0	0.00	23,823	4,883	4.88	0	0	0.00	0	0	0.00
SBUS	4,233	422	10.04	9,594	1,186	8.09	634	115	5.49	1	1	0.95
T6	86,641	18,617	4.65	593,729	70,577	8.41	6,946	976	7.12	0	0	0.00
T7	944	254	3.71	1,756,633	296,853	5.92	73,703	14,027	5.25	0	0	0.00
UBUS	20,790	2,461	8.45	76,010	9,627	7.90	8,059	1,173	6.87	1,244	2,169	0.57
Total	37,641,340	1,529,568	24.61	3,172,967	427,098	7.43	89,455	16,306	5.49	2,124,271	791,722	2.68

Source: EMFAC2021 (v1.0.2) Emissions Inventory

Region Type: Sub-Area

Region: Alameda (SF)

Calendar Year: 2023

Season: Annual

Vehicle Classification: EMFAC202x Categories

Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Electric Vehicle populations for vehicle classes above 8,500 lbs, except for buses, are removed consistent with the EPA's EMFAC2021 Adjustment Factors.

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	Total VMT	CVMT	EVMT	Trips	Fuel Consumption	Energy Consumption
Alameda (SF)	2023	All Other Buses	Aggregate	Aggregate	Diesel	280.9181706	16165.97601	16165.97601	0	2500.17172	1.864827933	0
Alameda (SF)	2023	All Other Buses	Aggregate	Aggregate	Natural Gas	1.767401719	113.7695563	113.7695563	0	15.7298753	0.015478573	0
Alameda (SF)	2023	LDA	Aggregate	Aggregate	Gasoline	554013.6559	20036783.06	20036783.06	0	2558524.71	679.7869826	0
Alameda (SF)	2023	LDA	Aggregate	Aggregate	Diesel	2383.835981	66808.06318	66808.06318	0	10029.2082	1.579043456	0
Alameda (SF)	2023	LDA	Aggregate	Aggregate	Electricity	40729.03985	1764778.784	0	1764779	201239.364	0	681350.2659
Alameda (SF)	2023	LDA	Aggregate	Aggregate	Plug-in Hybrid	13516.12352	611113.7159	310868.0736	300245.6	55889.1707	10.24232025	90683.13272
Alameda (SF)	2023	LDT1	Aggregate	Aggregate	Gasoline	53163.53646	1776790.802	1776790.802	0	235626.25	71.47202017	0
Alameda (SF)	2023	LDT1	Aggregate	Aggregate	Diesel	32.09604679	392.2189208	392.2189208	0	92.5300804	0.016282409	0
Alameda (SF)	2023	LDT1	Aggregate	Aggregate	Plug-in Hybrid	36.5913159	1912.738212	881.9864957	1030.752	151.305091	0.029098206	311.13177396
Alameda (SF)	2023	LDT2	Aggregate	Aggregate	Gasoline	246364.5187	9488897.948	9488897.948	0	1150781.05	397.3218402	0
Alameda (SF)	2023	LDT2	Aggregate	Aggregate	Diesel	848.1394293	34133.24415	34133.24415	0	4031.70352	1.070727905	0
Alameda (SF)	2023	LDT2	Aggregate	Aggregate	Plug-in Hybrid	1432.968339	71864.96366	34542.14219	37322.82	5925.32408	1.143695683	11272.60448
Alameda (SF)	2023	LHD1	Aggregate	Aggregate	Gasoline	18928.50477	709756.8266	709756.8266	0	282006.518	74.81940096	0
Alameda (SF)	2023	LHD1	Aggregate	Aggregate	Diesel	8925.7439	352807.8208	352807.8208	0	112274.63	22.24682601	0
Alameda (SF)	2023	LHD2	Aggregate	Aggregate	Gasoline	2690.871471	98114.73625	98114.73625	0	40089.9755	11.63136824	0
Alameda (SF)	2023	LHD2	Aggregate	Aggregate	Diesel	3758.314721	152722.2159	152722.2159	0	47274.8712	11.55227519	0
Alameda (SF)	2023	MCY	Aggregate	Aggregate	Gasoline	26178.52112	151525.7812	151525.7812	0	52357.0422	3.678226592	0
Alameda (SF)	2023	MDV	Aggregate	Aggregate	Gasoline	132134.9696	4851445.215	4851445.215	0	609226.54	246.2827011	0
Alameda (SF)	2023	MDV	Aggregate	Aggregate	Diesel	1855.50252	72688.75714	72688.75714	0	8756.74207	2.97860434	0
Alameda (SF)	2023	MDV	Aggregate	Aggregate	Plug-in Hybrid	813.1677445	38866.84104	19219.61038	19647.23	3362.44862	0.644484964	5934.049241

Alameda (SF)	2023 MH	Aggregate	Aggregate	Gasoline	1923.03689	17442.54821	17442.54821	0	192.38061	3.950582142	0
Alameda (SF)	2023 MH	Aggregate	Aggregate	Diesel	683.9458547	6905.476214	6905.476214	0	68.3945855	0.73563826	0
Alameda (SF)	2023 Motor Coach	Aggregate	Aggregate	Diesel	74.07255404	10553.46278	10553.46278	0	1702.18729	1.927257405	0
Alameda (SF)	2023 OBUS	Aggregate	Aggregate	Gasoline	636.5060868	32464.45565	32464.45565	0	12735.2138	6.812077986	0
Alameda (SF)	2023 PTO	Aggregate	Aggregate	Diesel	0	23823.23835	23823.23835	0	0	4.882879897	0
Alameda (SF)	2023 SBUS	Aggregate	Aggregate	Gasoline	79.55036005	4233.023294	4233.023294	0	318.20144	0.42150932	0
Alameda (SF)	2023 SBUS	Aggregate	Aggregate	Diesel	400.8352809	9594.316077	9594.316077	0	5804.09487	1.186052943	0
Alameda (SF)	2023 SBUS	Aggregate	Aggregate	Electricity	0.102413451	1.187980343	0	1.18798	1.48294678	0	1.251484534
Alameda (SF)	2023 SBUS	Aggregate	Aggregate	Natural Gas	24.87981978	633.67975	633.67975	0	360.25979	0.115397256	0
Alameda (SF)	2023 T6 CAIRP Class 4	Aggregate	Aggregate	Diesel	4.889398437	324.4119342	324.4119342	0	112.358376	0.036682168	0
Alameda (SF)	2023 T6 CAIRP Class 5	Aggregate	Aggregate	Diesel	6.563839349	445.077087	445.077087	0	150.837028	0.050257524	0
Alameda (SF)	2023 T6 CAIRP Class 6	Aggregate	Aggregate	Diesel	20.66527462	1162.313922	1162.313922	0	474.888011	0.129432457	0
Alameda (SF)	2023 T6 CAIRP Class 7	Aggregate	Aggregate	Diesel	35.70751246	7294.80197	7294.80197	0	820.558636	0.762641207	0
Alameda (SF)	2023 T6 Instate Delivery Class 4	Aggregate	Aggregate	Diesel	1037.818153	35277.88197	35277.88197	0	14809.665	4.32828463	0
Alameda (SF)	2023 T6 Instate Delivery Class 4	Aggregate	Aggregate	Natural Gas	2.880470739	107.9146904	107.9146904	0	41.1043174	0.016051428	0
Alameda (SF)	2023 T6 Instate Delivery Class 5	Aggregate	Aggregate	Diesel	759.4191167	26453.13156	26453.13156	0	10836.9108	3.23257696	0
Alameda (SF)	2023 T6 Instate Delivery Class 5	Aggregate	Aggregate	Natural Gas	1.548828596	58.28411651	58.28411651	0	22.1017841	0.008459705	0
Alameda (SF)	2023 T6 Instate Delivery Class 6	Aggregate	Aggregate	Diesel	2706.309591	94509.11416	94509.11416	0	38619.0379	11.584099975	0
Alameda (SF)	2023 T6 Instate Delivery Class 6	Aggregate	Aggregate	Natural Gas	4.499153957	166.1604254	166.1604254	0	64.202927	0.024191184	0
Alameda (SF)	2023 T6 Instate Delivery Class 7	Aggregate	Aggregate	Diesel	604.6256233	33648.86725	33648.86725	0	8628.00764	4.069356949	0
Alameda (SF)	2023 T6 Instate Delivery Class 7	Aggregate	Aggregate	Natural Gas	15.43568634	870.1375585	870.1375585	0	220.267244	0.126836181	0
Alameda (SF)	2023 T6 Instate Other Class 4	Aggregate	Aggregate	Diesel	1052.120582	43314.32578	43314.32578	0	12162.5139	5.102065971	0
Alameda (SF)	2023 T6 Instate Other Class 4	Aggregate	Aggregate	Natural Gas	2.093063282	97.06777457	97.06777457	0	24.1958115	0.013127807	0
Alameda (SF)	2023 T6 Instate Other Class 5	Aggregate	Aggregate	Diesel	2248.902588	99371.14137	99371.14137	0	25997.3139	11.75193275	0
Alameda (SF)	2023 T6 Instate Other Class 5	Aggregate	Aggregate	Natural Gas	4.784465251	210.8760337	210.8760337	0	55.3084183	0.027494612	0
Alameda (SF)	2023 T6 Instate Other Class 6	Aggregate	Aggregate	Diesel	2314.669396	99950.79054	99950.79054	0	26757.5782	11.73383577	0
Alameda (SF)	2023 T6 Instate Other Class 6	Aggregate	Aggregate	Natural Gas	4.109362782	178.3937248	178.3937248	0	47.5042338	0.02325269	0
Alameda (SF)	2023 T6 Instate Other Class 7	Aggregate	Aggregate	Diesel	1231.38533	60957.63549	60957.63549	0	14234.8144	7.028174989	0
Alameda (SF)	2023 T6 Instate Other Class 7	Aggregate	Aggregate	Natural Gas	30.34923813	1602.856989	1602.856989	0	350.837193	0.206752092	0
Alameda (SF)	2023 T6 Instate Tractor Class 6	Aggregate	Aggregate	Diesel	9.917334462	497.7101647	497.7101647	0	114.644386	0.057387695	0
Alameda (SF)	2023 T6 Instate Tractor Class 6	Aggregate	Aggregate	Natural Gas	0.01827918	1.051193285	1.051193285	0	0.21130732	0.000139457	0
Alameda (SF)	2023 T6 Instate Tractor Class 7	Aggregate	Aggregate	Diesel	528.7189266	33894.49559	33894.49559	0	6111.99079	3.70093261	0
Alameda (SF)	2023 T6 Instate Tractor Class 7	Aggregate	Aggregate	Natural Gas	12.69169844	849.8007085	849.8007085	0	146.716034	0.107168911	0
Alameda (SF)	2023 T6 OOS Class 4	Aggregate	Aggregate	Diesel	2.643901143	173.8258903	173.8258903	0	60.7568483	0.019642615	0
Alameda (SF)	2023 T6 OOS Class 5	Aggregate	Aggregate	Diesel	3.534106623	238.4578635	238.4578635	0	81.2137702	0.096818986	0
Alameda (SF)	2023 T6 OOS Class 6	Aggregate	Aggregate	Diesel	11.16369083	623.0972196	623.0972196	0	256.541615	0.069326541	0
Alameda (SF)	2023 T6 OOS Class 7	Aggregate	Aggregate	Diesel	18.14601325	4530.691602	4530.691602	0	416.995384	0.471120103	0
Alameda (SF)	2023 T6 Public Class 4	Aggregate	Aggregate	Diesel	117.9446511	3867.983399	3867.983399	0	605.05606	0.514085605	0
Alameda (SF)	2023 T6 Public Class 4	Aggregate	Aggregate	Natural Gas	2.18082717	94.11277654	94.11277654	0	11.1876434	0.013901115	0
Alameda (SF)	2023 T6 Public Class 5	Aggregate	Aggregate	Diesel	247.4262739	9213.940813	9213.940813	0	1269.29678	1.195044352	0
Alameda (SF)	2023 T6 Public Class 5	Aggregate	Aggregate	Natural Gas	18.68176372	781.5494956	781.5494956	0	95.8374479	0.12016364	0
Alameda (SF)	2023 T6 Public Class 6	Aggregate	Aggregate	Diesel	184.2901321	6535.332771	6535.332771	0	945.408377	0.850093023	0
Alameda (SF)	2023 T6 Public Class 6	Aggregate	Aggregate	Natural Gas	14.82977502	623.66716	623.66716	0	76.0767459	0.096874367	0
Alameda (SF)	2023 T6 Public Class 7	Aggregate	Aggregate	Diesel	430.4306417	19356.91361	19356.91361	0	2208.10919	2.492927887	0
Alameda (SF)	2023 T6 Public Class 7	Aggregate	Aggregate	Natural Gas	20.64329042	1126.28953	1126.28953	0	105.90008	0.16724708	0
Alameda (SF)	2023 T6 Utility Class 5	Aggregate	Aggregate	Diesel	204.6294071	8335.255911	8335.255911	0	2619.25641	0.946547805	0
Alameda (SF)	2023 T6 Utility Class 5	Aggregate	Aggregate	Natural Gas	2.871697697	113.5205813	113.5205813	0	36.7577305	0.015586728	0
Alameda (SF)	2023 T6 Utility Class 6	Aggregate	Aggregate	Diesel	38.92168268	1574.125842	1574.125842	0	498.197538	0.17812608	0
Alameda (SF)	2023 T6 Utility Class 6	Aggregate	Aggregate	Natural Gas	0.56868693	22.52188931	22.52188931	0	7.27919271	0.003070702	0
Alameda (SF)	2023 T6 Utility Class 7	Aggregate	Aggregate	Diesel	44.01771047	2178.005685	2178.005685	0	563.426694	0.245447243	0
Alameda (SF)	2023 T6 Utility Class 7	Aggregate	Aggregate	Natural Gas	0.944461711	41.40537318	41.40537318	0	12.0891099	0.005625741	0
Alameda (SF)	2023 T6T5	Aggregate	Aggregate	Gasoline	1683.243274	86640.7753	86640.7753	0	33678.3314	18.61696846	0
Alameda (SF)	2023 T7 CAIRP Class 8	Aggregate	Aggregate	Diesel	2020.738806	410663.2613	410663.2613	0	46436.5778	68.07478738	0
Alameda (SF)	2023 T7 CAIRP Class 8	Aggregate	Aggregate	Natural Gas	4.364849195	908.0372198	908.0372198	0	100.304234	0.161598046	0
Alameda (SF)	2023 T7 NNOOS Class 8	Aggregate	Aggregate	Diesel	1803.340182	484463.2238	484463.2238	0	41440.7574	79.5748682	0

Alameda (SF)	2023 T7 NOOS Class 8	Aggregate	Aggregate	Diesel	755.1694259	176037.9554	176037.9554	0	17353.7934	29.24010716	0
Alameda (SF)	2023 T7 Other Port Class 8	Aggregate	Aggregate	Diesel	202.3470846	37972.21328	37972.21328	0	3310.3983	6.405719845	0
Alameda (SF)	2023 T7 POAK Class 8	Aggregate	Aggregate	Diesel	1335.783032	134322.5995	134322.5995	0	21853.4104	23.0666604	0
Alameda (SF)	2023 T7 POAK Class 8	Aggregate	Aggregate	Natural Gas	0.560323076	54.43445915	54.43445915	0	9.16688552	0.009688696	0
Alameda (SF)	2023 T7 Public Class 8	Aggregate	Aggregate	Diesel	915.9189032	40429.22061	40429.22061	0	4698.66397	7.73741732	0
Alameda (SF)	2023 T7 Public Class 8	Aggregate	Aggregate	Natural Gas	3.816229545	196.5740376	196.5740376	0	19.5772576	0.042353864	0
Alameda (SF)	2023 T7 Single Concrete/Transit	Aggregate	Aggregate	Diesel	154.0948435	10875.70956	10875.70956	0	1451.57343	1.851972802	0
Alameda (SF)	2023 T7 Single Concrete/Transit	Aggregate	Aggregate	Natural Gas	9.147650575	662.5022739	662.5022739	0	86.1708684	0.116130913	0
Alameda (SF)	2023 T7 Single Dump Class 8	Aggregate	Aggregate	Diesel	744.9051091	46125.11988	46125.11988	0	7017.00613	7.923569253	0
Alameda (SF)	2023 T7 Single Dump Class 8	Aggregate	Aggregate	Natural Gas	43.89060817	2853.182932	2853.182932	0	413.449529	0.524980706	0
Alameda (SF)	2023 T7 Single Other Class 8	Aggregate	Aggregate	Diesel	989.7393314	56106.25635	56106.25635	0	9323.3445	9.560972645	0
Alameda (SF)	2023 T7 Single Other Class 8	Aggregate	Aggregate	Natural Gas	56.87476352	3355.819203	3355.819203	0	535.760272	0.605702107	0
Alameda (SF)	2023 T7 SWCV Class 8	Aggregate	Aggregate	Diesel	268.8351253	17441.81903	17441.81903	0	1236.64158	7.033017848	0
Alameda (SF)	2023 T7 SWCV Class 8	Aggregate	Aggregate	Natural Gas	315.8578327	20437.66835	20437.66835	0	1452.94603	4.517780698	0
Alameda (SF)	2023 T7 Tractor Class 8	Aggregate	Aggregate	Diesel	4236.091115	335525.1966	335525.1966	0	61550.4039	55.2317425	0
Alameda (SF)	2023 T7 Tractor Class 8	Aggregate	Aggregate	Natural Gas	562.6153484	45234.76122	45234.76122	0	8174.80101	8.048452322	0
Alameda (SF)	2023 T7 Utility Class 8	Aggregate	Aggregate	Diesel	144.0845019	6669.972431	6669.972431	0	1844.28162	1.152575958	0
Alameda (SF)	2023 T7IS	Aggregate	Aggregate	Gasoline	7.47982347	943.5103503	943.5103503	0	149.656308	0.254330476	0
Alameda (SF)	2023 UBUS	Aggregate	Aggregate	Gasoline	254.2405543	20789.94732	20789.94732	0	1016.96222	2.460607804	0
Alameda (SF)	2023 UBUS	Aggregate	Aggregate	Diesel	691.1833752	76010.43947	76010.43947	0	2764.7335	9.627477457	0
Alameda (SF)	2023 UBUS	Aggregate	Aggregate	Electricity	14.13091943	1244.382099	0	1244.382	56.5236777	0	2169.261776
Alameda (SF)	2023 UBUS	Aggregate	Aggregate	Natural Gas	91.10189943	8058.532619	8058.532619	0	364.407598	1.172782759	0

EMFAC Fuel Usage: Year 2045

Vehicle type	GAS			DSL			NG			ELEC		
	VMT/day	Gallons/day	Miles/gallon	VMT/day	Gallons/day	Miles/gallon	VMT/day	Gallons/day	Miles/gallon	VMT/day	kWh/day	Miles/kWh
All other buses	0	0	0.00	18,764	1,888	9.94	354	41	8.56	0	0	0.00
LDA	21,539,724	577,474	37.30	12,747	229	55.78	0	0	0.00	3,716,964	1,384,769	2.68
LDT1	1,349,029	41,825	32.25	16	1	30.23	0	0	0.00	19,017	5,744	3.31
LDT2	11,635,642	374,280	31.09	43,960	1,080	40.71	0	0	0.00	186,511	56,332	3.31
LHD1	481,497	42,806	11.25	302,635	18,035	16.78	0	0	0.00	0	0	0.00
LHD2	56,015	5,607	9.99	141,649	9,872	14.35	0	0	0.00	0	0	0.00
MCY	169,956	3,924	43.31	0	0	0.00	0	0	0.00	0	0	0.00
MDV	6,541,552	254,553	25.70	70,143	2,244	31.26	0	0	0.00	115,351	34,840	3.31
MH	18,304	4,139	4.42	10,009	1,072	9.33	0	0	0.00	0	0	0.00
Motor coach	0	0	0.00	11,878	1,868	6.36	0	0	0.00	0	0	0.00
OBUS	8,020	1,475	5.44	0	0	0.00	0	0	0.00	8,417	9,325	0.90
PTO	0	0	0.00	16,688	2,876	5.80	0	0	0.00	0	0	0.00
SBUS	5,719	506	11.29	5,686	656	8.67	408	71	5.73	8,042	8,471	0.95
T6	41,356	7,545	5.48	430,701	45,499	9.47	8,074	1,101	7.33	0	0	0.00
T7	151	32	4.66	2,350,196	316,238	7.43	70,991	12,366	5.74	0	0	0.00
UBUS	20,303	2,010	10.10	1,397	92	15.21	565	58	9.74	87,614	152,732	0.57
Total	41,867,268	1,316,176	31.81	3,416,468	401,649	8.51	80,392	13,638	5.89	4,141,916	1,652,213	2.51

Source: EMFAC2021 (v1.0.2) Emissions Inventory

Region Type: Sub-Area

Region: Alameda (SF)

Calendar Year: 2045

Season: Annual

Vehicle Classification: EMFAC202x Categories

Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Electric Vehicle populations for vehicle classes above 8,500 lbs, except for buses, are removed consistent with the EPA's EMFAC2021 Adjustment Factors.

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	Total VMT	CVMT	EVMT	Trips	Fuel Consumption	Energy Consumption
Alameda (SF)	2045	All Other Buses	Aggregate	Aggregate	Diesel	362.1621085	18763.97998	18763.97998	0	3223.24277	1.888355784	0
Alameda (SF)	2045	All Other Buses	Aggregate	Aggregate	Natural Gas	6.378487229	354.2460273	354.2460273	0	56.7685363	0.041364839	0
Alameda (SF)	2045	LDA	Aggregate	Aggregate	Gasoline	568315.2294	21126512.64	21126512.64	0	2639026.44	563.5353313	0
Alameda (SF)	2045	LDA	Aggregate	Aggregate	Diesel	389.6692088	12747.48289	12747.48289	0	1721.12923	0.228539486	0
Alameda (SF)	2045	LDA	Aggregate	Aggregate	Electricity	78907.20599	3118700.77	0	3118700.77	368837.375	0	1204075.898
Alameda (SF)	2045	LDA	Aggregate	Aggregate	Plug-in Hybrid	26775.4931	1011474.875	413211.798	598263.0766	110716.664	13.9382646	180693.2802
Alameda (SF)	2045	LDT1	Aggregate	Aggregate	Gasoline	37260.64666	1335973.853	1335973.853	0	168839.621	41.38195864	0
Alameda (SF)	2045	LDT1	Aggregate	Aggregate	Diesel	0.410435309	15.62855323	15.62855323	0	1.91298169	0.000516925	0
Alameda (SF)	2045	LDT1	Aggregate	Aggregate	Plug-in Hybrid	813.6786177	32072.14878	13055.00847	19017.14031	3364.56108	0.442614415	5743.743176
Alameda (SF)	2045	LDT2	Aggregate	Aggregate	Gasoline	307141.388	11507201.85	11507201.85	0	1417283.66	369.9072765	0
Alameda (SF)	2045	LDT2	Aggregate	Aggregate	Diesel	1164.738667	43959.52554	43959.52554	0	5396.30146	1.07987992	0
Alameda (SF)	2045	LDT2	Aggregate	Aggregate	Plug-in Hybrid	8165.51596	314950.656	128440	186510.656	33764.4085	4.372365072	56331.77703
Alameda (SF)	2045	LHD1	Aggregate	Aggregate	Gasoline	13640.38133	481496.7115	481496.7115	0	203221.358	42.80627817	0
Alameda (SF)	2045	LHD1	Aggregate	Aggregate	Diesel	8519.850388	302634.7717	302634.7717	0	107169	18.03506831	0
Alameda (SF)	2045	LHD2	Aggregate	Aggregate	Gasoline	1634.056697	56015.46588	56015.46588	0	24345.01	5.606906105	0
Alameda (SF)	2045	LHD2	Aggregate	Aggregate	Diesel	4164.620163	141649.153	141649.153	0	52385.6826	9.87175625	0
Alameda (SF)	2045	MCY	Aggregate	Aggregate	Gasoline	30052.7031	169956.1661	169956.1661	0	60105.4062	3.924191848	0
Alameda (SF)	2045	MDV	Aggregate	Aggregate	Gasoline	177275.7055	6462094.232	6462094.232	0	813513.221	251.8082716	0
Alameda (SF)	2045	MDV	Aggregate	Aggregate	Diesel	1944.069574	70143.34535	70143.34535	0	8895.0499	2.243747012	0
Alameda (SF)	2045	MDV	Aggregate	Aggregate	Plug-in Hybrid	5177.128564	194809.03	79457.57524	115351.4547	21407.4266	2.745092761	34839.57735
Alameda (SF)	2045	MH	Aggregate	Aggregate	Gasoline	1627.234894	18304.4528	18304.4528	0	162.788579	4.138518433	0
Alameda (SF)	2045	MH	Aggregate	Aggregate	Diesel	995.0485057	10008.54582	10008.54582	0	99.5048506	1.07247966	0
Alameda (SF)	2045	Motor Coach	Aggregate	Aggregate	Diesel	93.53108143	11878.38419	11878.38419	0	2149.34425	1.868186322	0

Alameda (SF)	2045 OBUS	Aggregate	Aggregate	Gasoline	254.0931602	8019.896935	8019.896935	0	5083.89595	1.475492098	0
Alameda (SF)	2045 OBUS	Aggregate	Aggregate	Electricity	121.5059978	8417.35683	0	8417.35683	2431.092	0	9325.143448
Alameda (SF)	2045 PTO	Aggregate	Aggregate	Diesel	0	16688.10611	16688.10611	0	0	2.875624456	0
Alameda (SF)	2045 SBUS	Aggregate	Aggregate	Gasoline	107.7090587	5718.664149	5718.664149	0	430.836235	0.506358397	0
Alameda (SF)	2045 SBUS	Aggregate	Aggregate	Diesel	286.7343178	5685.769295	5685.769295	0	4151.91292	0.655891984	0
Alameda (SF)	2045 SBUS	Aggregate	Aggregate	Electricity	236.6073681	8041.606525	0	8041.606525	2654.99259	0	8471.475347
Alameda (SF)	2045 SBUS	Aggregate	Aggregate	Natural Gas	21.19203308	408.2528811	408.2528811	0	306.860639	0.071228668	0
Alameda (SF)	2045 T6 CAIRP Class 4	Aggregate	Aggregate	Diesel	2.706541864	188.2007775	188.2007775	0	62.196332	0.018961035	0
Alameda (SF)	2045 T6 CAIRP Class 5	Aggregate	Aggregate	Diesel	3.330427278	258.7001832	258.7001832	0	76.5332188	0.026055284	0
Alameda (SF)	2045 T6 CAIRP Class 6	Aggregate	Aggregate	Diesel	15.06629346	672.2303462	672.2303462	0	346.223424	0.06792177	0
Alameda (SF)	2045 T6 CAIRP Class 7	Aggregate	Aggregate	Diesel	39.04901247	7700.532753	7700.532753	0	897.346307	0.681439328	0
Alameda (SF)	2045 T6 Instate Delivery Class 4	Aggregate	Aggregate	Diesel	725.0356875	23674.28522	23674.28522	0	10346.2593	2.575848059	0
Alameda (SF)	2045 T6 Instate Delivery Class 4	Aggregate	Aggregate	Natural Gas	9.532133099	314.739174	314.739174	0	136.023539	0.045534491	0
Alameda (SF)	2045 T6 Instate Delivery Class 5	Aggregate	Aggregate	Diesel	543.9722749	17760.55383	17760.55383	0	7762.48436	1.934658542	0
Alameda (SF)	2045 T6 Instate Delivery Class 5	Aggregate	Aggregate	Natural Gas	6.960566976	230.6455576	230.6455576	0	99.3272907	0.033310433	0
Alameda (SF)	2045 T6 Instate Delivery Class 6	Aggregate	Aggregate	Diesel	1944.755161	63480.75692	63480.75692	0	27751.6562	6.922121942	0
Alameda (SF)	2045 T6 Instate Delivery Class 6	Aggregate	Aggregate	Natural Gas	24.61671246	816.6416654	816.6416654	0	351.280487	0.117924433	0
Alameda (SF)	2045 T6 Instate Delivery Class 7	Aggregate	Aggregate	Diesel	607.3338247	30473.62994	30473.62994	0	8666.65368	3.386394081	0
Alameda (SF)	2045 T6 Instate Delivery Class 7	Aggregate	Aggregate	Natural Gas	13.84230753	686.4535426	686.4535426	0	197.529729	0.09814425	0
Alameda (SF)	2045 T6 Instate Other Class 4	Aggregate	Aggregate	Diesel	737.2274943	28121.53182	28121.53182	0	8522.34983	2.951073263	0
Alameda (SF)	2045 T6 Instate Other Class 4	Aggregate	Aggregate	Natural Gas	9.747290093	382.1595421	382.1595421	0	112.678673	0.048469037	0
Alameda (SF)	2045 T6 Instate Other Class 5	Aggregate	Aggregate	Diesel	1694.463522	64589.29917	64589.29917	0	19587.9983	6.786498492	0
Alameda (SF)	2045 T6 Instate Other Class 5	Aggregate	Aggregate	Natural Gas	21.90559998	864.9655717	864.9655717	0	253.228736	0.109450415	0
Alameda (SF)	2045 T6 Instate Other Class 6	Aggregate	Aggregate	Diesel	1705.855614	64992.23095	64992.23095	0	19719.6909	6.824439766	0
Alameda (SF)	2045 T6 Instate Other Class 6	Aggregate	Aggregate	Natural Gas	22.04850399	870.1830829	870.1830829	0	254.880706	0.110102403	0
Alameda (SF)	2045 T6 Instate Other Class 7	Aggregate	Aggregate	Diesel	1324.559284	50468.43519	50468.43519	0	15311.9053	5.381165622	0
Alameda (SF)	2045 T6 Instate Other Class 7	Aggregate	Aggregate	Natural Gas	29.6159143	1076.586191	1076.586191	0	342.359969	0.139710085	0
Alameda (SF)	2045 T6 Instate Tractor Class 6	Aggregate	Aggregate	Diesel	7.22668237	316.5110673	316.5110673	0	83.5404482	0.033008137	0
Alameda (SF)	2045 T6 Instate Tractor Class 6	Aggregate	Aggregate	Natural Gas	0.095218624	4.2686801	4.2686801	0	1.1007273	0.000533411	0
Alameda (SF)	2045 T6 Instate Tractor Class 7	Aggregate	Aggregate	Diesel	687.4482237	38790.53659	38790.53659	0	7946.90147	3.711705174	0
Alameda (SF)	2045 T6 Instate Tractor Class 7	Aggregate	Aggregate	Natural Gas	14.76088639	810.5056429	810.5056429	0	170.635847	0.098808345	0
Alameda (SF)	2045 T6 OOS Class 4	Aggregate	Aggregate	Diesel	3.387559792	240.6386469	240.6386469	0	77.846124	0.022752092	0
Alameda (SF)	2045 T6 OOS Class 5	Aggregate	Aggregate	Diesel	4.168772346	330.1129511	330.1129511	0	95.7983885	0.031214047	0
Alameda (SF)	2045 T6 OOS Class 6	Aggregate	Aggregate	Diesel	18.84653796	862.5945857	862.5945857	0	433.093442	0.081699764	0
Alameda (SF)	2045 T6 OOS Class 7	Aggregate	Aggregate	Diesel	23.10807033	6272.135266	6272.135266	0	531.023456	0.530628413	0
Alameda (SF)	2045 T6 Public Class 4	Aggregate	Aggregate	Diesel	67.91483811	2328.172612	2328.172612	0	348.40312	0.267952812	0
Alameda (SF)	2045 T6 Public Class 4	Aggregate	Aggregate	Natural Gas	4.62102171	159.8776799	159.8776799	0	23.7058414	0.023818791	0
Alameda (SF)	2045 T6 Public Class 5	Aggregate	Aggregate	Diesel	171.064024	5860.103111	5860.103111	0	877.558443	0.679712657	0
Alameda (SF)	2045 T6 Public Class 5	Aggregate	Aggregate	Natural Gas	13.91219722	466.7139749	466.7139749	0	71.3695717	0.070878998	0
Alameda (SF)	2045 T6 Public Class 6	Aggregate	Aggregate	Diesel	121.9442595	4180.427334	4180.427334	0	625.574051	0.482132095	0
Alameda (SF)	2045 T6 Public Class 6	Aggregate	Aggregate	Natural Gas	10.66695482	354.2240435	354.2240435	0	54.7214782	0.05418455	0
Alameda (SF)	2045 T6 Public Class 7	Aggregate	Aggregate	Diesel	317.9233821	13262.25527	13262.25527	0	1630.94695	1.492801691	0
Alameda (SF)	2045 T6 Public Class 7	Aggregate	Aggregate	Natural Gas	23.78605948	985.8683663	985.8683663	0	122.022485	0.144209543	0
Alameda (SF)	2045 T6 Utility Class 5	Aggregate	Aggregate	Diesel	102.2950611	4058.645433	4058.645433	0	1309.37678	0.420718816	0
Alameda (SF)	2045 T6 Utility Class 5	Aggregate	Aggregate	Natural Gas	0.869942991	34.51574405	34.51574405	0	11.1352703	0.004412277	0
Alameda (SF)	2045 T6 Utility Class 6	Aggregate	Aggregate	Diesel	19.3445405	767.2877848	767.2877848	0	247.610118	0.07954154	0
Alameda (SF)	2045 T6 Utility Class 6	Aggregate	Aggregate	Natural Gas	0.16451085	6.525208775	6.525208775	0	2.10573888	0.000834176	0
Alameda (SF)	2045 T6 Utility Class 7	Aggregate	Aggregate	Diesel	21.47506119	1050.825455	1050.825455	0	274.880783	0.108306484	0
Alameda (SF)	2045 T6 Utility Class 7	Aggregate	Aggregate	Natural Gas	0.182629335	8.936484613	8.936484613	0	2.33765549	0.001123523	0
Alameda (SF)	2045 T6T5	Aggregate	Aggregate	Gasoline	848.4541417	41356.28288	41356.28288	0	16975.8705	7.544721829	0
Alameda (SF)	2045 T7 CAIRP Class 8	Aggregate	Aggregate	Diesel	2432.445028	506444.5695	506444.5695	0	55897.5868	68.5725561	0
Alameda (SF)	2045 T7 CAIRP Class 8	Aggregate	Aggregate	Natural Gas	4.457187444	927.8351337	927.8351337	0	102.426167	0.148163717	0
Alameda (SF)	2045 T7 NNOOS Class 8	Aggregate	Aggregate	Diesel	2691.089439	767388.0807	767388.0807	0	61841.2353	98.85298517	0
Alameda (SF)	2045 T7 NOOS Class 8	Aggregate	Aggregate	Diesel	1156.883485	278843.5161	278843.5161	0	26585.1825	36.31827911	0
Alameda (SF)	2045 T7 Other Port Class 8	Aggregate	Aggregate	Diesel	199.2620935	48151.33026	48151.33026	0	3259.92785	6.630627125	0
Alameda (SF)	2045 T7 POAK Class 8	Aggregate	Aggregate	Diesel	1461.183944	168815.286	168815.286	0	23904.9693	23.66114243	0
Alameda (SF)	2045 T7 POAK Class 8	Aggregate	Aggregate	Natural Gas	3.298383621	381.0728804	381.0728804	0	53.961556	0.062521556	0

Alameda (SF)	2045 T7 Public Class 8	Aggregate	Aggregate	Diesel	713.6269556	28608.86898	28608.86898	0	3660.90628	4.753977901	0
Alameda (SF)	2045 T7 Public Class 8	Aggregate	Aggregate	Natural Gas	5.438292992	220.0186109	220.0186109	0	27.8984431	0.044881395	0
Alameda (SF)	2045 T7 Single Concrete/Transit	Aggregate	Aggregate	Diesel	79.87741923	5235.45543	5235.45543	0	752.445289	0.775438043	0
Alameda (SF)	2045 T7 Single Concrete/Transit	Aggregate	Aggregate	Natural Gas	4.916420209	322.1678076	322.1678076	0	46.3126784	0.051685059	0
Alameda (SF)	2045 T7 Single Dump Class 8	Aggregate	Aggregate	Diesel	577.5228211	27869.91455	27869.91455	0	5440.26497	4.312027302	0
Alameda (SF)	2045 T7 Single Dump Class 8	Aggregate	Aggregate	Natural Gas	35.99240921	1730.464739	1730.464739	0	339.048495	0.294977761	0
Alameda (SF)	2045 T7 Single Other Class 8	Aggregate	Aggregate	Diesel	1138.113711	46052.27437	46052.27437	0	10721.0312	7.125028636	0
Alameda (SF)	2045 T7 Single Other Class 8	Aggregate	Aggregate	Natural Gas	70.04447726	2834.361134	2834.361134	0	659.818976	0.490305281	0
Alameda (SF)	2045 T7 SWCV Class 8	Aggregate	Aggregate	Diesel	42.31344957	2746.054504	2746.054504	0	194.641868	1.071780275	0
Alameda (SF)	2045 T7 SWCV Class 8	Aggregate	Aggregate	Natural Gas	370.6516105	24023.20589	24023.20589	0	1704.99741	4.399740006	0
Alameda (SF)	2045 T7 Tractor Class 8	Aggregate	Aggregate	Diesel	7299.735406	465612.637	465612.637	0	106065.155	63.47591153	0
Alameda (SF)	2045 T7 Tractor Class 8	Aggregate	Aggregate	Natural Gas	640.0360606	40552.2263	40552.2263	0	9299.72396	6.873881492	0
Alameda (SF)	2045 T7 Utility Class 8	Aggregate	Aggregate	Diesel	107.7952369	4427.670036	4427.670036	0	1379.77903	0.688650714	0
Alameda (SF)	2045 T7IS	Aggregate	Aggregate	Gasoline	1.508740475	150.7261668	150.7261668	0	30.1868794	0.032336219	0
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Alameda (SF)	2045 UBUS	Aggregate	Aggregate	Diesel	34.64023958	1397.345166	1397.345166	0	138.560958	0.091870365	0
Alameda (SF)	2045 UBUS	Aggregate	Aggregate	Electricity	797.2229114	87613.8602	0	87613.8602	3188.89165	0	152732.3465
Alameda (SF)	2045 UBUS	Aggregate	Aggregate	Natural Gas	13.99670197	564.6099472	564.6099472	0	55.9868079	0.057979547	0

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 Vermillion, 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 (O₃) is a secondary pollutant formed from the oxidation of reactive organic gases (ROGs) and nitrogen oxides (NO_x) 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 indicator 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 CALIFORNIA

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.

SUPREME COURT
FILED

APR 13 2015

Frank A. McGuire Clerk
Deputy

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.

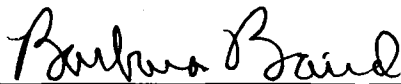
CERTIFICATION REGARDING AUTHORSHIP AND FUNDING

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 Irrigated 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

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

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 (PM₁₀) (particles with a diameter of 10 microns or less). (U.S. EPA, Particulate Matter (PM), <http://www.epa.gov/airquality/particulatepollution/> (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

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.

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 Irrigated 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 pollutants⁵, 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.)

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*

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

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.

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.

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.

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

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

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

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

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

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.)

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

SOUTH COAST AIR QUALITY
MANAGEMENT DISTRICT
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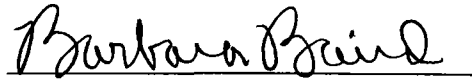
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CERTIFICATE OF WORD COUNT

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

PROOF OF SERVICE

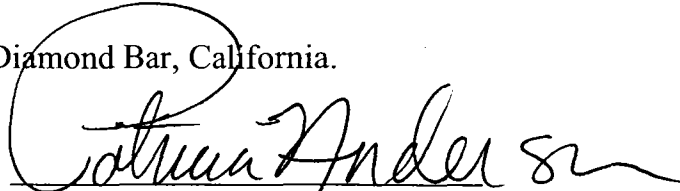
I am employed in the County of Los Angeles, California. I am over the age of 18 years and not a party to the within action. My business address is 21865 Copley Drive, Diamond Bar, California 91765.

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.


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SUPREME COURT COPY

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

SUPREME COURT
FILED

APR 13 2015

Frank A. McGuire Clerk
Deputy

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

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

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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Attorney for Proposed Amicus Curiae

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 (NO_x) 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 NO_x 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 NO_x 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 NO_x and VOC emissions per square mile than the San Joaquin Valley, but experiences lower

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 (SO_x) and NO_x.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 (NO_x, SO_x 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

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 (NO_x, SO_x 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

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 PM_{2.5} 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"

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/curnrules/Rule22010411.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

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%20August%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 NO_x 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

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.)

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

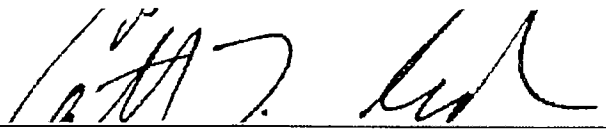
For all of the foregoing reasons, the Air District respectfully requests that the portion of the Court of Appeal’s decision requiring an analysis correlating the localized human health impacts associated with an individual project’s criteria air pollutant emissions be reversed.

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



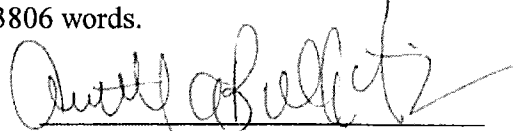
Catherine T. Redmond
Attorney for Proposed Amicus
Curiae

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 party 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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