Chapter 2d:

Emissions and Source Attribution

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Introduction

Chapter 2d Highlights

- Information about the sources of air pollution in this community is presented in a "source attribution" analysis
- Sources of air pollutant emissions in this community include on-road vehicles, trains, off-road equipment, and various industrial activities
- Diesel particulate matter (DPM) is currently the main TAC in this community, and comes mostly from on-road and off-road mobile sources
- Other key TACs in this community are 1,3-butadiene and benzene, and comes from mobile sources and/or plastic production
- In future years, DPM emissions will decrease substantially from ongoing and newly proposed regulations, but these emissions continue to be the main driver of TAC cancer risk in this community

The Community Emission Reduction Plan (CERP) identifies air quality priorities based on community input and evaluation of technical data on emission sources in the community. The CERP defines actions and strategies to reduce the emissions and exposure burden from sources of criteria air pollutants and toxic air contaminants (TACs). To accurately determine emission reductions from these actions and strategies baseline emissions are established. The baseline emissions provide a reference and is developed based upon an accounting of the current emissions from sources. This rigorous accounting of sources, their emissions and their contribution to cumulative exposure burden is what the California Air Resources Board (CARB) guidelines identify as a source attribution analysis. Per the direction of CARB guidelines, source attribution is required to meet Assembly Bill (AB) 617 statutory requirements.[1]

The emissions inventory presented here is consistent with CARB recommendations for conducting a source attribution analysis, with an emphasis on identifying sources within the community. This approach is considered best for the South Los Angeles (SLA) community based on the availability of data and resources. More information on source attribution methods is included in the Methodology for Source Attribution Analyses for the first year AB 617

[1] California Health and Safety Code, Section 44391.2 (b)(2) directs CARB to provide "[a] methodology for assessing and identifying the contributing sources or categories of sources, including, but not limited to, stationary and mobile sources, and an estimate of their relative contribution to elevated exposure to air pollution in impacted communities…"

Communities in the South Coast Air Basin Source Attribution Methodology Report (Technical Report).[2]

The most recent comprehensive air quality and TACs modeling analysis in the region was conducted as part of the fifth Multiple Air Toxics Exposure Study (MATES V)[3] released in August 2021.

MATES V showed DPM to be the air pollutant that contributed the most to air toxic pollutants cancer risks in the South Coast Air Quality Management District (South Coast AQMD).

As shown in **Figure 2d-1**, there are areas in SLA with significantly higher TAC cancer risks, compared to the average of the South Coast Air Basin (Basin). TAC cancers risk in SLA is generally above the Basin's average cancer risk of 450 per million and reaches values of up to 700 per million. The cancer risk estimates in the MATES V study align well with the CalEnviroScreen 4.0 scores,[4] shown in Figure 2d- 2 CalEnviroScreen 4.0 scores for SLA are mostly above the average, with many tracts being above the 90th percentile (**Figure 2d-2**).

[2] South Coast AQMD, Methodology for Source Attribution Analyses for the first year AB 617 Communities in the South Coast Air Basin (Technical Report), November 2019, http://www.aqmd.gov/docs/default-source/ab-617-ab-134/technical-advisory-group/source-attribution-methodology.pdf
[3] South Coast AQMD, The Multiple Air Toxics Exposure Study V (MATES V), August 2019, http://www.aqmd.gov/home/air-quality/air-quality-studies/health-studies/mates-v
[4] Office of Environmental Health Hazard Assessment (OEHHA), CalEnviroScreen 4.0, https://oehha.cagov/calenviroscreen/report/calenviroscreen-40

Figure 2d- 1: Residential Air Pollutants Cancer Risk Calculated in the MATES V Study for the Basin

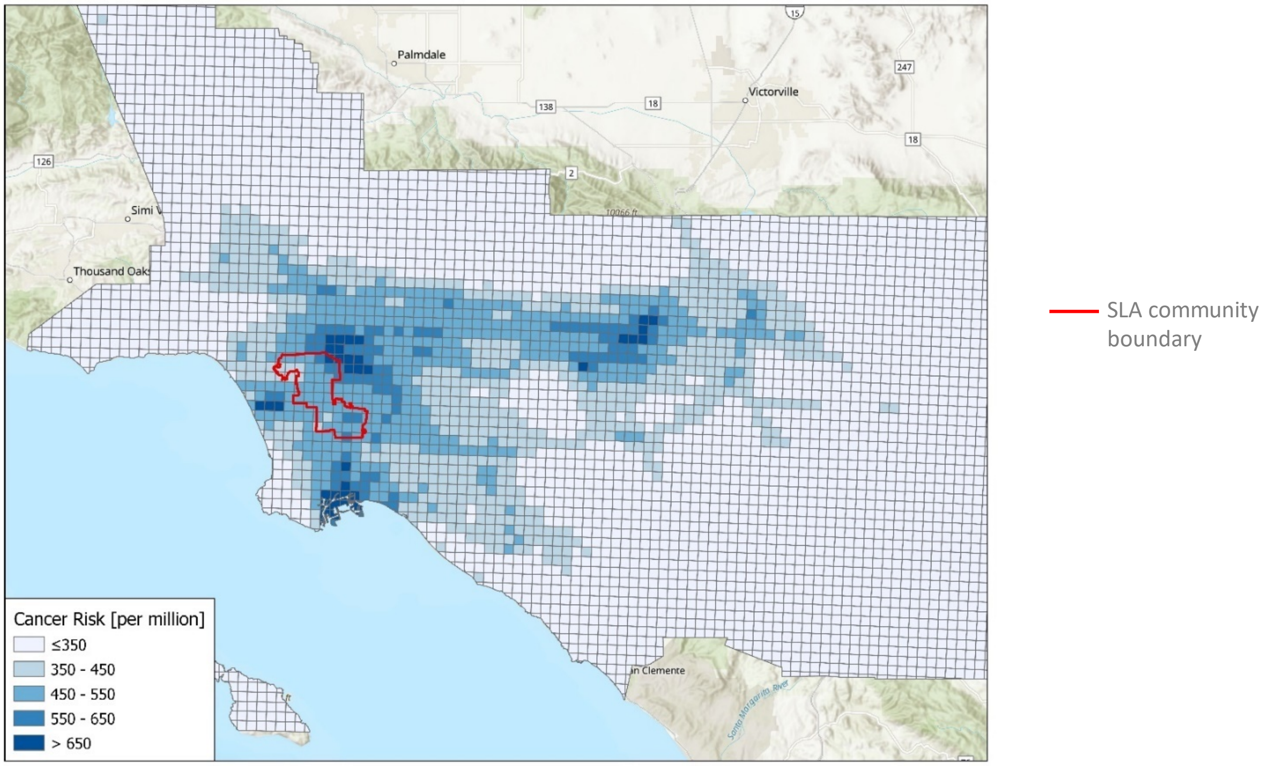
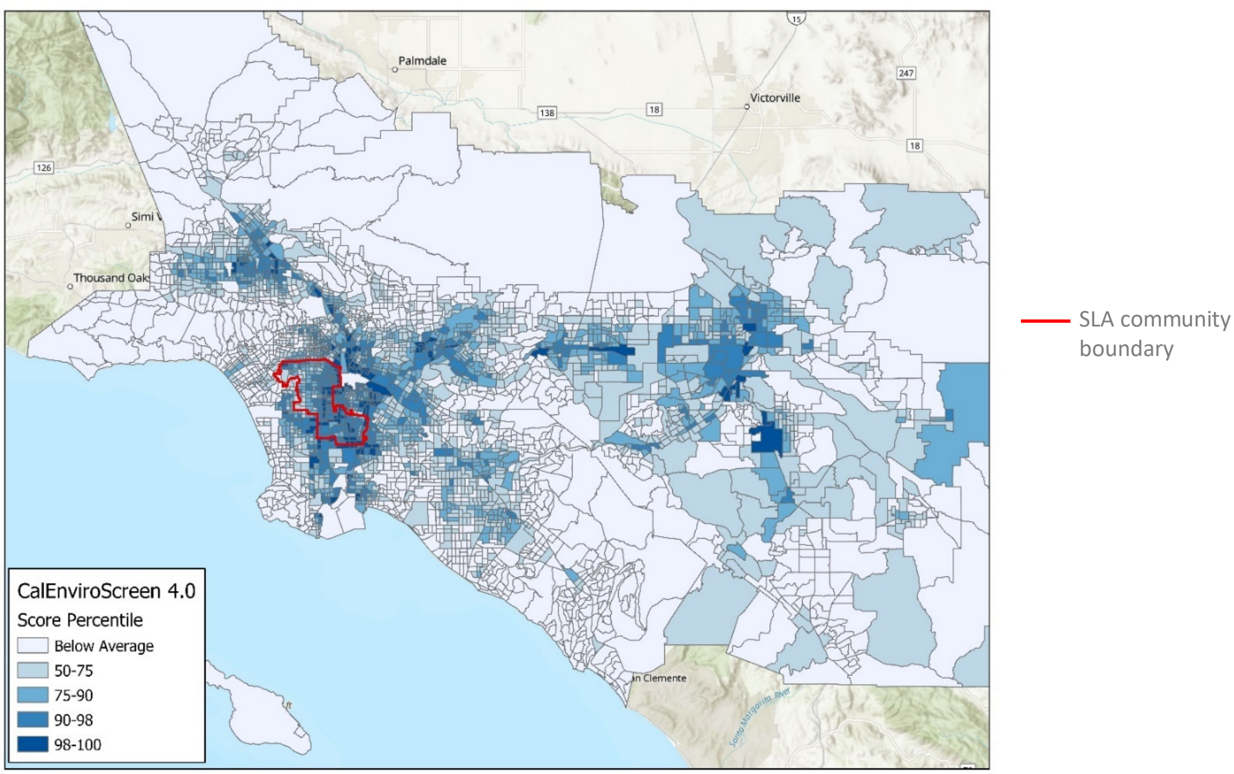


Figure 2d- 2: Overall CalEnviroScreen 4.0 Score Percentile for the Basin



United States Environmental Protection Agency (U.S. EPA) National Ambient Air Quality Air Quality Standards (NAAQS)[5]

The Clean Air Act requires the U.S. EPA to set NAAQS for each of the six criteria pollutants:

1. nitrogen oxides (NOx),
2. ozone, particulate matter (PM),
3. carbon monoxide (CO),
4. sulfur dioxides (SOx), and
5. lead.

The Clean Air Act identifies two types of standards: primary and secondary. Primary standards provide public health protection, including protecting the health of “sensitive” populations such as people with respiratory or other health conditions, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. federal air quality standards. South Coast AQMD currently does not meet the federal standards for ozone and fine particulate matter (PM2.5), which means that population is exposed to unhealthy levels of ozone and PM2.5 throughout a certain number of days in a year.[6] Thus, these are criteria pollutants of concern in the Basin. **Table 2d-1** provides the threshold levels, in parts per million (ppm) or parts per billion (ppb), as established by the U.S. EPA.

Table 2d-1: NAAQS Table[7]

Pollutant	Primary/Secondary		Averaging Time	Level
CO	Primary		8 hours	9 ppm
			1 hour	35 ppm
Lead	Primary and secondary		Rolling 3-month average	0.15 micrograms per cubic meter (µg/m^3)
NOx	Primary		1 hour	100 ppb
	Primary and secondary		1 year	53 ppb
Ozone	Primary and secondary		8 hours	0.070 ppm
PM	PM2.5	Primary	1 year	12.0 µg/m^3
		Secondary	1 year	15.0 µg/m^3
		Primary and secondary	24 hours	35 µg/m^3
	Coarse PM (PM10)	Primary and secondary	24 hours	150 µg/m^3

[5] U.S. EPA, Reviewing NAAQS: Scientific and Technical Information, https://www.epa.gov/naaqs

[6] In Los Angeles County in 2020, the ozone standard exceeded nearly 100 days and PM2.5 daily standard exceeded 28 times. South Coast AQMD, 2022 Air Quality Management Plan, Chapter 2: Air Quality and Health Effects, http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/05-ch2.pdf

[7] U.S. EPA, NAAQS Table, https://www.epa.gov/criteria-air-pollutants/naaqs-table

Pollutant	Primary/Secondary	Averaging Time	Level
SOx	Primary	1 hour	75 ppb
	Secondary	3 hours	0.5 ppm

Criteria Air Pollutants

This chapter provides a summary of pollutant emissions that affect the pollutant levels in this community. To develop an effective emissions reduction plan, it is important to understand the sources (**Figure 2d-3**) that contribute to, and have the greatest impact on, pollution levels in the community.

Figure 2d-3: Sources of Criteria Air Pollutants in SLA

Nitrogen Oxides (NOx)

NOx is a family of highly reactive gases which form when fuel is burned at high temperatures. NOx pollution is emitted from combustion sources, such as automobiles, trucks, and various non-road vehicles (e.g., construction equipment, boats) as well as industrial sources such as power plants, industrial boilers, cement kilns, and turbines. NOx is an important contributor to the regional formation of smog (ozone) and PM2.5, and hence, can further contribute to worsening health impacts.

Reactive Organic Gases (ROGs)

ROGs are not considered a criteria air pollutant; however, due to its contribution to ozone formation they are a pollutant of concern. Additionally, some ROGs are considered TACs. ROGs are a wide family of gaseous components that generally contain atoms of carbon, hydrogen, and other elements. Many of these compounds exist in liquid form but can slowly evaporate into the air and react to form smog and particulate matter (i.e., PM2.5). ROGs are present in products that are used regularly, such as cleaning products, cosmetics, paints, and fuels. They are also emitted from a wide variety of industrial processes that involve solvents, petroleum, paints, coatings, and cleaning and degreasing agents. Some ROG compounds are relatively safe, like alcohols and fragrances, but other ROG compounds like formaldehyde, benzene, and 1,3-butadiene, are known to be carcinogenic (cancer causing).

Ozone

Ozone forms when NOx and ROGs react in the presence of sunlight. Ozone levels are highest during warm months when there are high temperatures and an inversion layer. An inversion layer occurs when warm, dry air overlays cooler, moist air, thus, limiting the dispersion of emissions into the air. Health impacts from short-term exposure (lasting for a few hours) to ozone can result in breathing pattern changes, breathing capacity reduction, increased susceptibility to infections, and lung tissue inflammation.

Coarse Particulate Matter (PM10)

PM is a mixture of solid particles and liquid droplets suspended in the air. Particles with a diameter of 10 microns or less (PM10) are inhalable into the upper region of the lungs and can cause adverse health effects. Short-term exposures to PM10 can worsen health effects in those with respiratory diseases. PM10 typically comes from dust from construction sites, wildfires, industrial sources, and wind-blown dust from open lands. These compounds can be man-made or from natural sources such as trees and vegetation.

Fine Particulate Matter (PM2.5)

PM10 includes particles less than 2.5 micrometers in diameter, called fine PM, or PM2.5, which pose the greatest risk to health. Health impacts from PM2.5 include premature mortality, heart disease, and respiratory illnesses like asthma and bronchitis. Emissions of PM2.5 come from a variety of sources, including fuel combustion from vehicles, industrial processes and wood burning. Cooking and mechanical processes, like construction and resuspended dust from traffic, are also sources of PM2.5.

Toxic Air Contaminants (TACs)

A TAC is an air pollutant which may cause or contribute to an increase in mortality or serious illness, or which may pose a present or potential hazard to human health. TACs can have an associated cancer risk and/or have negative non-cancer health impacts.

Cancer and Non-Cancer Risk

Cancer risk is the estimated probability of an exposed individual contracting cancer as a result of exposure to toxic air contaminants. In the CERP, impacts are reported from all TACs by combining their associated cancer risk potency relative to DPM, which is the most prevalent TAC. TACs are combined to provide a succinct way to express the impacts of many different compounds with varying levels of toxicity. Cancer risk potency is a measure of cancer risk from a lifetime of exposure to a compound. Additional details are provided in the Source Attribution Methodology Report.[2]

Non-cancer health effects can include respiratory or reproductive harm resulting from exposure (acute or chronic) to toxic substances. Acute exposure refers to short-term contact (on the order of a few hours) with a toxic substance, whereas chronic exposure refers to continuous contact over long periods of time, from months to years.

Toxic Air Contaminants in South Los Angeles

DPM is a form of PM that comes from the combustion of diesel fuel. Most DPM is in the PM2.5 size range and has the same health burdens associated with fine PM. DPM has also been identified as a TAC and is known to cause cancer. In SLA, DPM is by far the most dominant air pollutant for cancer risk.

In addition to DPM, many other compounds emitted into the air have been identified as TACs. The most prevalent TACs in this community include benzene, formaldehyde, 1,3 butadiene, and hexavalent chromium, which are all carcinogens. In SLA, non-diesel sources of concern are on-road vehicles, mostly gasoline powered cars and light-duty trucks, and industrial stationary sources that use, process, or generate toxic compounds. Many of these TACs also have non-cancer health impacts. Hence, it is important to note that the strategies that reduce TACs will have health benefits beyond reductions in cancer risk.

Cancer risk potency varies widely among TACs. For instance, hexavalent chromium has a cancer potency factor that is 464 times higher than DPM, whereas the cancer potency of benzene is nine percent of the cancer potency of DPM. Thus, to quantify the overall TAC emissions within the community, we define total TAC emissions by the sum of the emissions of each individual TAC multiplied by their toxicity relative to DPM (note that the relative toxicity of DPM with respect to DPM is 1). As an example, consider a case with the following emissions:

- DPM Emissions: 10 lbs/day
- Benzene Emissions: 5 lbs/day
- Hexavalent Chromium Emissions: 0.1 lbs/day

The total TAC emissions considering only these three pollutants would be calculated as follows:

- Total TAC: 10 x 1 + 5 x 0.09 + 0.1 x 464 = 56.86 lbs/day

Pollution Sources

Air pollution affecting SLA comes from sources within the community, as well as sources throughout the region. This CERP and source attribution analysis focus on stationary, areawide, and mobile sources (on- and off- road) that are within the community boundary. Four major categories are identified in the inventory:

1. facilities (also referred to as stationary sources[8]),

[8] Stationary sources are divided into two major subcategories: point and area sources. Point sources consist of a single emission source with an identified location point at a facility. Area sources are small emission sources that are widely distributed but may have substantial cumulative emissions.

2. areawide sources[9] (e.g., emissions from sources widespread throughout the community like consumer products, home water heaters),
3. on-road sources,[10] and
4. off-road sources (e.g., construction equipment, forklifts).

South Coast AQMD studied local pollution sources for many decades and continues to develop databases and tools to estimate the emissions from all the known sources known in the region. South Coast AQMD in conjunction with CARB periodically updates the emissions inventory with the best and most up-to-date information possible.

Quantification of emissions from most sources relies on estimates that come from emissions modeling tools because it is impractical and unreasonable to install a pollutant measuring device on every single source of pollution (e.g., car, car, truck, stove, stack). Only certain facilities are required to report emissions to the South Coast AQMD, and their reports can be corroborated through inspections.

The following sections briefly explain the overall methodology to account for emissions from the four major source categories. Inventories are developed using the most up-to-date information and emission modeling tools employed by both South Coast AQMD and CARB. But, when accounting for emissions, there is an inherent uncertainty and limitation, whether they are based on self-reported emissions from facilities into the South Coast AQMD Annual Emissions Reporting (AER)[11] program, or from estimates based on emission modeling tools.

Facilities (Stationary Sources)

Emissions in the community come from stationary sources, such as industrial facilities, including those that conduct metal processing, surface coatings, auto body shops, and warehousing that attracts heavy-duty truck traffic (**Figure 2d-4**).

[9] Area-wide sources are smaller sources of pollution, including permitted sources smaller than the South Coast AQMD emission reporting threshold and those that do not receive permits (e.g., water heaters, gas furnace, fireplaces, woodstoves, architectural coatings) that often are typically associated with homes and non-industrial sources.

[10] Mobile sources are moving sources of air pollution such as on-road sources (e.g., automobiles, motorcycles, trucks) and off-road vehicles (e.g., construction equipment, forklifts).

[11] South Coast AQMD, AER, https://www.aqmd.gov/home/rules-compliance/compliance/annual-emission-reporting

Figure 2d-4: Air Pollution Sources from Industrial Facilities in SLA

Emissions data from facilities in the community that submit reports under the AER program are extracted from the database based on the facility's location coordinates. Facilities required to file an AER include the following:

- Every facility that has estimated annual emissions of four or more tons of either SOx, volatile organic compounds (VOC), other specific organic compounds, NOx, PM, or emissions of 100 tons or more per year of CO.
- Every facility subject to the AB 2588 Program[12] for reporting quadrennial updates to its TAC emissions inventory.[13]
- Every facility subject to CARB's Criteria Pollutants and Toxics Reporting Regulation (CTR).[14,15]

Emissions from smaller facilities that are not required to report under AER are estimated using emission modeling tools that calculate emissions aggregated at the county level, and then are geographically allocated using surrogate information that represents the location of each source. **Figure 2d-5** presents examples of geographic distributions for some sectors of interest based on the community's air quality priorities. The geographic distribution indicates the fraction of the total county emissions from a given activity sector in each one kilometer-by-one kilometer square within the community.

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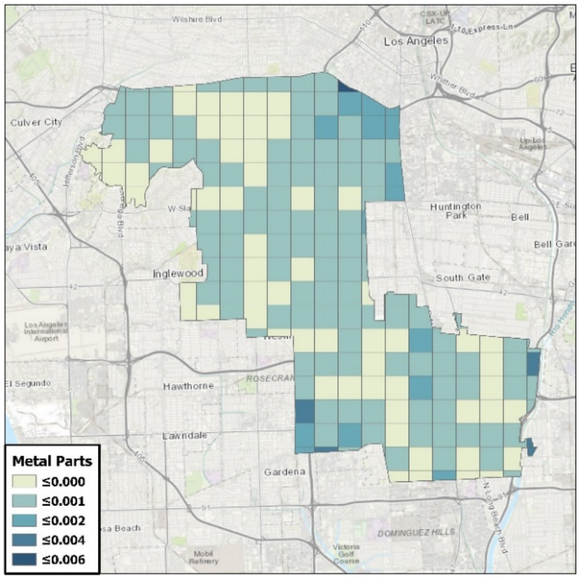
[12] South Coast AQMD, Air Toxics "Hot Spots" Program (AB 2588), http://www.aqmd.gov/home/rules-compliance/compliance/toxic-hot-spots-ab-2588

[13] California Health and Safety Code, Section 44344

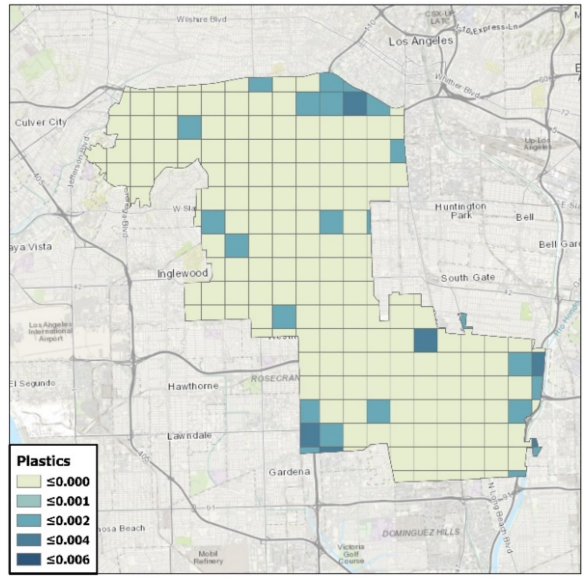
[14] CARB, CTR, https://ww2.arb.ca.gov/our-work/programs/criteria-and-toxics-reporting

[15] CTR is the statewide annual reporting of criteria air pollutant and TAC emissions data from facilities to support the mandates of AB 617, AB 197, and AB 2588.

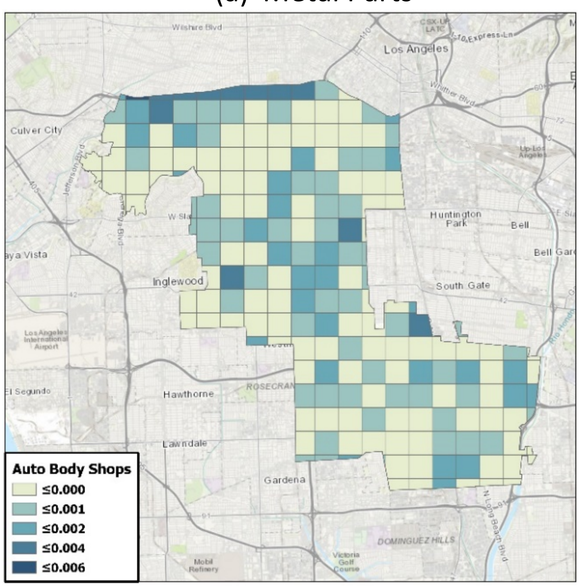
Figure 2d-5: Examples of Geographic Distribution of Small Facilities in Various Industrial Sectors in SLA



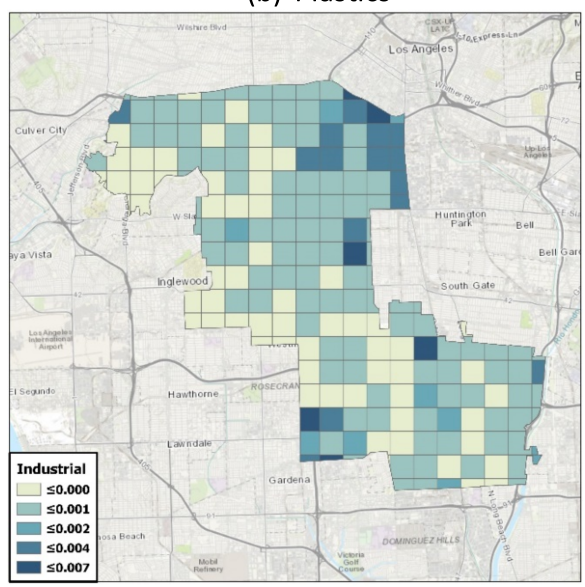
(a) Metal Parts



(b) Plastics



(c) Auto Body Shops



(d) General Industrial Facilities[16]

Areawide Sources

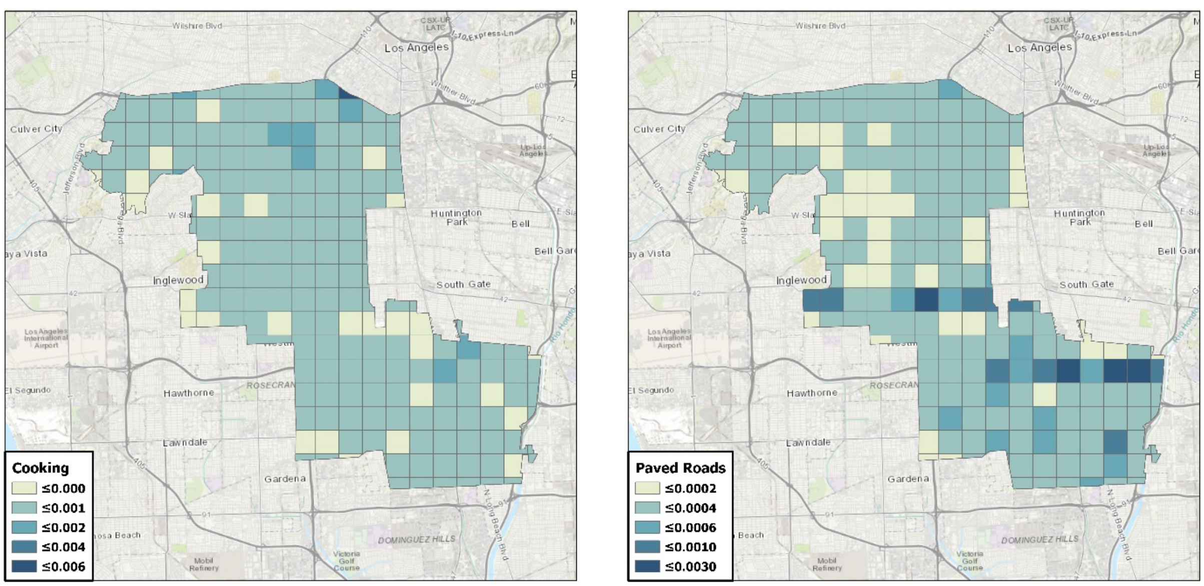
Areawide sources are sources of emissions that are generally small or that are not associated with an individual stack or engine. These sources (**Figure 2d-6**) include evaporation of consumer products (e.g., detergents, cosmetics, paints) and miscellaneous sources (e.g., residential fuel combustion, commercial cooking, road dust, construction, and demolition operations).

[16] The term "general industrial facilities" is used for the geographical distribution of a number of categories, such as fuel combustion in industrial and manufacturing facilities and industrial off-road equipment.

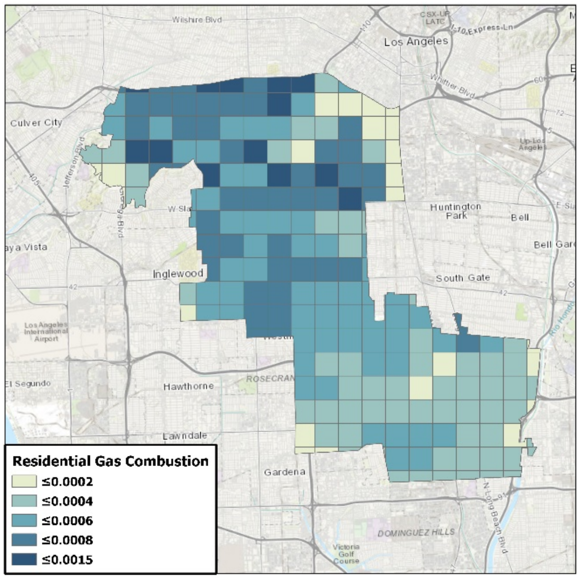
Figure 2d-6: Areawide Sources of Pollution in SLA

Areawide emissions are estimated using socio-economic parameters and land-use, such as population, housing, employment, and fuel consumption to calculate emissions at a county level, and then are geographically allocated using surrogate information specific to each source. **Figure 2d-7** presents examples of geographic distribution that are representative of areawide sources.

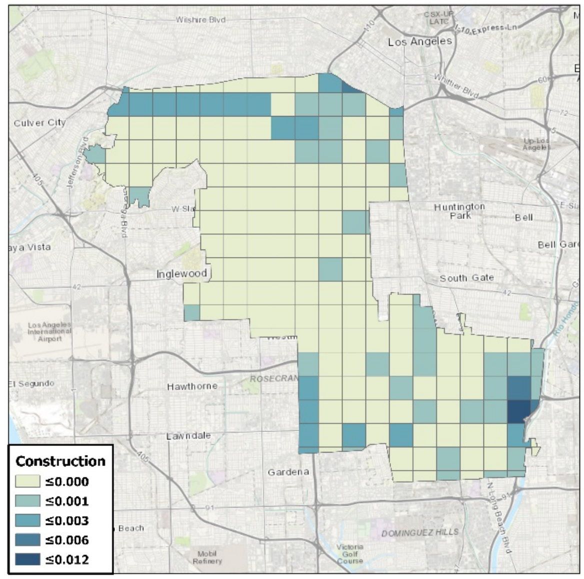
Figure 2d-7: Examples of Geographic Distribution of Various Areawide Sources in SLA



(a) Cooking (b) Paved Road Dust



(c) Residential Gas Combustion



(d) Construction Activity

Mobile Sources

Examples of mobile (on- and off-road) sources of air pollution within the community include traveling on major freeways – Interstate 10 (I-10), Interstate 110 (I-110), Interstate 105 (I-105), Interstate 710 (I-710), State Route 91 (SR-91) – and the Slauson Corridor and Alameda Corridor rail line. Additional examples are provided in the On-Road Sources and Off-Road Sources as follows.

On-Road Sources

On-road sources include any vehicle that drives along regular roads and freeways. These include passenger vehicles, light-, medium-, and heavy-duty trucks, buses, coaches, motorhomes, and motorcycles (**Figure 2d-8**).

On-road emissions are estimated using Southern California Association of Governments (SCAG's)[17] travel demand information on vehicle activity and emission factors from the Emission Factor (EMFAC) 2017 model.[18] EMFAC[19] is a model developed by CARB that estimates the official emissions inventories of on-road mobile sources in California. Emissions are geographically distributed along the major freeways and local streets.

[17] SCAG, https://scag.ca.gov/

[18] CARB, Mobile Source Emissions Inventory – Modeling Tools - EMFAC software and technical support documentation, https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools-emfac-software-and

[19] CARB, EMFAC, https://arb.ca.gov/emfac/

Figure 2d-8: Examples of On-Road Sources in SLA

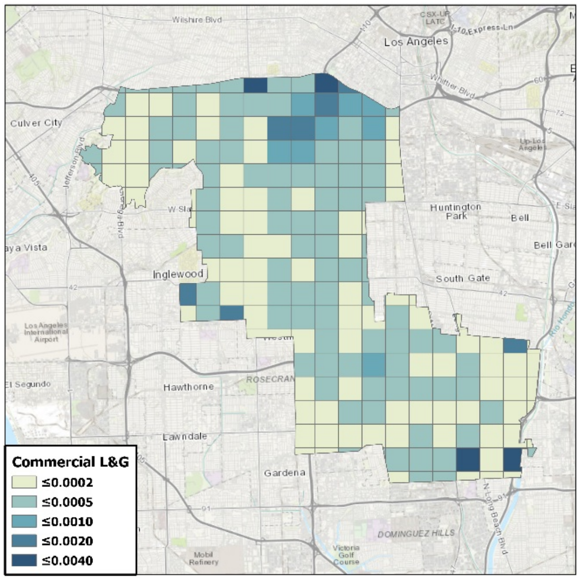
Off-Road Sources

Off-road sources include any mobile vehicle that operates off-road. These include trains, construction equipment, forklifts, lawn and garden equipment, transportation refrigeration units (TRUs), among many other types of equipment (**Figure 2d-9**). Off-road equipment emissions are estimated by CARB, which developed a suite of models that are specific to the type of off-road equipment,[20] and are geographically allocated using representative surrogate information for each type of equipment. **Figure 2d-10** presents examples of the geographic distribution of some off-road sources that contribute to air pollutant emissions in the community.

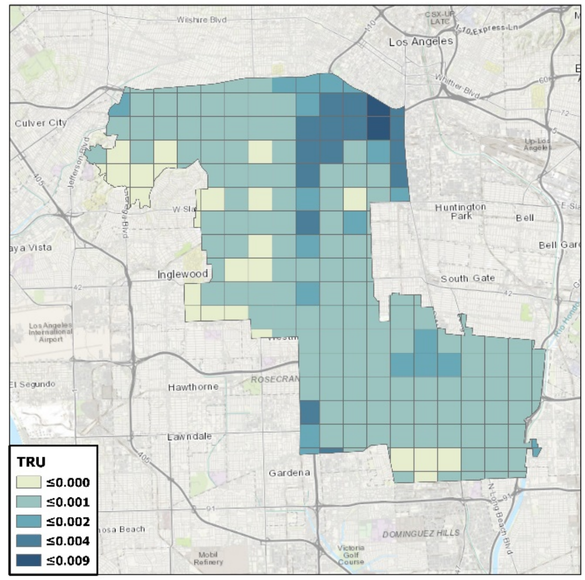
[20] CARB, Mobile Source Emissions Inventory – Off-road Documentation, https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-documentation-0

Figure 2d-9: Examples of Off-Road Sources in SLA

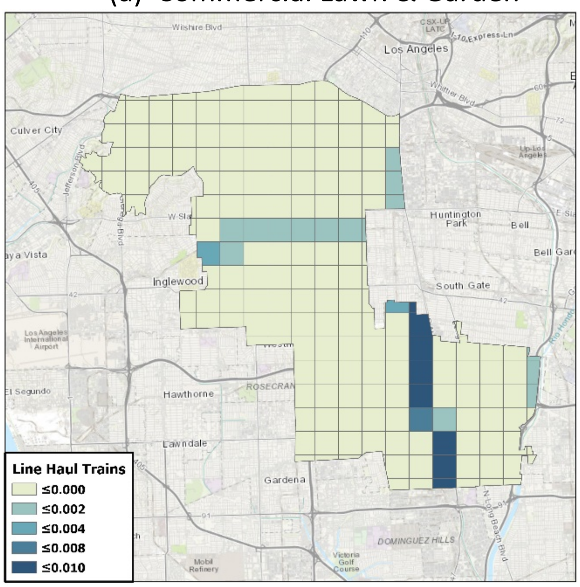
Figure 2d-10: Examples of Geographic Distribution of Off-Road Sources in SLA



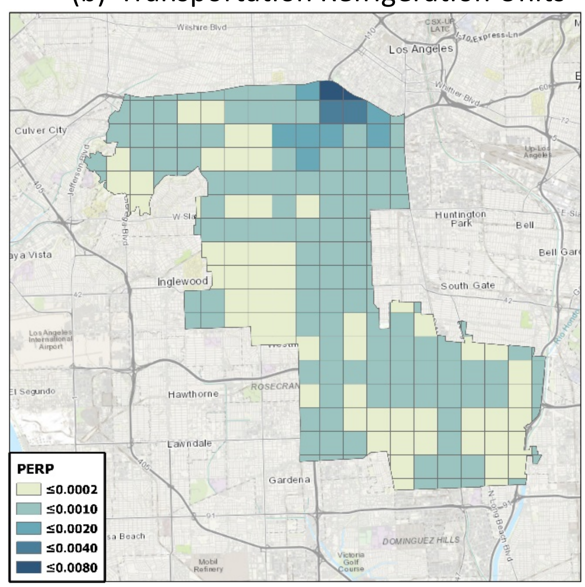
(a) Commercial Lawn & Garden



(b) Transportation Refrigeration Units



(c) Line Haul Trains



(d) Portable Off-Road Equipment

Baseline Emissions Inventory (Year 2019)

The emissions inventory for this community is developed following the methodology described in detail in the Source Attribution Methodology Report.[2] As described above, emissions are aggregated at one square kilometer grid resolution for the entire South Coast Air Basin, and the emissions from the SLA community correspond to the emissions of the grid squares that are included within the community boundary.

Emissions from Facilities that Report Their Emissions in AER to South Coast AQMD

In total, there are 43 facilities in SLA that are currently required to report annual emissions in the AER program. Total emissions from those facilities are grouped by industry in **Table 2d-2**.

Facilities manufacturing fabricated metals are the largest source of ROGs and TACs, whereas petroleum refining and related industries are the largest sources of NOx and PM2.5. As shown in **Table 2d-2**, the overall contribution of reporting facilities to total emissions in the community is relatively small, with up to three percent of total ROG, NOx and PM2.5 emissions, and less than one percent of total TAC emissions.

Table 2d-2: Emissions from Facilities in SLA Required to Report to AER

Facility Type	Emissions (pounds per day)			
	ROG	NOx	PM2.5	Total TACs*
Automotive Repair, Services, and Parking	9.47	0.27	0.37	0.00
Educational Services	7.70	103.47	7.88	0.01
Electric, Gas, and Sanitary Services	1.40	0.74	0.05	0.00
Fabricated Metal Products	138.67	27.14	18.45	1.59
Food and Kindred Products	0.00	0.00	11.91	0.00
Furniture and Fixtures	17.92	0.00	0.83	0.00
Health Services	9.49	52.15	9.51	0.02
Industrial and Commercial Machinery	0.44	1.99	0.12	0.00
Lumber and Wood Products, Except Furniture	0.00	0.00	0.12	0.00
Miscellaneous Repair Services	2.66	0.00	0.21	0.00
Miscellaneous Retail	26.06	0.00	0.00	0.02
Motor Freight Transportation and Warehousing	20.75	0.00	0.73	0.00
Oil and Gas Extraction	84.97	32.03	3.04	0.08
Paper and Allied Products	5.43	0.00	0.00	0.00
Petroleum Refining and Related Industries	83.34	189.98	38.63	0.09
Primary Metal Industries	1.64	16.10	1.80	0.00
Rubber and Miscellaneous Plastics Products	93.34	0.20	0.00	0.00
Stone, Clay, Glass, and Concrete Products	0.11	0.93	4.38	0.00
Textile Mill Products	99.51	55.44	10.76	0.00
Wholesale Trade-non-durable Goods	91.22	1.50	0.18	0.04
Total (pounds per day)	694.10	481.95	108.97	1.86
Total (tons per day)	0.35	0.24	0.05	<0.01

*Total TACs is calculated by the sum of individual TAC emissions multiplied by the cancer potency relative to DPM

Emissions from All Sources

The emissions from all sources in SLA are summarized in **Table 2d- 3**. This includes emissions of NOx, ROG, and PM2.5 (in tons per day) and DPM and total TACs (in pounds per day).

Table 2d-3: Emissions from all Sources in SLA in 2019

	Emissions (tons per day)			Emissions (pounds per day)	
	ROG	NOx	PM2.5	DPM	Total TACs*
Reporting Facilities					
Total Reporting Facilities	**0.35**	**0.24**	**0.05**	**0.00**	**1.86**
Stationary Sources					
Fuel Combustion	0.03	0.59	0.04	0.00	5.09
Waste Disposal	0.22	0.09	0.00	0.00	0.07
Cleaning and Surface Coatings	1.53	0.00	0.04	0.00	6.28
Petroleum Production and Marketing	0.46	0.00	0.00	0.00	0.53
Industrial Processes	0.07	0.00	0.17	0.00	8.69
Total Stationary	**2.30**	**0.68**	**0.25**	**0.00**	**20.65**
Areawide Sources					
Solvent Evaporation	5.99	0.00	0.00	0.00	1.22
Residential Fuel Combustion	0.33	0.96	0.27	0.00	2.39
Construction and Demolition	0.00	0.00	0.05	0.00	0.72
Road Dust	0.00	0.00	0.18	0.00	0.24
Cooking	0.03	0.00	0.36	0.00	0.54
Waste Burning and Disposal	0.00	0.00	0.00	0.00	0.00
Fires	0.01	0.00	0.02	0.00	0.02
Total Areawide	**6.36**	**0.97**	**0.88**	**0.00**	**5.13**
On-Road Sources					
Light and Medium Duty Vehicles	2.94	2.42	0.34	4.54	32.47
Heavy Duty Trucks	0.17	2.19	0.07	77.70	79.92
Buses	0.04	0.40	0.02	8.72	13.50
Total On-Road	**3.15**	**5.02**	**0.42**	**90.96**	**125.89**
Off-Road Sources					
Locomotives	0.02	0.34	0.01	16.94	17.17
Off-Road Equipment	2.33	1.57	0.08	92.41	122.25
Portable Off-Road Equipment (PERP)	0.03	0.33	0.01	25.10	25.52
Recreational Vehicles	0.11	0.00	0.00	0.00	0.17
Fuel Storage and Handling	0.30	0.00	0.00	0.00	0.30
Total Off-Road	**2.79**	**2.24**	**0.10**	**134.45**	**165.41**
Total	**14.95**	**9.14**	**1.70**	**225.42**	**318.94**

*Total TACs is calculated by the sum of individual TAC emissions multiplied by the cancer potency relative to DPM

Nitrogen Oxides Sources in South Los Angeles

In this community, on-road mobile sources are the largest emitters of NOx, with passenger vehicles and heavy-duty trucks contributing equally. Off-road mobile sources are the second largest contributor to NOx and include off-road equipment and trains. Stationary sources of NOx are mainly from fuel combustion in industrial activities and for space and water heating at commercial businesses and homes. **Figure 2d-11** shows the breakdown of NOx sources in the community.

Figure 2d-11 : Contribution of Major Source Categories to NOx Emissions in SLA in 2019

Reactive Organic Gas Sources in South Los Angeles

Figure 2d-12 summarizes the breakdown of ROG sources in SLA. Solvent evaporation[21] (mostly from consumer products and architectural coatings), and emissions from processes related to cleaning and surface coatings contribute to about two-thirds of the total ROG emissions in SLA. Mobile sources contribute to the remaining one-third of the ROG emissions, with light-duty vehicle exhaust and evaporative emissions being the largest contributor.

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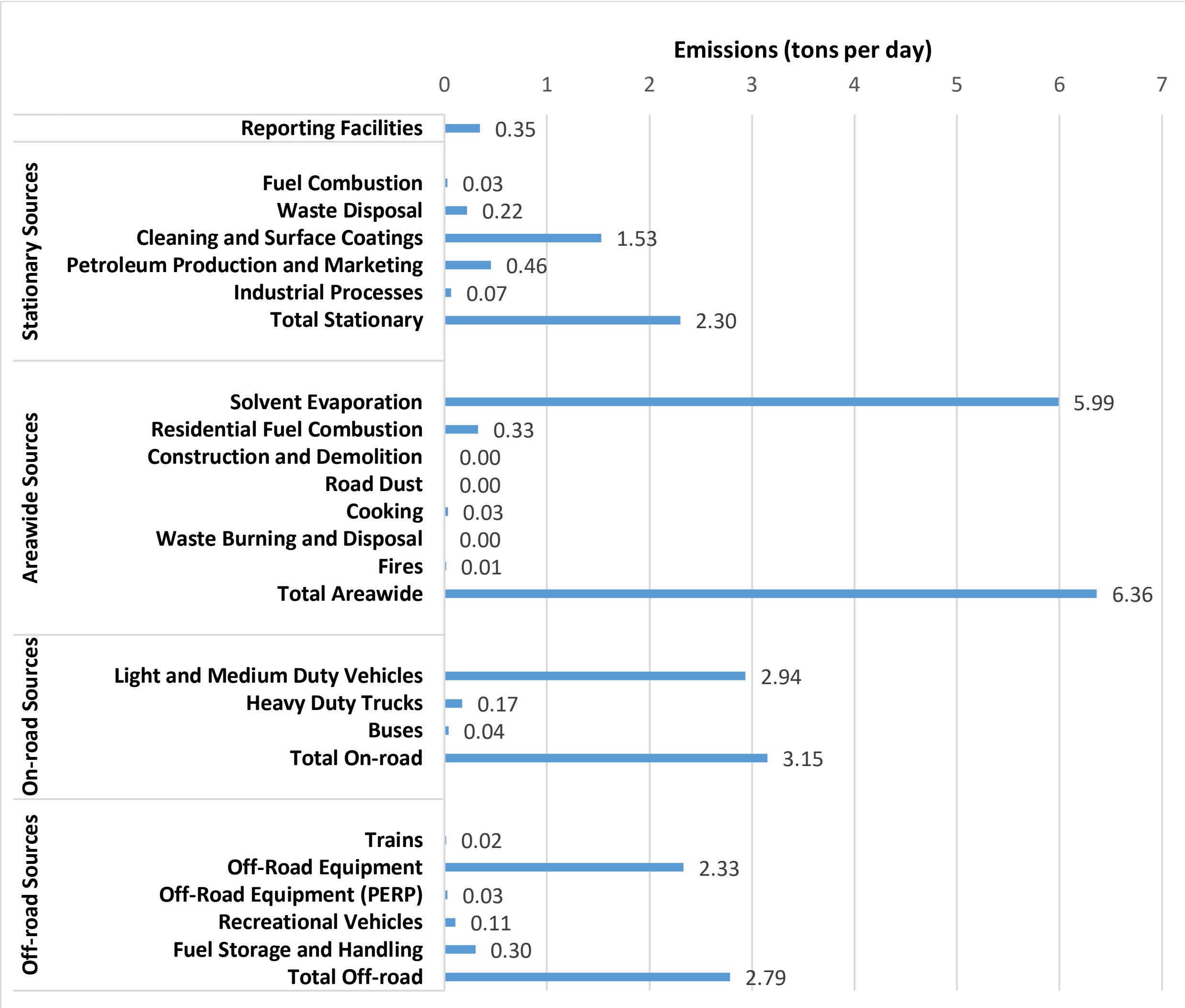
[21] Solvent evaporation refers to the emissions from household and commercial product that typically include volatile compounds. These products include cleaning and disinfecting agents, body care and cosmetics, paint and adhesives, products for automotive care, and paints, primers, coatings, and sealers used for architectural coatings. These emissions are not from industries manufacturing the products, but rather from the use of the products by consumers.

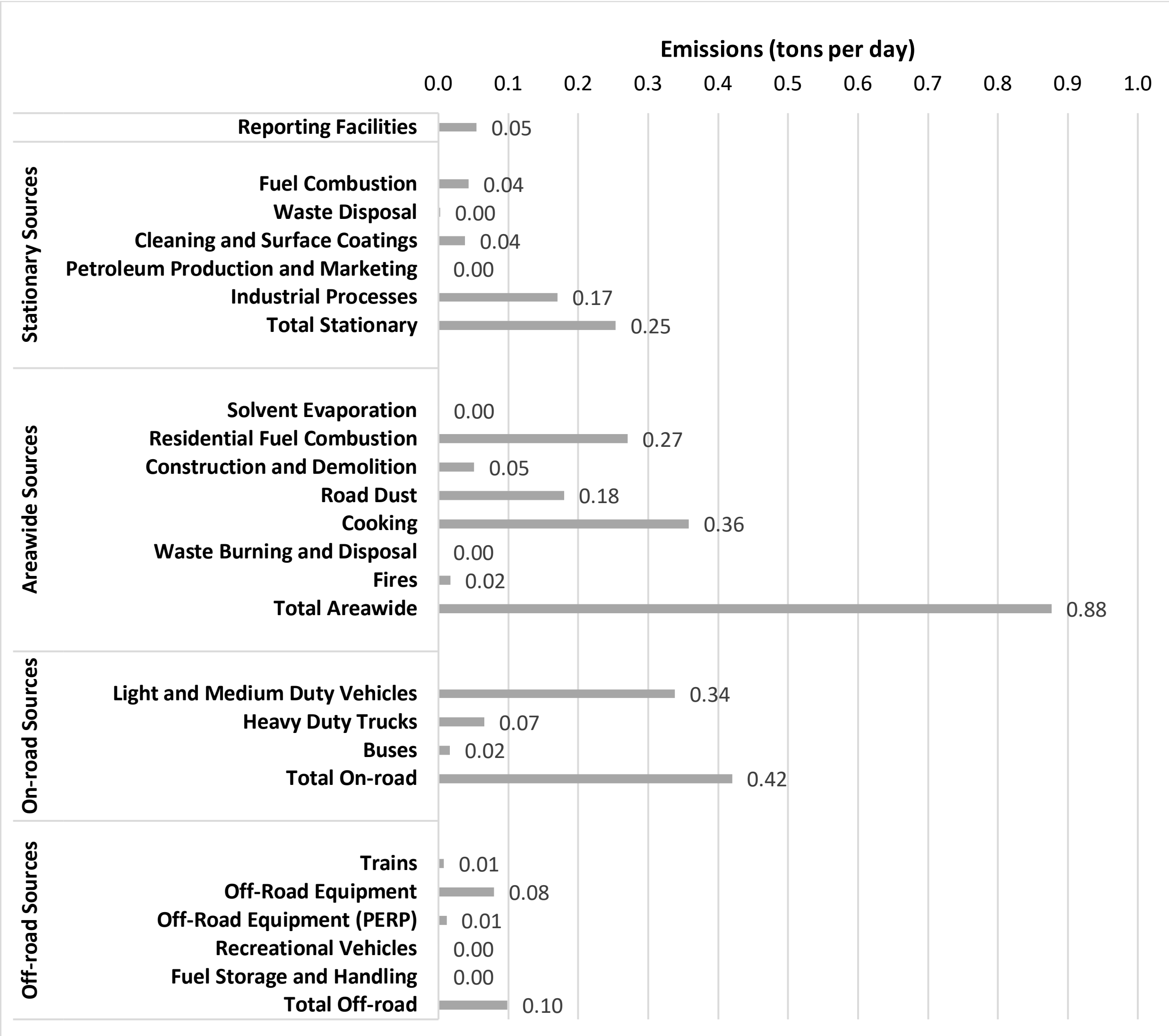
Figure 2d-12: Contribution of Major Source Categories to ROG Emissions in SLA in 2019



Fine Particulate Matter (PM2.5) Sources in South Los Angeles

Figure 2d-13 summarizes the breakdown of PM2.5 sources in SLA. Areawide sources are the largest contributors to PM2.5 emissions with commercial cooking and residential fuel combustion as the major sources. PM2.5 is also emitted from industrial processes, vehicle exhaust, and tire and brake wear. Road dust, another contributor of PM2.5 emissions, is related to vehicles traveling on roads but is considered as an areawide source.

Figure 2d-13: Contribution of Major Source Categories to PM2.5 Emissions in SLA in 2019



Toxic Air Contaminant (TAC) Emissions

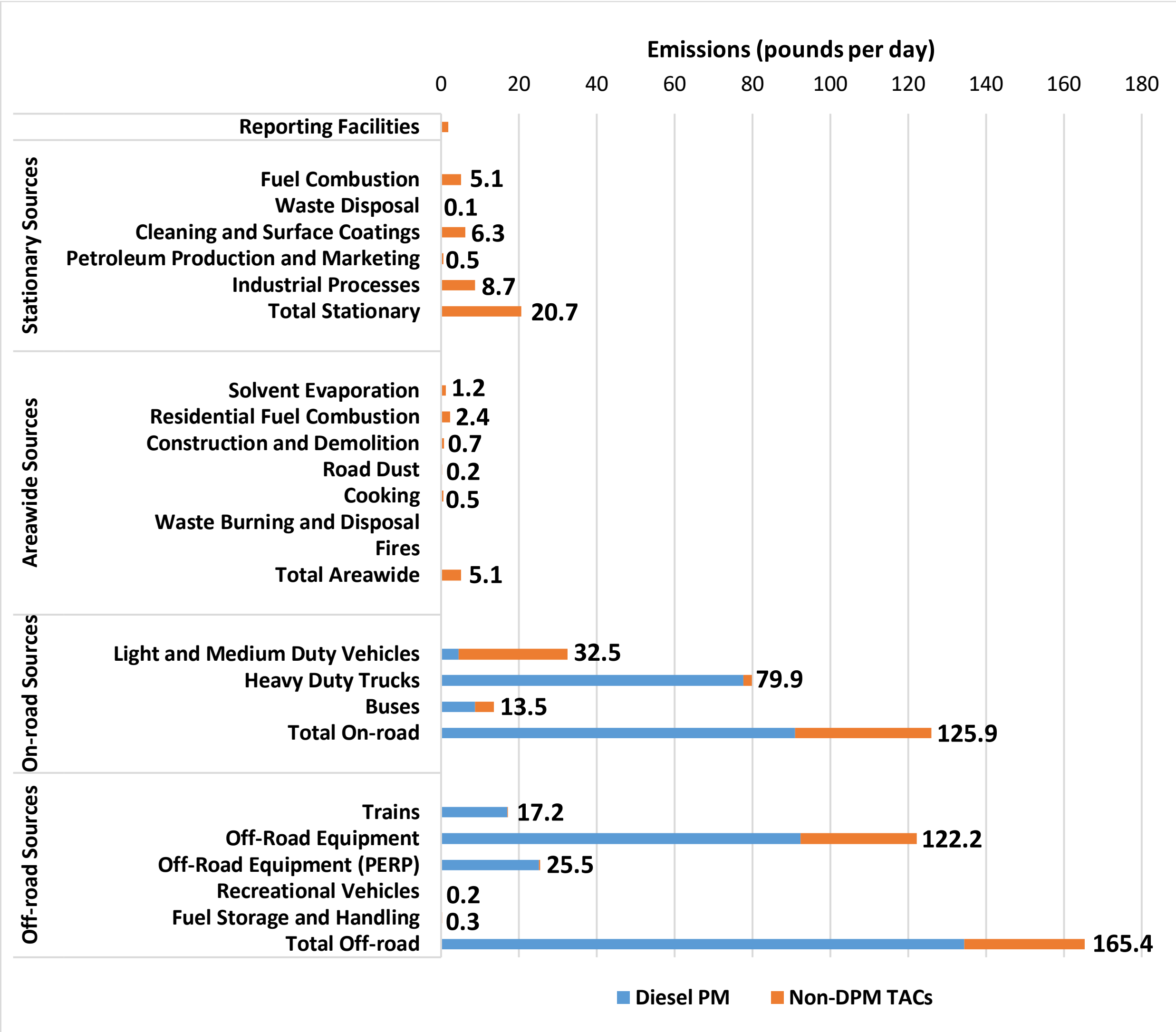
In total, 21 TACs were analyzed and included in this report. Facilities reporting to AER are required to report TAC emissions under South Coast AQMD's AER and AB 2588 Air Toxics Hot Spots programs.[22] The AB 2588 Program is a statewide program that focuses on reducing TACs pollution from facilities and requires facilities above certain levels to disclose and/or reduce risks. The AB 2588 program is implemented at South Coast AQMD through Rule 1402[23] requiring certain facilities to conduct Health Risk Assessments to assess the health risk (long-term versus short-term) to the surrounding community. Currently, there are no AB 2588 facilities in SLA that require risk reduction per AB 2588 requirements. Please refer to **Table A2a-2** in Appendix 2a: Community

[22] South Coast AQMD, Overview of the AB 2588 Program, https://www.aqmd.gov/home/rules-compliance/compliance/toxic-hot-spots-ab-2588/iws-facilities/dice/dice-b1

[23] South Coast AQMD, Rule 1402 – Control of Toxic Air Contaminants from Existing Sources, http://www.aqmd.gov/docs/default-source/rule-book/reg-xiv/rule-1402.pdf

Profile for a list of facilities in the AB 2588 program within SLA. TAC emissions from all the remaining sources are estimated using the same emission modeling tools described above. The most prevalent TAC in the community is DPM, followed by 1,3-butadiene, benzene, formaldehyde, and hexavalent chromium. The contribution from major emission categories to TAC emissions in SLA is presented in **Figure 2d-14**.

Figure 2d-14: Contribution of Major Source Categories to TAC Emissions in SLA



A brief summary of the main sources of TACs in SLA are as follows:

- DPM is the most prevalent TAC in the community and is emitted from diesel on-road and off-road vehicles. Also, mobile sources are the major contributor to all the other major TACs: 1,3 butadiene, benzene, formaldehyde, and hexavalent chromium.
- Plastic production in the chemical industry is another major contributor to 1,3-butadiene.
- Fuel combustion in industrial, commercial, and residential sectors contribute to benzene and formaldehyde emissions.
- Industrial activities related to laundering, degreasing, and coatings contribute to emissions of methylene chloride, perchloroethylene, and cadmium.

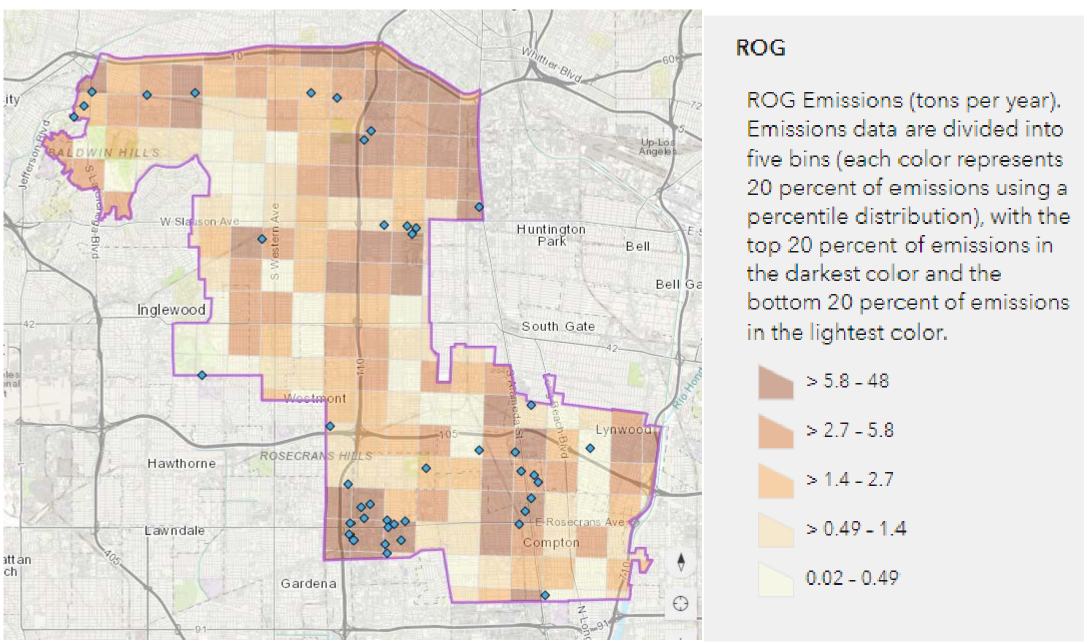
A detailed emission inventory by major source category is provided in Appendix 2d: Source Attribution Analysis.

Emissions by Source Category

As mentioned above, four major categories are identified for the emissions inventory: facilities (stationary sources), areawide, on-road, and off-road sources. Figures are included to show the geographic distribution of each category.

Figure 2d-15 and **Figure 2d-16** present the geographic distribution of ROG emissions from stationary and areawide sources, respectively. ROG includes some TACs like benzene, formaldehyde, and 1,3-butadiene. Areawide emissions include emissions from solvent evaporation and miscellaneous processes (e.g., residential fuel combustion commercial cooking), and populated areas. The highest areawide emissions occur across populated areas. Stationary sources include the facilities that report to AER and smaller aggregated industrial sources. Some hot spots of ROG emissions are concentrated near these AER reporting facilities in SLA, whereas other areas with high ROG emissions are near commercial and industrial activities related to cleaning and surface coatings. Note that reported emissions from AER facilities account for less than one percent of the overall toxicity-weighted TAC emissions in the community. **Figure 2d-17** and **Figure 2d-18** present the geographic distribution of DPM emissions from on-road and off-road sources, respectively. The highest emissions from on-road sources are aligned with the main transportation corridors. Off-road emissions come from a variety of sources, but the highest emissions are near industrial areas or near railroad tracks.

Figure 2d-15: ROG Emissions from Stationary Sources* in SLA



*Includes AER reporting facilities and aggregated small stationary sources.

Figure 2d-16: ROG Emissions from Areawide Sources in SLA

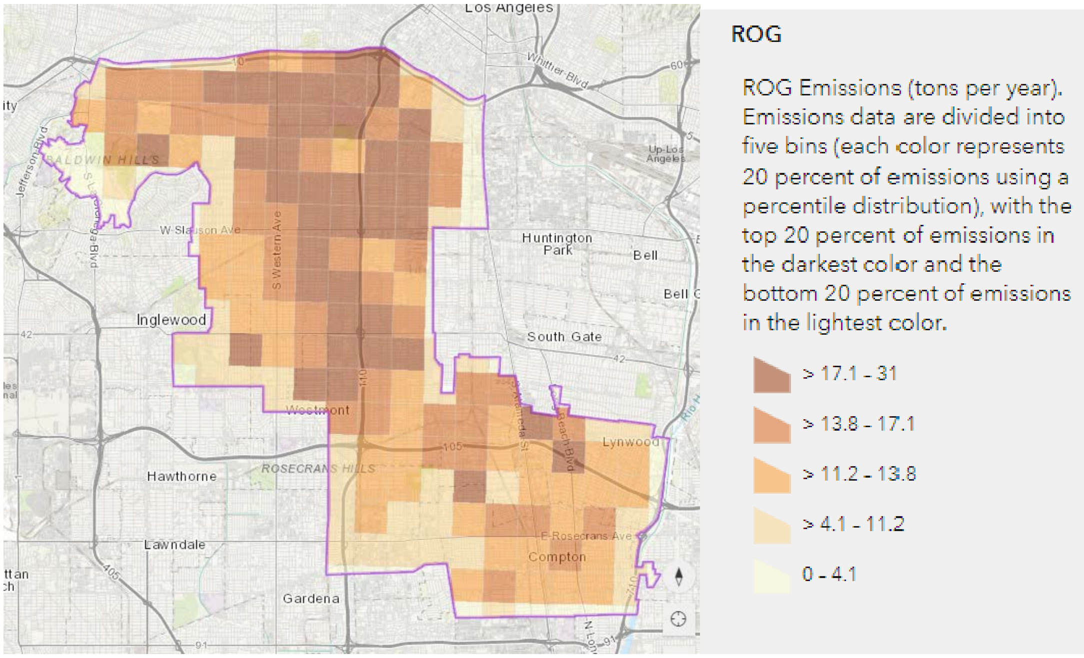


Figure 2d-17: DPM Emissions from On-Road Sources in SLA in 2019

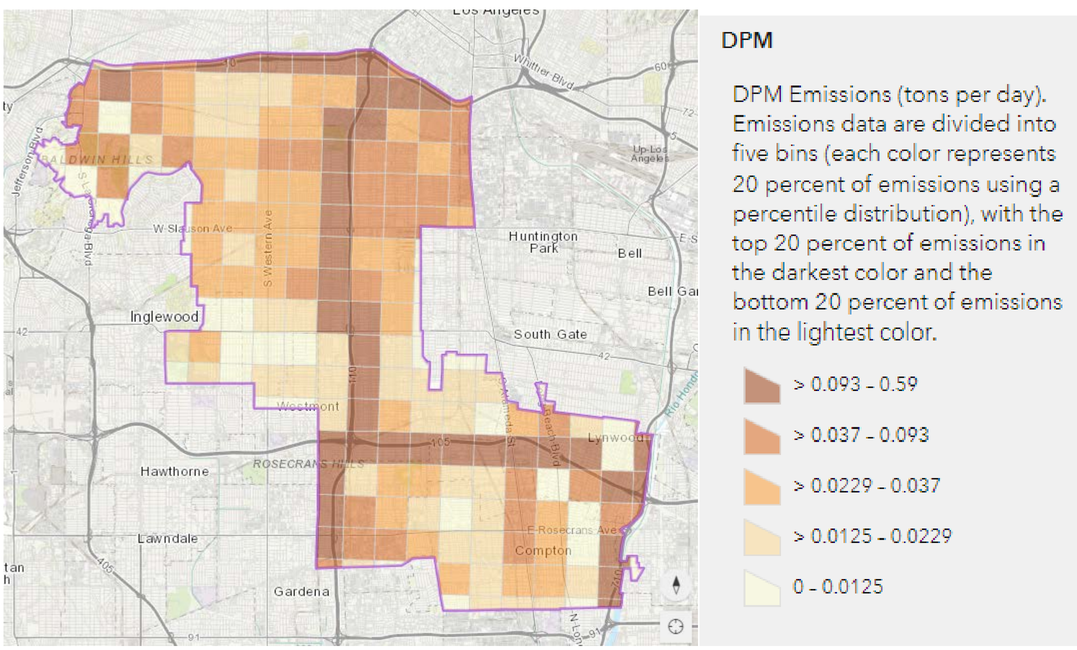
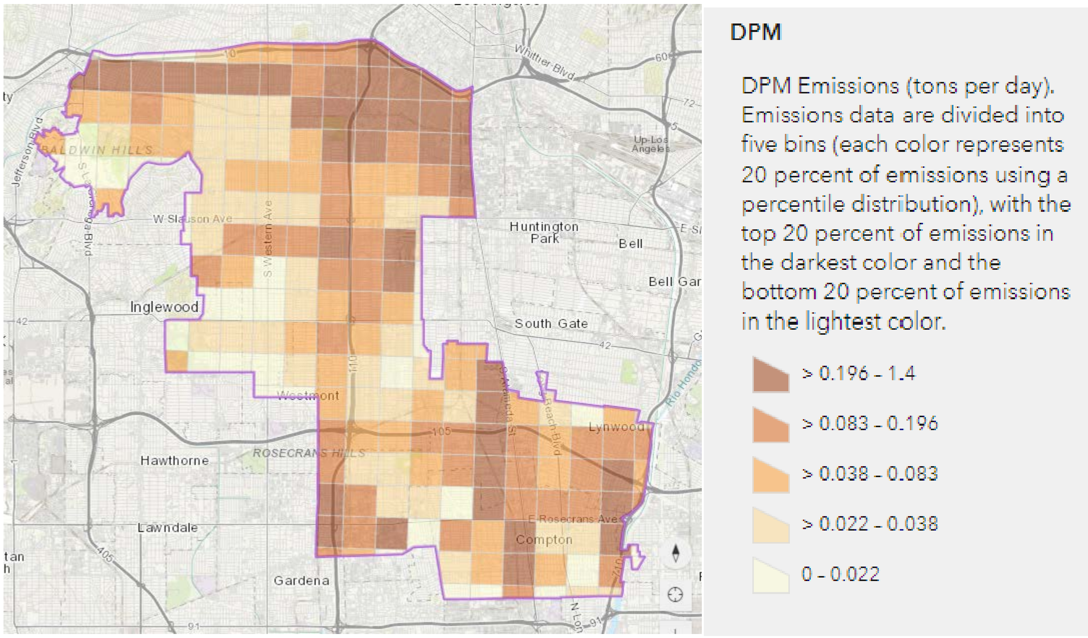


Figure 2d-18: DPM Emissions from Off-Road Sources in SLA in 2019



Future Year Baseline Emissions Inventory

As part of the source attribution analysis and along with CARB guidance, projected emission trends are determined for two future milestone years, 2026 and 2031. Future emissions of criteria pollutants and TACs in SLA are projected using the best available information for population growth, economic growth, and emissions adjustments that reflect the ongoing implementation of existing regulations. The estimates shown here do not reflect the potential impact of any new programs or measures not yet approved, and/or included in this CERP. The community boundary includes a variety of facilities subject to rules targeting toxic emissions. Furthermore, on-road DPM emissions from heavy-duty diesel vehicles are subject to CARB's Truck and Bus Regulation.[24] Off-road diesel equipment is also subject to state regulations that will reduce DPM and NOx emissions and the South Coast AQMD has also developed and implemented various regulations and programs to reduce NOx and ROG emissions from stationary and mobile sources. A detailed emission inventory by major source category for future years is provided in the Appendix 2d.

Figure 2d-19 presents the projected trend in major criteria air pollutant emissions (NOx, ROG, and PM2.5) in SLA from 2019 to the two milestone years, 2026 and 2031. NOx emissions in the community are expected to decrease substantially between 2019 and 2031, due to the existing regulations and incentive programs for mobile and stationary sources. The transition of South Coast AQMD's RECLAIM program, which covers the largest NOx stationary sources, to a command-and-control regulatory structure[25] are expected to bring a significant amount of NOx

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[24] CARB, Truck and Bus Regulation, https://ww2.arb.ca.gov/our-work/programs/truck-and-bus-regulation/about

[25] Command-and-control regulatory structure is a direct regulation with specified emissions limits as opposed to the market-based approach of RECLAIM.

emission reductions as well. ROG emissions are also expected to decrease between the years 2019 and 2031, mostly due to cleaner vehicle emissions. Unlike NOx and ROG emissions, PM2.5 emissions remain virtually unchanged during the period from 2019 to 2031. While some sources of PM2.5, (e.g., on- and off-road vehicles) are expected to decline due to vehicle emissions regulations, other sources that are not regulated (e.g., road dust, construction dust, cooking) are expected to increase because their emissions are strongly related to population, and population is projected to increase.

Trends for TAC emissions are shown in **Figure 2d-20** and are summarized here:

- DPM continues to dominate the TAC emissions inventory in future years, despite a significant reduction in DPM from heavy-duty trucks through statewide measures (ongoing and newly proposed regulations). See Chapter 5a: Introduction to Actions to Reduce Community Air Pollution for additional information on statewide measures.
- DPM is expected to decrease by 61 percent from 2019 through 2031 due to existing diesel vehicle emission regulations and turnover from older, higher polluting vehicles to cleaner vehicles
- The second largest contributor from TACs is 1,3-butadiene. These emissions are anticipated to decrease due to existing vehicle emission regulations and turnover from older, higher polluting vehicles to cleaner vehicles.
- Benzene and formaldehyde emissions are also expected to decrease throughout the 12-year period due to overall emission reductions from vehicles resulting from ongoing implementation of existing vehicle emission regulations and turnover from older, higher polluting vehicles to cleaner vehicles
- Hexavalent chromium emissions are expected to decrease from 2019 to 2031 due to a decrease in vehicle emissions that are despite a slight increase in industrial emissions. Industrial activity is projected to increase based on SCAG's economic trends, which will result in an increase in emissions of pollutants if no new regulations or more stringent requirements are established.
- Emissions of perchloroethylene, methylene chloride and cadmium are not expected to change much with existing regulations.

It is important to note that many of the South Coast AQMD regulations addressing toxic metal emissions from industrial facilities (e.g., South Coast AQMD Rule 1407.1[26] and Rule 1469[27]) include requirements to reduce fugitive metal toxic particulate emissions. Fugitive metal particulate emissions can make up a portion of the toxic metal emissions from a metal processing

[26] South Coast AQMD, Rule 1407.1 – Control of Toxic Air Contaminant Emissions from Chromium Alloy Melting Operations, http://www.aqmd.gov/docs/default-source/rule-book/reg-xiv/rule-1407-1.pdf?sfvrsn=18

[27] South Coast AQMD, Rule 1469 – Hexavalent Chromium Emissions from Chromium Electroplating and Chromic Acid Anodizing Operations, http://www.aqmd.gov/docs/default-source/rule-book/reg-xiv/rule-1469.pdf

facility but are often difficult to quantify because there are not widely accepted emission estimation methods established. The inventories shown here may not illustrate an overall decrease in toxic metal emissions, but existing regulations, in particular requirements to reduce fugitive metal toxic particulate emissions, are expected to result in overall decreased emissions. The analysis presented in this section is a regional analysis evaluating total TAC emissions. This analysis is different than a localized health risk assessment which takes into account specific parameters (e.g., temperature, stack height, distance from nearby receptors) about the emission sources within a facility, the proximity and types of receptors around the facility, and local meteorological conditions.

Figure 2d-19: Total Emission Trends for NOx, ROG, and PM2.5 in SLA for 2019, 2026, and 2031

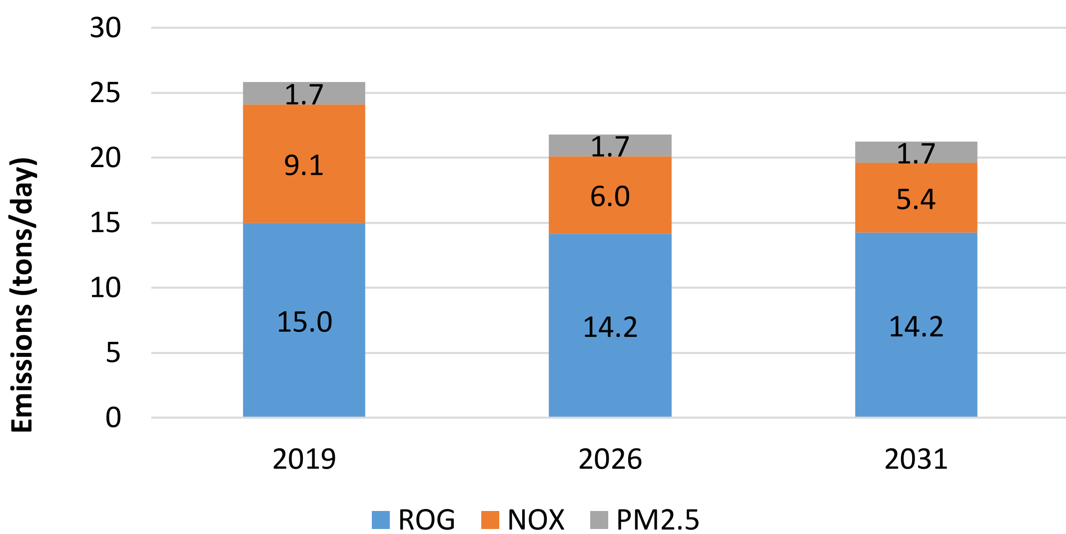
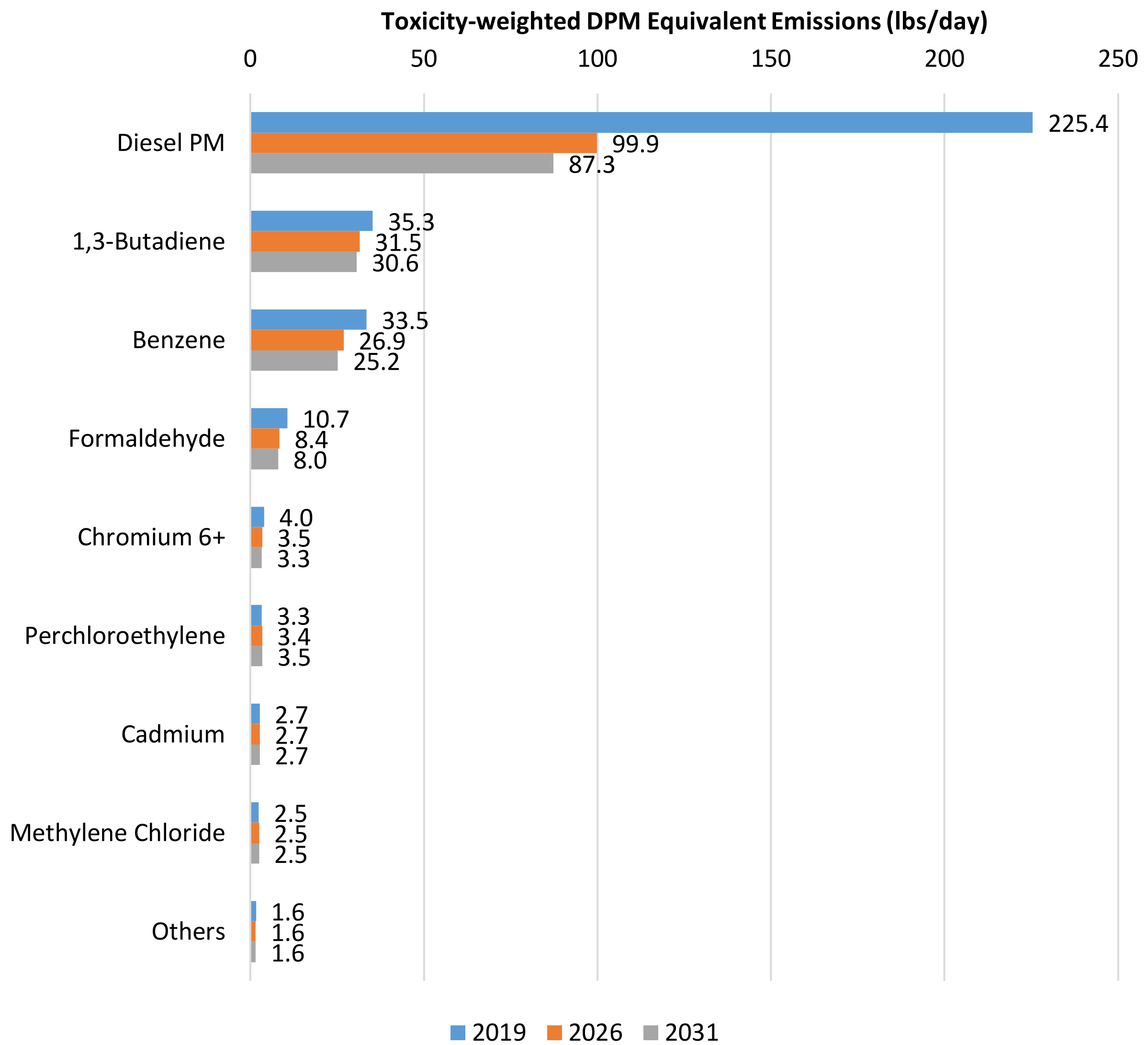


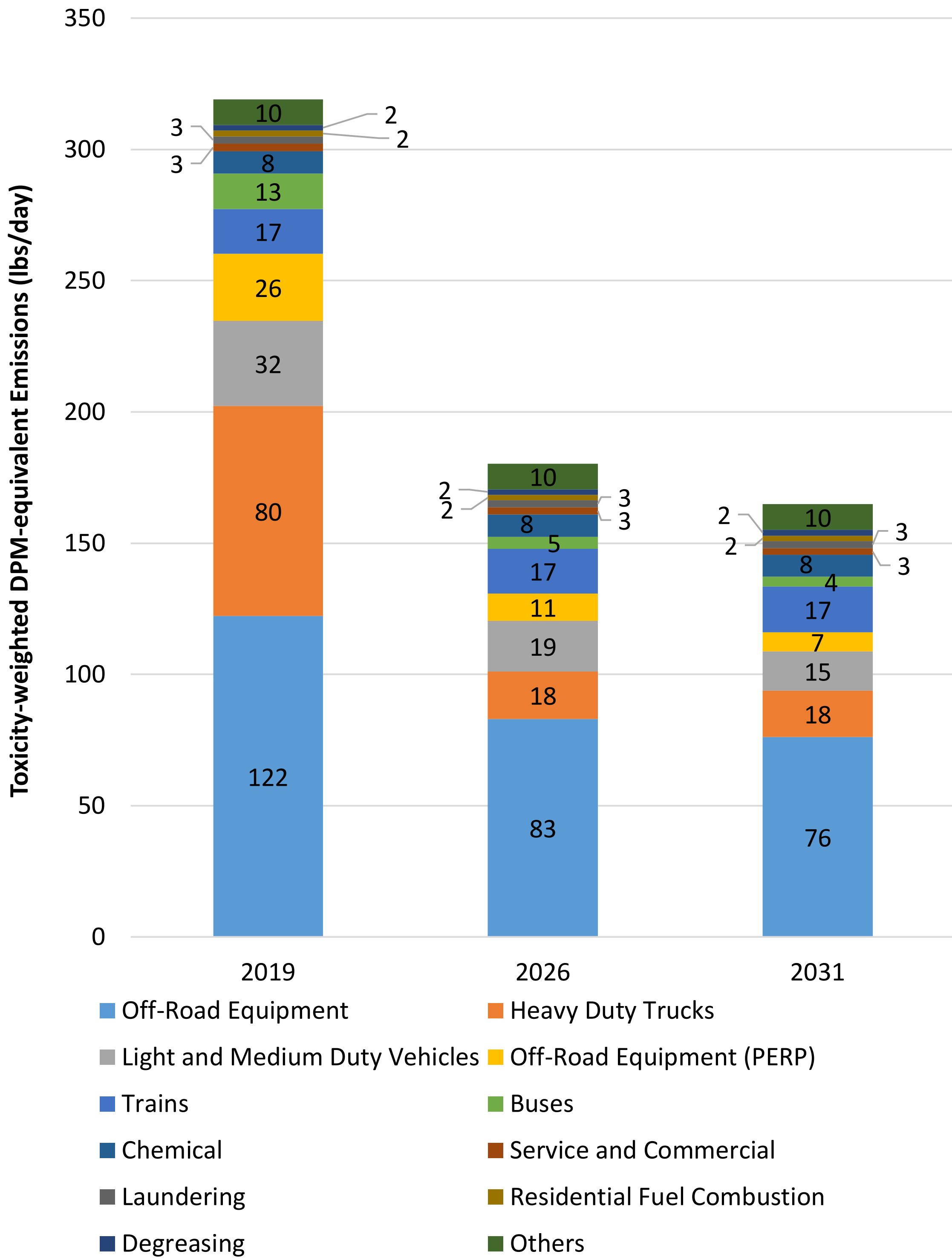
Figure 2d-20: Total Emission[ǂ] Trends for TACs in SLA for 2019, 2026, and 2031



ǂCancer potency-weighted diesel-equivalent emissions.

Figure 2d-21 presents the total TAC emissions by the major emission categories for the three years of interest. The overall toxicity-weighted emissions decrease between 2019 and 2031. In particular, emissions from diesel heavy-duty trucks and off-road equipment are expected to decrease substantially over the 12-year period, reducing overall TAC emissions. While TAC emissions from mobile sources are expected to decrease over time, emissions from stationary sources in facilities can still affect the nearby population, if these emissions are not remediated.

Figure 2d-21: TAC Emissions from All Sources in SLA



~Shown by major categories.

Summary

Sources of air pollutant emissions in SLA include on-road vehicles, trains, off-road equipment, and various industrial activities.

Figure 2d-22 summarizes the baseline (Year 2019) emissions inventory and **Figure 2d-23** summarizes the projected trends (Years 2026 and 2031) in the major air pollutants in SLA.

Figure 2d-22: Baseline Emissions Inventory in SLA for 2019

NOx	• Primarily from mobile sources (e.g., heavy-duty trucks, off-road equipment) • Stationary source contributors include fuel combution in the residential, commercial, and industrial sector
ROGs	• Primarily from areawide sources such as consumer products (e.g., solvents, cleaning supplies) • Mobile source contributors include passenger vehicle and off-road equipment (e.g., lawn mowers)
PM2.5	• From a variety of sectors, including commercial cooking, light- and medium-duty automobiles, fuel combustion, road dust, and wood and paper industries
TACs	• Primarily from DPM from heavy-duty trucks, trains, buses, and off-road equipment • Second TAC contributor is 1,3 butadiene from on- and off-road vehicles and plastic production and other TACs include benzene and formaldehyde from mobile sources and hexavalent chrome from metal processing facilities and vehicles

Figure 2d-23: Projected Trends in Major Air Pollutants in SLA for 2026 and 2031

NOx

- Future NOx emissions in SLA are expected to decrease from ongoing implementation of existing regulations and incentive programs on mobile (on-road and off-road) and stationary sources

ROGs

- ROG emissions are expected to decline at a slower rate than NOx emissions, from ongoing implementation of existing regulations and turnover from older, higher polluting vehicles to cleaner vehicles
- However, ROG emissions from consumer products are expected to increase due to projected population growth

TACs

- DPM emissions from heavy-duty tracks are also expected to decrease from ongoing implementation of existing regulations and incentive programs that expedite the replacement of older, higher polluting trucks with cleaner technology. Despite the projected reductions of DPM over the next decade, DPM continues to be the main contributor to air toxics cancer risk in SLA
- 1,3-butadiene, benzene, formaldehyde, and hexavalent chromium emissions are expected to decrease from overall reductions in vehicle emissions