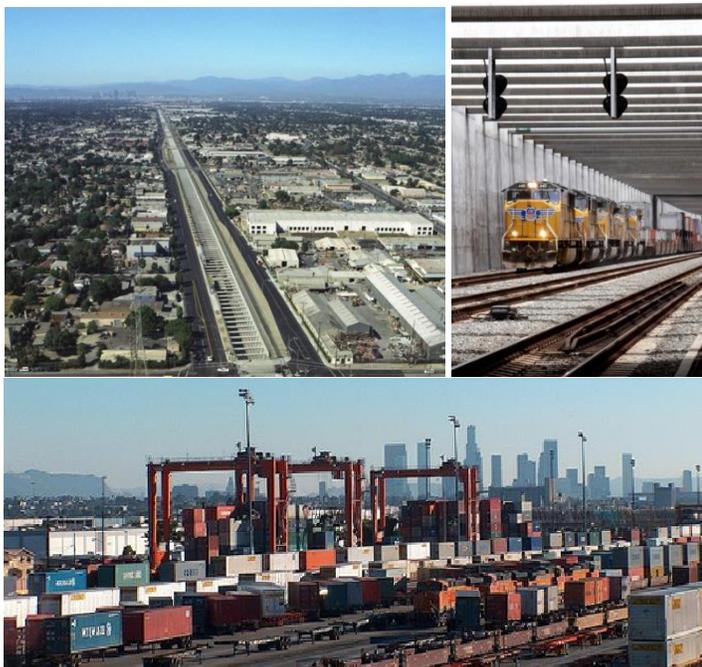


Railyards and Locomotives

Community Concerns

Railyards are used to store, sort, or load and unload railroad cars. Common loads include containers (stacked or on trailers), tankers with chemical or petroleum products, and bulk products such as construction materials or grain. Containers can be transported to and from warehouses for storage and sorting before reaching their destination. Regional rail volumes are projected to increase between 2016-2040 in response to growing international trade;¹ however, the potential amount of growth at railyards in this community is unknown. The Southeast Los Angeles (SELA) community boundary and emissions study area encompasses the BNSF Hobart Railyard, BNSF Commerce Eastern Railyard, and BNSF Sheila Mechanical railyards.



The SELA community boundary also includes parts of the Alameda Corridor that runs from the Ports of Long Beach and Los Angeles to Downtown Los Angeles, primarily along and adjacent to Alameda Street. The Alameda Corridor is a trench that parallels Alameda Street that contains three rail tracks used by BNSF and UP to transport trains to and from the ports. Nearly forty (40) trains and a volume of about thirteen thousand (13,000) twenty-foot equivalent units (TEUs) travel through the Alameda Corridor daily.² Stations and rail lines for passenger rail services operated by LA Metro, Amtrak, and Metrolink also run through the SELA community boundary, and the California High Speed Rail project has also indicated that they will use tracks in the northern part of the SELA emissions study area.³

Emissions from Railyards and Locomotives

Air pollution is generated by equipment and vehicles that are used for railyard operations (Figure 1). These vehicles and equipment move containers and railcars into and around the railyard to load, unload, and transport goods in and out of the railyard. Emissions can also be generated during maintenance activities (e.g., load testing). Examples of equipment used for railyard operations include:

- Locomotives (including ‘switchers’ that build and deconstruct trains, often within railyards, and larger ‘line-haul’ locomotives that pull trains hundreds of miles between railyards)

¹ Southern California Association of Governments, The 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy. <http://scagrtpsc.net/Documents/2016/final/f2016RTPSCS.pdf>. Accessed July 8, 2020.

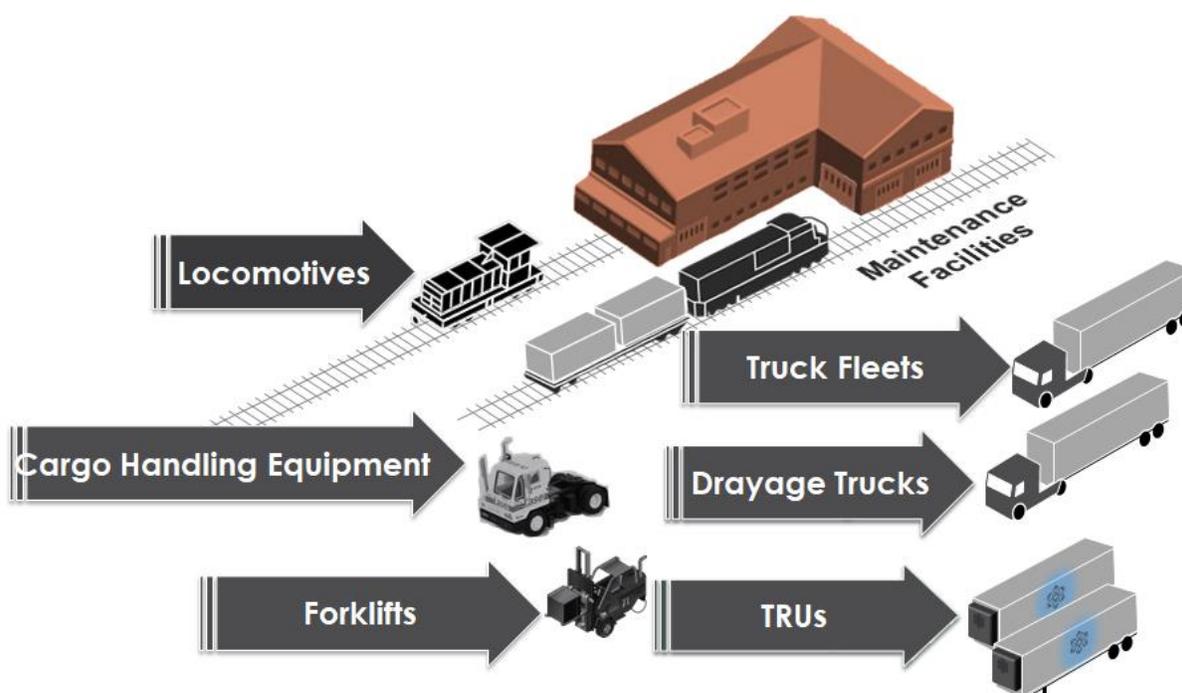
² Alameda Corridor Transportation Authority. <http://www.acta.org/>. Accessed July 14, 2020.

³ California High Speed Rail Authority, Los Angeles to Anaheim. https://hsr.ca.gov/high_speed_rail/project_sections/los_angeles_anaheim.aspx. Accessed July 15, 2020.

- Drayage trucks (i.e., on-road tractors that pull trailers loaded with containers, often from the ports)
- Cargo handling equipment (e.g., gantry cranes, top picks, and off-road yard trucks)
- Transportation Refrigeration Units (e.g., truck refrigeration units and refrigerated railcars)
- Miscellaneous equipment (e.g., fuel trucks)

Potential opportunities to reduce emissions from diesel equipment used at railyards include replacing older equipment with newer less polluting equipment (e.g., replacing diesel-fueled yard trucks with lower or zero-emission yard trucks, capturing and controlling emissions from locomotive load testing), and ensuring that the replacement or repower of equipment is based on the cleanest technology commercially available.

Figure 1 – Examples of Railyard Operations Equipment⁴

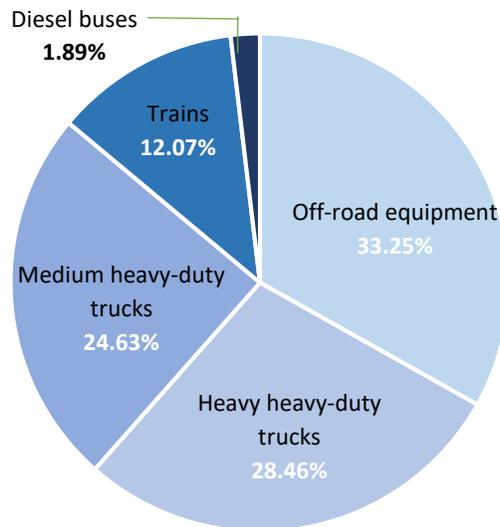


Based on a preliminary emissions inventory covering the years 2016 and 2017, trains (including line-haul and switcher locomotives, Metrolink, and passenger trains) contribute approximately 12% of all diesel particulate matter (DPM) in SELA. Off-road equipment, including equipment used for railyard operations, is also a source of DPM in SELA. Other large sources of DPM in SELA include medium heavy-duty trucks, heavy heavy-duty trucks, and diesel buses. For the overall contribution of these sources by percentage, see Figure 2 – Sources of DPM in SELA. DPM is a toxic air pollutant that comes from diesel engines and it is estimated that 68% of total known cancer risk related to air toxics in the South Coast Air Basin is attributable to DPM. However, the California Air Resources Board (CARB) projects that between 2012 and 2030 there will be over a 95% reduction in on-road DPM emissions in the South Coast Air Basin from the implementation of mobile source regulations,

⁴ Concepts to Reduce Emissions from Locomotives, South Coast AQMD and CARB Workshop.
https://www.ecfr.gov/cgi-bin/textidx?SID=159ba6f126272ea1995c71a43b7af309&mc=true&node=pt40.36.1033&rgn=div5#se40.36.1033_1101.
Accessed July 9, 2020.

with most of the reductions occurring before 2023.⁵ Additional information about DPM and health effects is available at <https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health>.

Figure 2 – Sources of DPM in SELA



Railyards and locomotives also contribute particulate matter (PM), volatile organic compounds (VOCs), and nitrogen oxides (NOx) emissions. PM10 and PM2.5 are particles smaller than 10 and 2.5 microns in diameter, respectively, that can be inhaled deep into the lungs and cause health problems. Additional information about PM10 and PM2.5 are available at <https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>. ROG is a group of gases that contribute to forming smog, such as acetone, benzene, and formaldehyde. NOx is a family of gases that are highly reactive with other pollutants to form ozone (smog). Ozone can affect the respiratory system. Additional information about ozone is available at <https://ww2.arb.ca.gov/resources/ozone-and-health>.

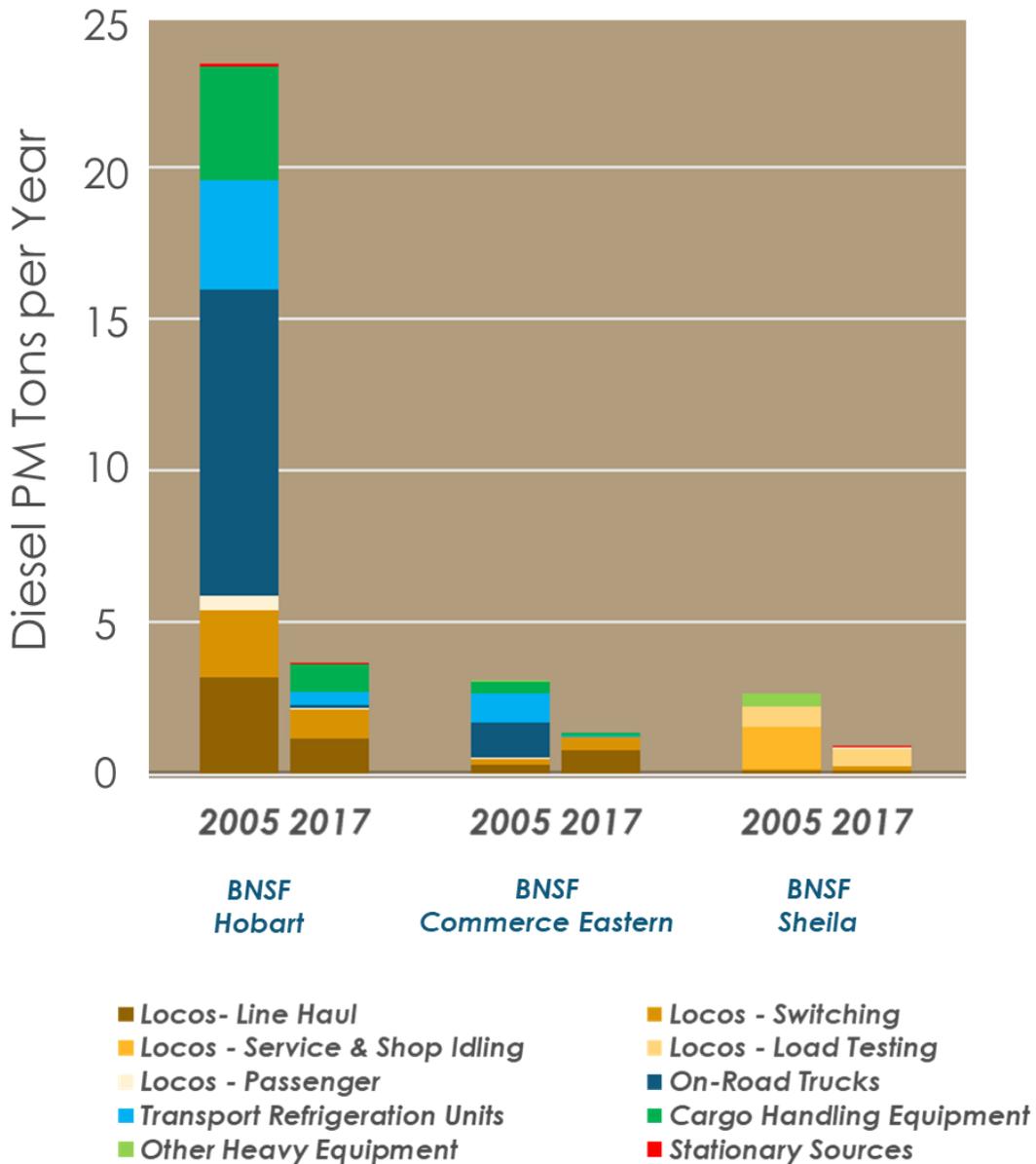
Table 1 – Emissions from Off-Road Mobile Sources in SELA below, provides an overview of emissions from trains and off-road equipment in SELA. The Off-Road Equipment category includes equipment used to operate railyards (e.g., cargo handling equipment and forklifts) as well as other sources outside of railyards (e.g., diesel-powered construction trucks and construction equipment). Figure 3 – Railroad Self-Reported Onsite Railyard Emissions Inventories shows the SELA railyard DPM emissions during 2005 and 2017.

Table 1 – Emissions from Off-Road Mobile Sources in SELA (Tons per Year)

Emissions Source	NOx	VOC	PM10	PM2.5	DPM
Trains	366.82	19.92	7.05	6.47	6.47
Off-Road Equipment	431.80	266.94	29.57	25.51	13.36

⁵ South Coast Air Quality Management District, Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES-IV). <https://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf>. Accessed July 15, 2020.

Figure 3 – Railroad Self-Reported Onsite Rail Yard Emissions Inventories



Air Monitoring

The air quality concern for this source category is related to diesel exhaust emissions from locomotives, cargo handling equipment, trucks and other diesel equipment. Emissions can also be generated during maintenance activities (e.g., load testing of locomotives). Diesel engines emit a complex mixture of air pollutants, including both gaseous and solid material. The solid material in diesel exhaust is known as DPM, which is one of the components of PM2.5. There is no technique to directly measure DPM (a major contributor to health risk); therefore, indirect estimates based on surrogates for diesel exhaust are used, specifically black carbon (BC). DPM is typically composed of carbon particles (“soot”, also called BC) and numerous organic compounds. Diesel exhaust also contains gaseous pollutants, including volatile organic compounds (VOC) and NOx.

The monitoring strategy to study and characterize this air quality priority consists of measurements using a mobile platform capable of monitoring a wide range of particulate and gaseous pollutants, including BC, PM, ultrafine particles (UFP), and nitrogen dioxide (NO₂). If needed, air monitoring can also be conducted to determine specific emission sources; identify activities that may lead to increase in emissions; identify potential sites for fixed monitoring, if appropriate; help assess the potential contribution of railyards to the overall air pollution burden in the SELA community; and help track the progress of emission reduction strategies.

Regulatory Efforts and Enforcement

Federal Efforts

Railroad operations are regulated at the federal level primarily by the Federal Railroad Administration and the Surface Transportation Board, and locomotive emissions are regulated by the U.S. EPA. Table 2 – Federal Line-Haul Locomotive Standards and Table 3 – Federal Switcher Locomotives below, identify the emissions standards required by the United States Environmental Protection Agency (U.S. EPA).⁶ These agencies' regulatory authority may preempt certain federal, state, and local regulatory authorities and actions. However, U.S. EPA has used its authority under the Clean Air Act to require new diesel locomotives to be built to meet the cleanest emission standard (also known as Tier 4).⁷

These regulations require the installation of devices that reduce idling (i.e., require idling limits with exceptions) on newly manufactured and remanufactured locomotives⁸ and mandate the use of ultra-low sulfur diesel fuel.⁹ However, these regulations do not require railroads to reduce their use of existing older, higher-emitting locomotives. Locomotives must meet federal emissions standards when they are remanufactured and may become cleaner at that time. In 2017, CARB also petitioned U.S. EPA to develop a new regulation requiring engine manufacturers to meet a cleaner Tier 5 emission standard for new engines. The new emission standards would provide critical NO_x and PM reductions, particularly in the disadvantaged communities that surround railyards. The U.S. EPA has not yet acted on this petition. Locomotive fleet turnover is slow as locomotive engines can last over 30 years, so even if the U.S. EPA were to develop a Tier 5 emission standard, it would not result in immediate emission reductions.

⁶ Control of Emissions from Locomotives. https://www.ecfr.gov/cgi-bin/text-idx?SID=159ba6f126272ea1995c71a43b7af309&mc=true&node=pt40.36.1033&rgn=div5#se40.36.1033_1101. Accessed July 9, 2020.

⁷ U.S. EPA, Regulations for Emissions from Locomotives. www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-emissions-locomotives, Accessed July 8, 2020.

⁸ U.S. EPA, Control of Emissions from Idling Locomotives, nepis.epa.gov/Exe/ZyPdf.cgi?Dockey=P100HP4Q.pdf, Accessed July 8, 2020.

⁹ U.S. EPA, Diesel Fuel Standards and Rulemakings, www.epa.gov/diesel-fuel-standards/diesel-fuel-standards-and-rulemakings#nonroad-diesel, Accessed July 8, 2020.

Table 2 – Federal Line-Haul Locomotive Emission Standards

Emission Tier	Year of Original Manufacture	NOX (g/bph·hr)	PM (g/bph·hr)	HC (g/bph·hr)
Tier 0	1973 - 1992	8.0	0.22	1.00
Tier 1	1993 - 2004	7.4	0.22	0.55
Tier 2	2005 - 2011	5.5	0.10	0.30
Tier 3	2012 – 2014	5.5	0.10	0.30
Tier 4	2015 or later	1.3	0.03	0.14

Table 3 – Federal Switcher Locomotive Emission Standards

Emission Tier	Year of Original Manufacture	NOX (g/bph·hr)	PM (g/bph·hr)	HC (g/bph·hr)
Tier 0	1973 - 1992	11.8	0.26	2.10
Tier 1	1993 - 2004	11.0	0.26	1.20
Tier 2	2005 - 2011	8.1	0.13	0.60
Tier 3	2012 – 2014	5.0	0.10	0.60
Tier 4	2015 or later	1.3	0.03	0.14

State Actions (CARB)

CARB has signed two agreements with BNSF and UP to reduce locomotive emissions, including in and around railyards.¹⁰ An agreement in 1998 required BNSF and UP to meet a fleet average of Tier 2 locomotives in the South Coast Air Basin every year between 2010 and 2030. Both railroads have met this commitment every year, though emissions in recent years have increased due to increased activity as seen in Figure 4. The second agreement between 2005 and 2015 focused on railyards and required implementation of an idling-reduction program, maximizing the use of ultra-low sulfur diesel fuel, preparation of health risk assessments, evaluation of measures to further reduce diesel particulate emissions, and an assessment of remote sensing technology to identify high-emitting locomotives.

¹⁰ California Air Resources Board, 1998 Tier 2 Fleet Average in the South Coast Air Basin Agreement, ww2.arb.ca.gov/1998-mou-summay-data-archive, and 2005 Statewide Rail Yard Agreement, <https://ww2.arb.ca.gov/sites/default/files/2020-06/2005%20MOU%20Remediated%2003102020.pdf>, Accessed June 5, 2019.

Table 4 – CARB Concepts for Cleaner Locomotive Use

Concept	Description
<p>Locomotive Emissions Reductions Spending Account</p>	<ul style="list-style-type: none"> Require railroads to place funds in a trust account when using dirtier locomotives in the state Funds in the trust account could only be used for cleaner locomotives Railroads would be required to report purchasing activity, which CARB would make available to the public. CARB would pursue an economic analysis to determine the relevant amounts
<p>In-Use Locomotive Remanufacture Limit</p>	<p>Ban locomotives that have exceeded a second useful life (i.e., remanufactured more than once) from operating in California, unless the engine is remanufactured to Tier 4 standards or cleaner.</p>
<p>U.S. EPA 30-minute Idling Limit</p>	<p>Allow CARB to respond to violations and public complaints on locomotive idling, with the potential for enforcement by air districts through an enforcement MOU</p>
<p>Genset Repurposing</p>	<ul style="list-style-type: none"> Smaller railroads commonly use older Tier 0 locomotives Larger railroads own some Tier 3 ‘genset’ locomotives that aren’t a good match for the work needed Smaller railroads would scrap older locomotives and replace them with the Tier 3 generator sets from the larger railroads Class 1 railroads could then acquire Tier 4 locomotives to replace their Tier 3s

Also, CARB staff plans to develop amendments to the Cargo Handling Equipment Regulation, Transportation Refrigeration Unit Regulation, as well develop new zero-emission fleet rules to transition the state’s trucking fleet to zero-emission starting in 2024 with a focus on drayage and railyards.^{11, 12, 13}

Currently, CARB enforces several regulations at railyards. The Cargo Handling Equipment Regulation requires equipment such as yard trucks, rubber-tired gantry cranes, top and side picks, forklifts, etc. at ports and intermodal railyards to meet engine performance standards and opacity standards. The Drayage Truck Regulation requires heavy-duty vehicles that transport containers and bulk to and from ports and intermodal railyards to meet engine emission performance standards. The Transportation Refrigeration Unit (TRU) Regulation requires refrigeration units to meet engine performance standards and be registered with CARB. At railyards, TRUs can be found on truck trailers, railcars, and connected to shipping containers as generator sets (gensets). CARB is also fielding locomotive complaints by working with air districts, railroad companies, and U.S. EPA to resolve them.

¹¹ California Air Resources Board, Sustainable Freight Transport. <https://ww2.arb.ca.gov/our-work/programs/sustainable-freight-transport>, Accessed March 17, 2020.

¹² California Air Resources Board, Zero-Emission Vehicle Fleet. <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets>. Accessed July 14, 2020.

¹³ California Air Resources Board, New Transport Refrigeration Unit Regulation in Development. <https://ww2.arb.ca.gov/our-work/programs/transport-refrigeration-unit/new-transport-refrigeration-unit-regulation>. Accessed July 17, 2020.

South Coast AQMD

South Coast AQMD has limited authority over locomotives and railroad activity, and any regulations it might pass will likely require federal approval before they can go into effect. With these limits in mind, South Coast AQMD is pursuing four concepts to reduce emissions from railyards, including developing an Indirect Source Rule (ISR).¹⁴ These include:

- Reducing exposures from locomotive maintenance and service emissions
- Requiring railroads to develop zero emission infrastructure plans for railyards
- Developing new incentive programs to focus on incentivizing cleaner locomotive activity instead of cleaner locomotive purchases
- Evaluating new monitoring approaches for in-use locomotives

South Coast AQMD staff continues to work with stakeholders (i.e., rail yard operators, communities, etc.) on proposed concepts for the Railyard ISR. The proposed Railyard ISR is currently scheduled for consideration by the Governing Board in the second quarter of 2021.

Incentives

South Coast AQMD has various programs through which incentives are available to reduce emissions from both locomotives and railyard operations. Table 5 summarizes some of South Coast AQMD's programs, the amounts distributed, and the equipment replaced through these incentive programs. Further, South Coast AQMD has also proposed a new incentive program concept to focus on the cleanest locomotive use. Current incentive programs have limited effectiveness in accelerating the widespread use of the cleanest locomotives (Tier 4). Therefore, South Coast AQMD staff is working on a concept for a new local program that provides incentives tied to clean locomotive use, not replacements. This approach will attract the cleanest existing locomotives now and achieve faster emissions reductions than regulations. The concept also includes the potential for increased incentives in disadvantaged communities.

¹⁴ South Coast Air Quality Management District, Railyards and Intermodal Facilities Working Group. <http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/facility-based-mobile-source-measures/rail-fac-wkng-grp>. Accessed July 8, 2020.

Table 5 – South Coast AQMD Railyard and Locomotive Incentive Programs

Program	Description	Emission Source	Amount Distributed	Equipment Replaced
Prop 1B: Goods Movement Emission Reduction Program	To reduce diesel air pollution from goods movement operations and achieve the earliest possible health risk reduction in nearby communities	Locomotives and cargo handling equipment at rail yard facilities	¹⁵ \$16,885,195	6 Yard Tractors 4 Forklifts 10 Locomotives
Carl Moyer	To obtain emission reductions from heavy-duty vehicles and other equipment operating in California as early and as cost-effectively as possible	On- and off-road heavy-duty vehicles/equipment and infrastructure for zero and near-zero emission technologies	¹⁶ \$12,776,780	7 Locomotives

Clean Off-Road Equipment Voucher Incentive Project

CARBs’s Clean Off-Road Equipment Voucher Incentive Project (CORE)¹⁷ is designed to accelerate deployment of cleaner off-road technologies by providing a streamlined way for fleets ready to purchase specific zero-emission equipment to receive funding to offset the higher cost of such technologies. CORE specifically target zero-emission off-road freight equipment that is currently in the early stages of commercial deployment. CORE will provide vouchers to California purchasers and lessees of zero-emission off-road freight equipment on a first-come, first-served basis, with increased incentives for equipment located in disadvantaged communities.

Examples of Actions to Reduce Emissions or Exposure

To address community concerns about emissions from Railyards and Locomotives in SELA the South Coast AQMD staff is seeking input from the CSC on goals and policies (or actions) for the SELA Community Emissions Reduction Plan (CERP). Figure 4 – Example of CERP Goal and Actions, provides an example of a goal and actions to address emissions from railyards and locomotives. South Coast AQMD staff is interested in hearing innovative ideas from the CSC to reduce railyard and locomotive emissions through the SELA CERP.

¹⁵ Data since 2016

¹⁶ Data since 2018

¹⁷ California Air Resources Board, Clean Off-Road Equipment Voucher Incentive Project.

<https://ww2.arb.ca.gov/our-work/programs/clean-off-road-equipment-voucher-incentive-project/about>. Accessed July 13, 2020.

Figure 4 – Example of CERP Goal and Actions

Goal	Potential Actions
<p>Reduce Emissions from Railyards and Locomotives</p>	<ul style="list-style-type: none"> Continue to pursue strategies to reduce air pollution from locomotives and railyards through the development of an indirect source rule.
	<ul style="list-style-type: none"> Work with CARB on the development of new concepts to reduce air pollution from railyards.
	<ul style="list-style-type: none"> Work with local utilities and state agencies to encourage the installation of infrastructure needed to fuel/charge zero-emission vehicles and equipment, and onsite equipment at the railyards.
	<ul style="list-style-type: none"> Conduct mobile air measurements around railyards to identify activities that may cause increased levels of air pollution.