



State of California

Beneficiary Mitigation Plan



For the Volkswagen
Environmental Mitigation
Trust



June 2018



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EXECUTIVE SUMMARY

The Beneficiary Mitigation Plan (Plan) for California contains the eligible mitigation actions (or project funding categories) that the California Air Resources Board (CARB or Board) will fund from the State's \$423 million allocation of the Volkswagen (VW) Environmental Mitigation Trust (Trust or Mitigation Trust).¹ The Board approved this Plan at a public meeting on May 25, 2018. The Trust is an element of the settlement with Volkswagen for their use of an illegal defeat device (software designed to cheat emissions tests) in certain 2.0- and 3.0-liter VW diesel vehicles. CARB is the designated Lead Agency acting on the State's behalf as beneficiary to implement California's allocation of the \$3 billion national Trust. As provided in two court-approved Partial Consent Decrees (Consent Decrees), the Mitigation Trust is intended to fully mitigate the lifetime excess oxides of nitrogen (NOx) emissions caused by VW's actions.

Staff estimates the funding described in this Plan will result in over 10,000 tons of NOx reductions over a 10-year period, fully mitigating the excess NOx caused by the subject VW vehicles. In addition, the funding will support advanced technology vehicle and equipment deployments and accelerate the zero-emission transformation of the heavy-duty fleet, all of which are necessary to meet the State's air quality, climate change, zero-emission vehicle, and petroleum use reduction goals. Unlike other states that are also beneficiaries of the Trust, California's air quality challenges have resulted in many groundbreaking regulations to drastically cut air pollution and improve public health. These regulations apply to the existing in-use, on-road heavy-duty and off-road fleets in the State – sectors to which the majority of the project funding categories in the Consent Decree apply – and to light-duty vehicle manufacturers, many of whom must comply with California's Zero-Emission Vehicle (ZEV) Regulation. This funding ensures emission reductions resulting from the use of Trust funds are direct and surplus to reductions that are already being credited to those regulatory efforts.

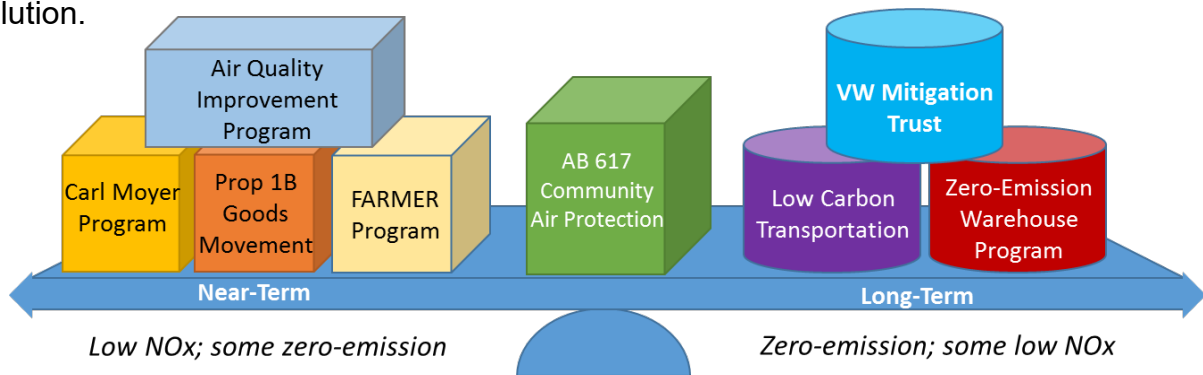
Funding Portfolio to Balance Investments

The funding in this Plan will be offered statewide and is intended to complement the portfolio of clean transportation investments being made by CARB, other State agencies, and local governments. There will be considerable investment in heavy-duty vehicle emission reductions, including low NOx natural gas trucks, through continued implementation of the Carl Moyer Program, Low Carbon Transportation Investments, the Proposition 1B Goods Movement Emission Reduction Program, agricultural incentives (the FARMER program) and the Assembly Bill (AB) 617 Community Air Protection Program. Even with these investments, stakeholders have expressed the need for additional funding to provide cleaner options for fleets, infrastructure to support zero-emission vehicles in both the heavy-duty and light-duty sectors, and to reduce the incremental costs of advanced technologies.

¹ California's total Trust allocation is \$422,636,320.

CARB’s role in implementing each incentive program in its portfolio varies. CARB makes the statewide investment decisions for some programs consistent with direction from the Legislature. These include the Low Carbon Transportation Program and VW Mitigation Trust. For others, such as the Carl Moyer and AB 617 Community Air Protection Programs, CARB establishes guidelines, but investment decisions are made locally by air pollution control or air quality management districts (air districts), so investments can be customized for each region’s unique situation. There is need for both models.

One of CARB’s challenges is finding the right balance between investing in technologies that provide cost-effective, near-term emission benefits, versus investing in transformative zero-emission technologies that cost more in the near-term but are necessary to meet our longer-term 2030 and 2050 goals discussed later in this Plan. We need both. Some air districts have State Implementation Plan (SIP) emission reduction goals that may call for focusing on investments that maximize near-term NOx reductions even if they do not set California up for the longer-term transformation of the fleet to technologies that are zero-emitting. Similarly, local air districts may want to focus on projects that maximize near-term health risk reduction coupled with investments in zero-emission technologies in their communities most impacted by air pollution.



The large-scale, multi-year statewide investments CARB can make through the Low Carbon Transportation Program and VW Mitigation Trust are unique in that they can send a market signal and move the needle in terms of advancing technologies that smaller, locally-focused investments simply cannot match. The State’s \$500 million investment in consumer rebates for ZEV passenger vehicles has resulted in California leading the nation in ZEV deployment by a considerable margin even compared to the other states that have opted into our ZEV regulation. CARB is doing the same with large scale investments to electrify the heavy-duty sector. California is already starting to experience success with investments in zero-emission transit buses, a natural beachhead for transforming the heavy-duty sector. These investments also set California up to benefit from the green economy with companies establishing zero-emission vehicle manufacturing operations in the state.

However, these statewide investments are not as well suited to target regional and community scale air quality challenges that are integral to air districts’ SIP strategies and AB 617 Community Air Protection strategies. This is where the locally directed

incentive programs – the Carl Moyer Program, AB 617 Community Air Protection Program, and agricultural incentives – play a key role. CARB provides air districts great latitude in how they invest these funds, particularly with the recent Carl Moyer Program changes that give air districts more flexibility. These programs can be customized to meet each region’s unique needs and designed with local input for an investment strategy that works best locally. That may be investments focusing on a particular source category such as agricultural sources in the San Joaquin Valley, investments in low NOx technologies for regions with challenging 2023 SIP NOx reduction targets, or investments in local community-focused projects guided by the AB 617 technical work.

In this Beneficiary Mitigation Plan, CARB staff is recommending a balanced investment strategy. Staff includes funding for low NOx combustion freight categories to ensure the near-term NOx reductions to mitigate the VW vehicles’ emissions, coupled with investments in ZEV technologies to accelerate the deployment of zero-emission buses, trucks, and freight equipment. This is consistent with the guiding principles below. The funding directs a larger share of investments to the zero-emission categories because of the relatively higher cost of the zero-emission technologies at this stage of their development compared to combustion technologies. This is necessary and appropriate in order to fund enough vehicles to move the market and have a real impact in accelerating zero-emission technologies towards broader commercialization.

Guiding Principles

Staff developed guiding principles in order to inform the types of eligible mitigation actions to fund and the corresponding allocations. Public comments helped shape these guiding principles. For example, many commenters requested a focus on zero-emission technologies where available, including more than 4,000 emails received. The guiding principles are summarized below:

- Fund actions that offset the VW NOx impacts while reducing risk to sensitive populations and ensuring disadvantaged or low-income community benefits.
- Align with State priorities.
- Focus on zero-emission technologies where available; low NOx everywhere else.
- Prioritize expenditures that are surplus to regulatory requirements and complementary and additional to other public investments.
- Provide investments statewide to transform the heavy-duty sector.
- Use a known method of implementation, including public process, project management, and competitive solicitations where appropriate.
- Ensure accountability and transparency.

Additional information and discussion on the guiding principles is included in Section II of this Plan.

Funding Allocations

CARB will fund nearly all of the project funding categories listed as eligible in the Consent Decree with a focus on zero-emission technologies. In March 2018, during an informational update on emission reduction concepts for the freight sector, the Board directed CARB staff to move forward on nine new measures to reduce emissions and community health impacts from large freight facilities.² Many of the measures, such as those for cargo handling equipment and drayage trucks, are zero-emission focused and cannot be achieved without additional funding. Allocating California’s VW Mitigation Trust funding with a focus on zero-emission technology is not only consistent with our overall State priorities, it is the necessary foundation for some of these freight measures. The project funding categories and allocations are shown in Table 1 below.

Table 1: Project Funding Categories and Allocations

Eligible Mitigation Action Project Funding Category	Benefiting Disadvantaged or Low-Income Communities	Project Allocation (millions)
Zero-Emission Transit, School, and Shuttle Buses	50%	\$130
Zero-Emission Class 8 Freight and Port Drayage Trucks	50%	\$90
Zero-Emission Freight and Marine Projects Forklifts and Port Cargo Handling Equipment Airport Ground Support Equipment Oceangoing Vessel Shore Power Zero-Emission Ferry, Tugboat, and Towboat Repowers	75%	\$70
Combustion Freight and Marine Projects Low NOx Class 7-8 Freight Trucks Tier 4 Freight Switchers Tier 4 or Hybrid Ferry, Tugboat, and Towboat Repowers	50%	\$60
Light-Duty Zero-Emission Vehicle Infrastructure	35%	\$10
Reserve (including administrative costs)		\$63
TOTAL	> 50%	\$423

The funding allocations above provide a balanced approach for fully mitigating the excess NOx by investing in cost-effective projects using cleaner combustion technologies, such as low NOx, and for committing to long-term goals by investing in

² Staff presentation, March 22, 2018: https://www.arb.ca.gov/board/books/2018/032218/18-2-6pres.pdf?utm_medium=email&utm_source=govdelivery

zero-emission technologies. Staff believes that focusing exclusively on the projects that are most cost-effective today would miss the opportunity to accelerate deployment of zero-emission technologies, thereby jeopardizing our ability to meet 2030 and 2050 goals. There is no doubt that these more transformative zero-emission technologies are more expensive today than combustion-based technologies. The State's investments are intended to help commercialize these technologies and bring down costs through economies of scale, so they become the cost-effective technologies of tomorrow. Conversely, focusing solely on more expensive advanced technologies with a longer-term payoff would miss the opportunity for near-term emission reductions and would not fully mitigate the excess NOx as required for this funding.

The Consent Decree requires that the Plan consider the estimated air quality benefits of the project funding categories on areas that are disproportionately affected by air pollution. Additionally, in Senate Bill (SB) 92 the State Legislature set a 35 percent target for the State's Trust allocation to benefit disadvantaged or low-income communities; staff estimates that more than 50 percent of the total project funds in the Plan will benefit these communities.

Public input has been essential in determining the project funding categories and allocations in this document. Since September 2017, stakeholders and other members of the public have submitted more than 80 individual comments and more than 4,000 emails to an online docket³ created to help inform CARB staff in developing the Plan. The California Legislature also provided input and direction in passing SB 92. This input, along with comments received at two public meetings in October 2017, six public workshops conducted throughout California in February and March 2018, and multiple individual stakeholder meetings, have aided staff in determining the funding in this document.

The funding described here is consistent with the guiding principles described above, the requirements of the Consent Decree, and California's air quality and climate change goals. Each of the project funding categories are expected to benefit disadvantaged communities or low-income areas. Most project categories will be funded in at least two installments over a few years, which will allow staff to assess project performance and will provide additional funding opportunities, particularly for rural areas and small businesses and agencies. For all categories except light-duty ZEV infrastructure and oceangoing vessel shore power, an existing eligible vehicle or engine in the owner's fleet must be scrapped, and the new vehicle, new engine, or new zero-emission motive power system must be certified, verified, or otherwise approved by the U.S. EPA or CARB for operation in California. Each project within the project funding categories must meet the definitions and requirements of the corresponding eligible mitigation action in the Consent Decree and as further described in the Plan. Additional information regarding each of the project funding categories is included later in the Plan.

The funds allocated to California from the VW Mitigation Trust are expected to provide incentives for sustainable freight technology and clean trucks and buses and provide

³ <https://www.arb.ca.gov/lispub/comm2/bccommlog.php?listname=vw-mititrust-pl-ws>

direct benefits to areas disproportionately impacted by air pollution through the replacement of older, high-emitting vehicles and equipment with low- and zero-emission advanced technology vehicles and equipment. These projects will additionally result in improved ambient air quality and human health in communities located in nonattainment areas and in areas with historical air quality issues, and in disadvantaged or low-income areas that bear a disproportionate share of the air pollution burden. At the same time, this funding will provide benefits to the local economy and the welfare of residents in those communities.

I. INTRODUCTION: THE VOLKSWAGEN SETTLEMENT

In September 2015, following an ongoing investigation, Volkswagen Group of America, Inc. admitted to the United States Environmental Protection Agency (U.S. EPA) and CARB their use of illegal software “defeat devices” in certain model year 2009 through 2015 2.0-liter diesel passenger vehicles sold in the U.S. and California. Approximately 500,000 2.0-liter vehicles were affected nationwide, with about 70,000 of those in California. Continuing investigations found about another 87,000 model year 2009 through 2016 3.0-liter diesel vehicles were also affected throughout the country, with about 15,000 of those in California. The illegal software was specifically designed to detect when the car was being tested in the laboratory and operate to meet the rigorous certification standards for emissions. The software also detected when the car was on the open road, and then effectively bypassed emissions control equipment. As a result, the NOx emissions in normal, everyday driving reached levels up to 40 times the legal standard. NOx emissions in California are the most important contributor to ambient ozone and a key contributor to fine particulate matter pollution, which is associated with premature death, increased hospitalizations, emergency room visits due to exacerbation of chronic heart and lung diseases, and other serious health impacts. Figure 1 below shows the estimated geographic distribution of the subject vehicles.

Figure 1: Map of Estimated Subject VW Vehicle Populations by Air Basin



On October 25, 2016 and May 17, 2017, the United States District Court, Northern District of California, approved class action settlement programs for the 2.0-liter and 3.0-liter vehicles, respectively, to compensate vehicle owners and to provide environmental relief, as enumerated in two Consent Decrees. The first Consent Decree describes the primary elements of the settlement in four separate appendices:

- Appendices A and B (the Buyback, Lease Termination, and Vehicle Modification Recall Program and the Vehicle Recall and Emissions Modification Program, respectively) describe the procedures that VW is using to offer its affected consumers the option of either: (1) a buyback or lease termination; or (2) the option of an emissions modification in accordance with the technical specifications prescribed in Appendix B. The Consent Decree also allows consumers to choose to do nothing.
- Appendix C (the Zero-Emission Vehicle or ZEV Investment Commitment) requires VW to invest \$800 million in California over a ten-year period to support the increased use and availability of ZEVs. VW will implement these investments in four \$200 million 30-month cycles, the first cycle was described in VW's ZEV Investment Plan that the Board approved in July 2017, and is scheduled to receive an update at its April 2018 meeting.
- **Appendix D (the Environmental Mitigation Trust) – the subject of this Beneficiary Mitigation Plan** – is intended to mitigate past and future excess NOx emissions from the subject vehicles. Under the terms of the two Consent Decrees, VW must pay about \$3 billion into a national Environmental Mitigation Trust over a three-year period for specified eligible mitigation actions. California's allocation of the trust is about \$423 million: about \$381 million from the first Consent Decree and about \$42 million from the second Consent Decree.⁴ The 10 eligible mitigation actions listed in the first Consent Decree are mostly scrap-and-replace projects, including supportive infrastructure for zero-emission advanced technology replacements, for the heavy-duty sector. The following are the eligible mitigation action categories:
 1. Class 8 Local Freight Trucks and Port Drayage Trucks: Trucks with 1992-2012 model year engines and gross vehicle weight rating (GVWR) greater than 33,000 pounds used for freight or cargo delivery, including waste haulers, dump trucks, and concrete mixers.
 2. Class 4-8 School Buses, Shuttle Buses, and Transit Buses: Buses with pre-2013 model year engines and GVWR greater than 14,001 pounds used for transporting people, including Class 4-8 school buses sold or introduced into interstate commerce for purposes that include carrying students to and from school or related events (may be Type A-D).

⁴ First Consent Decree : https://www.arb.ca.gov/msprog/vw_info/vsi/vw-mititrust/documents/2016-10-25_2l_cd.pdf; second Consent Decree: https://www.arb.ca.gov/msprog/vw_info/vsi/vw-mititrust/documents/2017-05-17_3l_cd.pdf

3. Freight Switchers: Pre-Tier 4 engine switcher locomotives that move rail cars around a rail yard (as compared to line-haul engines that move freight long distances).
4. Ferries and Tugs: Tier 2 or earlier marine engines used in ferries and dedicated tugboats and towboats.
5. Ocean-Going Vessels (OGV) Shore Power: Systems that enable a compatible vessel's main and auxiliary engines to remain off while the vessel is at berth.
6. Class 4-7 Local Freight Trucks: Trucks with 1992-2012 model year engines and GVWR between 14,001 and 33,000 pounds used to deliver cargo and freight, such as courier services, delivery trucks, box trucks moving freight, waste haulers, dump trucks, and concrete mixers.
7. Airport Ground Support Equipment (GSE): Tier 2 and earlier diesel engine GSE, and spark ignition engine GSE with uncertified or certified 3.0 gram per brake-horsepower-hour (g/bhp-hr) or higher engines.
8. Forklifts and Port Cargo Handling Equipment: Lift equipment, such as forklifts, reach stackers, side loaders, and top loaders, with greater than 8,000 pounds lift capacity; and port cargo handling equipment, such as rubber-tired gantry cranes, straddle carriers, shuttle carriers, and yard trucks that operate within ports.
9. Light-Duty Zero-Emission Vehicle Supply Equipment: Acquisition, installation, operation, and maintenance of new light-duty zero-emission vehicle supply equipment (Level 1, Level 2, or fast charging) located in a public place, workplace, or multi-unit dwelling; or light-duty hydrogen fuel cell vehicle supply equipment dispensing at a pressure of 70 megapascals (MPa) located in a public place. The State may use no more than 15 percent of its total allocation for this category.
10. Diesel Emissions Reduction Act (DERA) Option: Non-federal voluntary match for projects not enumerated above but are otherwise eligible for DERA funds. Staff will not utilize the DERA option. Currently, CARB spends State DERA funds on school bus retrofits or replacements. Furthermore, DERA funds are not guaranteed and are limited, typically only about \$500,000 annually. Staff believes the demand for the other eligible project funding categories exceeds that for the DERA option.

Excluding the OGV shore power and light-duty zero-emission vehicle supply equipment categories, eligible vehicles or engines in the above projects must be scrapped. Zero-emission vehicle infrastructure is also an allowable expenditure when accompanying funded zero-emission vehicles or repowers. The maximum funding per

vehicle or equipment in this document is intended to incorporate, but not fully offset, infrastructure costs. The Consent Decree specifies the maximum eligible funding amounts (percentages of cost) for each category, based on the type of replacement engine, motive power system, or vehicle or equipment and whether or not the eligible vehicle or equipment is government owned. For most heavy-duty categories, funding for non-government fleets is limited to up to 25 percent for a new vehicle and up to 40 percent for a repower. Government fleets may be funded up to 100 percent of the cost of the new vehicle or repower. CARB must decide the appropriate level of funding and cost-share requirements for each project funding category, while not exceeding the maximum funding amounts allowed by the Consent Decree. Section III of this Plan includes the maximum funding amounts per vehicle or equipment.

CARB's responsibilities as the Lead Agency implementing California's allocation of the VW Mitigation Trust include developing a Beneficiary Mitigation Plan, as required by the Consent Decree (Appendix D), that describes the State's overall goals for the use of the funds, the categories of eligible mitigation actions to be funded, and the estimated percentages of funds to be allocated to each of those categories. The Plan must also consider potential benefits of the eligible mitigation actions on air quality in areas that bear a disproportionate share of the air pollution burden and the estimated ranges of expected emission benefits of those actions.

In March 2017, the Court appointed Wilmington Trust, N.A. as Trustee, and in October 2017, the Court approved two Trust Agreements: one for the 50 states, the District of Columbia, and the Commonwealth of Puerto Rico, and one for the separate \$55 million allocation for federally recognized Indian tribes in the U.S. The State of California officially became a beneficiary of the Trust on January 29, 2018,⁵ allowing the State to fund eligible mitigation actions, as defined in the Consent Decree, that are described in the State's Beneficiary Mitigation Plan. To date, Volkswagen has funded two-thirds of the national Trust, including an allocation for California; the Trust will be fully funded in November 2018.

This Beneficiary Mitigation Plan meets the Consent Decree requirements. Section III describes the project funding categories, including the allocation amounts, the maximum funding amounts per vehicle or equipment, and expected benefits of each.

⁵ Wilmington Trust filed the Notice of Beneficiary Designation with the court on January 29, 2018: [https://www.vwenvironmentalmitigationtrust.com/pdfs/Dkt%204700%20Notice%20of%20Beneficial%20Designation%20\(State%20Trust\).pdf](https://www.vwenvironmentalmitigationtrust.com/pdfs/Dkt%204700%20Notice%20of%20Beneficial%20Designation%20(State%20Trust).pdf)

II. GOALS FOR CALIFORNIA'S ALLOCATION OF THE TRUST

The VW Environmental Mitigation Trust provides an opportunity for California to not only fund projects that mitigate the excess NOx caused by VW's actions, but to do so in a way that furthers the State's long-term clean air goals. The Consent Decree provides the State many options in selecting technologies to comply with its Trust allocation expenditure requirements, including zero-emission and alternative fuel technologies. This section provides the goals and policy drivers for achieving additional emission benefits from the Trust funds.

A. Mitigating Excess NOx

The mitigation actions in this Beneficiary Mitigation Plan must fully mitigate the excess lifetime NOx caused by the subject VW diesel vehicles. CARB staff estimates the excess NOx in California is about 10,000 tons. This estimate assumes 85 percent of the subject vehicles will meet recall or buy-back requirements by mid-2019 and takes into account the uncertainty in the heavy-duty advanced technology vehicle market demand, mix of projects within the project funding categories that could be funded, and infrastructure needs. Staff used this estimate in determining the project funding categories and allocations presented in this document.

B. California's Air Quality Challenges

Statewide, about 12 million Californians live in communities that exceed the federal ozone and particulate matter (PM2.5) standards. Despite improvements made through California's groundbreaking air pollution regulations, incentives for advanced technology vehicle deployments, and clean energy policies, the South Coast and the San Joaquin Valley are the only two areas in the nation with an Extreme classification for the federal ozone standard and also experience some of the nation's highest PM2.5 levels. Exposure to PM2.5 and ozone are associated with premature death, increased hospitalizations and emergency room visits due to exacerbation of chronic heart and lung diseases, and other serious health impacts. Elevated ozone levels can also reduce crop and timber yields, as well as damage native plants.

The effects of climate change are also having an impact on California's ability to reduce air pollution. Extreme weather, forest fires, and drought create additional impacts on air quality. Without increased focus on reducing greenhouse gas emissions and short-lived climate pollutants, the State will continue to struggle with combatting the resulting increase in other pollutants.

While poor air quality affects all of the State, some communities are disproportionately impacted by air pollution because of their proximity to freeways, industrial facilities, freight corridors, or other localized pollution sources. Many disadvantaged communities are also low-income and face even more environmental and/or other socio-economic burdens. As required by the Consent Decree, staff considered the impacts of the mitigation actions on disadvantaged or low-income communities.

California's unique air quality challenges have led the State to adopt many policies that not only aim to address those challenges in the near term, but also guide longer term solutions. As mentioned previously, the VW Mitigation Trust is one funding source in a large portfolio of funding that CARB is implementing to help the State meet its air quality and climate related objectives.

C. Policy Drivers for Additional Emission Benefits and Strategies

In addition to fully mitigating the excess lifetime NOx emissions of the VW vehicles subject to the settlement, the projects expected to be funded are consistent with and will aid the State in meeting many of California's air quality goals. State law has set ambitious climate change goals that include reducing greenhouse gas (GHG) emissions 40 percent below 1990 levels by 2030.⁶ Additionally, Governor Brown has called for reducing petroleum use up to 50 percent by 2030 and reducing GHG emissions from the transportation sector to 80 percent below 1990 levels by 2050.⁷ At the same time, we must continue efforts to attain compliance with national ambient air quality standards and minimize near-source risk and exposure to toxic air contaminants.

To help further the State's air quality, climate change, and petroleum reduction goals, California is committed to deploying one million zero- and near zero-emission vehicles by 2023, as codified in Health and Safety Code Section 44258.4(b); 1.5 million zero-emission vehicles by 2025 as directed in Executive Order B-16-2012; and 5 million zero-emission vehicles by 2030 as directed in Executive Order B-48-18. As part of these overall zero-emission vehicle deployment targets, California established the goal to deploy over 100,000 freight vehicles and equipment capable of zero-emission operation and maximize near zero-emission freight vehicles and equipment powered by renewable energy by 2030 in the 2016 California Sustainable Freight Action Plan developed in response to Governor Brown's Executive Order B-32-15.⁸

In June 2017, the California Legislature passed SB 92 (Committee on Budgets and Fiscal Review, Chapter 26, Statutes of 2017), which directs the Lead Agency (CARB) to strive to ensure that 35 percent of California's Mitigation Trust allocation benefit low-income or disadvantaged communities and report annually to the Legislature. In order to maintain consistency with legislation that defined disadvantaged and low-income communities and the associated implementation of California Climate Investments, staff will use the disadvantaged and low-income community designations previously made by the California Environmental Protection Agency (CalEPA) with the California Communities Environmental Health Screening Tool 3.0 (CalEnviroScreen),⁹ as well as guidelines CARB continues to develop for State agencies implementing California Climate Investments. Taking advantage of the extensive efforts made to

⁶ SB 32 (Pavley, Chapter 249, Statutes of 2016)

⁷ Executive Order B-16-2012.

⁸ California Sustainable Freight Action Plan, July 2016; Plan can be accessed from CARB's website at <https://www.arb.ca.gov/gmp/sfti/sfti.htm>.

⁹ SB 535 (De León, Chapter 830, Statutes of 2012) and AB 1550 (Gomez, Chapter 369, Statutes of 2016); California Climate Investments to Benefit Disadvantaged Communities; <https://calepa.ca.gov/EnvJustice/GHGInvest/>

create these community designations, mapping tools, and implementation guidelines will effectively allow VW Mitigation Trust projects to be funded in a timely manner. Staff expects the funded projects to exceed the target established by SB 92, as shown in Table 1 on page 3.

D. Guiding Principles

In order to inform the decision-making for the project categories to be funded and their corresponding allocations, staff developed and used the following guiding principles, several of which were influenced by stakeholder comments received during the development of the Beneficiary Mitigation Plan:

- Fund actions that offset the VW NOx impacts as well as reduce risk to children and other sensitive populations, including dedicating at least 35 percent of the funds for investment in or benefiting disadvantaged or low-income communities.
- Align with State priorities (as required by SB 92).
- Focus on zero-emission technologies where available; low NOx everywhere else (certified Tier 4¹⁰ if low NOx is not available for the application).
- Prioritize expenditures that are surplus to regulatory requirements and complementary and additional to other investments being made by government and the private sector in California.
- Invest across a variety of geographic regions of the State while transforming the heavy-duty sector through focused implementation of advanced technologies.
- Implement projects using known methods of public process and project management, including competitive solicitations where appropriate, as successfully demonstrated with Low Carbon Transportation Investments.
- Ensure accountability and transparency to help determine effectiveness of programs and identify implementation, durability, and maintenance issues.

The guiding principles above are intended to help further progress towards the State's goals mentioned earlier in this section. Those goals will require a commitment to long-term strategies, including zero-emission technologies, as well as near-term emission reductions, primarily from low NOx engines, necessary to provide health benefits to communities. A significant portfolio of funding will continue to be needed to support the transformation that must occur, particularly for the heavy-duty sector, where advanced technologies have not reached full maturity or market penetration necessary to decrease costs. The project funding categories in the next section are consistent

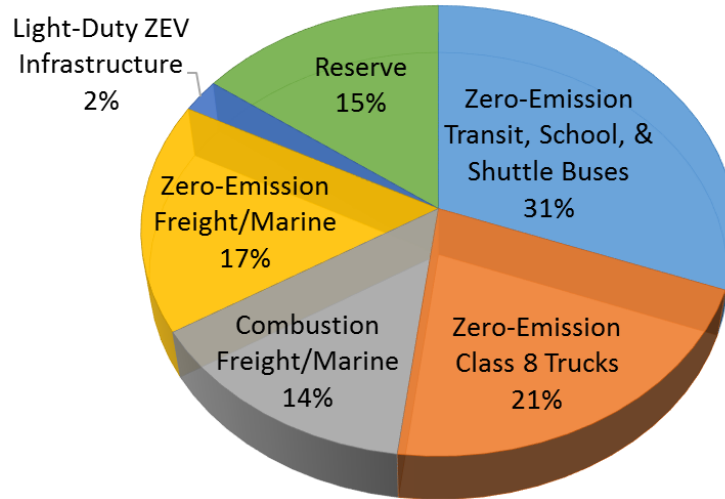
¹⁰ Emission standards for off-road compression-ignition engines (title 13, CCR, section 2423(b)(1)(B) and/or Title 40, CFR, Part 1039.101).

with the guiding principles and CARB's commitment to the State's air quality related goals.

III. PROJECT FUNDING CATEGORIES AND ALLOCATIONS

This section contains discussions of the project funding categories and allocations for each. The percentage of funding for each category is shown in Figure 2 below.

Figure 2: Project Funding Allocation Distribution



The categories and allocation amounts were determined with public input and are based on technology availability, the market demand as demonstrated by other funding programs, and the ability of the project funding categories to fully mitigate the excess NOx caused by the subject VW diesel vehicles. Staff also considered opportunities to support the beachheads that were identified in the Three-Year Investment Strategy for Heavy-Duty Vehicles and Off-Road Equipment that was part of the Fiscal Year 2017-18 Funding Plan for Clean Transportation Incentives.¹¹ Several stakeholders requested funds be distributed regionally based on the locations and population of VW diesel vehicles that were the subject of the Consent Decrees. As shown in Figure 1 on page 5, the subject VW diesel vehicles are located statewide with the largest numbers in the most populous areas. Staff believes making the funding available statewide will provide the most equitable opportunity while also supporting the guiding principle to invest across a variety of geographic regions of the State to aid in the transformation of the heavy-duty sector. A statewide approach would also ensure funding is available where the demand is greatest and would result in more competitive and cost-effective projects that balance our near-term and long-term goals.

Staff will allocate most project funding categories in at least two installments, providing additional funding opportunities for rural areas with fewer staffing resources and fleets that have multi-year budget cycles. CARB staff may modify allocation installments or make other necessary changes within the project funding categories to ensure staying on track with the required NOx mitigation and to ensure projects continue to follow the intent of the guiding principles. During Beneficiary Mitigation Plan implementation,

¹¹ https://www.arb.ca.gov/msprog/aqip/fundplan/proposed_1718_funding_plan_final.pdf

CARB staff will monitor fund distribution and make aggregated information available on CARB's website.¹²

Potential for Reallocation Based on Project Category Performance

In consultation with project administrators, if the CARB Executive Officer determines that demand exceeds available funding in any project category, and another project category is undersubscribed, funding may be reallocated to better meet demand. The Executive Officer may reallocate up to 20 percent of each undersubscribed project category's original allocation to another category with unmet demand, based on cost effectiveness, technology availability, and market demand. Prior to any reallocation, and no later than one year after release of the first solicitation, CARB will ensure the required NOx mitigation target will be met and will analyze alternate funding scenarios for emissions benefits and alignment with the guiding principles. Reallocations in excess of 20 percent of a project funding category will be proposed for Board approval. CARB will submit Beneficiary Mitigation Plan updates to the Trustee as required. In addition, CARB will continue working with administering air districts to finalize and agree on implementation and administrative issues prior to entering into agreements to administer project funding.

Heavy-Duty Zero-Emission Vehicle Infrastructure

For categories other than light-duty zero-emission vehicle infrastructure and oceangoing vessel shore power, the Consent Decree allows funding for infrastructure only to support funded zero-emission vehicle or equipment replacements. In other words, heavy-duty zero-emission vehicle infrastructure cannot be funded as a stand-alone project. The funding per vehicle or equipment for zero-emission projects includes funding to help offset, but not fully cover, supportive infrastructure costs. Stakeholders commented that heavy-duty zero-emission vehicle infrastructure is under-funded and demand is high. This Plan intends to help balance the infrastructure funding need while considering the need to fully mitigate NOx emissions and prevent double-counting of emission reductions. Additionally, incorporating the infrastructure funding into the per-vehicle funding provides each fleet the flexibility to use the additional, incorporated funds to meet their individual fleet's infrastructure needs, while also allowing for a streamlined funding process.

Combining Funds from Other Sources

California's VW Mitigation Trust funds are not to be combined with any other CARB-implemented funding or other funding program where any portion of the resulting NOx reductions could be double-counted. This approach will support additional deployments of advanced technology vehicles and equipment that move the State closer to meeting its air quality, climate, zero-emission vehicle, and petroleum use reduction goals and will reduce the amount of complexity that is inherent in coordinating multiple funding sources for vehicle or equipment purchases. Funding applicants are

¹² https://www.arb.ca.gov/msprog/vw_info/vsi/vw-mititrust/vw-mititrust.htm

encouraged to combine or leverage vehicle or equipment funding from federal sources, as well as zero-emission infrastructure-only funding from all sources.

Public Process

Staff began the public process for developing the Beneficiary Mitigation Plan by opening an online comment docket in September 2017. Since then, more than 120 comment letters have been received, providing additional guidance, support, and useful information to staff and the public on stakeholder priorities for California's allocation of the Trust. The comments received included advocacy for nearly all of the eligible mitigation actions in the Consent Decree and support for many technologies, including diesel, alternative fuels, low NOx, and zero-emission. Commenters also supported going above and beyond the 35 percent expenditure target established by SB 92 for disadvantaged or low-income communities. More than 4,000 emails from Sierra Club members were also received, all supporting a focus on zero-emission technologies for the heavy-duty sector, particularly in communities most impacted by air pollution. The comment docket closed on April 19, 2018, the day before the release of a proposed Beneficiary Mitigation Plan, opening a new 30-day public comment docket prior to the May 25, 2018 public meeting where the Board approved the Plan.

In addition to the comment dockets, staff held a public workshop on October 9, 2017 in Sacramento and presented at the Board's public meeting on October 26, 2017 in Riverside. Both meetings provided information on the Environmental Mitigation Trust, California's role as the Lead Agency for the State's Trust allocation, and the public process to develop a Beneficiary Mitigation Plan, and provided an opportunity for public input on the eligible mitigation actions that the State should fund. That input included strong support for funding zero-emission technologies where available and low NOx everywhere else, which became a guiding principal for this Plan.

On February 16, 2018, CARB staff publicly released a Discussion Document identifying staff's preliminary funding recommendations for the Beneficiary Mitigation Plan and held six public workshops throughout the State in February and March to solicit feedback. Table 2 below shows the public meetings that were held to obtain input for developing the Plan. Staff also had more than a dozen individual meetings with stakeholders.

Table 2: Public Meetings on Developing California’s Beneficiary Mitigation Plan

Date	Location	Meeting
October 9, 2017	Sacramento and Webcast	Workshop
October 26, 2017	Riverside and Webcast	Board Meeting
February 26, 2018	Sacramento and Webcast	Workshop
February 28, 2018	Fresno	Workshop
March 1, 2018	Oakland	Workshop
March 5, 2018	Redding	Workshop
March 7, 2018	Diamond Bar	Workshop
March 8, 2018	Fontana	Workshop
May 25, 2018	Sacramento and Webcast	Board Meeting

Commenters advocated for more funding for each of the project funding categories and technologies, indicating a high demand for zero-emission on-road and off-road vehicles, low NOx trucks, and light-duty zero-emission vehicle infrastructure. Overall, commenters were strongly supportive of the focus on zero-emission, the project funding categories and allocations, and the increased funding target for disadvantaged or low-income community benefits. More specific comments are addressed in the following project funding category sections where appropriate.

Implementation Phase

The Beneficiary Mitigation Plan is intended to provide a high-level vision for the use of the mitigation funds. Implementation details for each project funding category will be developed through a public process in the phase following Beneficiary Mitigation Plan approval and submittal to the Trustee. That phase will include stakeholder work group meetings to determine appropriate funding amounts per vehicle or equipment based on the stated maximum amounts in this Plan, application process for obtaining funding for the vehicles and equipment for first-come, first-served projects and solicitation requirements for competitive projects, reporting requirements and operational requirements, and other implementation details.

CARB staff will evaluate the effectiveness of each project funding category throughout implementation using metrics identified during the implementation phase. Such metrics may include the number of vehicles, engines, and equipment replaced by vocation, the corresponding actual emission reductions achieved, the location of the vehicles or equipment, the declining incremental costs for advanced technologies, and other potential metrics to be developed. Staff will also evaluate the demand for funding for each of the project categories.

A description of each project funding category is included in this chapter. For each eligible vehicle, equipment, or engine that is replaced using these funds, the eligible vehicle, equipment, or engine in the owner's fleet must be scrapped.¹³

¹³ "Scrapped" means to render inoperable and available for recycle, and at a minimum, to specifically cut a 3-inch hole in the engine block for all engines. If a vehicle or equipment is replaced, scrapped also includes disabling the chassis by cutting the vehicle or equipment's frame rails completely in half.

A. Zero-Emission Transit, School, and Shuttle Buses

Allocation: \$130 Million

Funding for this category will be used to replace eligible Class 4-8 school, transit, and shuttle buses with new, commercially available, zero-emission technologies. This includes a maximum incentive of up to \$400,000 for a battery electric school bus, up to \$180,000 for a new battery electric transit bus, up to \$400,000 for a new fuel cell electric transit bus, and up to \$160,000 for a new battery electric shuttle bus, each including supportive infrastructure. These amounts are expected to fund up to 95 percent of the cost of a battery-electric school bus, to fund the incremental costs of a zero-emission transit bus above the typical Federal Transit Administration funding, and to fund a large portion of the incremental costs for a battery-electric shuttle bus. As required by the Consent Decree, total costs per vehicle must not exceed 75 percent for non-government owned vehicles and 100 percent for government owned vehicles. For school bus incentives, staff recommends a minimum five percent match from the school district or other funding source.



These funds will be administered in two equal increments on a first-come, first-served basis to applicants statewide. The first \$65 million increment will be made available once the program is established, and the second \$65 million will become available at least two years following the release of the first increment.

To ensure that no one category receives most or all of the funding, no more than 50 percent of the available funds in each increment will be allocated to a single bus category. Only vehicles with internal combustion engines that are compliant with current regulations at the time of application are eligible for replacement. They include most school buses, and engine model year 2009 and older transit and shuttle buses. At least 50 percent of this allocation is expected to benefit disadvantaged or low-income communities.

Background

Throughout California, transit, school, and shuttle bus fleets have demonstrated that (1) zero-emission technology is readily available; and (2) there is significant market demand for zero-emission bus technology.

Today, transit agencies rely almost entirely on public funding for capital expenditures, fleet and infrastructure operation and maintenance, and other day-to-day operations. Incentives for zero-emission transit buses are also needed to help transit agencies meet their zero-emission goals, support in-state manufacturing, repair, and training networks, and help reduce exposure to sensitive communities. Zero-emission transit incentives will also help to reduce technology costs and advance technology transfer to other

heavy-duty sectors. Transit agencies may stack Federal Transit Administration (FTA) funds with VW Mitigation Trust funds for purchasing zero-emission transit buses and supportive infrastructure.

About 65 percent of California's fleet of over 25,000 school buses are diesel-fueled and are a primary focus for air quality concerns due to diesel's harmful impact on children, one of the State's most sensitive populations. Diesel-fueled buses emit diesel particulate matter (PM), which is a toxic air contaminant that adversely affects human health, including proper lung development in children. CARB has sponsored several studies of diesel PM and children's exposure to air pollution on school buses and has found that the school bus itself is a major source of diesel PM exposure for children riding the bus. Funding school bus replacements not only reduces diesel PM, but also reduces NOx, which is the focus of the VW Mitigation Trust.

Shuttle buses are used throughout the state in many applications. Vehicles like airport shuttle buses that operate on fixed routes, have stop-and-go operations, maintain low average speeds, and are centrally maintained and fueled, are ideal candidates for zero-emission electric technologies.

CARB has received strong stakeholder support for focusing this allocation on zero-emission technology and for using this funding to support infrastructure. Some school districts and smaller transit agencies expressed concern about successfully applying in a first come, first served model due to their long budget planning cycles. Staff anticipates that administering the funding in two increments and capping the amount of funding to each bus category will give applicants additional time to apply for these funds.

Stakeholders also requested they be allowed to stack VW Mitigation funds with vouchers provided through the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP). Stacking funds is not allowable for school buses because the maximum funding amount covers up to the entire cost of the bus plus most of the charging infrastructure. Similarly, stacking VW funds with HVIP funds is not allowable for transit or shuttle buses because the maximum funding amounts are intended to encourage transit agencies and shuttle bus operators to leverage other existing funding sources.

Finally, some stakeholders requested additional funding for fuel cell buses to cover the higher initial costs of installing hydrogen fueling infrastructure. This Plan allows higher funding amounts for fuel cell electric buses compared to battery electric buses and encourages stacking of infrastructure funding with other infrastructure incentives. Staff will monitor results from the first funding increment to make sure that funds are benefiting disadvantaged or low-income communities, and will make adjustments, where necessary, in the next funding increment.

Applicable Regulations

Up until 2009, transit agencies were required to comply with the Fleet Rule for Transit Agencies. This rule required agencies to select either the diesel path or the alternative-fuel path, and transit agencies with 200 or more buses were required to demonstrate zero-emission buses with an earlier schedule for diesel and a later schedule for the alternative fuel path. CARB suspended the Rule's purchase requirement in 2009 and directed staff to assess the technology and commercial readiness of zero-emission bus technology.¹⁴ Staff has been working with stakeholders to develop a proposed Innovative Clean Transit regulation, considering the technology assessment findings and recent technology advances. Staff expects that the funding provided here will help transit agencies meet future regulatory requirements.

To reduce children's exposure to diesel PM, CARB requires all diesel-fueled school buses subject to the Truck and Bus Regulation to have a retrofit or original-equipment diesel particulate filter (DPF) installed. Further, school buses and other buses are prohibited from idling at or near schools, and nearly all heavy-duty diesel vehicles, including school buses, are required to be routinely inspected for excessive smoke. The expense of turning over school buses and engines in favor of zero-emission options has been a barrier for many school districts, particularly those in low-income areas. Nearly 4,500 school buses are without DPFs or are nearing the end of their useful life and need to be replaced with cleaner alternatives, such as zero-emission technologies.

Funding for zero-emission shuttle buses will complement the Zero-Emission Airport Shuttle Bus Measure that CARB is developing.¹⁵ In order to initiate fleet transformation, CARB staff is discussing new purchase requirements starting in 2023, and fleet turnover requirements starting in 2025, with a goal of 100 percent transformation to zero-emission in 2031. Currently, diesel shuttle bus owners in California are subject to the Truck and Bus Regulation, which requires them to replace older vehicles with vehicles meeting the most stringent 2010 model year engine emission standards. By January 1, 2023, fleets must have all of their diesel shuttle buses equipped with 2010 model year or emissions-equivalent engines. Natural gas shuttle buses currently do not have in-use fleet requirements.

Expected Benefits

Staff estimates that this project could fund an estimated 425 zero-emission buses and provide an estimated 1,650 tons of NOx reductions, as detailed in Appendix A. A majority of the estimated reductions are expected to come from transit bus replacements, since they provide the highest cost-effectiveness based on their higher annual miles. Zero-emission buses of all types represent a beachhead that has strong potential to transfer and spread to broader applications. This project supports the early adoption of zero-emission technology, increases economies of scale to help bring down technology costs, and reduces harmful exposure for the State's most sensitive

¹⁴ <https://www.arb.ca.gov/msprog/bus/bus.htm>

¹⁵ <https://www.arb.ca.gov/msprog/asb/asb.htm>

populations. Based on an evaluation of historical participation data from other first-come, first-served zero-emission bus incentives, staff anticipates that at least 50 percent of the funds in this category will go to projects that benefit disadvantaged or low-income communities.

B. Zero-Emission Class 8 Freight and Port Drayage Trucks

Allocation: \$90 Million

Funding for this category will be used to replace eligible Class 8 freight trucks¹⁶ and port drayage trucks with new zero-emission technologies. At least four additional manufacturers are expected to introduce zero-emission Class 8 commercial trucks in the next one to three years, and manufacturers representing the majority of the California truck market have publically announced plans to launch zero-emission trucks in the next five years. While a portion of this allocation will support the early deployment of existing commercially available trucks, 70 percent of the allocation be focused on expanding the market as manufacturers bring additional zero-emission trucks to market in the next 3 to 5 years. The first installment of this funding will be \$27 million, and the next installment(s) will be determined during the implementation process.



The funding for this category includes a maximum incentive of up to \$200,000 per truck, including supportive infrastructure, in the first year, and will reevaluate incentive amounts in subsequent years, as incremental costs are expected to decline. As required by the Consent Decree, total costs per vehicle must not exceed 75 percent for non-government owned vehicles and 100 percent for government owned vehicles. Staff expects funding demand to be limited in the first two years, with rapidly growing demand around 2020. Staff expects these funds to be administered on a first-come, first-served basis to applicants statewide. Only trucks with internal combustion engine model years 1992 to 2012 that are compliant with current regulations at the time of application are eligible for replacement. At least 50 percent of this allocation is expected to benefit disadvantaged or low-income communities.

Background

Most heavy-duty trucks in use today are powered by diesel engines. While the California truck fleet is cleaner due to existing regulatory and incentive programs, trucks still contribute significant NOx emissions as well as greenhouse gases, toxics, and other pollutants. Health risk at the community level, where exposure is high, especially near ports and high-volume truck traffic, can be reduced by supporting the deployment of zero-emission technologies.

Existing incentive funding options are available for this category. HVIP provides vouchers to reduce the purchase cost of battery electric, fuel cell, and hybrid trucks and buses and low NOx engines. Other funding options include the Carl Moyer Program and Goods Movement Emission Reduction Program, and the new AB 617 Community Air Protection Program.

¹⁶ Also includes waste haulers, dump trucks, and concrete mixers.

During development of this Beneficiary Mitigation Plan, most stakeholders expressed support for the guiding principle of funding zero-emission technology in applications where commercially available, and low NOx everywhere else. While zero-emission Class 8 trucks are commercially available today, manufacturer diversity is limited. The focus of this funding is to support the market introduction of zero-emission trucks from a wide range of manufacturers that will be deploying trucks in the next five years.

Applicable Regulations

The Statewide Truck and Bus Regulation applies to nearly all diesel-fueled trucks and buses with a gross vehicle weight rating greater than 14,000 pounds.¹⁷ Starting in 2015, the regulation requires accelerated replacements of both lighter and heavier vehicles that do not have PM filters installed. From 2020 to 2023, nearly all older vehicles need to be upgraded or replaced to have exhaust emissions meeting 2010 model year engine emission levels.

Diesel-fueled trucks transporting cargo destined to or coming from California's ports and intermodal rail yards must be registered in the statewide Drayage Truck Registry prior to entry.¹⁸ Drayage fleets must comply with requirements by operating only vehicles with 2007 MY engines or newer. By January 1, 2023, all Class 7 and 8 diesel-fueled drayage trucks must have 2010 and newer engines. Trucks with 2010 and newer engines are fully compliant with both the Truck and Bus and Drayage regulations.

Expected Benefits

Staff estimates that NOx reductions from this project category will be approximately 1,500 tons, and about 540 zero-emission trucks could be funded, as detailed in Appendix A. Based on the number of freight hubs and ports located in disadvantaged or low-income communities, the number of drayage trucks transiting through those areas, and historical participation data from HVIP, staff anticipates that at least 50 percent of the funds in this category will go to projects that benefit disadvantaged or low-income communities.

Funding zero-emission Class 8 Freight and Port Drayage Trucks supports expansion of zero-emission truck availability to the heaviest weight class. Early commercial deployments tend to have higher capital costs, and this funding is expected to help achieve manufacturing economies of scale that help to reduce costs while reducing California's dependence on petroleum use.

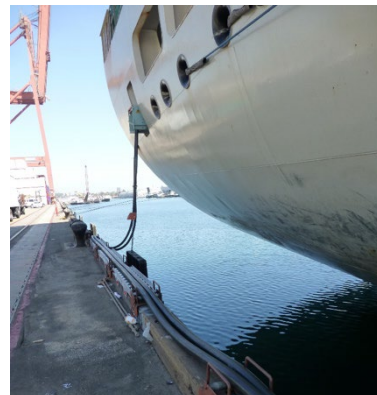
¹⁷ <https://www.arb.ca.gov/msprog/onrdiesel/regulation.htm>

¹⁸ <https://www.arb.ca.gov/msprog/onroad/porttruck/porttruck.htm>

C. Zero-Emission Freight and Marine Projects

Allocation: \$70 Million

Funding for this category will be used to replace eligible airport ground support equipment (GSE),¹⁹ forklifts, and port cargo handling equipment with new, commercially available, zero-emission technologies and to install oceangoing vessel shore power systems at port terminals. The goal of this project category is to maximize NOx reductions by funding the most cost-effective zero-emission freight or marine projects. Maximum funding per vehicle or equipment includes up to the full incremental cost for an airport GSE vehicle; up to \$175,000 for a heavy-lift forklift or battery electric port cargo handling equipment vehicle, including supportive infrastructure; up to \$2,500,000 for installing a portside oceangoing vessel shore power system at berths that service vessels that are not required by regulation to reduce their onboard power generation; and up to \$2,500,000 for a ferry, tugboat, or towboat all-electric engine repower, including fuel cell technology.



As required by the Consent Decree, total costs per vehicle or equipment must not exceed 75 percent for non-government owned vehicles or equipment and 100 percent for government owned vehicles or equipment. These funds will be administered in two equal increments of \$35 million, two years apart so that CARB can monitor progress and adjust as needed. Vehicle or equipment owners will be eligible to apply for funding via competitive solicitation. At least 75 percent of this allocation will benefit disadvantaged or low-income communities.

Background

Marine shore power systems enable a compatible vessel's main and auxiliary engines to remain off while the vessel is at berth. The Consent Decree limits funding to the following components: cables, cable management systems, shore power coupler systems, distribution control systems, and power distribution. Eligible shore power systems must comply with international shore power design standards and should be supplied by power sourced from the local utility grid.

Airport ground support equipment performs a variety of functions, including: starting aircraft, aircraft maintenance, aircraft fueling, transporting cargo to and from aircraft, loading cargo, transporting passengers to and from aircraft, baggage handling, lavatory service, and food service.

Forklifts are non-road equipment used to lift and move materials short distances. Types of forklifts identified as eligible in the Consent Decree include reach stackers, side loaders, and top loaders with greater than 8,000 pounds lift capacity. Port cargo

¹⁹ Pre Tier-3 diesel, or uncertified or certified ≥ 3 g/bhp-hr NOx + hydrocarbon spark-ignition engines.

handling equipment are rubber-tired gantry cranes, straddle carriers, shuttle carriers, terminal tractors, yard hostlers, and yard tractors that operate within ports.

During development of this Plan, many stakeholders expressed strong support for funding zero-emission technology. Stakeholders also expressed concern regarding the ability to compete, especially for GSE, with the variety of projects included in this category. Staff will address those concerns as well as defining GSE incremental cost during the implementation phase. For example, staff will monitor the variety of projects funded, geographical diversity, and disadvantaged or low-income community benefits from the first solicitation and recommend adjustments for the second solicitation if needed.

The funding for this category will support the zero-emission freight measures CARB staff presented to the Board during an informational update in March 2018 on emission reduction concepts for the freight sector.²⁰ The Board directed staff to move forward on the new measures to reduce emissions and community health impacts from large freight facilities. The funding for zero-emission freight equipment is foundational to some of those measures.

Applicable Regulations

Currently, a 70 percent power reduction/visit requirement exists for fleets subject to the At-Berth Regulation.²¹ This requirement increases to 80 percent in 2020. Additional and improved infrastructure is essential to provide access to shore power berths in regulated ports as an increasing number of vessels are expected to utilize shore power to comply with the At-Berth Regulation. Potential amendments to the At-Berth Regulation are under discussion, with CARB staff exploring ways to achieve additional emission reductions by including additional vessel types and additional ports/marine terminals in the Regulation. This effort will likely require additional shore power installation at ports in California, with funding available for vessel types not currently covered under the Regulation.

Most GSE are subject to either the Regulation for In-Use Off-Road Diesel-Fueled Fleets²² (commonly known as the Off-Road Regulation), or the Large Spark-Ignition (LSI) Fleet Regulation.²³ Diesel-fueled GSE must meet increasingly stringent NOx fleet averages based on fleet size. Spark-ignition GSE fleets of four or more vehicles must meet a NOx and hydrocarbon fleet average established in 2013, based on fleet size. Diesel-fueled cargo handling equipment at California ports are subject to the CARB Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards (CHE regulation).²⁴ The CHE regulation is applicable to any diesel-fueled mobile

²⁰ Staff presentation, March 22, 2018: https://www.arb.ca.gov/board/books/2018/032218/18-2-6pres.pdf?utm_medium=email&utm_source=govdelivery

²¹ <https://www.arb.ca.gov/ports/shorepower/shorepower.htm>

²² <https://www.arb.ca.gov/msprog/ordiesel/ordiesel.htm>

²³ <https://www.arb.ca.gov/msprog/offroad/orspark/orspark.htm>

²⁴ section 2479 of title 13, CCR, article 8, chapter 9

equipment used at California ports to either handle freight or bulk material or to perform other on-site activities, such as maintenance. The CHE regulation requires emission reductions from in-use equipment, mostly through early vehicle turnover, and includes requirements for vehicles added to the fleet.

Expected Benefits

Staff estimates that NOx reductions from this project category will be about 250 tons, and about 450 pieces of zero-emission or zero-emission enabling equipment could be funded, as detailed in Appendix A. Because projects in this category would be funded via competitive solicitation, the mix of actual projects funded may vary from those used to estimate NOx reductions. CARB is required to monitor and report actual emission reductions during the lifetime of the Trust.

Funding for vehicles in this category is expected to help drive wide-scale adoption of zero-emission off-road freight equipment, particularly in the port cargo handling equipment sector, which has typically relied on conventional diesel technologies. These deployments will help to act as models for other freight facilities, such as intermodal rail yards and distribution centers, to encourage zero-emission transformation. The competitive solicitations for this project will include criteria that ensures that at least 75 percent of the funds in this category will go to projects that benefit disadvantaged or low-income communities.

D. Combustion Freight and Marine Projects

Allocation: \$60 Million

Funding for this category will be used to replace eligible Class 7 and 8 freight trucks, including waste haulers, dump trucks, and concrete mixers, or their engines (1992 to 2012 model year), freight switcher locomotives or their engines (pre-Tier 1), and ferry, tugboat, and towboat engines (pre-Tier 3), with the cleanest commercially



available internal combustion or hybrid technologies. For each vehicle, locomotive, or engine replaced, an existing vehicle, locomotive, or engine must be scrapped. The goal of this project category is to maximize NOx reductions by funding the most cost-effective, lowest emission engine projects. This includes maximum funding up to \$85,000 for a certified 0.02 g/bhp-hr low NOx engine truck and up to \$35,000 for a non-government owned low NOx repower. Government owned vehicles may be eligible for up to \$50,000 for a low NOx repower. The maximum funding amount is up to \$1.35 million for a Tier 4 freight switcher locomotive or engine repower, and up to \$1 million for a Tier 4, or hybrid with Tier 4-equivalent NOx emissions, ferry, tugboat, or towboat engine repower. In most cases, total funding per vehicle or equipment will be less than the maximums above due to the limits stated in the Consent Decree.²⁵

This category funding will be allocated in two installments of \$30 million each, two years apart so that CARB can monitor progress and adjust as needed. Vehicle or equipment owners will be eligible to apply for funding via competitive solicitation. Staff expects that at least 50 percent of this allocation will benefit disadvantaged or low-income communities.

Background

The first engines certified to California's most stringent, optional low NOx standard entered the heavy-duty on-road vehicle market in 2015. The 8.9-liter 0.02 g/bhp-hr low NOx Cummins Westport natural gas engine is currently available for truck and bus applications. Recently, the 11.9-liter natural gas engine was certified to the same low NOx standard and is expected to be available for deployment this year, expanding low NOx technology availability to Class 7 and Class 8 trucks. Because the NOx emission level of these engines is 90 percent lower than the mandatory standard, they can be a very cost-effective, near-term solution for cleaning up the existing diesel or natural gas truck fleet.

²⁵ Maximum amounts: up to 25 percent (50 percent for Class 8 port drayage) of the cost of a non-government owned truck or switcher; up to 40 percent of the cost of a non-government owned truck, switcher, or vessel repower; up to 100 percent of the cost of a government owned truck, switcher, or vessel repower. https://www.arb.ca.gov/msprog/vw_info/vsi/vw-mititrust/documents/appendixd2.pdf.

The Goods Movement Emission Reduction Program (Prop 1B) has offered funding for heavy-duty trucks but excludes refuse trucks. For Class 8 regional or line-haul trucks, the Prop 1B program offers \$100,000 per replacement vehicle, which is significantly greater than the Consent Decree allows. The Carl Moyer Program also provides funding for cleaner trucks, including low NOx engines. Both programs are subject to local air district funding discretion; funding is not offered in all regions. While incentive funding for low NOx trucks is currently also available through HVIP and Low NOx Engine Incentives, funding incentive amounts are typically lower because scrapping of an older truck or engine is not required. The per-vehicle funding amounts above would be offered statewide and are intended to offset the incremental costs from diesel to low NOx as well as help offset the revenue loss associated with scrapping an eligible truck.

Freight switcher locomotives are those rated between 1,006 and 2,300 hp and designed to move rail cars around a rail yard, as opposed to larger line-haul locomotives that move freight or passengers. While freight switcher locomotive replacements and engine repowers can cost millions of dollars, most existing switchers in California are equipped with uncertified (pre-Tier 1) engines and typically consume 10,000 to 50,000 gallons of diesel fuel annually, making replacements with Tier 4 engines a cost-effective emission reduction strategy.²⁶ While incentive funding to offset up to 85 percent of the costs of a new locomotive or engine is available through the Carl Moyer Program, participation has been limited.

Ferries are designed for efficient passenger transport to and from destinations within California's coastal waterways. This funding is not intended to include excursion vessels, which are not an eligible category in the Consent Decree. In addition to ferries, tugboats and towboats that push or pull other vessels in ports, harbors, and inland waterways would be eligible for funding. Several hybrid systems have been built for commercial harbor craft applications and can be effective in reducing fuel consumption and NOx emissions.²⁷ Funding opportunities for these vessels are also available through the Carl Moyer Program and depend on compliance with existing regulations.

Several stakeholders expressed concern over the availability of funding for all project types specified in this category and the concern that a one-time funding opportunity will not allow more complex projects to compete. As stated above, CARB will allocate this category in two equal installments, two years apart, to allow more time for projects to be developed and an additional funding opportunity for all.

²⁶ CARB, Technical Options to Achieve Additional Emissions and Risk Reductions from California Locomotives and Railyards, 2009: <https://www.arb.ca.gov/railyard/ted/083109tedr.pdf>; CARB, Technology Assessment: Freight Locomotives, 2016: https://www.arb.ca.gov/msprog/tech/techreport/final_rail_tech_assessment_11282016.pdf

²⁷ CARB, Technology Assessment: Commercial Harbor Craft, 2015: https://www.arb.ca.gov/msprog/tech/techreport/draft_chc_technology_assessment.pdf.

Applicable Regulations

Diesel trucks are typically covered under one of three regulations: Truck and Bus Regulation, Solid Waste Collection Vehicle Rule, or the Fleet Rule for Public Agencies and Utilities. The latter two rules require Best Available Control Technology to reduce diesel PM, and both rules' compliance deadlines have passed. The Truck and Bus Regulation initially required verified particulate filter diesel emission control system be installed depending on engine model year. Beginning in 2015, truck owners were required to begin replacing their vehicles with newer used or new vehicles meeting 2010 model year engine emission standards. The regulation requires all heavy-duty trucks to be equipped with 2010 model year or emissions-equivalent engines by January 1, 2023.

Under the Clean Air Act (CAA), U.S. EPA has the sole authority to establish emission standards for new locomotives. The two largest rail operators, BNSF Railway Company and Union Pacific Railroad Company entered into voluntary but enforceable agreements in 1998 and 2005 to respectively achieve a Tier 2 locomotive NOx fleet average in the South Coast Air Basin by 2010 and reduce railyard PM emissions statewide.²⁸

Ferries, tugboats, and towboats are required to comply with CARB's Commercial Harbor Craft Regulation, which includes replacing Tier 1 and earlier propulsion and auxiliary engines with those meeting U.S. EPA Tier 2 or Tier 3 standards.²⁹ Compliance dates are based on existing engine model year and range from 2009 through 2022. Additional regulatory measures may be proposed in the future.

Expected Benefits

Staff estimates the project category could provide an estimated 6,750 tons of NOx reductions, and about 830 vehicles or equipment could be funded, as detailed in Appendix A. Because projects in this category would be funded via competitive solicitation, it is not possible to accurately estimate the emission benefits until implementation. However, in order to provide a rough characterization of the potential benefits of this project category, staff quantified the emission reductions associated with projects in this category by estimating vehicle and equipment replacements or repowers.

Staff expects the replacement of older, higher polluting diesel engines will result in significant co-pollutant benefits, including diesel PM emission reductions, particularly in areas that are disproportionately impacted, such as freight corridors, ports, and rail yards. Additionally, this project has the potential to support early adoption of the newly commercialized 11.9 liter low NOx engine for Class 8 trucks, particularly in long-haul and port drayage truck applications. The competitive solicitation for this project will

²⁸ CARB, Technical Options to Achieve Additional Emissions and Risk Reductions from California Locomotives and Railyards, 2009: <https://www.arb.ca.gov/railyard/ted/083109tedr.pdf>

²⁹ CARB, Commercial Harbor Craft Regulation Fact Sheet: <https://www.arb.ca.gov/ports/marinevess/harborcraft/documents/chcfactsheet0516.pdf>

include criteria that ensures at least 50 percent of the funds in this category will benefit disadvantaged or low-income communities.

E. Light-Duty Zero-Emission Vehicle Infrastructure

Allocation: \$10 Million

Funding for this category will be used for fueling infrastructure for light-duty zero-emission vehicles (ZEVs), with a target of \$5 million for charging stations and \$5 million for hydrogen fueling stations. For charging stations, maximum funding amounts are up to 100 percent of the cost of publicly accessible charging stations at government owned properties, up to 80 percent for public charging stations at privately owned properties, and up to 60 percent for non-public charging stations at workplaces and multi-unit dwellings. This allocation will provide funding to help purchase, install, operate, and maintain new charging stations for battery electric vehicles. For hydrogen fueling stations, maximum funding amounts are up to 33 percent of the cost to purchase, install, and maintain a new hydrogen fueling station for fuel cell electric vehicles.



Staff will encourage applicants to combine this funding with other available charging station funding sources for multi-unit dwellings and for available hydrogen fueling station funding sources at the state, federal, and local level. This funding will complement light-duty infrastructure funding from other sources, including the Energy Commission, the California Public Utilities Commission, the Electrify America ZEV Investment Plan, and some local air districts. These funds will be administered statewide using a competitive process and will support projects that meet the fueling needs of a growing ZEV fleet and fill gaps not met by other funding programs. At least 35 percent of this allocation is expected to benefit disadvantaged or low-income communities.

Background

Considerable investment in light-duty ZEV infrastructure made in California over the past several years has facilitated increasing numbers of ZEVs on the road today, as well as a growing variety of ZEV choices. The growing market enhances the need to develop ZEV fueling infrastructure at a faster pace. Governor Brown recognized this need when he signed Executive Order (EO) B-48-18, ordering State entities to collaborate with the private sector to put at least 5 million ZEVs on California roads by 2030, and spur the construction and installation of 200 hydrogen fueling stations and 250,000 charging stations, including 10,000 fast chargers, by 2025. To support these goals, Governor Brown's proposed budget for 2018-19 includes \$235 million specifically to accelerate investments in the statewide network of hydrogen refueling and electric vehicle charging stations. The \$235 million will be administered by the Energy Commission through the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP). The draft Energy Commission Fiscal Year (FY) 2018-2019

ARFVTP Investment Plan Update proposes allocating \$134.5 million to electric vehicle charging infrastructure and \$92 million to hydrogen refueling infrastructure.³⁰

The current and planned investments in supportive light-duty ZEV infrastructure in California is expected to exceed \$1 billion over the next 10 years. At the same time, there is significant need for funding in the heavy-duty sector to accelerate zero-emission technologies toward broader commercialization. CARB staff will strive to ensure that the \$10 million allocation for this project category is strategically invested to address the most critical light-duty ZEV infrastructure needs.

Charging Stations for Battery Electric Vehicles

Several programs fund the installation and maintenance of charging stations in public, workplace, and multi-unit dwelling settings. According to Energy Commission staff analysis, there are nine critical players investing in charging infrastructure: the Energy Commission's ARFVTP, Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric, Sacramento Municipal Utility District, Los Angeles Department of Water & Power, NRG/EVGo, Electrify America, and Japan's New Energy and Industrial Technology Development Organization. Considering both existing charging stations and funded charging station projects that are in the planning stage, these investments will result in roughly 3,000 public fast chargers, 38,000 public Level 2 chargers, 26,000 Level 2 workplace chargers, and 37,000 Level 2 multi-unit dwelling chargers within the next few years. However, these numbers fall short of Energy Commission staff's estimate that between 125,000 and 174,000 additional chargers will be needed to meet California's earlier light-duty vehicle electrification goals of 1.5 million ZEVs by 2025 (see discussion on EO B-16-2012 below). The proposed FY 2018-19 ARFVTP allocation, along with increasing public and private investments in charging infrastructure, will be necessary to keep pace with the expected deployments of plug-in electric vehicles. Staff expects that the funds for this project category will be used to fill in gaps not served by other funding programs. Specifically, staff expects funding for public and private charging stations be administered to projects in areas that are not served by SB 350 (DeLeon, Chapter 547, Statutes of 2015),³¹ Electrify America, and Energy Commission programs.

Hydrogen Fueling Stations for Fuel Cell Electric Vehicles

To date, most of the funding for public hydrogen fueling stations has been provided by AB 8 (Perea, Chapter 401, Statutes of 2013). AB 8 directs the Energy Commission to allocate up to \$20 million annually from the ARFVTP for developing hydrogen fueling stations until there are at least 100 publicly available stations in California. The \$92 million proposed in the FY 2018-2019 ARFVTP Investment Plan Update, if

³⁰Second Revised Staff Report, 2018-2019 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program, California Energy Commission, March 2018. CEC-600-2017-010-SD-REV2. <http://www.energy.ca.gov/altfuels/2017-ALT-01/documents/>

³¹ SB 350, the act of 2015, intends to remove regulatory disincentives that prevent investor-owned and local publically owned electric utilities from increasing investments in electrification.

approved, will provide a significant boost in funding to meet the 200 hydrogen fueling station goal in EO B-48-18. To ensure the successful launch of this new market, the Energy Commission funds the stations and technologies that have the greatest potential for achieving self-sufficiency. To inform future investments, the Energy Commission relies on CARB to evaluate fuel cell electric vehicle and hydrogen fueling station deployments annually and project relative need for new hydrogen stations (in terms of both location and capacity) based on automaker's fuel cell electric vehicle market projections, existing and planned public hydrogen fueling stations, and a number of other factors.³² As a result, priority for funding is placed on stations located in major metropolitan areas (i.e., priority areas). The \$92 million proposed for FY 2018-19 ARFVTP Investment Plan, plus increasing private investments in hydrogen fueling infrastructure, will facilitate a considerable increase in both the number of hydrogen fueling stations and the statewide refueling capacity sufficient to prevent the near term capacity shortfalls predicted in CARB's 2017 Annual Evaluation Report.³³

This process described above of prioritizing ARFVTP funding for stations in priority areas with the greatest potential for self-sufficiency results in hydrogen fueling station gaps along major highway corridors between priority areas and at popular destinations. Establishing hydrogen fueling stations in these *gap* areas will increase the utility and adoption of fuel cell electric vehicles. As such, staff expects funding for hydrogen fueling stations to be administered to projects that: (1) enable fuel cell electric vehicle travel between major metropolitan areas and to popular destinations; (2) have the potential to seed new markets between priority areas; or (3) help disadvantaged or low-income communities that express a need within their areas.

Applicable Regulations

The main regulatory driver behind the need for light-duty ZEV infrastructure is the ZEV Regulation, which requires most automakers to produce increasing numbers of ZEVs for sale or lease in California and in other states that have adopted the ZEV Regulation.³⁴ The 2016 California ZEV Action Plan (developed per EO B-16-2012) supports the ZEV Regulation with a goal of deploying infrastructure capable of supporting up to 1 million ZEVs by 2020, and having 1.5 million electric vehicles on California roads by 2025. Executive Order B-48-18, discussed above, extends this goal to 5 million ZEVs on California roadways by 2030, and adds specific goals for fueling infrastructure. In addition, the California Green Building Standards Code requires charging infrastructure³⁵ for 3 percent of parking spaces in new commercial buildings. Finally, CARB is developing a regulation that will implement Electric Vehicle Charging

³² AB 8 requires CARB to conduct this annual evaluation. The most recent evaluation, "2017 Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fueling Station Network Development", can be accessed at https://www.arb.ca.gov/msprog/zevprog/ab8/ab8_report_2017.pdf

³³ Ibid.

³⁴ <https://www.arb.ca.gov/msprog/zevprog/zevprog.htm>

³⁵ "Charging infrastructure" in the CalGreen Code refers to installing a raceway for cables, sufficient panel capacity, and a dedicated circuit; it does not include the actual EVSE device and connector, which could be purchased and installed at a later date.

Stations Open Access Act (SB 454, Statutes of 2013), which will facilitate electric vehicle charging station open access for all users.

Expected Benefits

Increasing investments in light-duty ZEV infrastructure will result in emission reductions associated with increased ZEV adoption and usage. However, to avoid double-counting emission benefits, this plan will not quantify direct NOx reductions. While we recognize and support efforts made by other states to quantify NOx benefits from infrastructure investments in their Plans, staff has not quantified reductions in this plan given California's unique benefits from the combination of the ZEV Regulation, vehicle incentives, infrastructure investments, and other supportive policies.

The competitive solicitation for the charging station allocation will include criteria that ensures at least 50 percent of the funds in this category will go to projects that benefit disadvantaged or low-income communities. Hydrogen fueling station funding will be offered as match to hydrogen fueling station projects competitively awarded through other hydrogen fueling station funding programs, with emphasis on projects that fill infrastructure gaps discussed above. In addition, this project supports the ongoing adoption of ZEVs by enhancing the availability of publicly accessible fueling infrastructure as well as the emission reductions associated with increased ZEV usage.

Many stakeholders commented that additional funding beyond \$10 million is needed to help fill infrastructure gaps. Staff acknowledges that additional funding will be needed as part of a broader long-term effort to fully meet growing demand.

IV. ESTIMATED NOX EMISSION REDUCTIONS

CARB staff estimates the Beneficiary Mitigation Plan's funding actions in aggregate will reduce about 10,000 tons of NOx over a 10-year period, which would fully mitigate the environmental harm caused by the subject VW diesel vehicles. Additionally, this funding provides an important path for zero-emission technologies, which are essential in meeting California's health-based air quality standards as well as its GHG emission reduction targets and zero-emission vehicle mandates. These emission reductions are expected to be surplus to regulatory requirements. As stated in the previous section, California's VW Mitigation Trust funds are not to be combined with any other CARB-implemented funding or other funding program where any portion of the resulting NOx reductions could be double-counted.

The distribution of estimated NOx emission reductions for the project funding categories is presented in Appendix A. Emission reduction estimates were only calculated for categories that achieve direct NOx emission reductions through vehicle or equipment replacements or shore power.

The anticipated emission reductions were used to inform the funding priorities, categories of eligible mitigation projects, and funding allocation considerations for each category of projects. It is important to note that the estimated emission benefits are based on potential project scenarios; actual NOx emission reductions will vary based on the type of projects that actually apply for funding and the eligible mitigation projects that are ultimately funded. Therefore, not all potential vehicle or equipment types have been modeled. Appendix A conservatively estimates the emission reductions of the funding actions and provides additional details on the methodology developed and assumptions used.

As stated previously in this document, CARB staff will monitor project performance during implementation. As actual data for the funded projects becomes available, staff will refine the emission reduction estimates and will make adjustments as necessary to ensure staying on track with meeting the required NOx mitigation target.

V. PROJECT ADMINISTRATION AND PROGRAM OVERSIGHT

As mentioned earlier in this document, the project categories will be funded either on a first-come, first-served basis or through competitive solicitations. California's three largest air districts will administer, on a statewide basis, the project funding categories (one statewide administrator per project category). The Bay Area Air Quality Management District will implement the Zero-Emission Freight and Marine Projects and the Light-Duty Zero-Emission Vehicle Infrastructure categories; the San Joaquin Valley Air Pollution Control District will implement the Zero-Emission Transit, School, and Shuttle Buses category; and the South Coast Air Quality Management District will implement the Zero-Emission Class 8 Freight and Port Drayage Trucks and the Combustion Freight and Marine Projects categories. At the end of each mitigation action project agreement period, CARB has the discretion to either enter into a new mitigation action project agreement with the current project administrator or select a new administrator, which may also include another government entity or a non-profit organization. CARB will maintain oversight for project implementation. The project administrator for each project category will be expected to conduct outreach, including potential workgroup meetings to determine project implementation details, develop solicitations where applicable, and meet program review, audit, and reporting requirements. Administrative costs for CARB, the project administrator, and any third-party contractors will be paid from the 15 percent Reserve and must be tied to eligible mitigation actions. All of these elements will be identified in the mitigation action project agreements. General information is included below for project agreements, disbursements, expected program oversight, and reporting requirements.

Staff believes that statewide implementation of the VW Mitigation Trust is essential. The Trust is the only program in CARB's funding portfolio that is governed by a Consent Decree and that has a required NOx reduction target, making accountability and accessibility crucial. Implementing these funds on a statewide basis streamlines the accounting, review, and auditing by CARB as required by the Consent Decree. It also ensures that funding is available where the demand is greatest, reducing the risk of having unspent funds in regions where the demand for certain project types is lower. Air districts, other government entities, and non-profit organizations have experience implementing other statewide heavy-duty project funding, which makes them well suited to successfully implement this new funding program.

A. Mitigation Action Project Agreements

CARB will develop and execute a mitigation action project agreement with each project administrator. The agreement will include programmatic details for the project administrator to implement the projects, such as applicant solicitation requirements, provisions for first-come, first-served project implementation, amount of funds provided per project, applicant and vehicle eligibility, recordkeeping, and reporting requirements. Funding applicants statewide will submit their applications to the designated administrator for their specified project category and will receive approved funding from

that administrator. CARB will continue to provide oversight and participate in the solicitation development process where applicable.

B. Administrative Costs

The Consent Decree limits the administrative costs associated with implementing eligible mitigation actions to 15 percent of the total cost of the eligible mitigation action. The 15 percent cap includes administrative costs for CARB, the project administrator, and any third-party contractor(s). Administrative costs for project administrators will be capped lower than the maximum allowable for most or all of the project funding categories, which will make funding available to additional projects. The project administrator's costs should be detailed such that they include all necessary staff and tasks to implement the project. If appropriate, this includes activities such as outreach and education and research, data management, and reporting. The allowable administrative costs are listed in Appendix D-2 of the Consent Decree.³⁶

C. Disbursements

The mitigation action project agreement between CARB and the project administrator will prescribe disbursement requirements in accordance with the Trust. Each project administrator will be responsible for submitting funding requests to CARB, who will then submit to the Trustee. CARB will direct the Trustee on the disbursement method. Project funds may be disbursed directly from the Trust to the project administrator in advance of project expenditures or following completion of specified milestones, as stated in the mitigation action project agreement.

D. Program Oversight

Program oversight is designed to ensure that all projects funded from the VW Mitigation Trust meet the requirements of the Consent Decree, State Trust Agreement, and the Beneficiary Mitigation Plan. CARB staff will review a sufficient number of funded projects each year to ensure effective program implementation and accountability.

CARB staff will conduct both programmatic reviews and fiscal audits.³⁷ During the review and audit process, CARB will:

- 1) Identify the scope of the review;
- 2) Work collaboratively, while maintaining open communication with the project administrator;
- 3) Ensure objectivity and predictability;

³⁶ https://www.arb.ca.gov/msprog/vw_info/vsi/vw-mititrust/documents/appendixd2.pdf (Appendix D-2, page 10).

³⁷ Fiscal audits will be conducted in accordance with Generally Accepted Government Auditing Standards.

- 4) Make reports and related documents (including solicitations, awarded grants, expenditures, and results) available on CARB's VW Mitigation Trust website; and
- 5) Conduct follow-up activities to ensure that any deficiencies are mitigated.

Project administrators will be expected to maintain program and accounting records and make them available to CARB staff as requested, work to fully and promptly mitigate deficiencies identified during the review and audit process, work to resolve any disagreements, and request assistance from CARB as necessary.

E. Reporting Requirements

As the Lead Agency for implementing California's allocation of the VW Mitigation Trust, CARB is required to report semi-annually to the Trustee on eligible mitigation action implementation. SB 92 further directs CARB to report annually to the Legislature on the proposed and actual expenditures from the Trust. In order to help fulfill these reporting requirements, each project administrator will be required to report to CARB semi-annually on the implementation progress of each funded project category. Reports will include, but may not be limited to, a project summary, status, expenditures, and emission reductions achieved during the reporting period and to date. Additionally, staff expects that funding recipients will also be required to report to the project administrator usage information for their funded vehicle, engine, or equipment. The data and reporting requirements will be determined, along with other implementation details, during a public process following Beneficiary Mitigation Plan approval. CARB expects to make available on its website the semi-annual reports submitted to the Trustee and annual reports submitted to the Legislature.

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Appendix A:

Emission Reductions: Quantification Methodology

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Overview

This appendix describes the methodology used to estimate the potential emission reductions of the mitigation actions in the Beneficiary Mitigation Plan. The purpose of this estimate is to demonstrate that the mitigation actions, in aggregate, are reasonably expected to fully mitigate the oxides of nitrogen (NOx) impact from the subject Volkswagen vehicles. During implementation, additional calculations will be performed as more specific information becomes available. For example, as required by the Consent Decree, each funding request submitted by the California Air Resources Board (CARB) to the trustee will include an estimate of the NOx reductions anticipated as a result of that mitigation action. CARB will also provide semiannual reports to the Trustee that updates the progress of implementing each mitigation action. Finally, staff anticipates providing NOx benefit updates as part of the SB92 annual report to the Legislature on actual and proposed expenditures.

Table A-1 summarizes the allocation, number of vehicles and estimated NOx reductions by project category that fully mitigate 10,000 tons of NOx.

Table A-1: Summary of Proposed Projects and Emission Reductions

Project Category	Allocation (millions)	# of Vehicles or Equipment Funded	Estimated Total NOx Reductions over 10 years (tons)
Zero-Emission Buses	\$130	425	1,650
Zero-Emission Class 8 Freight and Port Drayage Trucks	\$90	540	1,500
Zero-Emission Freight / Marine Projects	\$70	450	250
Combustion Freight / Marine Projects	\$60	830	6,750
Light-Duty Zero-Emission Vehicle Infrastructure	\$10	0	0
Reserve (Including Administrative Costs)	\$63	0	0
Totals	\$423	2,245	10,150

Quantification Methodology for Projects

To quantify the potential emission reductions for each mitigation action, staff calculated the annual per-vehicle or equipment emission reductions for each mitigation action, taking into account current populations and regulatory requirements. Once the annual per-vehicle or equipment emission reductions were calculated, staff estimated typical

project costs to determine the number of vehicles or equipment that may be funded for each project category. Finally, to calculate the total potential emission reductions for each mitigation action, the average annual emission reductions is multiplied by the number of vehicles or equipment funded and assumed a project life of 10 years. As noted in the individual project category sections, emission reductions were quantified based on a conservative illustrative example that accounts for the uncertainty in the vehicles, technology, and equipment types that will be funded.

Annual Per-Vehicle or Equipment Emission Reductions

Annual emission reductions are first calculated for each eligible mitigation action based on emission factors from existing CARB programs. Annual emission reductions are in units of tons per year (tpy) and represent the difference in emissions between the baseline vehicle or equipment and clean vehicle (CV) or equipment and then multiplying by usage.

For on-road mitigation actions, annual emission reductions are calculated using the difference between the emission factor (EF) for the baseline vehicle and the EF for the CV and are in terms of grams per mile (g/mi). Usage is based on annual vehicle miles traveled (VMT) or miles per year (mi/yr) and when applicable deterioration product (DP) is factored into the calculation utilizing 2017 Carl Moyer Program Guidelines (Carl Moyer Program)¹ formulas. For off-road mitigation actions, annual emission reductions are calculated in terms of grams per hour (g/hr) and usage is in terms of hours per year (hr/yr) or gallons of fuel used per year (gal/yr). When applicable, the vehicle or equipment's load factor (LF), which is an indicator of the nominal amount of work done by the engine for a particular application, and the horsepower rating (hp) of the engine are included when modeling off-road projects.

Emission Reductions from Zero-Emission Buses

School, transit and shuttle buses will account for an approximate NO_x reduction of 1,650 tons over the 10-year project life. The specific methodology for each type of bus is presented below.

School Buses

Staff assumed that the average school bus replaced will be a model year 1997 diesel bus replaced with a battery electric bus. Staff used methodology and assumptions from the approved 2017-18 Funding Plan for Clean Transportation Incentives² to estimate NO_x emission reductions associated with school bus replacement. Annual usage for

¹ https://www.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017_cmp_gl_volume_1.pdf

² https://www.arb.ca.gov/msprog/aqip/fundplan/proposed_1718_funding_plan_final.pdf

school buses is assumed to be 13,000 miles per year. The table and equation used to determine the estimated NOx reductions per school bus are listed below.

Table A-2: 2017-18 Funding Plan for Clean Transportation Incentives Table A-21 Rural School Bus Pilot Project Emission Factors

Pollutant	1997 Diesel (g/mi)
NOx (g/mile)	16.242

$$NOx \text{ Emission Reductions} = \frac{(EF_{baseline} - EF_{CV}) \text{ g}}{\text{mi}} * \frac{\text{mi}}{\text{yr}} * \frac{\text{ton}}{907,200\text{g}}$$

$$NOx \text{ Emission Reductions} = \frac{16.242\text{g}}{\text{mi}} * \frac{13,000\text{mi}}{\text{yr}} * \frac{\text{ton}}{907,200\text{g}}$$

Transit Buses

Emission reductions for transit buses are based on a model year 2000-2006 diesel or compressed natural gas (CNG) bus replaced with either a battery electric or a fuel cell bus. Emission factors were based on the Carl Moyer Program, and annual mileage of 32,000 miles and population of approximately 4,200 transit buses was based on the 2016 National Transit Database.³ Staff then determined a model year weighted average (WA) using the bus population from the 2016 National Transit Database. Staff calculated an annual NOx reduction of 0.4471 tpy per diesel transit bus and 0.6230 tpy per CNG transit bus. The tables and equations used to determine the estimated NOx reductions per bus per year are listed below.

Table A-3: 2016 National Transit Database Transit Buses by Model Year

Engine Model Year	2000 or older	2001	2002	2003	2004	2005	2006
# of Transit Buses Statewide	787	749	489	729	400	543	483

Table A-4: Carl Moyer Program Table D-3 Diesel Urban Buses Emission Factors (g/mile)

Engine Model Year	1999-2002	2003	2004-2006
	18.97	13.02	3.56

³ <https://www.transit.dot.gov/ntd/ntd-data>

Table A-5: Carl Moyer Program Table D-4 Alternative Fuel Urban Buses Emission Factors (g/mile)

Engine Model Year	Pre – 2003	2003-2006
NOx (g/mi)	21.60	15.40

$$NOx \text{ Emission Reductions} = \frac{(EF_{baseline} - EF_{CV}) g}{mi} * \frac{mi}{yr} * \frac{ton}{907,200g}$$

$$NOx \text{ Emission Reductions} = \frac{(WA) g}{mi} * \frac{32,000mi}{yr} * \frac{ton}{907,200g}$$

Shuttle Buses

Emission reductions for shuttle buses are based on a model year 2009 diesel or CNG bus replaced with a new battery electric bus. Emission factors were based on the Carl Moyer Program and annual mileage of 35,000 miles from CARB’s Survey for Zero-Emission Airport Shuttle Bus.⁴ The table and equation used to determine the estimated NOx reductions per bus are listed below.

Table A-6: Carl Moyer Program Table D-1 Heavy-Duty Vehicles 14,001-33,000 pounds (lbs) Gross Vehicle Weight Rating (GVWR) Emission Factors (g/mile)

Engine Model Year	2007-2009
NOx (g/mi)	3.99

$$NOx \text{ Emission Reductions} = \frac{(EF_{baseline} - EF_{CV}) g}{mi} * \frac{mi}{yr} * \frac{ton}{907,200g}$$

$$NOx \text{ Emission Reductions} = \frac{3.99g}{mi} * \frac{35,000 mi}{yr} * \frac{ton}{907,200g}$$

Staff modeling assumed approximately 425 school, transit, and shuttle buses would be funded and the funding amount would range between \$160,000 and \$400,000, depending on type of bus and the technology.

⁴ <https://www.arb.ca.gov/msprog/asb/workgroup/dec4presentation.pdf>

Emission Reductions from Zero-Emission Class 8 Freight and Port Drayage Trucks

Class 8 freight and port drayage trucks will account for an approximate NOx reduction of 1,500 tons over the 10-year project life. The specific methodology for determining emission reductions is presented below.

Staff anticipates the majority of these projects would not begin until 2020. Staff assumed that during the first three years (2020-2022), a Class 8 model year 2007-2009 diesel truck is replaced with a battery electric truck, and during the last seven years, a Class 8 model year 2010-2012 diesel truck is replaced with a battery electric truck. Modeling assumed that 30 percent of the trucks would be funded in the first three years, and 70 percent of the trucks would be funded in the last seven years. Emission factors and deterioration product were based on the Carl Moyer Program, and annual mileage of 39,900 was based on the 2002 Vehicle In-use Survey.⁵ The tables and equations used to determine the estimated NOx reductions per truck per year are listed below.

Table A-7: Carl Moyer Program Table D-2 Heavy-Duty Vehicles over 33,000 pounds (lbs) GVWR (g/Mile)

Engine Model Year	2007-2009	2010-2012
NOx (g/mile)	6.80	1.76
Deterioration Rate (g/mile-10k miles)	0.077	0.068

$$NOx \text{ Emission Reductions} = \frac{(EF_{baseline} + DP_{baseline}) - (EF_{CV} + DP_{CV}) \text{ g}}{mi} * \frac{mi}{yr} * \frac{ton}{907,200g}$$

First three years

$$NOx \text{ Emission Reductions} = \frac{10.95g}{mi} * \frac{39,900mi}{yr} * \frac{ton}{907,200g}$$

Last seven years

$$NOx \text{ Emission Reductions} = \frac{6.24g}{mi} * \frac{39,900mi}{yr} * \frac{ton}{907,200g}$$

Staff modeling assumed approximately 540 Class 8 trucks would be funded, and the funding amount would start at \$200,000 and gradually decrease to \$150,000.

⁵ <https://www.census.gov/svsd/www/vius/2002.html>

Emission Reductions from Zero-Emission Freight / Marine Projects

Zero-Emission Freight / Marine will account for an approximate NOx reduction of 250 tons over the 10-year project life. The specific methodology for determining emission reductions is presented below.

Heavy-Lift Capacity Forklifts and Yard Trucks

Staff modeling assumed that a Tier 4 heavy-lift capacity forklift or yard truck is replaced with a zero-emission heavy-lift capacity forklift or yard truck. Emission factors and annual usage were based on the 2017-18 Funding Plan for Clean Transportation Incentives. The table and equation used to determine the estimated NOx reductions per heavy-lift capacity forklift or yard truck per year are listed below.

Table A-8: 2017-18 Funding Plan for Clean Transportation Incentives Table A-30 and A-31: Zero-Emission Off-Road Freight Voucher Incentive Project Emission Factors and Usage Assumptions

Vehicle Class	NOx (g/hour)	Usage (hours/year)
Heavy-Lift Capacity Forklift	0.781	800
Yard Truck	8.238	2,400

$$NOx \text{ Emission Reductions} = \frac{(EF_{baseline} - EF_{CV}) g}{hr} * \frac{hr}{yr} * \frac{ton}{907,200g}$$

Heavy-Lift Capacity Forklift

$$NOx \text{ Emission Reductions} = \frac{0.781g}{hr} * \frac{800hr}{yr} * \frac{ton}{907,200g}$$

Yard Truck

$$NOx \text{ Emission Reductions} = \frac{8.238g}{hr} * \frac{2,400hr}{yr} * \frac{ton}{907,200g}$$

Ground Support Equipment

Staff modeling assumed a 2010+ gasoline ground support equipment is replaced with zero-emission ground support equipment. Emission factors, deterioration product, and load factor were based on Carl Moyer Program, and annual hours were based on average annual use from the 2012 Off-Road Equipment Rule-Inventory Updates.⁶ The tables and equation used to determine the estimated NOx reductions per ground support equipment per year are listed below.

⁶ https://www.arb.ca.gov/msprog/ordiesel/documents/Inventory_Updates_OffRdEquip_07_12.pdf

Table A-9: 2012 Off-Road Equipment Rule-Inventory Updates Table 3: Average Use Updates – Airport Ground Support Equipment (hours/year)

Equipment Type	A/C Tug Narrow Body	Baggage Tug	Belt Loader	Bobtail	Cargo Loader	Avg.
Annual Hours	625	1392	974	683	906	916

Table A-10: Carl Moyer Program Table D-11a: Off-Road LSI Engines Emission Factors (g/bhp-hr)

Horsepower	Model Year	NOx EF (g/bhp-hr)	NOx DF (g/bhp-hr)
51-120	Controlled 2010+	0.35	0.00003

NOx Emission Reductions

$$= \frac{(EF_{baseline} + DP_{baseline}) - (EF_{cv} + DP_{cv}) \text{ g}}{bhphr} * hp * LF * \frac{hrs}{yr} * \frac{ton}{907,200g}$$

$$NOx \text{ Emission Reductions} = \frac{0.50g}{bhphr} * 120hp * 0.5 * \frac{916hrs}{yr} * \frac{ton}{907,200g}$$

Shore Power

Staff used a conservative approach to calculate shore power reductions to account for regulatory requirements. Therefore, emission reduction calculations were modeled using auto carriers, since they are one of the vessel types not required to plug into a shore power vault under the ATCM for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port.⁷ Since auto carriers are not required to plug in, and many vessels are not equipped to use shore power, staff assumed five percent of the auto carriers would utilize shore power. Emission factors were based on taking an average from the 2011 Ocean Going Vessels Emissions Estimation Methodology for Ocean-Going Vessels Appendix D.⁸ The tables and equation used to determine the estimated NOx reductions per shore power project are listed below.

⁷ <https://www.arb.ca.gov/ports/shorepower/finalregulation.pdf>

⁸ <https://www.arb.ca.gov/regact/2011/oqv11/oqv11appd.pdf>

Table A-11: 2011 Ocean Going Vessels Emissions Estimation Methodology for Ocean-Going Vessels Appendix D Summary of Tables II-1 and II-2 for Auto Carriers.

Arrival Port	Carquinez	Long Beach	Los Angeles	Port Hueneme	Richmond	San Diego	Avg.
# of Arrivals (per year)	49	168	61	211	55	129	112
Hoteling time (hours)	18	16	21	16	19	18	18

Table A-12: 2011 Ocean Going Vessels Emissions Estimation Methodology for Ocean-Going Vessels Appendix D Summary of Tables II-4 and II-8 Average Vessel Characteristics

Vessel Type	Auxiliary Power (kW)	Hoteling Emission Factor NOx (g/kW-hr)
Auto Carrier	2999	13.9

NOx Emission Reductions

$$= \left[\frac{\text{ship emission factor (g)}}{\text{kWhr}} * \text{power requirements (kW)} * \frac{\text{berthing time (hrs)}}{\text{visit}} * \frac{\text{annual number of visits (visits)}}{\text{yr}} * 0.9 * \frac{\text{ton}}{907,200\text{g}} \right] * 0.05$$

NOx Emission Reductions

$$= \left[\frac{13.9\text{g}}{\text{kWhr}} * 2999\text{kW} * \frac{18\text{h}}{\text{visit}} * \frac{112\text{ visits}}{\text{yr}} * 0.9 * \frac{\text{ton}}{907,200\text{g}} \right] * 0.05$$

Staff modeling assumed approximately 450 vehicles or shore power projects would be funded, and the funding rate would range between \$60,000 and \$2,500,000 depending on type of vehicle or equipment.

Emission Reductions from Combustion Freight / Marine Projects

Combustion Freight / Marine will account for an approximate NOx reduction of 6,750 tons over the 10-year project life. The specific methodology for determining emission reductions is presented below.

Class 7 Combustion Trucks

Emission reduction calculations are based on a model year 2006 or older diesel or CNG refuse truck or engine replaced with a low NOx (0.02g/bhp-hr) natural gas truck or engine. Emission factors were based on the Carl Moyer Program, annual mileage of 22,000 was based on the 2002 Vehicle In-use Survey, and vehicle population data was based on Department of Motor Vehicles (DMV) data. The tables and equations used to determine the estimated NOx reductions per refuse truck are listed below.

Table A-13: Carl Moyer Program Table D-5 Diesel Refuse Trucks Emission Factors (g/mile)

Engine Model Year	Pre 1994	1994-1997	1998-2002	2003-2006
NOx (g/mile)	34.69	31.53	31.25	21.39

Table A-14: Carl Moyer Program D-6 Alternative Fuel Refuse Trucks Emission Factors (g/mile)

Engine Model Year	Pre 2007
NOx (g/mile)	53.20

Table A-15: DMV Vehicle Population Data

Engine Model Year	Pre 1994	1994-1997	1998-2002	2003-2006
Number of Vehicles	2002	1147	1843	2841*

*includes a mixture of diesel and CNG refuse trucks

$$NOx \text{ Emission Reductions} = \frac{(WA EF_{baseline} - EF_{cv}) g}{mi} * \frac{mi}{yr} * \frac{ton}{907,200g}$$

$$NOx \text{ Emission Reductions} = \frac{(WA)g}{mi} * \frac{22,000 mi}{yr} * \frac{ton}{907,200g}$$

Class 8 Combustion Trucks

Staff modeling assumed that for the first five years (2018-2022), a model year 2007-2009 diesel truck or engine is replaced with a low NOx truck or engine (0.02 g/bhp-hr). For the last five years (2023-2027), a model year 2010 diesel truck or engine is replaced with a low NOx engine (0.02 g/bhp-hr). Emission factors and DR were based on Carl Moyer Program, and annual mileage of 48,000 was based on the 2002 Vehicle In-use Survey. The tables and equations used to determine the estimated NOx reductions per truck are shown below.

Table A-16: Carl Moyer Table D-2 Heavy-Duty Vehicles over 33,000 pounds (lbs) GVWR Emission Factors (g/mile) (EF) and Deterioration Rates (g/mile-10K miles) (DR)

Engine Model Year	NOx EF (g/mile)	NOx DR (g/mile-10k miles)
2007-2009	6.80	0.077
2010-2012 (0.02 g/bhp-hr NOx std)	1.76	0.068
2016+ (0.02 g/bhp-hr NOx std)	0.18	0.004

NOx Emission Reductions

$$= \frac{(EF_{baseline} + DP_{baseline}) - (EF_{cv} + DP_{cv})}{mi} g \cdot \frac{mi}{yr} \cdot \frac{ton}{907,200g}$$

First five years

$$NOx \text{ Emission Reductions} = \left[\frac{11.24g}{mi} - \frac{0.272g}{mi} \right] \cdot \frac{48,000mi}{yr} \cdot \frac{ton}{907,200g}$$

Last five years

$$NOx \text{ Emission Reductions} = \left[\frac{6.64g}{mi} - \frac{0.272g}{mi} \right] \cdot \frac{48,000mi}{yr} \cdot \frac{ton}{907,200g}$$

Switcher Locomotives

Staff modeling assumed that a diesel engine Tier 0 or older is replaced with a Tier 4 diesel engine. Emission factors were based on the Carl Moyer Program, and annual fuel usage for switcher locomotives ranges between 10,000 gallons and 50,000 gallons based on the Technology Assessment: Freight Locomotives November 2016.⁹ Fuel consumption rate (FCR) was assumed to be 15.2 bhp-hr/gal. The baseline emission factor for locomotives assumed one half of the locomotives would be pre Tier 0 and one half would be Tier 0, so an average NOx emission rate was used. The tables and equations used to determine the estimated NOx reductions per switcher are listed below.

⁹ https://www.arb.ca.gov/msprog/tech/techreport/final_rail_tech_assessment_11282016.pdf

Table A-17: Carl Moyer Program Table D-14a and D-14b Locomotive Emission Factors (g/bhp-hr)

Engine Model Year	Type	NOx	AVG NOx (g/bhp-hr)
Pre-1973	Switcher	16.36	14.76
1973-2001 Tier 0	Switcher	13.16	
2015 Tier 4	Switcher	1.22	1.22

$$NOx \text{ Emission Reductions} = \frac{(EF_{baseline} - EF_{CV}) g}{bhp\text{hr}} * \frac{FCR \text{ bhp}\text{hr}}{gal} * \frac{gal}{yr} * \frac{ton}{907,200g}$$

$$NOx \text{ Emission Reductions} = \frac{13.54g}{bhp\text{hr}} * \frac{15.2 \text{ bhp}\text{hr}}{gal} * \frac{25,000gal}{yr} * \frac{ton}{907,200g}$$

Ferries

Staff modeling assumed a repower of two diesel powered Tier 2 750hp engines with two diesel powered Tier 4 engines between 805-4960hp. Emission factors and LF were based on the Carl Moyer Program. The annual usage of 1,000 hours was based on the 2003 CARB Commercial Harbor Craft Survey.¹⁰ The tables and equation used to determine the estimated NOx reductions per ferry are listed below.

Table A-18: Summary of Carl Moyer Tables D-15b, D-16 and D-18 Controlled Harbor Craft Propulsion Engine Emission Factors in (g/bhp-hr) and Load Factor

Horsepower	Tier	NOx	Load Factor
176-750	2	4.84	0.42
805-4960	4	1.34	

$$NOx \text{ Emission Reductions} = \left[\frac{(EF_{baseline} - EF_{CV}) g}{bhp\text{hr}} * hp * LF * \frac{hr}{yr} * \frac{ton}{907,200g} \right] * 2$$

$$NOx \text{ Emission Reductions} = \left[\frac{3.50g}{bhp\text{hr}} * 750hp * 0.42 * \frac{1,000hr}{yr} * \frac{ton}{907,200g} \right] * 2$$

Staff modeling assumed approximately 830 trucks, locomotives, or ferries would be funded and the funding rate would range between \$60,000 and \$1,350,000 depending on type of project.

¹⁰ <https://www.arb.ca.gov/regact/2007/chc07/appd.pdf>

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