California Environmental Protection Agency
AIR RESOURCES BOARD

TECHNICAL SUPPORT DOCUMENT

REGULATION TO CONTROL EMISSIONS FROM IN-USE ON-ROAD DIESEL-FUELED HEAVY DUTY DRAYAGE TRUCKS

Stationary Source Division
Project Assessment Branch
October 2007

State of California
AIR RESOURCES BOARD

Technical Support Document: Proposed Regulation to Control Emissions from In-Use On-Road Diesel-Fueled Heavy Duty Drayage Trucks

Public Hearing to Consider

ADOPTION OF PROPOSED REGULATION TO CONTROL EMISSIONS FROM IN-USE ON-ROAD DIESEL-FUELED HEAVY DUTY DRAYAGE TRUCKS

To be considered by the Air Resources Board on December 6 and 7, 2007, at:

Air Resources Board
Auditorium
9530 Telstar Avenue
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State of California
AIR RESOURCES BOARD

PROPOSED REGULATION TO CONTROL EMISSIONS FROM IN-USE ON-ROAD DIESEL-FUELED HEAVY DUTY DRAYAGE TRUCKS

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Acknowledgements

This report was prepared with the assistance and support from the other divisions and offices of the Air Resources Board. In addition, we would like to acknowledge the assistance and cooperation that we have received from many individuals and organizations.

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I. INTRODUCTION

The California Air Resources Board's (ARB or Board) mission is to protect public health, welfare, and ecological resources through the effective and efficient reduction of air pollutants, while recognizing and considering the effects on the economy of the State. ARB's vision is that all individuals in California, especially children and the elderly, can live, work, and play in a healthful environment – free from harmful exposure to air pollution. To achieve this, ARB has adopted numerous regulations to control emissions from many different sources, including diesel engines. Diesel engine exhaust is a health concern because it is a source of unhealthful air pollutants including gaseous and particulate-phase toxic air contaminants (TAC), particulate matter (PM), oxides of nitrogen (NOx), carbon monoxide, and hydrocarbons.

This technical support document (TSD) is an addendum to the Staff Report: Initial Statement of Reasons (Staff Report) and provides more detailed information supporting the development of the proposed regulatory action. As noted in the Staff Report, the proposed regulation was developed pursuant to ARB's authorities under Health and Safety Code (HSC) sections 43013(b) and 43018, and 39666.

The TSD includes information on ARB's legal authority to adopt the proposed regulation, descriptions of drayage trucks, their uses, and the diesel engines used on them along with projected inventories, an evaluation of the need for emission reductions from drayage trucks including the corresponding health impacts, a summary and discussion of the proposed regulation, information supporting the technical feasibility of implementing the proposed regulation, the projected emissions reductions along with the associated reduction in health risk, and a discussion of the economic impact of the regulation and the corresponding economic analysis. (ARB – CHC, 2007)

A. Need for Proposed Regulation

In 1998, the Board identified diesel PM as a TAC with no Board-specified threshold exposure level, pursuant to Health and Safety Code (HSC) sections 39650 through 39675 (ARB, 2007). A needs assessment for diesel PM was conducted between 1998 and 2000 pursuant to HSC sections 39658, 39665, and 39666. This resulted in ARB staff developing and the Board approving the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (Diesel RRP) in 2000. The Diesel RRP presented information on the available options for reducing diesel PM and recommended regulations to achieve these reductions. The Diesel RRP's scope was broad, addressing all categories of mobile and stationary engines. It included recommendations for the development of control measures for diesel sources, such as those covered by the proposed regulation. The ultimate goal of the Diesel RRP is to reduce, by 2020, California's diesel PM emissions and associated cancer risks by 85 percent from the 2000 levels. (ARB, 2000)

In April 2006, the Board approved the *Emission Reduction Plan for the Ports and Goods Movement in California* (Plan). The Plan identifies strategies for reducing emissions created from the movement of goods through California ports and into other regions of the State. The Plan is part of the broader Goods Movement Action Plan (GMAP) being jointly carried out by the California Environmental Protection Agency and the Business, Transportation, and Housing Agency. Phase I of the GMAP was released in September 2005, and highlighted the air pollution impacts of goods movement and the urgent need to mitigate localized health risk in affected communities. The final GMAP was released in January 2007 and includes a framework that identifies the key contributors to goods movement-related emissions.

The Plan identifies numerous strategies for reducing emissions from all significant emission sources involved in goods movement, including ocean-going vessels, harbor craft, cargo handling equipment, locomotives, and trucks. The Plan establishes emission reduction goals for drayage trucks including modernizing (replacing and/or retrofitting) port trucks, implementing California and federal 2007 truck emission standards, and restricting entry of trucks new to port service unless equipped with diesel PM controls. The proposed regulation would represent a significant first step toward satisfying the Emission Reduction Plan goals. (BTH & CalEPA, 2007)

The federal Clean Air Act (CAA) requires U.S. EPA to establish National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health, including fine particulate matter ($PM_{2.5}$) and ozone. Set to protect public health, the NAAQS are adopted based on a review of health studies by experts and a public process. Ambient $PM_{2.5}$ is associated with premature mortality, aggravation of respiratory and cardiovascular disease, asthma exacerbation, chronic and acute bronchitis and reductions in lung function. Ozone is a powerful oxidant. Exposure to ozone can result in reduced lung function, increased respiratory symptoms, increased airway hyper-reactivity, and increased airway inflammation. Exposure to ozone is also associated with premature death, hospitalization for cardiopulmonary causes, and emergency room visits for asthma. (EPA, 1990)

Areas in the State that exceed the NAAQS are required by federal law to develop State Implementation Plans (SIPs) describing how they will attain the NAAQS by certain deadlines. The NOx emission reductions are needed because NOx leads to formation in the atmosphere of both ozone and $PM_{2.5}$; diesel PM emission reductions are needed because diesel PM contributes to ambient concentrations of $PM_{2.5}$.

The South Coast Air Quality Management District (SCAQMD) and the San Joaquin Valley Air Pollution Control District (SJVAPCD) are designated as nonattainment of both the federal 8-hour ozone and federal $PM_{2.5}$ NAAQS. In order to demonstrate that the necessary emission control programs are in place, the U.S. EPA requires that all necessary emission reductions be achieved by 2014 for $PM_{2.5}$ and 2023 for ozone.

In both the South Coast and San Joaquin Valley air basins, significant reductions of NOx are crucial to meet the federal standards. For example, at this time, the strategy to achieve attainment of the $PM_{2.5}$ standards in the South Coast Air Basin includes staff estimates that a 55 percent reduction in NOx emissions from 2006 levels (i.e., a total reduction of hundreds of tons per day) and a 15 percent reduction in direct $PM_{2.5}$ emissions from 2006 baseline levels will be necessary for attainment of the $PM_{2.5}$ standards in the South Coast Air Basin. The NOx emission reductions from the proposed regulation would play an essential role in assisting the South Coast Air Basin with meeting its 2014 $PM_{2.5}$ deadline as well as its future ozone deadlines.

The federal CAA permits states to adopt more protective air quality standards and California has set standards for particulate matter and ozone that are more protective of public health than respective federal standards. The Bay Area, South Coast, San Joaquin Valley, and San Diego areas are nonattainment for the State standards for ozone and $PM_{2.5}$. HSC section 40911 requires the local air districts to submit plans to the Board for attaining the State ambient air quality standards, and HSC section 40924 requires triennial updates of those plans. The NOx and $PM_{2.5}$ emission reductions from the proposed regulation will assist the local air districts in achieving attainment of the State ambient air quality standards.

Staff is proposing a regulation to reduce diesel PM and NOx emissions from trucks in drayage service at California's ports and intermodal rail yards. The regulation would significantly reduce diesel PM emissions by the end of 2009. Diesel PM emission reductions are needed to reduce premature mortality, cancer risk, and other adverse impacts from exposure to this TAC, especially in heavily impacted communities near major ports and rail yards. By 2014, staff projects that drayage truck diesel PM emissions would be reduced about 86 percent and NOx emissions about 56 percent from the 2007 baseline. These emission reductions would occur in areas on and near ports and rail yards, along the major truck roadway arteries leading into the ports and rail yards, and in those communities surrounding these areas, as well as further inland.

The regulation would also reduce diesel PM and NOx emissions that contribute to exceedances throughout the State of ambient air quality standards for both $PM_{2.5}$ and ozone. These reductions would assist California in its goal of achieving state and federal air quality standards.

The emission reductions from the proposed regulation would result in lower ambient PM levels and reduced exposure to diesel PM. Staff estimates that approximately 580 premature deaths statewide would be avoided by year 2014 from implementation of the proposed regulation. The estimated cost benefit of the avoided premature deaths and other health benefits due to the emission reductions are estimated to range from $3.5 to $4.3 billion. (ARB – CHC, 2007)

B. Summary of Proposed Regulation

The purpose of the proposed regulation is to reduce the near-source and regional health risks caused by elevated levels of diesel PM emissions and reduce regional exposures to ozone and secondary PM through NOx emission reductions. The regulatory goals focus on reducing diesel PM as expeditiously as possible and meet, in particular, $PM_{2.5}$ standards in the South Coast by 2014.

Staff is proposing a regulation that would reduce emissions of diesel PM and NOx from an estimated 21,000 – 29,000 drayage trucks that would service California's ports and intermodal rail yards in 2009. The regulation would achieve these emission reductions by requiring the installation of ARB certified retrofit technologies, the use of trucks meeting more recent California and federal emission standards, or both. The regulation is projected to reduce emissions significantly at a reasonable cost.

The regulation would also set requirements for port and rail authorities, port terminals operators, rail yards located within 80 miles of ports, motor carriers, trucks owners and drivers, and potentially other businesses located on port and rail yard property. The regulation would include recordkeeping and reporting requirements to provide staff up-to-date information on drayage trucks, dispatching activities and compliance status. Drayage trucks that don't operate at ports or intermodal rail yards, military tactical vehicles, and dedicated uni-body vehicles would not be covered by the rule. Additionally, ports or rail yards can apply for exemptions providing certain requirements are met.

The proposed regulation would require all current drayage trucks to operate with 1994 or newer model year (MY) engines and install diesel particular filters (DPF) on 1994 – 2003 MY engines by the end of 2009 and then meet the 2007 California and federal diesel emission standards by the end of 2013. The proposed regulation would not set emission standards for 2004 – 2006 MY engines; however, these trucks would have to meet all other regulation requirements, such as registering in the Drayage Truck Registry (DTR). Staff expects these engines will be required to reduce emissions under the general private fleet rule currently under development by ARB.

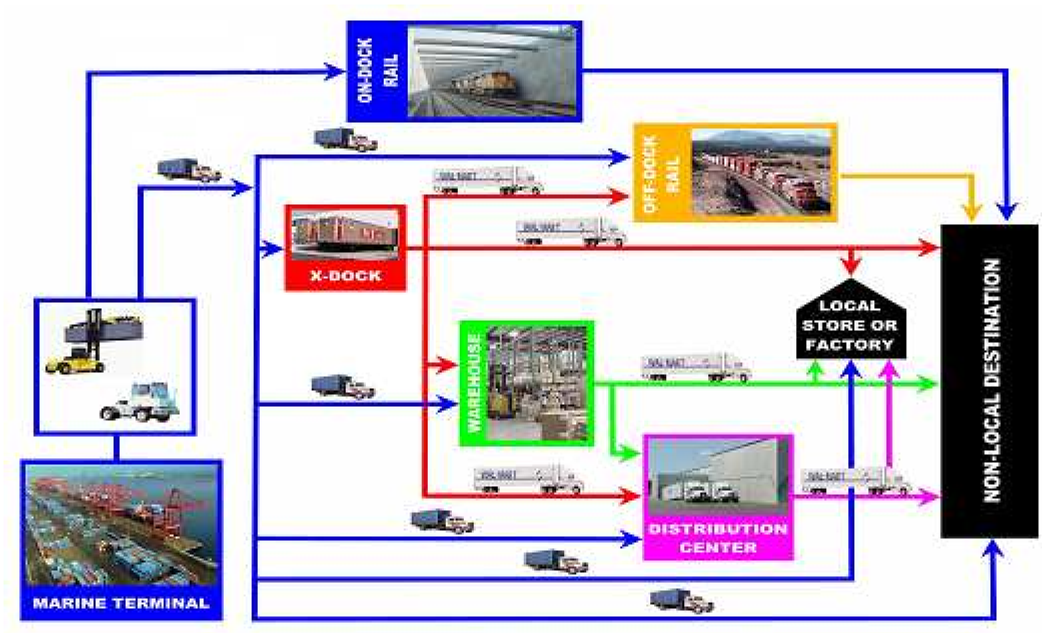
C. Background

To better understand the difficulties and possible solutions to reduce emissions from drayage trucks servicing California's ports and intermodal rail facilities, staff exhaustively analyzed and researched all aspects of goods movement in California. This section provides a brief description of goods movement at California's ports and rail yards.

1. Goods Movement at California's Port and Intermodal Rail Yards

The California goods movement industry is driven by both the rise in United States demand for foreign imports and the growing California marketplace. In the last 25 years, both California and the United States, driven by rising demand for lower cost products and a desire to take advantage of production costs overseas, have assumed expanded roles in global trade, particularly as importers. The system comprising product request, movement from producer, and delivery to customer is commonly referred to as the "supply chain" (Schematic I-1). This supply chain is a dynamic system influenced heavily by customer demand. The more global the supply chain becomes, the greater the impact on the State's goods movement transportation system of streets and highways, rail lines and yards, and seaports.

Schematic I-1: Intermodal Container Supply Chain



Graphic source: **Port container movement.ppt provided by TIAX LLC.**

Goods arrive at ports either as bulk cargo or within containers. Bulk items are transported within the hull of a ship and then transferred to waiting trucks or offloaded directly into manufacturing facilities located at the port. Examples of bulk items are grains, gypsum, and petroleum coke. Trucks that transport bulk material are a relatively minor part of the port traffic and account for roughly four percent of the on-road trucks operating at the ports. The age distributions and economics of bulk transport trucks are assumed to mirror those of the container transport trucks.

The primary method of goods movement is by container. At points of origin, goods are loaded into standard sized containers of either 20 foot, 40 foot, or 40+ foot lengths and transported by ship, train or truck (Photograph I-1). After the containers are emptied, they are then either reloaded or transported empty to the next destination. When discussing container traffic and volume, containers are also referred to as TEU units. A 'TEU' is shorthand for a 'twenty-foot equivalent unit'. Thus, a 40 foot container would be the equivalent of two TEUs.

Photograph I-1: Intermodal Container Movement

Photo source: http://www.polb.com/images/PhotoGallery/PortTour/index.htm

Containers may be transported by trains and on-road vehicles. Trains are used for both container and bulk transport and are typically used for long distance deliveries from ports in California to Chicago. Intermodal train yards (where containers are off-loaded from trailer chassis and loaded on rail cars) may be located on a port terminal, at a common yard within or next to a port, or some distance from port property. When train yards are located within port boundaries, off-road vehicles such as yard hostlers may transport containers directly from ship to train without the use of on-road trucks. When containers must be transported to train yards located off port property via public roads, they are typically staged on port property and transferred via on-road truck to the train yard. Currently, trains transport 25 percent of the total container traffic directly from the ports of Long Beach and Los Angeles and 30 percent of container traffic from the port of Oakland. Still, other ports may have no nearby rail yards (within 80 miles) and 100 percent of cargo is transported by on-road trucks.

Drayage trucks are trucks that pick-up or drop-off cargo at California's ports and intermodal rail yards and are typically class 8[1] heavy-duty vehicles with maximum hauling capacities up to 80,000 pounds[2] (combined weight of truck and cargo). For the purposes of this report, drayage trucks are defined as on-road, diesel-fueled, heavy-duty vehicles (HDDV) with gross vehicle weight ratings (GVWR) greater than 33,000 pounds.

[1] Class 8 vehicles are defined as having a gross vehicle weight of 33,001 lbs and over. Federal Code of Regulations, Title 49: Part 565, http://www.washingtonwatchdog.org/documents/cfr/title49/part565.html
[2] California Vehicle Code 35551, http://www.dmv.ca.gov/pubs/vctop/d15/vc35551.htm

Drayage trucks are almost universally large class 8 sleeper-equipped tractors due to the size (loading capacity) of most cargo containers and weight capacities of California roadways. Only the larger class 8 trucks, with more powerful engines, are able to move loaded containers and the heavier bulk and break-bulk loads. Drayage trucks are typically equipped with sleeper cabs, although staff believes this is an artifact of the types of available trucks on the used truck market and owner preference and is not a requirement for drayage service (Photograph I-2).

Photograph I-2: Drayage Trucks with Containers at the Port of Long Beach

Photo source: http://www.polb.com/images/PhotoGallery/PortTour/index.htm

Drayage trucks owners typically do not own their own container chassis (Photograph I-3). They may bring a container to the port or rail yard and drop the container and chassis, arrive without a chassis as a bobtail[3], or arrive with just a chassis. Trucks may also shuttle chassis from one location to another without cargo.

Photograph I-3: Container Chassis

Photo source: www.imgcommerce.com/chassis_new.htm

Additionally, some trucks are dedicated trucks and transport bulk cargo (such as grain), cars, and liquid-bulk cargo (such as oil). The majority of these trucks is of uni-body

[3] A bobtail is the truck tractor only (no chassis, flatbed, tank etc.)

design and built to haul specific cargo and cannot haul containers or attach container chassis. Examples of dedicated trucks are auto carriers and dedicated uni-body fuel delivery vehicles. The proposed regulation will not affect these types of vehicles (Photographs I-4 and I-5).

Photograph I-4: Dedicated Auto Carrier

Photo source: http://classyauto.com/images/truck.jpg

Photograph I-5: Uni-Body Fuel Delivery Vehicle

Photo source: http://www.trucktanks.com/catalog/wp006.htm

Drayage trucks do not pick-up or drop-off cargo without first being dispatched by a motor carrier. Motor carriers may contract with beneficial cargo owners, shipping companies, freight forwarders etc. for the movement of cargo. Once they have contracted for the movement of cargo, motor carriers will then dispatch drayage trucks to the ports or rail yards. Upon arrival, the truck drivers check in with the terminal operators or at the rail yard gates to obtain instructions and locations for dropping off their cargo, pickling up new cargo, or both. The truck driver then proceeds with his / her assignment, checked for accuracy by port or rail yard staff, and then departs to complete delivery.

Drayage trucks making local deliveries can deliver multiple containers per day from the port or rail yard. When used efficiently, these same trucks can also deliver out-bound containers on their trip to the port. As each trip includes driving to and from the port or rail yard, a truck may pass local communities multiple times per day. These multiple passes, and the resultant emission exposure levels, can dramatically affect the health of nearby communities.

The regulation affects all trucks entering the ports and rail yards. Virtually all drayage trucks entering the ports are trucks described above. However, there are trucks that enter the rail yards that are not 'typical' drayage trucks. These trucks never service the ports. These trucks may service affected rail yards, but only to pick up or drop off the larger over the road trailers as seen in (Photograph I-6) below. For the purposes of the proposed regulation, these truck are considered 'drayage trucks' if they service affected ports or rail yards and will be subject to all requirements of the regulation.

Photograph I-6: Non-Typical Drayage Truck

Photo source: http://www.medjames.com/images/bigTruck.gif

2. Goods Movement Growth

As mentioned earlier, in April 2006, the Board approved the Emissions Reduction Plan for Ports and Goods Movement in California as part of the Action Plan. Within the supporting documentation of the Action Plan, an analysis was performed to project future port growth. Most of the forecasts issued by the ports are unconstrained, i.e., not limited by port terminal capacity, landside access, or environmental considerations, making it difficult to determine actual throughput capabilities. One such analysis estimates the actual existing throughput capacity for the Ports of Los Angeles and Long Beach to be between 28 and 30 million TEUs – slightly more than double the 2004 volume of 13.1 million TEUs. (ARB – GMAP, 2005)

Factoring in continuing congestion and the likelihood that ports and rail yards will significantly increase after-hours and weekend cargo throughput, staff anticipates the population of drayage trucks in frequent port and rail yard service will increase from approximately 21,000 in 2007 to as many as 34,000 in 2014. A detailed analysis of drayage truck inventories and emissions is presented in section III.

3. Affected Ports

This regulation will affect drayage trucks at all non-exempted ports in California. Ports can be located on the ocean or bay or well inland along a river way. They can be located within large population centers or at a distance from urban settings. California's ports have unique conditions relative to their operations (i.e. location, budget, size, cargo) which may directly affect their ability to implement any new regulatory requirements. Each of the affected ports is listed below along with a brief description and map.

Port of Benicia

The Port of Benicia (Aerial View I-1) is privately owned and located to the east of the town of Benicia and 16 miles east of the Golden Gate Bridge along the Carquinez Straits. Owned and operated by AMPORTS, the port primarily processes new automobiles. Most automobiles arrive by train at the eastern end of the port with additional arrival via roll-on roll-off (RORO) ships. The port sees about four ships per week which offload approximately 1,000 cars. The cars are then either transported by train from the nearby (see map) rail yard or by specialized on-road car carriers (30-40 per day). An average of ten 40' containers per day are loaded with cars and transported from the port via intermodal truck. Most outbound marine cargo is pet coke (from the nearby Valero refinery) and is transported by roughly four ships per year. Also, the port owns some land which houses commercial enterprises not affiliated with marine activities, but may get occasional deliveries from heavy-duty diesel-powered trucks. (PortBenicia, 2007)

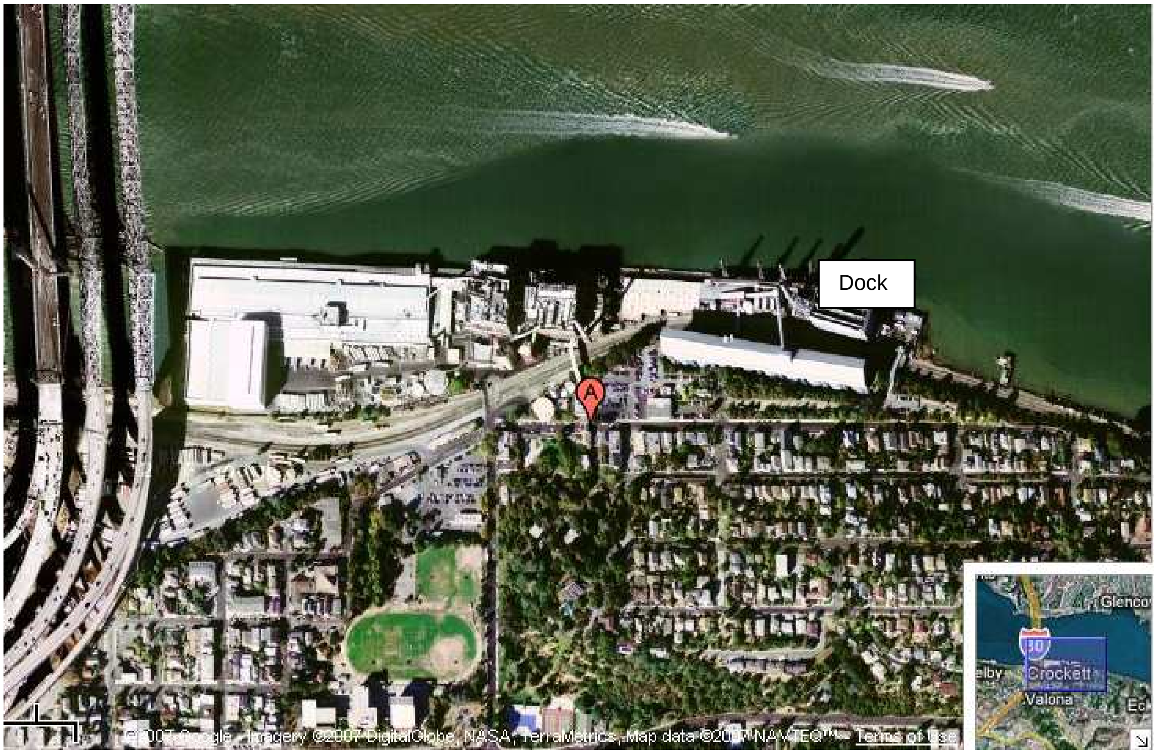
Aerial View I.1: Port of Benicia

■ ■ ■ ■ ■ Approximate Port Boundary
Estimated population of trucks affected by regulation: 22
Port of Benicia website: http://www.amports.com/prod04.htm

Port of Crockett

The Port of Crockett (Aerial View I-2) is essentially a dock servicing the adjacent C & H sugar processing plant. There are no intermodal goods movement activities at the plant, but staff estimates approximately 149 trucks service the refinery.

Aerial View I-2: Port of Crockett

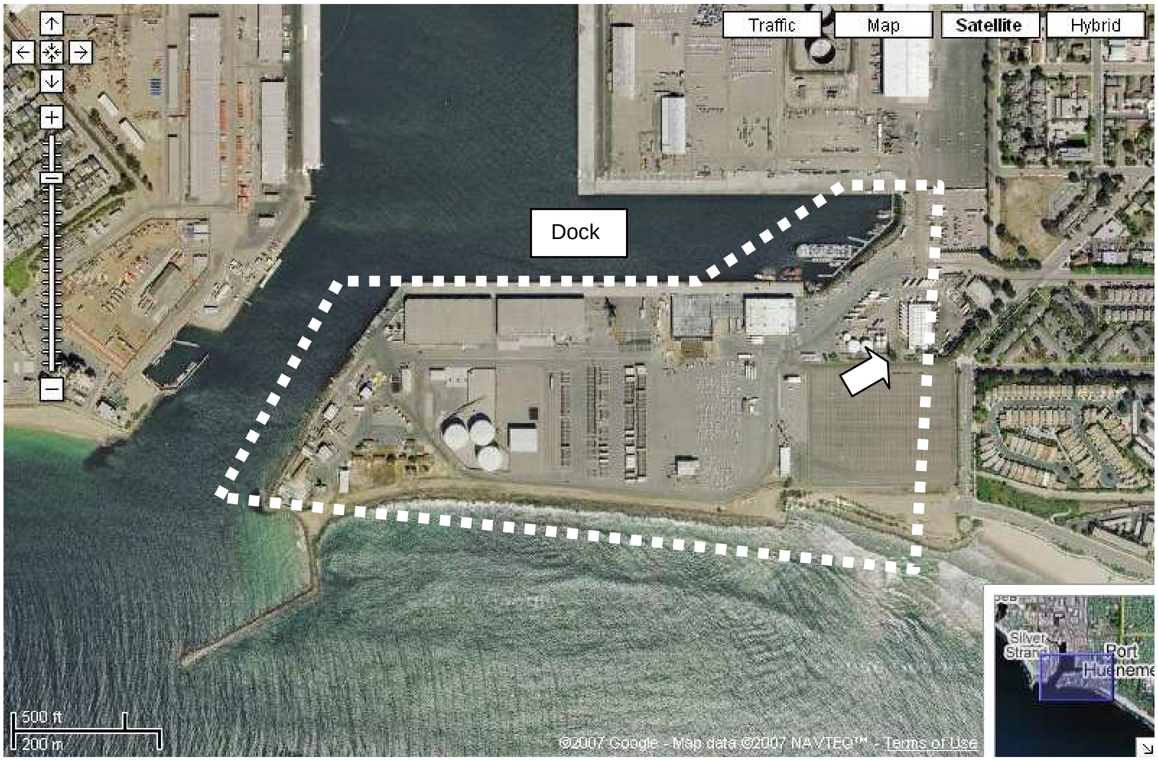


Estimated population of trucks affected by regulation: 149

Port of Hueneme

The commercial port of Hueneme (Aerial View I-3) is owned and operated by the State of California. The port is located approximately 60 miles northwest of Los Angeles along the California coast and consists of ~140 acres. The Port of Hueneme is operated by the Oxnard Harbor District. It services niche markets by importing and exporting fresh fruit, produce, and new automobiles. The port is also a support facility for the offshore oil industry. Virtually all automobiles are individually driven on or off port property – only very rarely are car carriers used. Trucks arrive and depart via a single gate located on the west end of the port (see map – white arrow). The majority of trucks that may be affected by the regulation are those transporting fruit and produce. Additional intermodal trucks could include car carriers and the occasional bulk truck transporting liquid fertilizer to an on-site distribution facility. (PortHueneme, 2007)

Aerial View I-3: Port of Hueneme



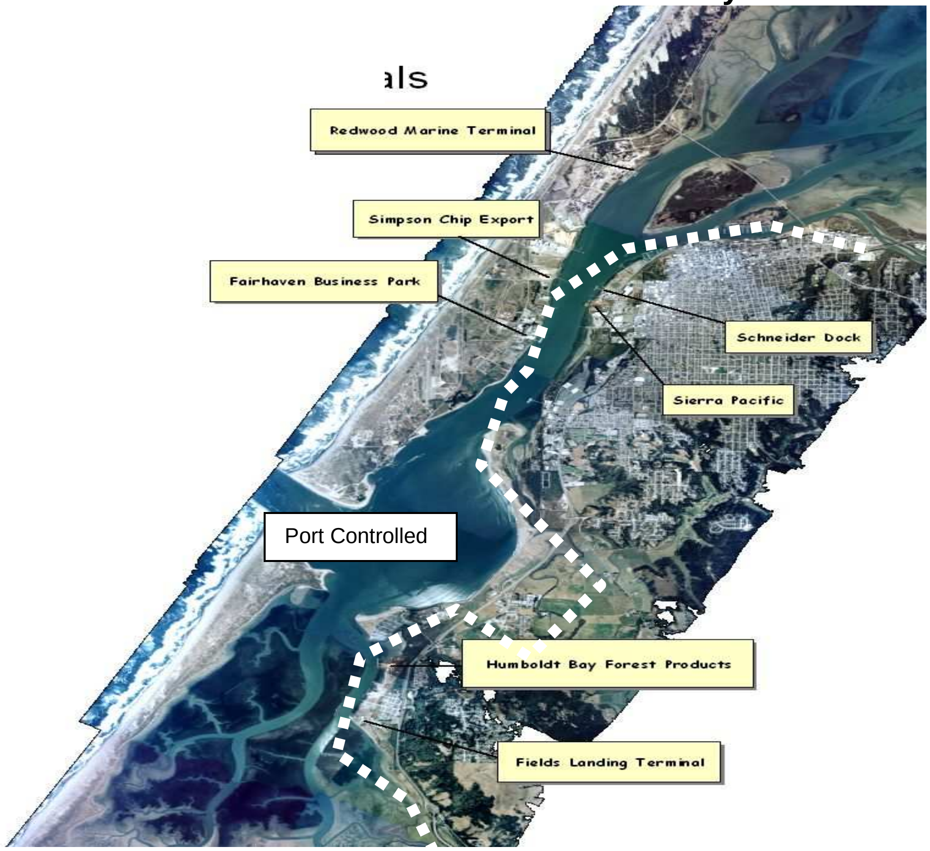
▪▪▪▪▪ Approximate Port Boundary

Estimated population of trucks affected by regulation: 316
Port of Hueneme website: http://www.portofhueneme.org

Port of Humboldt Bay

The commercial port of Humboldt Bay (Aerial View I-4) is operated by the Humboldt Bay Harbor, Recreation and Conservation District. The port is located on the California coast about 225 miles north of San Francisco and primarily exports lumber and lumber derived products. Trucks affected by this regulation include transport bulk, break-bulk and liquid-bulk cargos. (PortHB, 2007)

Aerial View I-4: Port of Humboldt Bay



Main Photo: http://www.humboldtbay.org/portofhumboldtbay/terminals/

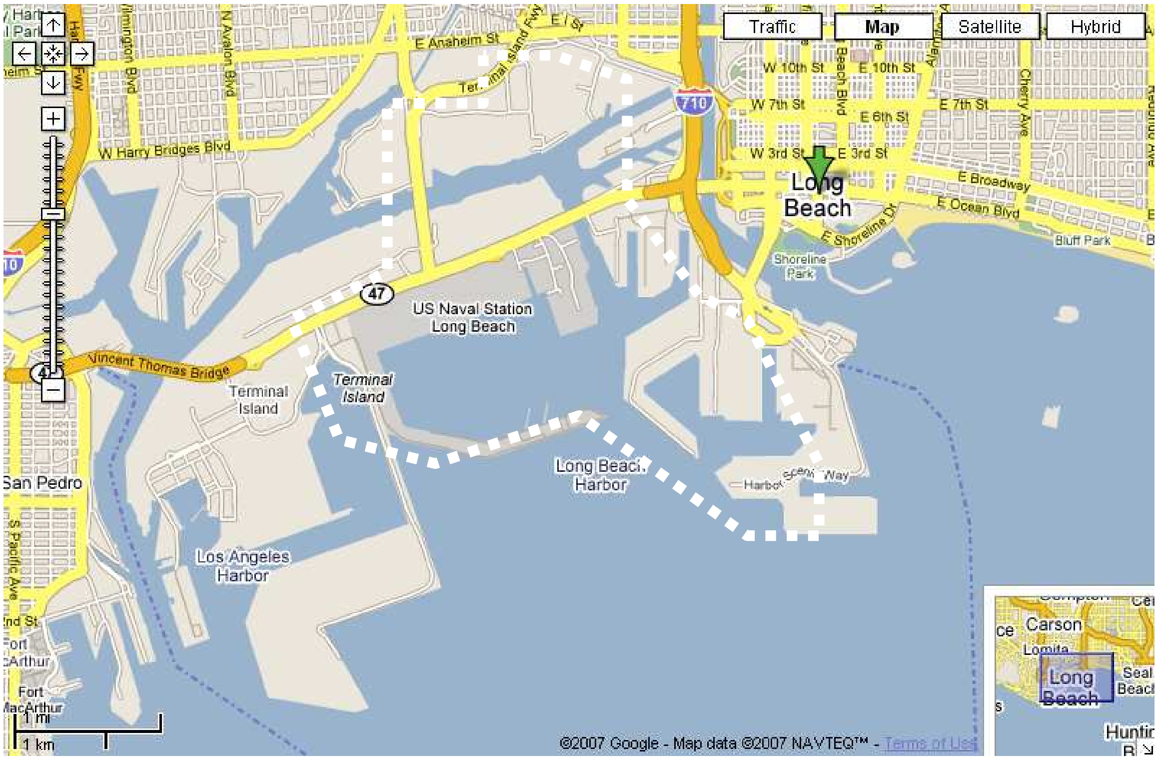
■ ■ ■ ■ ■ Approximate Port Boundary

Estimated population of trucks affected by regulation: 95
Port of Humboldt Bay website: http://www.humboldtbay.org/portofhumboldtbay

<u>Port of Long Beach</u>

The Port of Long Beach (POLB) (Aerial View I-2) is located adjacent to the city of Long Beach in Southern California and consists of ~3,200 acres. POLB is a public agency managed and operated by the City of Long Beach Harbor Department. In 2006, the port handled greater than 7 million TEUs in container volume with over 5,000 vessel calls. The port contains multiple piers that import and export containerized cargo, dry bulk and petroleum/liquid bulk. The terminals contract with the ports for the use of the piers and berths. The terminals operate their respective vehicle entry gates where trucks stop to receive dray instructions. All trucks entering this port will be affected by the regulation with a vast majority transporting containers. (PortLB, 2007)

Aerial View I-5: Port of Long Beach



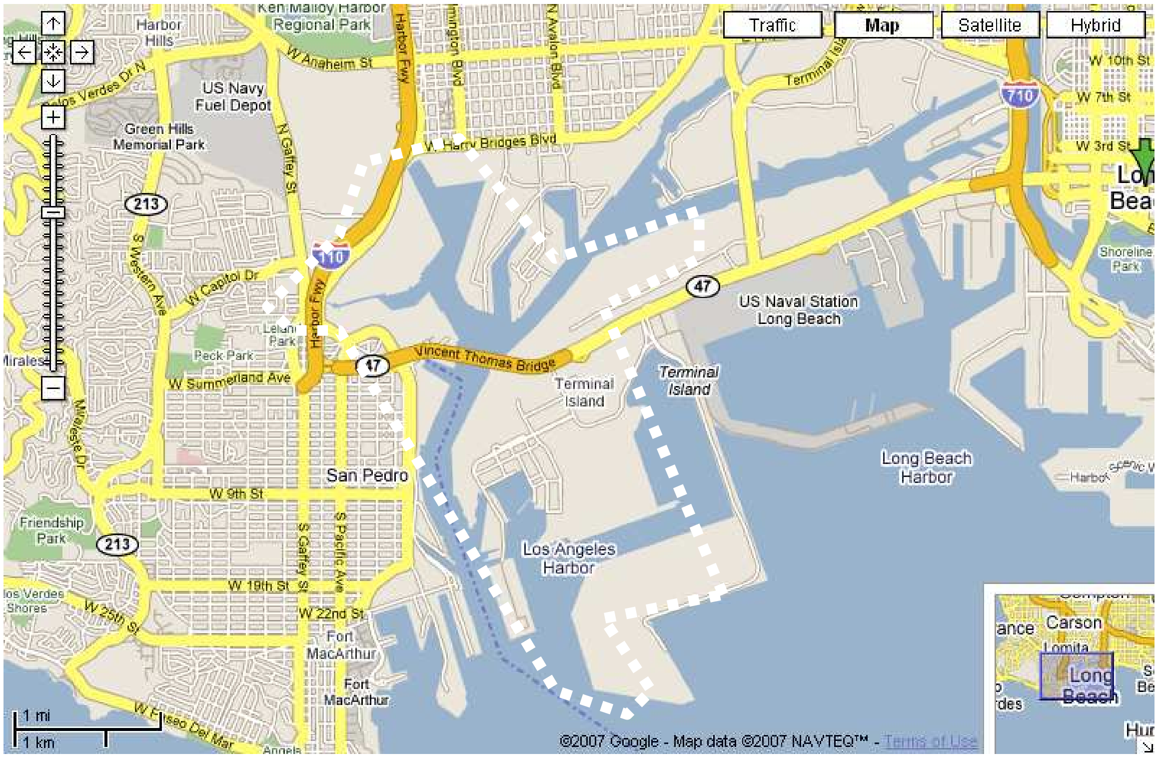
▪▪▪▪▪ Approximate Port Boundary

Estimated population of trucks affected by regulation: 55,000 – 90,000 (Total POLA and POLB)
Port of Long Beach website: http://www.polb.com

Port of Los Angeles

The Port of Los Angeles (POLA) (Aerial View I-6) is located adjacent to the Port of Long Beach and the cities of San Pedro and Wilmington. It encompasses 43 miles of waterfront and 7,500 acres (3,200 water and 4,300 lands). The port is the busiest port in the United States with 27 major facilities importing and exports containers, break-bulk, automobiles, and liquid bulk in addition to servicing more than 15 cruise lines. In 2006, the port handled over 8 million TEUs in container volume, over 100,000 automobiles, and 2,900 vessel calls. Similar to the Port of Long Beach, the terminals contract with the ports for the use of the piers and berths and operate their respective vehicle entry gates. Staff expects all trucks entering this port will be affected by the regulation with the possible exception of specialty trucks such as dedicated auto transports. (PortLA, 2007)

Aerial View I-6: Port of Los Angeles



▪ ▪ ▪ ▪ ▪ Approximate Maritime Port Boundary

Estimated population of trucks affected by regulation: 55,000 – 90,000 (Total POLA and POLB)
Port of Los Angeles website: http://www.portoflosangeles.org

Port of Oakland

The Port of Oakland (Aerial View I-7) is located adjacent to the city of Oakland in the San Francisco Bay and is managed and operated by the City of Oakland. The port is the third busiest in California and contains multiple piers that import and export containerized cargo. The port has 20 deep water berths and is located adjacent to Union Pacific and BNSF rail yards. Virtually all truck traffic transports containerized cargo and will be affected by the proposed regulation. (PortOakland, 2007)

Aerial View I-7: Port of Oakland

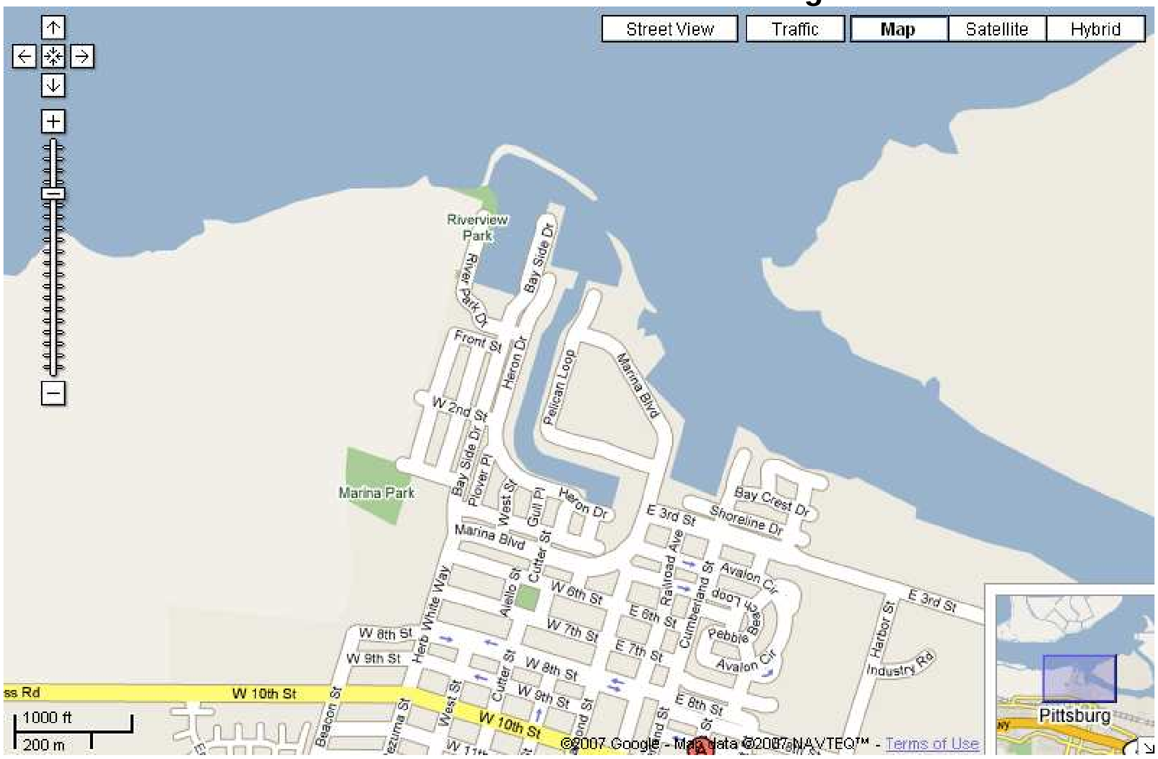
▪▪▪▪▪ Approximate Port Maritime Boundary

Estimated population of trucks affected by regulation: 8,000
Port of Oakland website: http://www.portofoakland.com

Port of Pittsburg

The Port of Pittsburg (Aerial View I-8) is located in the northwest corner of San Francisco Bay. The port consists of a small craft marina and nearby land used by industries. Additionally, the port is analyzing possible expansion and development of a harbor to the east of the marina. The city of Pittsburg owns the water-side of the bay shoreline up to the highest tide level. Trucks affected by the proposed regulation transport bulk cargos for the aforementioned industries. (PortPitt, 2007)

Aerial View I-8: Port of Pittsburg



Estimated population of trucks affected by regulation: 121
Port of Pittsburg website: http://www.pittsburgmarina.com/pittsburg/marina

<u>Port of Redwood City</u>

The Port of Redwood City (Aerial View I-9) is located 18 nautical miles south of San Francisco Bay. The port lands are owned by Redwood City and managed by a Board of Port commissioners appointed by the city. The port contains five wharves and specializes in bulk and liquid cargos. Trucks affected by the proposed regulation transports the aforementioned bulk cargos. (PortRed, 2007)

Aerial View I-9: Port of Redwood City

Photo Source: http://www.redwoodcityport.com/

Estimated population of trucks affected by regulation: 210
Port of Redwood City website: http://www.redwoodcityport.com

Port of Richmond

The Port of Richmond (Aerial View I-10) is located about nine miles west of the Golden Gate Bridge along the east shore of the San Francisco Bay. The port of Richmond consists of five city-owned terminals and ten privately owned terminals. The terminals handle bulk liquids, dry bulk materials, metals and break-bulk cargos. Most terminals have connections to nearby rail facilities operated by either BNSF or UPSP. The majority of the trucks affected by the proposed regulation at this port are transporting bulk and break-bulk cargos. (PortRich, 2007)

Aerial View I-10: Port of Richmond

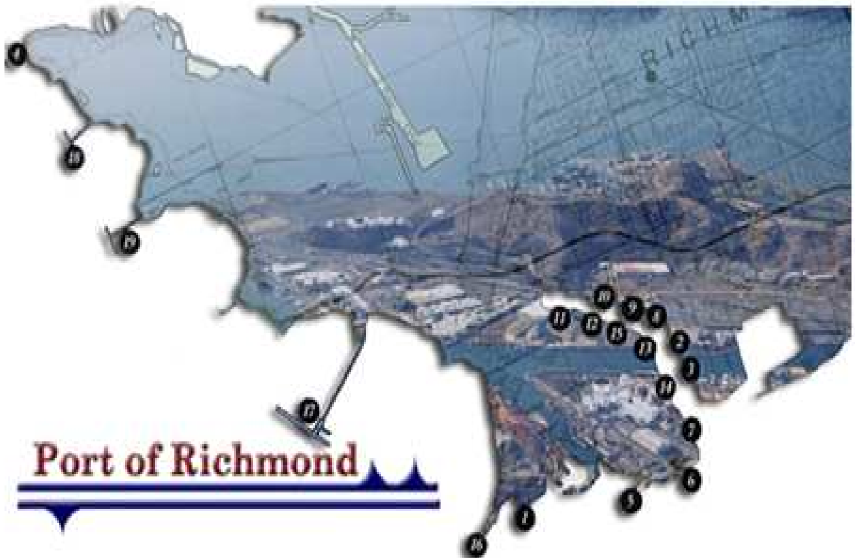


Photo Source: http://www.ci.richmond.ca.us/index.asp?NID=324

Port of Richmond website: http://www.ci.richmond.ca.us/index.asp?NID=102

Port of Sacramento

The Port of Sacramento (Aerial View I-11) is located in the city of West Sacramento and about 79 nautical miles northeast of San Francisco. The port of Sacramento consists of 3,000 acres in the Sacramento Delta and contains five berths and a 200 railcar terminal area marshaling yard serviced by BNSF, UP and Sierra Northern. The port primarily handles bulk and break-bulk cargo such as agricultural grains, rice, and lumber. The majority of the trucks affected by the proposed regulation at this port are transporting bulk and break-bulk cargos. (PortSac, 2007)

Aerial View I-11: Port of Sacramento

Photo Source: http://www.portofsacramento.com/f_overview.html

Estimated population of trucks affected by regulation: 106
Port of Sacramento website: http://www.portofsacramento.com

Port of San Diego

The Port of San Diego (Aerial View I-12) is located along San Diego Bay in Southern California. The port is a special government entity, created by the California legislature to manage the San Diego Harbor, and administer the public lands along San Diego Bay. The port manages two marine terminals, a cruise ship terminal as well as land used by a myriad of other privately owned entities.   In addition, the Tenth Avenue Marine terminal has two rail tracks that connect with nearby railways. Cargo types include, bulk, break-bulk, and automobiles. Types of trucks that service this port include trucks that haul bulk products, containers, larger delivery trucks (that supply cruise ships), and auto transports. (PortSD, 2007)

Aerial View I-12: Port of San Diego

Photo Source: http://www.portofsandiego.org/

Estimated population of trucks affected by regulation: 929
Port of San Diego website: http://www.portofsandiego.org

Port of San Francisco

The Port of San Francisco (Aerial View I-13) is located along San Francisco Bay just south of the Golden Gate Bridge. It consists of seven and one-half miles of San Francisco waterfront front Hyde Street Pier on the north to India Basin on the south. The port consists of over 500 ground, commercial, retail, office, industrial and maritime leases. The port land is owned by the state of California and the port of San Francisco is the managing entity. The marine terminals are located on the southern boundaries of the port and nearby rail facilities. Most imported cargo (bulk and break-bulk) is destined for local use while non-local cargo typically is off-loaded in the port of Oakland across the bay. Trucks affected by this regulation are almost exclusively bulk and break-bulk transports. (PortSF, 2007)

Aerial View I-13: Port of San Francisco

▪▪▪▪▪ Approximate Port Boundary
Estimated population of trucks affected by regulation: 287
Port of San Francisco website: http://www.sfport.com

<u>Port of Stockton</u>

The Port of Stockton (Aerial View I-14) is located on 2,000 acres along the Stockton Deepwater Ship Channel about 75 nautical miles east of the Golden Gate Bridge. The port has approximately 60 tenants who have leased land or constructed their own facilities. The port typically handles liquid bulk and bulk cargos. It also services several large distribution facilities. The port land is state owned and the port authority is a special district with authority given by the State. Roberts Island was recently ceded to the port and represents significant possibilities for expansion. Types of trucks servicing the port include those that transport bulk products to and from the marine facility and trucks that pick-up and deliver cargo from the privately owned warehouses and distribution centers located on port grounds. (PortStockton, 2007)

Arial View I-14: Port of Stockton

Photo Source: http://www.portofstockton.com/

Estimated population of trucks affected by regulation: 501
Port of Stockton website: http://www.portofstockton.com

4. Affected Intermodal Rail Yards

Initially, staff efforts focused only on drayage trucks servicing California's ports. After the initial research was concluded, it became apparent that trucks being phased out of port service as a result of this regulation may migrate to intermodal rail service or only haul from local transfer yards to the rail yards. The term for this migration is 'dray-off'. Realizing dray-off is a distinct possibility; staff concluded the proposed regulation should also include trucks servicing intermodal rail facilities in addition to those servicing the ports.

Photograph I-7: Intermodal Rail Yard – ICTF

Similar to ports, rail yards are not all the same. The two big operators of rail yards in the United States and California are Burlington Northern Santa Fe (BNSF) and Union Pacific (UP). They operate the 'class-1' railroads in California (Photograph I-7). There are also a multitude of privately owned railroads which are much smaller than the class-1 railroads. Many of these rail roads operate small rail 'spurs', with limited capacity and no drayage truck activity. Rail yards can also be segregated into intermodal yards and switcher yards. Switcher yards do not have any drayage truck activity. Instead, they use locomotives to move (switch) train cars and build trains depending on the rail car destination. Conversely, intermodal rail yards can have significant drayage truck activity and are typically located near (within 80 miles) ports. To eliminate dray-off, staff included all rail facilities within 80 miles from the ports as listed below (Table I-1).

Table I-1: Intermodal Rail Yards within 80 Miles of Ports

Rail Yard	Operator	Distance to Port (Miles)	Port	Truck Population
BNSF Oakland	BNSF	<1	Oakland	0
Commerce Eastern BNSF	BNSF	20	POLA / POLB	1,301
Commerce	UP	20	POLA / POLB	1,676
ICTF UP	UP	5	POLA / POLB	0
LATC Union Pacific	UP	23	POLA / POLB	1,075
Lathrop International UP	UP	9	Stockton	652
Burlington Northern Santa Fe Hobart	BNSF	20	POLA / POLB	3,297
Richmond BNSF	BNSF	12	Oakland	358
San Bernardino	BNSF	70	POLA / POLB	2,365
Stockton Intermodal	BNSF	10	Stockton	767
Union Pacific Oakland	UP	1	Oakland	447

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(ARB, 1998) Air Resources Board. *Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant*, Appendix III, Part A, Exposure Assessment, April 1998.

(ARB, 2000) California Air Resources Board, *Risk Reduction Plan to Reduce Particulate Emission from Diesel-Fueled Engines and Vehicles,* October 2000

(ARB – CHC, 2007) California Air Resources Board. *Technical supporting document: Initial Statement of Reasons for the Proposed Regulation for Commercial Harbor Craft*; September 2007

(ARB – GMAP, 2005) *California Air Resources Board. Goods Movement action Plan, Phase I: Foundations;* September 2005

(BTH & Cal EPA, 2007) Business Transportation and Housing Agency and California Environmental Protection Agency , *Goods Movement Action Plan* 2007

(EPA 1990) US Environmental Protection Agency
http://www.epa.gov/air/caa/peg/

(PortBenicia, 2007) Port of Benicia, AMPORTS, Website
http://www.amports.com/prod04.htm

(Port HB, 2007) Port of Humboldt Bay – Humboldt Bay Recreation & Conservation District Website: http://www.humboldtbay.org/portofhumboldtbay

(PortHueneme, 2007) Port of Hueneme, Oxnard harbor District, website:
http://www.portofhueneme.org

(PortLA, 2007) Port of Los Angeles website: http://www.portoflosangeles.org

(PortLB, 2007) Port of Long Beach website: http://www.polb.com

(PortOakland, 2007) Port of Oakland website: http://www.portofoakland.com

(PortPitt, 2007) Port of Pittsburg – Marina Home Page – City of Pittsburg, California website: http://www.pittsburgmarina.com/pittsburg/marina

(PortRed, 2007) Port of Redwood City website: http://www.redwoodcityport.com

(PortRich, 2007) Port of Richmond – Richmond CA – Official Website:
http://www.ci.richmond.ca.us/index.asp?NID=102

(PortSac, 2007) Port of Sacramento website: http://www.portofsacramento.com

(PortSD, 2007) Port of San Diego website: http://www.portofsandiego.org

(PortSF, 2007) Port of San Francisco website: http://www.sfport.com

(PortStocton, 2007) Port of Stockton website: http://portofstockton.com

II. REGULATORY STATUS AND PUBLIC OUTREACH

A. Regulatory Authority

California's Air Toxics Program, established under California law by AB 1807 (Stats. 1983, Ch. 1047) and set forth in the Health and Safety Code (HSC) sections 39650 through 39675, mandates that ARB identify and control air toxics emissions in California. The identification phase of the Air Toxics Program requires the ARB, with participation of other state agencies, such as the Office of Environmental Health Hazard Assessment (OEHHA), to evaluate the health impacts of, and exposure to, substances and to identify those substances that pose the greatest health threat as TACs. ARB's evaluation is then made available to the public and is formally reviewed by the Scientific Review Panel (SRP) established under HSC section 39670. Following the ARB's evaluation and the SRP's review, the Board may formally identify a TAC at a public hearing. Following the identification of a substance as a TAC, HSC sections 39658, 39665, 39666, and 39667 require ARB, with the participation of the air pollution control and air quality management districts (districts), and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance.

In addition, the trucks subject to this regulation are considered vehicular sources. As such, the proposed regulation would be adopted under the authority provided in the HSC section 39667. The Air Resources Board is authorized to implement and enforce the proposed regulation under HSC Sections 39674 and 42400.

ARB has been granted both general and specific authority under the Health and Safety Code (HSC) to adopt the proposed regulation. HSC sections 39600 (General Powers) and 39601 (Standards, Definitions, Rules, and Measures) confer to the ARB, the general authority and obligation to adopt rules and measures necessary to execute the Board's powers and duties imposed by State law. HSC sections 43013(b) and 43018(a) provide broad authority to achieve the maximum feasible and cost effective emission reductions from <u>all</u> mobile source categories, including on-road diesel engines.

B. Summary of Existing Regulations and Programs

1. Diesel Risk Reduction Program

In 1998, the Board identified diesel PM as a TAC with no Board-specified threshold exposure level, pursuant to Health and Safety Code (HSC) sections 39650 through 39675. A needs assessment for diesel PM was conducted between 1998 and 2000 pursuant to HSC sections 39658, 39665, and 39666. This resulted in ARB staff developing and the Board approving the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (Diesel RRP) in 2000. The Diesel RRP presented information on the available options for reducing diesel PM and recommended regulations to achieve these reductions. The plan's scope was broad, addressing all categories of mobile and stationary engines. It included recommendations for the development of control measures for diesel sources, such as those covered by the proposed regulation. The ultimate goal of the Diesel RRP is to reduce, by 2020, California's diesel PM emissions and associated cancer risks by 85 percent from the 2000 levels (ARB, 2000).

In 2001, the Office of Health Hazard Assessment (OEHHA), pursuant to SB 25 (1999, Escutia), identified diesel PM as a TAC due to its potential to cause children and infants to be more susceptible to illness. Furthermore, SB 25 required ARB to adopt control measures to reduce the public's exposure to diesel PM (HSC § 39669.5).

The proposed regulation reduces diesel PM emissions from commercially fueled diesel motor vehicles with gross vehicle weight rating (GVWR) of 33,000 lbs. and greater and helps achieve the ambient air quality goals set forth in this Diesel Reduction Plan.

2. State Implementation Plan

The federal Clean Air Act (CAA) requires U.S. EPA to establish National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health, including fine particulate matter ($PM_{2.5}$) and ozone. Set to protect public health, the NAAQS are adopted based on a review of health studies by experts and a public process. Ambient $PM_{2.5}$ is associated with premature mortality, aggravation of respiratory and cardiovascular disease, asthma exacerbation, chronic and acute bronchitis and reductions in lung function. Ozone is a powerful oxidant. Exposure to ozone can result in reduced lung function, increased respiratory symptoms, increased airway hyper-reactivity, and increased airway inflammation. Exposure to ozone is also associated with premature death, hospitalization for cardiopulmonary causes, and emergency room visits for asthma.

Areas in the State that exceed the NAAQS are required by federal law to develop State Implementation Plans (SIPs) describing how they will attain the NAAQS by certain deadlines. The NOx emission reductions are needed because NOx leads to formation in the atmosphere of both ozone and $PM_{2.5}$; diesel PM emission reductions are needed because diesel PM contributes to ambient concentrations of $PM_{2.5}$.

The South Coast Air Quality Management District (SCAQMD) and the San Joaquin Valley Air Pollution Control District (SJVAPCD) are designated as nonattainment of both the federal 8-hour ozone and federal PM2.5 NAAQS. In order to demonstrate that the necessary emission control programs are in place, the U.S. EPA requires that all necessary emission reductions be achieved by 2014 for PM2.5 and 2023 for ozone.

In both the South Coast and San Joaquin Valley air basins, significant reductions of NOx are crucial to meet the federal standards. For example, at this time, the strategy to achieve attainment of the $PM_{2.5}$ standards in the South Coast Air Basin includes staff estimates that a 55 percent reduction in NOx emissions from 2006 levels (i.e., a total reduction of hundreds of tons per day) and a 15 percent reduction in direct $PM_{2.5}$ emissions from 2006 baseline levels will be necessary for attainment of the $PM_{2.5}$ standards in the South Coast Air Basin. The NOx emission reductions from the proposed regulation would play an essential role in assisting the South Coast Air Basin with meeting its 2014 $PM_{2.5}$ deadline as well as its future ozone deadlines.

3. Goods Movement Action Plan

In April 2006, the Board approved the *Emission Reduction Plan for the Ports and Goods Movement in California* (Plan) (ARB, 2006). The Plan identifies strategies for reducing emissions created from the movement of goods through California ports and into other regions of the State. The Emission Reduction Plan is part of the broader Goods Movement Action Plan being jointly carried out by the California Environmental Protection Agency and the Business, Transportation, and Housing Agency. Phase I of the Goods Movement Action Plan (GMAP) was released in September 2005, and highlighted the air pollution impacts of goods movement and the urgent need to mitigate localized health risk in affected communities. The final GMAP was released in January 2007 and includes a framework that identifies the key contributors to goods movement-related emissions.
The Plan identifies numerous strategies for reducing emissions from all significant emission sources involved in goods movement, including ocean-going vessels, harbor craft, cargo handling equipment, locomotives, and trucks. The Plan establishes emission reduction goals for drayage trucks including modernizing (replacing and/or retrofitting) port trucks, implementing California and federal 2007 truck emission standards, and restricting entry of trucks new to port service unless equipped with diesel PM controls. The proposed regulation would represent a significant first step toward satisfying the Emission Reduction Plan goals (BTH & CalEPA, 2007).

C. Chemical and Physical Characteristics of Diesel

Diesel engines produce a complex mixture of inorganic and organic compounds that exist in gaseous, liquid, and solid phases. The gaseous fraction is composed of typical combustion gases such as nitrogen, oxygen, carbon dioxide, and water vapor. However, as a result of incomplete combustion, the gaseous fraction also contains air pollutants such as carbon monoxide, sulfur oxides, nitrogen oxides, volatile organics, alkenes, aromatic hydrocarbons, and aldehydes, such as formaldehyde and 1,3-butadiene and low-molecular weight polycyclic aromatic hydrocarbons (PAH) and PAH-derivatives (ARB, 1998).

One of the main characteristics of diesel exhaust is the release of particles at a markedly greater rate than from gasoline-fueled vehicles, on an equivalent fuel energy basis (ARB, 1998). The composition of diesel exhaust varies according to engine type, engine age, and horsepower, operating conditions, fuel, lubricating oil, and whether or not an emission control system is present. Diesel PM is either directly emitted from diesel-powered engines, mostly particulate matter, or is formed from compounds in gaseous diesel emissions such as SO_2, NO_X, or organic compounds, also called secondary compounds.

Diesel PM consists of both solid and liquid material and can be divided into three primary fractions: the soluble organic fraction, sulfate fraction, and the elemental carbon fraction. The organic fraction consists of soluble organic compounds such as aldehydes, alkanes and alkenes, and high-molecular weight PAH and PAH-derivatives, such as nitro-PAHs. Many of these PAHs and PAH-derivatives, especially nitro-PAHs, have been found to be potent mutagens and carcinogens. The soluble organic fraction (SOF) consists of unburned organic compounds in the small fraction of the fuel and atomized and evaporated lube oil that escaped oxidation. These compounds condense into liquid droplets or are absorbed into surfaces of elemental carbon particles. Several components of these SOF have been identified as individual toxic air contaminants (ARB, 1998).

Diesel particles are mainly aggregates of spherical carbon particles coated with inorganic and organic substances. Almost the entire diesel particle mass is in the fine particle range of 10 microns or less in diameter (PM_{10}). Approximately 94 percent of the mass of these particles are less than 2.5 microns in diameter. Fine particles can remain in the atmosphere for weeks and travel thousands of kilometers from the emission source. By contrast, course particles can deposit onto the landscape within minutes and travel only tens, not thousands, of kilometers upon discharge. The high degree of elemental carbon distinguishes diesel PM from non-combustion sources of $PM_{2.5}$.

Nitrogen oxides emissions are produced almost entirely by the combustion processes. During combustion, oxygen reacts with nitrogen to form nitric oxide (NO), nitrogen dioxide (NO_2), and relatively small amounts other compounds of oxygen and nitrogen. Both molecular nitrogen (N_2) in the atmosphere and the chemically bound nitrogen in materials being burned can react with oxygen to form oxides of nitrogen (NO_X). When ultraviolet light from the sun reacts with a mixture of oxides of nitrogen and hydrocarbons, ozone is formed. Ozone is the major constituent of what is commonly referred to as smog.

D. Environmental Justice and Public Outreach

Environmental Justice

The ARB is committed to integrating environmental justice in all of its activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for incorporating Environmental Justice into the ARB's programs, consistent with the directive of California state law

(ARB, 2001). Environmental Justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. These policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities.

The Environmental Justice Policies are intended to promote the fair treatment of all Californians and cover the full spectrum of the ARB's activities. Underlying these Policies is a recognition that the agency needs to engage community members in a meaningful way as it carries out its activities. People should have the best possible information about the air they breathe and what is being done to reduce unhealthful air pollution in their communities. The ARB recognizes its obligation to work closely with all communities, environmental and public health organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these Policies.

The proposed regulation is consistent with the environmental justice policy to reduce health risks from TACs in all communities, including those with low-income and minority populations, regardless of location. The regulation will reduce diesel PM emissions from drayage trucks at ports and rail yards by accelerated turnover to cleaner engines and the use of the emission control technologies. The proposed regulation will provide air quality benefits for all Californians, particularly those living near ports and intermodal rail facilities where drayage trucks operate.

<u>Public Outreach</u>

During the development process, the ARB staff provided opportunities to present information about the proposed regulation at places and times convenient to stakeholders. For example, the meetings were held at times and locations that encouraged public participation, including evening sessions. Attendees included representatives from environmental community organizations, terminal operators, port and rail representatives, engine and diesel emission control associations, and other parties interested in mobile cargo handling equipment. These individuals participated both by providing data and reviewing draft regulations and by participating in open forum workshops, in which staff directly addressed their concerns. Table II-1 provides meeting dates that were made to apprise the public about the development of the proposed regulation.

Table II-1: Workshop/Workgroup and Public Outreach Meetings

Date	Meeting	Location	Time
August 30, 2006	Public Consultation	Port of Los Angeles	11:00 a.m.
September 8, 2006	Public Consultation	Elihu Harris Building, Oakland	10:00 a.m.
September 12, 2006	Maritime Air Quality Technical Working Group Meeting	Port of Long Beach, Board Room	8:00 a.m.
November 13, 2006	Public Workgroup	Cal/EPA Building, Sacramento (teleconference)	1:30 p.m.
October 27, 2006	No Net Increase Air Quality Task Force	Sheraton Los Angeles Harbor Hotel, San Pedro	1:00 p.m.
November 10, 2006	Public Workshop	ARB 13th Street Office, Sacramento	10:00 a.m.
January 9, 2007	Public Workshop	Port of Long Beach, Training Room	1:00 p.m.
January 31, 2007	Truck Driver Town Hall	Wilmington Senior Center	6:00 p.m.
February 13, 2007	Motor Carrier Town Hall	Oakland	9:30 a.m.
February 26 – 28, 2007	Faster Freight Convention	Long Beach Convention Center	8:00 a.m.
March 29, 2007	Truck Driver Town Hall	West Oakland Senior Center	6:00 p.m.
July 9, 2007	Public Workshop	Cal/EPA Building, Sacramento	1:00 p.m.
July 10, 2007	Public Workshop	Port of Los Angeles, Board Room	4:00 p.m.
July 11, 2007	Public Workshop	Port of San Diego, Board Room	1:00 p.m.
July 13, 2007	Public Workshop	West Oakland Senior Center	4:00 p.m.
October 30, 2007	Public Workshop	Port of Los Angeles, Board Room	1:00 p.m.
November 1, 2007	Public Workshop	Port of Oakland, Board Room	1:00 p.m.

Additional Outreach Efforts

Since the identification of diesel PM as a TAC in 1998, the public has been more aware of the health risks posed by the emissions of this TAC. At many of the ARB's community outreach meetings over the past few years, the public has raised questions regarding our efforts to reduce exposure to diesel PM. At these meetings, ARB staff told the public about the Diesel Risk Reduction Plan adopted in 2000 and described some of the measures in that plan, including those for both on-road and off-road diesel-fueled engines.

The ARB has held four public workshops and two public working group meetings since August 2006 in developing this rule (see Table II-1). Over 2,400 individuals and/or companies were notified for each workshop/meeting through our email listserve. Notices were posted to ARB's drayage truck and public workshops web sites. When possible, the workshops were broadcast live via the internet or available via teleconference, making them more easily accessible the public.

In addition to the public workshops and working group meetings presented in Table II-1, ARB staff and management participated in numerous industry, government agency, and community meetings over the past two years, presenting information on the Diesel Risk Reduction and Goods Movement Action Plans and our proposed regulatory approach at ports and intermodal rail yards. Some of the industry groups and environmental associations participating were railroad companies, California ports, air pollution control districts, the Wilmington Coalition for a Safe Environment, Citizens for a Better Environment, California Trucking Association, American Trucking Association, the Manufacturers of Emission Controls Association, National Resources Defense Counsel, port terminal operators, the Pacific Merchant Shipping Association, the Pacific Maritime Association, local community EJ organizations, private businesses, and others. Staff also gave many presentations at the request of individual stakeholder groups.

Outreach efforts have also included hundreds of personal contacts via telephone, electronic mail, regular mail, surveys, facility visits, and individual meetings with interested parties. These contacts have included interactions with engine manufacturers and operators, emission control system manufacturers, local, national, and international trade association representatives, and environmental, community, and public health organizations.

As a way of inviting public participation and enhancing the information flow between the ARB and interested parties, staff created a intermodal truck Internet web site (http://www.arb.ca.gov/msprog/onroad/porttruck/porttruck.htm) in February 2006. Since that time, staff has consistently made available on the web site all related documents, including meeting presentations and draft versions of the proposed regulatory language. The web site has also provided background information on diesel PM, workshop and meeting notices and materials, and other diesel related information, and has served as a portal to other web sites with related information.

REFERENCES

(ARB, 1998) Air Resources Board. *Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant*, Appendix III, Part A, Exposure Assessment, April 1998.

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(ARB, 2001) California Air Resources Board, *Policies and Actions for Environmental Justice*; December 2001.

(ARB, 2006) California Air Resources Board, *Emission Reduction Plan for Ports and Goods Movement in California*; March 2006

(BTH & Cal EPA, 2007) Business Transportation and Housing Agency and California Environmental Protection Agency, *Goods Movement Action Plan* 2007

III. DRAYAGE TRUCK INVENTORY AND EMISSIONS ESTIMATION

This chapter provides information about drayage trucks operating at California's ports and intermodal rail yards, including population, age distribution, emission inventory, and emission benefits resulting from the implementation of the proposed regulation. A detailed description of the methodologies used to determine this information is presented in Appendix B.

A. Drayage Truck Population and Age Distribution

To accurately estimate the number of trucks engaged in drayage business proved difficult. Currently, the ports and rail yards are not collecting license plate data on all trucks entering their respective facilities. To develop an inventory and age distribution of the trucks servicing the ports and intermodal rail facilities, staff utilized all possible sources of information. Staff analyzed container lift data, annual loaded and unloaded port tonnage data, Caltrans daily volume traffic data, as well as information collected during visits to the ports and intermodal rail yards.

ARB staff also received truck traffic data provided by the ports of Los Angeles, Long Beach, Oakland and the Hobart Burlington Northern Santa Fe (BNSF) intermodal rail facility in Commerce.

<u>Port and Intermodal Rail Truck Population</u>

The data collected by the ports and intermodal rail yard facilities showed that all trucks servicing the ports and rail yards can be segregated into three categories:

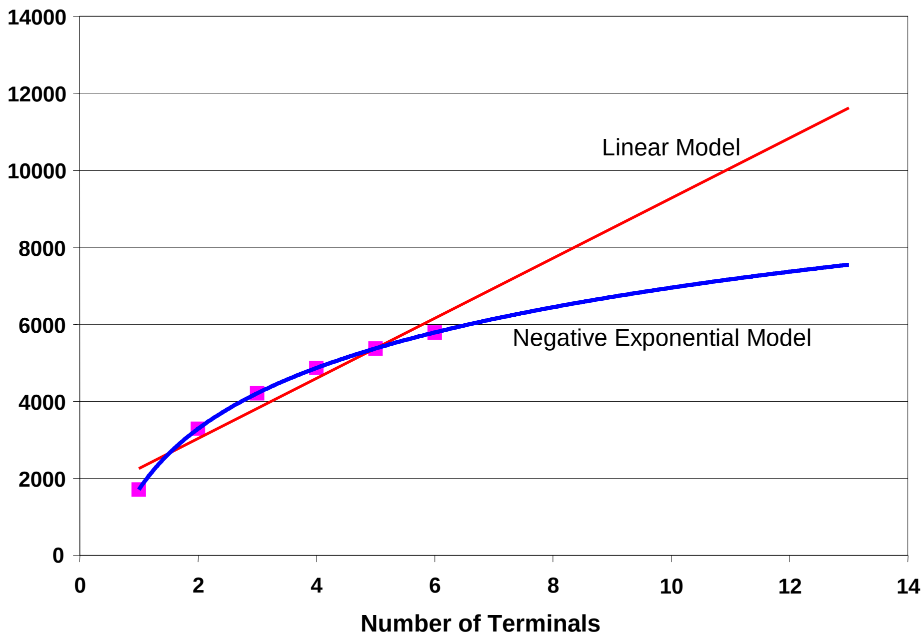
- Frequent Callers - Trucks that visited the port or rail yard one or more times per day
- Semi-Frequent Callers - Trucks that visited the port or rail yard at least 3.5 times per week.
- Non Frequent Callers - Trucks that visited the port or rail yard less than 3.5 times per week

<u>Ports of Los Angeles and Long Beach: Drayage Truck Population</u>

The ports of Los Angeles and Long Beach collected license plate data from seven of the thirteen container terminals using optical character recognition (OCR) technology during the 2006 calendar year. Optical character recognition data is captured by utilizing equipment which optically scans and records characters (in this case, license plate information) from trucks entering terminals. Approximately 2,460,000 truck visit data records were collected. From those data, it was determined that over 55,000 unique tucks visited the seven terminals and that frequent and semi-frequent trucks accounted for 70 percent of all trips to the ports. The vast majority of the trucks visiting the two ports were California registered. To determine the total number of trucks that visited the ports, staff used linear and exponential models. Figure III-1 represents the estimated population of frequent and semi-frequent callers using both models.

Calculations were verified using Caltrans daily traffic volume data for the major arteries servicing the ports (Freeways 710, 110 and 47). (Caltrans, 2006) Staff estimates that approximately 13,800 trucks are servicing all Los Angeles and Long Beach terminals. The total estimated number of trucks which visited both ports in 2006 is between 55,000 and 90,000**.**

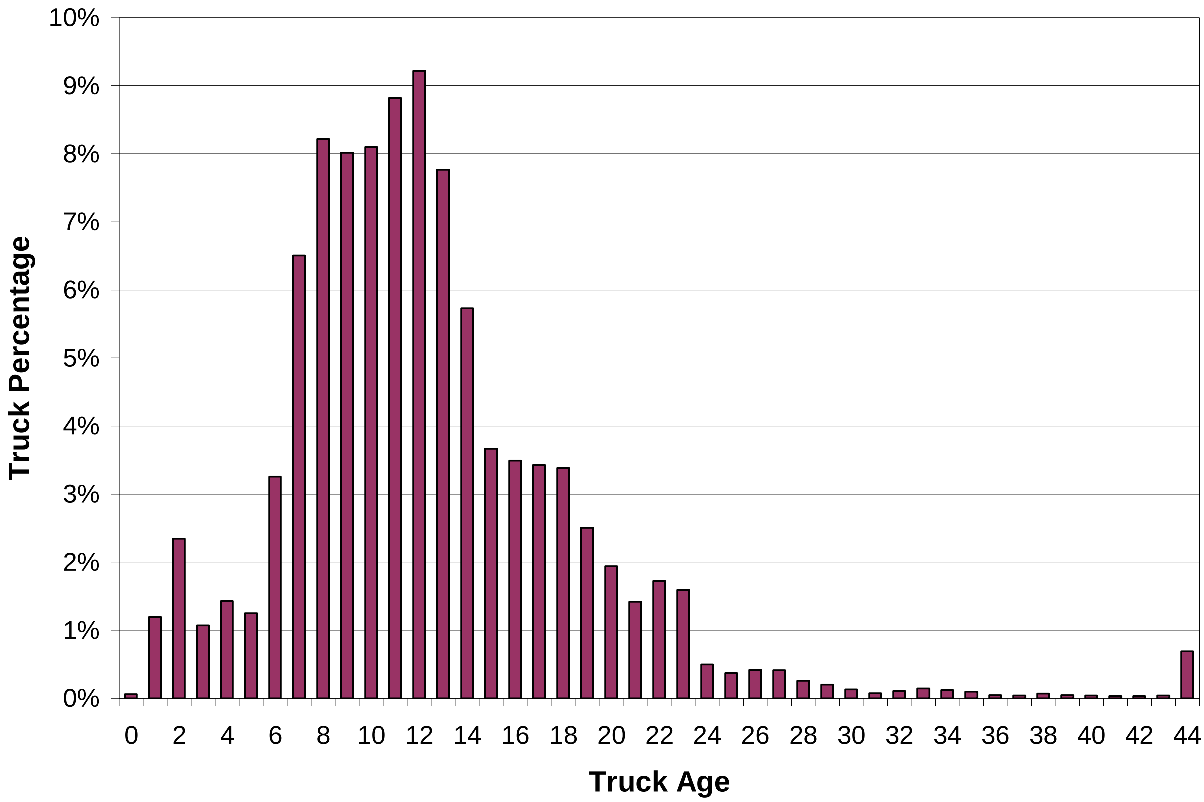
Figure III-1: Total Number of Frequent and Semi-Frequent Trucks



Port of Los Angeles and Long Beach: Drayage Truck Age Distribution

To determine the age distribution of the trucks visiting the Los Angeles and Long Beach ports, staff again analyzed the OCR data collected by the ports. The staff compared the license plate information with the Department of Motor Vehicle (DMV) data base and developed an age distribution for the trucks servicing the ports. Since the DMV data base only contained California registered trucks, Staff was unable to obtain age information on the out of state trucks. Overall, the average age of the trucks visiting the ports is 13 years old. Figure III-2 represents age distribution of frequent, semi-frequent and non frequent trucks servicing ports of Los Angeles and Long Beach.

Figure III-2: Drayage Truck Age Distribution at the Ports of Los Angeles and Long Beach



Port of Oakland: Drayage Truck Population

The Port of Oakland conducted a survey of trucks in and around the Port over three days in October 2006. Approximately 3,400 records were collected. Of those records, 2,400 unique trucks were identified.

Since the Port of Oakland collected truck traffic data for a very short period of the time, the ARB staff used data collected by the port, as well as Caltrans daily volume traffic data and rail yard traffic data to estimate the total, frequent, and semi-frequent population of the trucks servicing the Port of Oakland. (Caltrans, 2006)

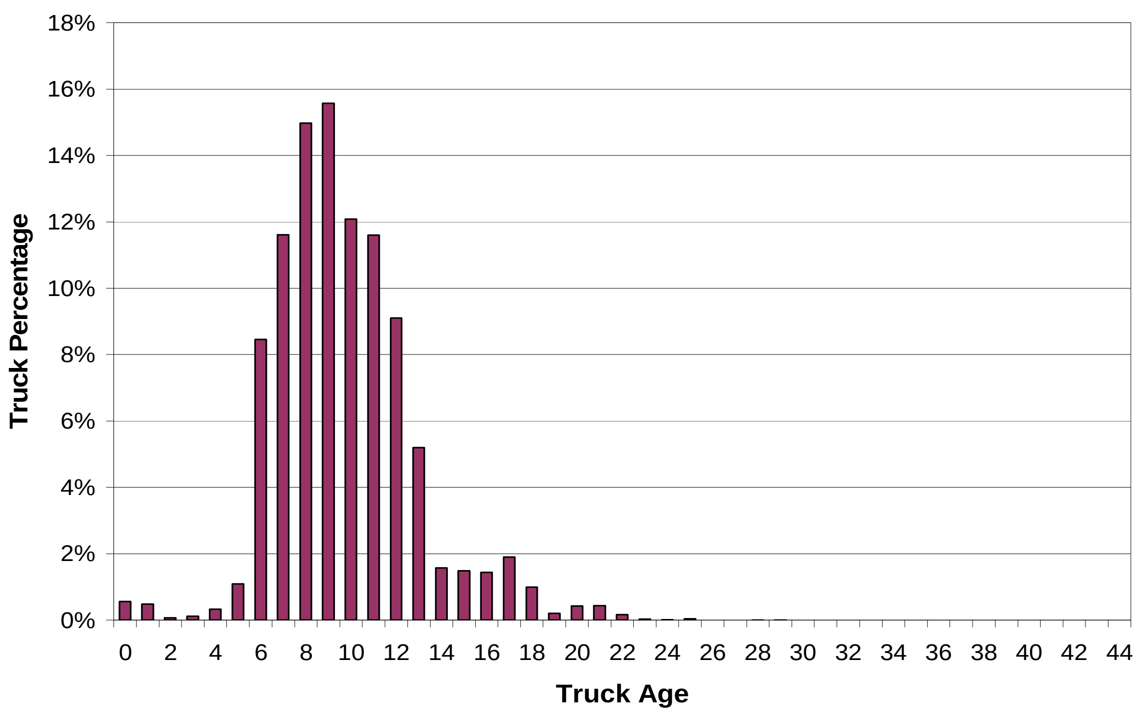
Approximately 8,000 trucks visited the port and the frequent and semi-frequent categories accounted for approximately 2,800 trucks.

Frequent and semi-frequent trucks visiting the Port of Oakland could be divided into two distinctive groups: one primarily focusing on servicing intermodal rail yards BNSF and UP and the second on servicing transloading facilities and distribution centers. Due to the proximity of the intermodal rail yard trucks, drivers on average can make four round trips per day. Trucks delivering containers to transloading facilities and distributions centers make on average two round trips per day.

Port of Oakland: Drayage Truck Age Distribution

The Port of Oakland truck age distribution was developed using truck survey data collected by the port. The ARB staff compared license plate information with the Department of Motor Vehicle (DMV) data base and developed an age distribution for the trucks servicing the port. Since the port of Oakland collected data from trucks entering the port for only a few days in October 2006, it was difficult to develop separate truck age distributions for frequent, semi-frequent and non frequent trucks. Figure III-3 represents the age distribution for all trucks servicing the Port of Oakland.

Figure III-3: Port of Oakland Truck Age Distribution



Intermodal Rail Yards: Drayage Truck Population

The ARB staff identified eleven intermodal rail yard facilities located less than 80 miles from the ports that are subject to this regulation. The majority of the effected rail yards are located in Southern California. To estimate the intermodal rail yard's drayage truck population, the staff used container lift data as well as truck traffic data provided by the rail yards. The BNSF Hobart in Commerce intermodal rail facility provided license plate data for all trucks entering their facility between October 1- 31, 2006. Approximately 134,000 truck trips were recorded and approximately 8,600 individual trucks visited the rail yard. To develop a drayage truck population, the staff separated container traffic for all intermodal rail yards into two categories:

- Trucks delivering containers directly from the ports
- Trucks delivering containers from warehouses or transloading facilities

Information obtained from the intermodal rail yards were used to determine the percentage of the trips in each category. Table III-1 represents the percentage of the containers delivered directly from the ports and the percentage of the containers delivered from the warehouses or transloading facilities. (ARB, 2007)

Table III-1: Intermodal Rail Yards Port versus Non-Port Containers Throughput

Facility Name	Port Containers	Warehouse/Transloading Containers
Oakland UP	80%	20%
Hobart BNSF	60%	40%
LATC UP	10%	90%
Commerce UP	30%	70%
Richmond BNSF	0%	100%
Commerce Eastern BNSF	0%	100%
ICTF UP	100%	0%
San Bernardino	25%	75%
Stockton Intermodal BNSF	50%	50%
Lathrop Intermodal UP	50%	50%
Oakland BNSF	100%	0%

To determine the intermodal rail yard truck population, only the warehouse/transloading container trips were counted in the inventory. Trucks transporting containers directly from the ports were included in port truck inventory.

ARB staff used license plate data collected by Hobart to calculate visit frequency. Frequent and semi-frequent trucks accounted for 80 percent of all trips. Staff assumed the same ratio of frequent, semi-frequent, and non- frequent truck visits for all effected rail yards. To calculate the number of trucks visiting rail facilities, the staff used lift data provided by the rail yards. Table III-2 summarizes the intermodal truck population.

Table III-2: Intermodal Rail Yard Truck Population

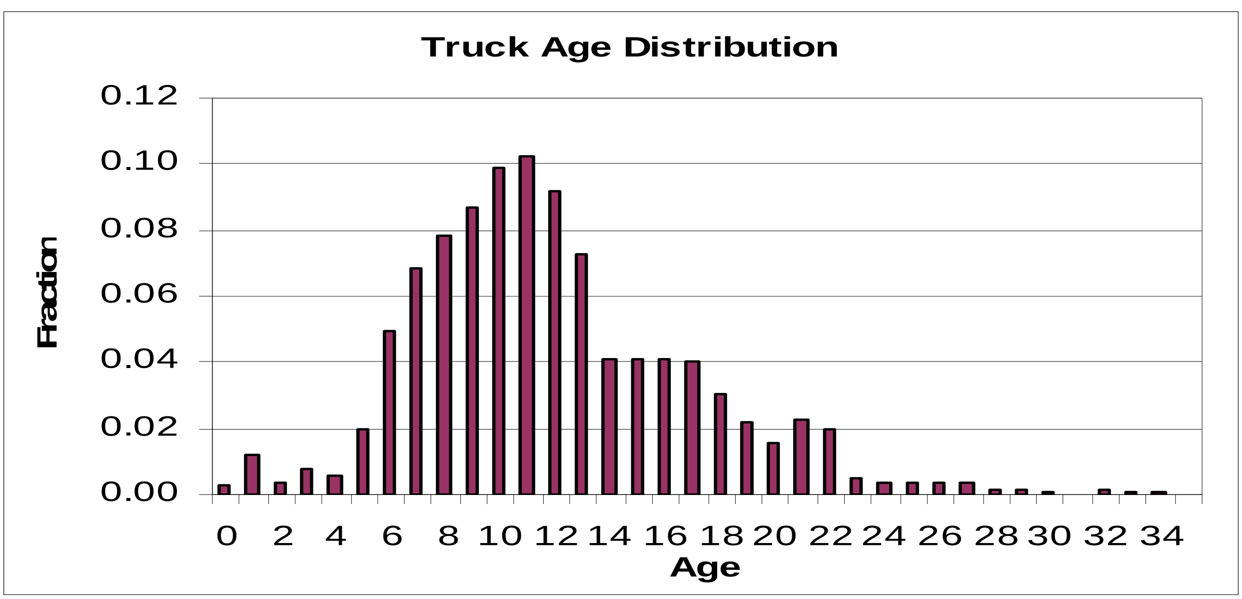
Facility Name	Frequent and Semi-Frequent Trucks	Total Number of Trucks
Oakland UP	134	447
Hobart BNSF	989	3,297
LATC UP	322	1,075
Commerce UP	503	1,676
Richmond BNSF	107	358
Commerce Eastern BNSF	390	1,301
ICTF UP*	0	0
San Bernardino	709	2,365
Stockton Intermodal BNSF	230	767
Lathrop Intermodal UP	196	652
Oakland BNSF *	0	0
Total	**3,581**	**11,937**

*ICTF UP in Los Angeles and BNSF in Oakland handled only port container traffic.

Intermodal Rail Yards: Drayage Truck Age Distribution

ARB Staff developed an intermodal rail yards drayage truck age distribution using license plate data provided by the Hobart intermodal rail facility. License plate information were collected and compared with the DMV data base to develop an age distribution for the trucks servicing the rail yards (Figure III-4).

Figure III-4: Intermodal Rail Yard Truck Age Distribution



Other California Ports: Truck Population

Unfortunately, only the ports of Los Angeles, Long Beach, and Oakland collected data on trucks entering their facilities. To estimate truck population for the remaining ports in California, ARB staff used tonnage data provided by the Pacific Maritime Association. Assuming that an average truck can transport between 45,000 and 50,000 lbs of cargo, the staff calculated the number of trucks needed to move the cargo from the port by dividing annual port tonnage by average truck capacity (Table III-3). (PMA, 2006) Staff assumed that the ratio of frequent and semi-frequent trucks to the total number of trucks is constant for all ports.

Table III-3: California Truck Population in Rest of the Ports

Facility Name	Frequent and Semi-Frequent Trucks	Total Number of Trucks
San Diego	325	929
Hueneme	111	316
San Francisco	100	287
Redwood City	73	210
Richmond	Dedicated Car Carriers	Dedicated Car Carriers
Humboldt Bay (Eureka)	33	95
Crockett	52	149
Pittsburgh	42	121
Stockton	175	501
Sacramento	37	106
Benicia	8	22
Total	957	2,734

Remainder of Ports in California: Truck Fleet Age Distribution

Only the ports of Los Angeles, Long Beach, and Oakland conducted license plate data for trucks entering their facilities.   For the remaining California ports, ARB staff assumed that the trucks have the same age distributions as trucks servicing the Port of Oakland *(*Chart III-4*)*. The staff decided to use the Port of Oakland truck age distribution data because traveling patterns and vehicle miles traveled (VMT) for these ports were similar.

Using the port and rail yard specific fleet age distributions, staff developed an overall drayage truck age distribution. Approximately 28 percent of the drayage fleet will have to be replaced to meet the Phase 1 requirements of the regulation. Additionally, 68 percent of the fleet can be retrofitted with DPFs (trucks MY 1994-2003) (Table III-4).

Table III-4: ARB Predicted 2007 Drayage Truck Age Distribution

Model Year	Percent of Population
2007	0.2%
2004-2006	3.8%
1994-2003	68.4%
Pre-1994	27.7%

Drayage Truck Population Growth

Due to the expected growth in goods movement at California ports, the drayage truck population is expected to increase to accommodate the increase in container and cargo volume. For future container and cargo volume growth, staff assumed that half the growth will be accommodated through the growth of the port truck fleet and half by an increase in efficiency of port operations. Furthermore, staff expects that the regulation requirements will create a pool of trucks that will service the ports exclusively (i.e., semi-frequent trucks will migrate to the frequent truck category and majority of the non frequent callers will make business decision to become frequent callers or option out port service). Table III-5 presents the estimated future port and intermodal rail yard truck population. Staff calculated upper and lower ranges of the truck population to account for the transition from semi-frequent and non frequent callers to exclusive drayage vocation.

Table III-5: Future Port and Intermodal Rail Yard Truck Population

Calendar Year	2007	2009	2010	2013	2014
Truck Population lower range	21136	22177	22716	24417	25012
Truck Population upper range	28349	29755	30484	32782	33586

B. Heavy Duty Diesel Truck Emission Standards

Table III-6: EPA Heavy-Duty Diesel on Road Engine Standards

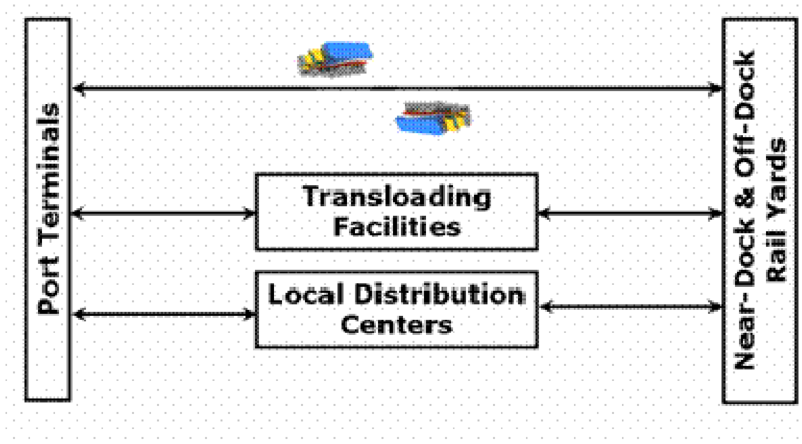
Emissions Standards (g/bhp-hr)		
Model Year	NOx	PM
1988	10.7	0.6
1990	6.0	0.6
1991	5.0	0.25
1994	5.0	0.1
1998	4.0	0.1
2004-2006	2.0	0.1
2007-2009	1.2(a)	0.01
2010-plus	0.20	0.01

(a) Between 2007 and 2009 U.S. EPA requires 50 percent of the heavy-duty diesel engine family certifications to meet the 0.20 g/bhp-hr NOx standard. Averaging is allowed and it is expected that most engines will conform to the fleet NOx average of approximately 1.2 g/bhp-hr. (EPAfac, 2000)

C. Estimated Emissions and Emission Reductions

Drayage truck emission inventory was developed using a step-wise approach. The first step was to obtain container lift data from major ports and intermodal rail yards. These data were used in a “container balancing” approach to estimate truck trips and destinations of those trips, as shown in Figure III-5. The method is based upon the assumption that the number of inbound and outbound container moves, as well as empty container moves is proportional to the number of trips generated by the drayage trucks. Port container lift data were used as baseline information to estimate the total number of import, export, and empty containers moved between terminals, to rail yards, to local distribution centers, and on longer hauls.

Figure III-5: Containerized Cargo Movements by Truck



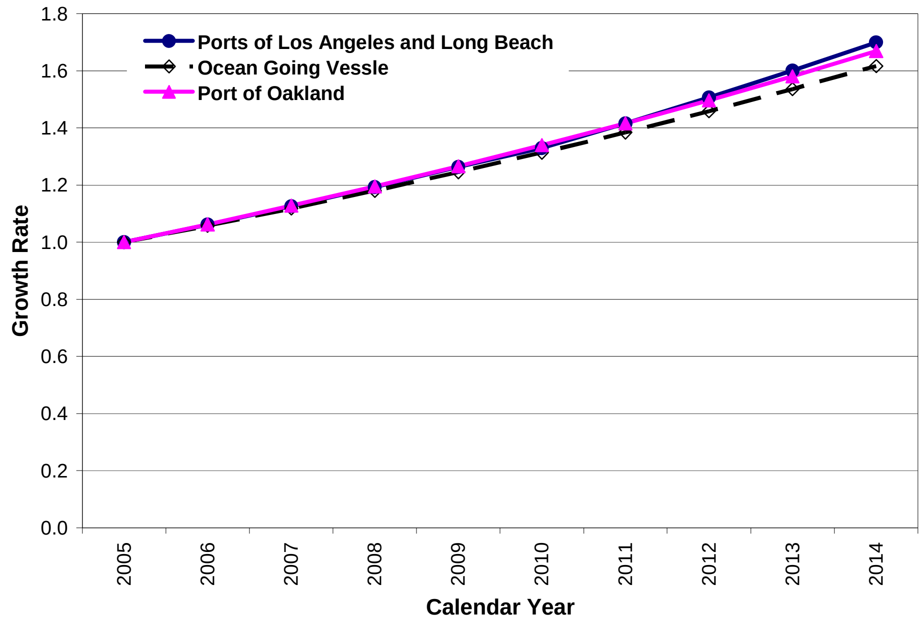
In the second step to develop this emissions inventory, staff estimated fleet average travel miles per trip by analyzing drayage truck activity studies and data collected in 2004 to 2007. With truck trips and travel miles per trip, we estimated drayage truck travel miles (VMT). Next, we estimated base year emissions by coupling emission rates to VMT. Equation EIII-1 describes our method for estimating emissions by calendar year.

$$EM_y = Trip_y * Mile * ER_y * DFG_y \qquad \text{(EIII-1)}$$

Where, *EM* = emissions (tons/year)
y = calendar year
Trip = the number of trips (trips/year)
Mile = truck travel miles (miles/year)
ER = emissions rates (g/mile)
DFG = drayage truck activity growth rate (ARB, 2006a)

Future year emissions, 2007 to 2014, were forecasted with the projected drayage fleet growth rate. These growth rates were based on container vessel installed power growth rates previously developed for ARB's Goods Movement Emissions Reduction Plan and adjusted with rail facility growth rates at the ports of Los Angeles/Long Beach and Oakland. Truck activity is anticipated to grow approximately 5 percent per year between 2005 and 2014 as shown in Figure III-6. (POLA, 2005)(POLB, 2007)

Figure III-6: Drayage Truck Activity Growth Rates at Ports in California



Using the emissions inventory approach described above, staff estimated total drayage truck VMT by year in California. VMT is projected to grow every year, consistent with increasing international trade and economic growth, and is projected to grow 50 percent statewide by 2014.

Finally, in the process of emissions inventory development, staff conducted extensive emissions inventory model validation studies by collecting drayage truck traffic information, surveying truck trip origins and destinations (O-D), interviewing port terminal and intermodal rail yard operators, and communicating with drayage truck trip generation / travel demand model developers / modelers. Validation studies were very important in developing this emissions inventory, because these studies led to a more complete understanding of drayage truck behavior and therefore key assumptions affecting activity and emissions estimates.

Truck activity data were not available for the Ports of Stockton, Hueneme, and San Diego, and smaller Bay Area ports, which complicated emissions estimates. To estimate emissions, staff scaled emissions from the Port of Oakland to other smaller ports using non-petroleum related throughput tonnage. This approach assumed that operations at other ports are similar to operations at the Port of Oakland. This assumption is simplistic but necessary given the limited information available for these ports.

For future projection we estimated truck activity growth based upon container vessel installed power growth rates developed for ARB's Goods Movement Emissions Reduction Plan and adjusted with rail facility growth rates at the ports of Los Angeles /

Long Beach and Oakland. Truck activity is anticipated to grow approximately 5 percent per year between 2005 and 2014 as shown in Figure III-6.

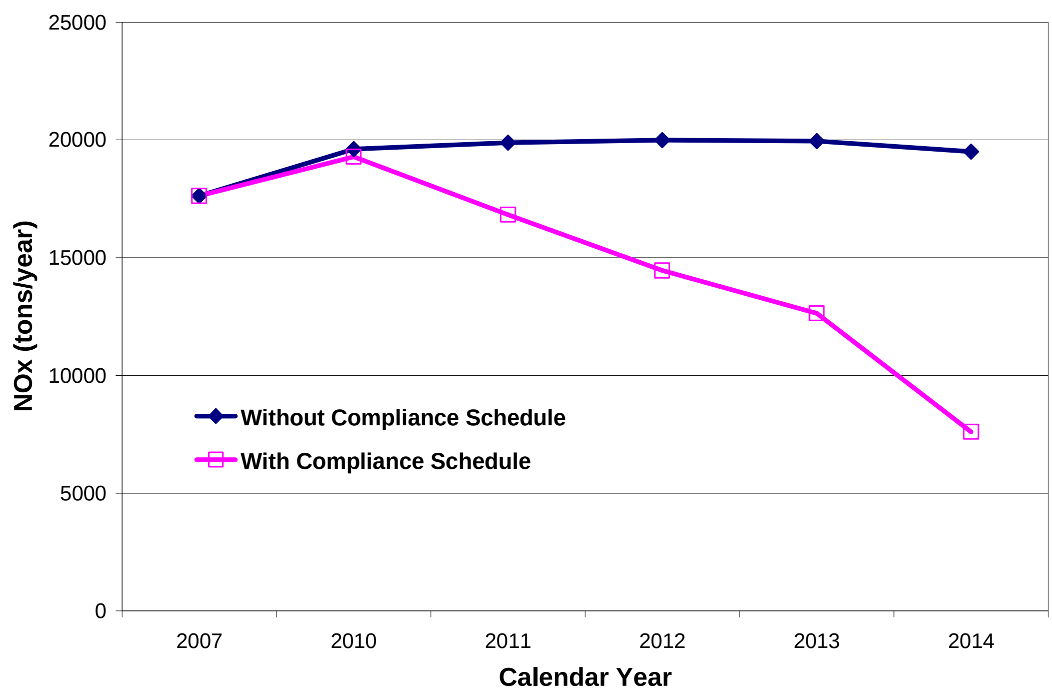
Table III- 7 summarizes emissions benefits from the drayage truck regulation.

Table III-7: Emissions Benefits from Drayage Truck Regulation

Calendar Year	2007	2010	2011	2012	2013	2014
NOx (T/Y) emission without regulation	17624	19602	19883	19996	19952	19503
NOx (T/Y) emission with regulation		19286	16821	14452	12636	7606
PM (T/Y) emission without regulation	854	849	868	889	893	873
PM (T/Y) emission with regulation		122	120	121	126	127

Figure III-7 provides baseline and with regulation NOx emissions estimates. Results show the regulation is projected to generate 61 percent reductions in NOx through the turnover of the fleet to 2007 emission standard trucks by 2014.

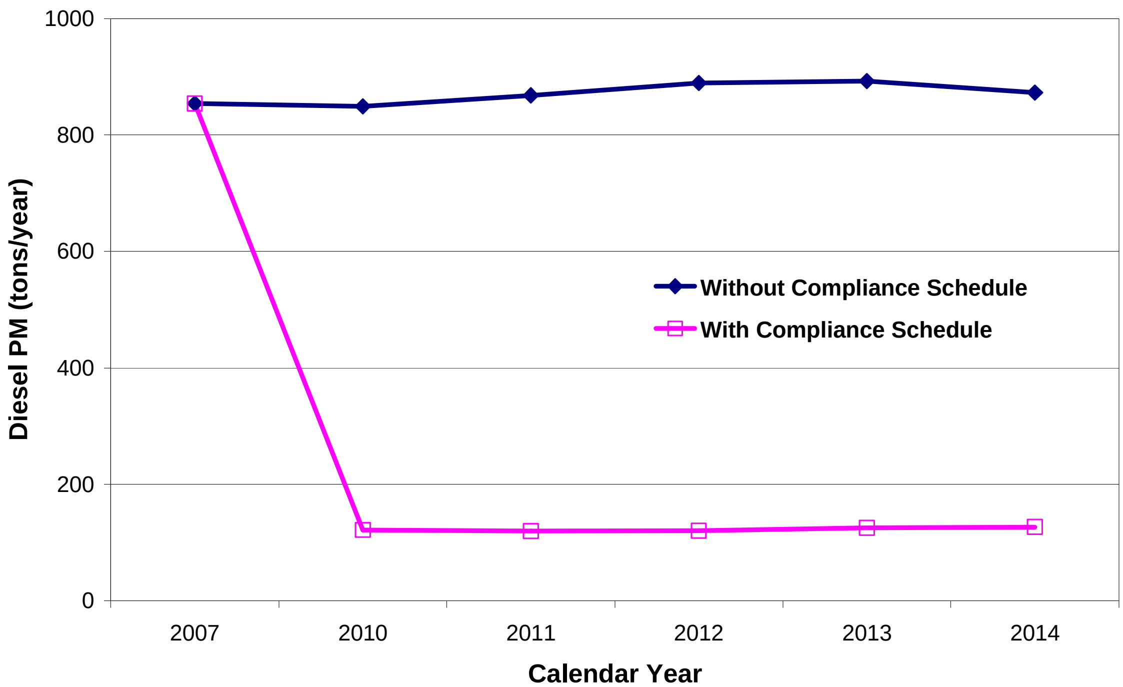
Figure III-7: Statewide Drayage Truck NOx Emissions with and without the Proposed Regulation



By December 31, 2013 all drayage truck engines would meet or exceed 2007 emission standards except for 2004 to 2006 MY engines. As a result, staff redistributed the population of pre-2004 MY trucks to trucks meeting 2007 or better emission standards across each of the calendar years 2010 to 2014. The result of this methodology shows a decrease in NOx emissions (Figure III-3) in the years 2011 to 2013, although the proposed regulation does not require it.

Figure III-8 displays baseline and with regulation statewide diesel PM exhaust emissions. Results show the regulation is projected to generate 85 percent reductions in diesel PM with the integration of diesel particulate filters and the turnover of the fleet to 2007 emission standard trucks by 2014.

Figure III-8: Statewide Drayage Truck Diesel PM Emissions with and without the Proposed Regulation



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IV. ENVIRONMENTAL IMPACTS

This chapter describes the potential environmental impacts of this proposed regulation. This proposed regulation is intended to protect the health of California's citizens by reducing diesel engine emissions from drayage trucks operating in California. An additional consideration is the impact that implementation of the proposed regulation may have on the environment. Based upon available information, the ARB staff has determined that no significant adverse environmental impacts should occur as the result of adopting the proposed regulation. This chapter also describes the potential impacts that the proposed regulation may have on hazardous waste disposal and air quality.

A. Legal Requirements

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential environmental impacts of proposed regulations. Because the ARB's program involving the adoption of regulations has been certified by the Secretary of Resources pursuant to Public Resources Code section 21080.5, the CEQA environmental analysis requirements may be included in the Initial Statement of Reasons (ISOR) for this rulemaking. In the ISOR, ARB must include a "functionally equivalent" document, rather than adhering to the format described in CEQA of an Initial Study, a Negative Declaration, and an Environmental Impact Report. In addition, staff will respond, in the Final Statement of Reasons for the regulation, to all significant environmental issues raised by the public during the public review period or at the Board public hearing.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following:

- An analysis of reasonably foreseeable environmental impacts of the methods of compliance;
- An analysis of reasonably foreseeable feasible mitigation measures; and,
- An analysis of reasonably foreseeable alternative means of compliance with the regulation.

Compliance with the proposed regulation is expected to directly affect air quality and potentially affect other environmental media as well. Our analysis of the reasonable foreseeable environmental impacts of the methods of compliance is presented below.

Regarding mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

The proposed regulation is needed to reduce the risk from exposures to diesel PM as required by Health and Safety Code (HSC) sections 39650 et seq., to help fulfill the goals of the October 2000 Diesel Risk Reduction Plan (ARB-OR, 2000), and to help meet the goals of the Emission Reduction Plan for Ports and Goods Movement in California (ARB-OR, 2006). The regulation is also necessary to fulfill ARB's obligations under HSC 43013 and 43018 to achieve the maximum feasible and cost effective emission reductions from all mobile source categories. The emission reductions from the proposed regulation in ambient levels of PM, NOx and reactive organic gases (ROG) will help make progress in meeting the State and Federal ambient air quality standards for ozone and PM in non-attainment areas of the State. Alternatives to the proposed regulation will be discussed in the Economic Impacts chapter of this report (Chapter VIII). ARB staff have concluded that there are no feasible alternative mitigation methods that would achieve similar diesel PM emission reductions at a lower cost.

B. Effects on Air Quality

The proposed regulation will provide diesel PM and NOx emission reductions throughout California, especially in communities surrounding sea ports and intermodal rail yards. These communities are heavily impacted by the heavy duty diesel trucks that service the ports and rail yards.

In 2010, we estimate approximately 727 tons/year (t/y) of diesel PM and in 2014, 11,900 tons/year of NOx will be removed from California's air as a result of the regulation, as shown in Table IV-1.

Table IV-1: Emission Benefits from Implementation of the Proposed Regulation

	PM (t/y)	NOx (t/y)
Emissions Reduced (tons)	727	11,897

The reductions due specifically to the regulation are summarized in Table IV-2 and Table IV-3 below. As shown below, PM emissions will be approximately 86 percent lower in 2010 and approximately 85 percent lower in 2014 than they would be without the regulation when compared to the 2007 baseline. The estimated NOx emissions are 3 percent lower and 56 percent lower in 2010 and 2014, respectively due to the implementation of the proposed regulation when compared to the 2007 baseline.

Table IV-2: Projected Statewide Diesel PM Benefits of the Proposed Regulation

Year	PM without Regulation (tons/day)	PM with Regulation (tons/day)	Emission Reductions from 2007 (tons/day)	% Emission Reductions from 2007
2007	3.0	3.0	0	0
2010	3.0	0.4	2.6	86
2011	3.0	0.4	2.6	86
2012	3.1	0.4	2.7	90
2013	3.1	0.4	2.7	90
2014	3.0	0.4	2.6	86

Table IV-3: Projected Statewide NOx Benefits of the Proposed Regulation

Year	NOx without Regulation (tons/day)	NOx with Regulation (tons/day)	Emission Reductions from 2007 (tons/day)	% Emission Reductions from 2007
2007	61	61	0	0
2010	68	67	6 (increase)	15 (increase)
2011	69	59	2	3
2012	70	50	11	18
2013	70	44	17	28
2014	68	27	34	56

C. Reasonably Foreseeable Environmental Impacts as a Result of Potential Compliance Methods

The ARB has identified two potential negative impacts resulting from the use of catalyzed diesel particulate filters to comply with the proposed regulation. These include increased NO_2 emissions and generation of hazardous ash that is accumulated on the filter (ARB-OR, 2007).

1. Increased Nitrogen Dioxide Emissions with Passive Catalyzed Diesel Particulate Filters

While not the case with active diesel particulate filters, most catalyzed diesel particulate filters (CDPF) form nitrogen dioxide (NO_2) as part of their normal operation. The CDPF works by mechanical filtration of PM from the exhaust through a ceramic or metallic filter followed by oxidation of the captured PM, mostly elemental carbon particles, to CO_2 which is released into the atmosphere. The oxidizing agent for this filter regeneration process is NO_2 which is produced through the catalytic oxidation of the nitric oxide (NO) created in the engine's combustion process (ARB-OR, 2007).

Typically during the regeneration process, more NO_2 is created than used and the excess NO_2 is emitted. Emissions measurements have shown an increase in the NO_2 fraction of NO_X emissions (NO plus NO_2) from heavy-duty diesel vehicles equipped with passive catalyzed diesel particulate filters even though total NO_X emissions remain approximately the same. The NO_2 to NO_X ratios downstream from a CDPF range from 20 to 70 percent, depending on the following factors: the diesel particulate filter systems, the sulfur level in the diesel fuel, and the duty cycle. On average, for diesel engines not equipped with a CDPF, approximately seven percent of the emitted NO_X is in the form of NO_2 (ARB-OR, 2007).

The ARB's Verification Procedure sets limits for secondary emissions from verified emission control systems. The limit on NO_2 emissions is intended to limit increases in ambient NO_2, secondary nitrate PM, ozone, and adverse public health impacts. Higher NO_2 emissions will result in a very small increase in ambient levels of NO_2 and ozone – pollutants associated with adverse health effects including respiratory symptoms, cardio-respiratory hospital admissions, and reduced lung function. Currently, all of California is in compliance with the State 1-hour ambient NO_2 air quality standard. The anticipated reductions in NO_X and associated ozone from the proposed regulation are expected to more than offset any increases that result from the use of CDPFs (ARB-OR, 2007).

2. Ash that is Accumulated on the DPF

The particulate matter trapped by a DPF includes solid carbonaceous material or soot, semi-volatile organic matter (SOF), and inorganic solid particles. During the regeneration of the trap, the captured soot and other combustible organic matter are oxidized to carbon dioxide and water, but the inorganic material is not typically combusted and accumulates on the filter as ash. The DPF provides an environmental benefit by filtering metallic ash from the exhaust, but for effective operation of the DPF, the accumulated ash, which is classified as a hazardous waste, must be periodically removed from the filter (ARB-OR, 2007).

The sources of ash in a DPF are fuel additives, engine lubricating oil, salts from environmental air, and motor wear. Ash primarily consists of oxides, sulfates and phosphates of iron, calcium, and zinc. Depending on the concentration of zinc, the ash may be classified as a hazardous waste. Title 22, CCR, section 66261.24 establishes two limits for zinc in a waste: 250 milligrams per liter for the Soluble Threshold Limit Concentration and 5,000 milligrams per kilogram for the Total Threshold Limit Concentration. The presence of zinc at or above these levels in ash is characterized as hazardous waste. Under California law, it is the generator's responsibility to determine whether their waste is hazardous or not. Applicable hazardous waste laws are found in the HS&C, division 20; title 22, CCR, division 4.5, and title 40 of the Code of Federal Regulations. Staff recommends that owners who install a DPF on a vehicle contact both the manufacturer of the DECS and the California Department of Toxic Substances Control (DTSC) for advice on waste management (ARB-OR, 2007).

DTSC personnel have advised ARB that it maintains a list of facilities that accept Household Hazardous Waste, such as ash, from small quantity generators. Dispose of Household Hazardous Waste usually includes a small fee. An owner who needs specific information regarding the identification and acceptable disposal methods for this waste should contact the California DTSC (ARB-OR, 2007).

Because of the time and costs associated with filter maintenance, there are also efforts by industry to reduce the amount of ash formed. Most of the ash is formed from the inorganic materials in engine oil, particularly from zinc-containing additives necessary to control acidification of engine oil; due in part to sulfuric acid derived from sulfur in diesel fuel. As the sulfur content of diesel fuel is decreased, the need for acid neutralizing additives in engine oil should also decrease. There are also a number of ongoing technical programs to determine the impact of changes in oil ash content and other characteristics of engine oil on exhaust emission control technologies, engine wear and performance. It may also be possible to reduce the ash level in diesel exhaust by reducing oil consumption from diesel engines. Diesel engine manufacturers over the years have reduced engine oil consumption in order to reduce PM emissions and to reduce operating costs for diesel engine owners. Further improvements in oil consumption may be possible in order to reduce ash accumulation rates in diesel particulate filters (ARB-OR, 2007).

D. Reasonably Foreseeable Mitigation Measures

The ARB staff has concluded that no significant adverse environmental impacts should occur from adoption of and compliance with the proposed regulation. Therefore no mitigation measures would be necessary.

E. Reasonably Foreseeable Alternative Means of Compliance

Alternative means to comply with the proposed regulation are provided through the use of alternative fuels or the use of available verified diesel emission control strategies that would achieve the same emission benefits as a MY 2007 vehicle replacement.

These compliance options provide the regulated entities with some flexibility for compliance with the proposed regulation. In addition, they also promote the development of cleaner retrofit technologies for drayage trucks.

F. Impact on Global Warming

Global warming is the process whereby emissions from anthropogenic sources, together with naturally-occurring gases, absorb infrared radiation in the atmosphere, leading to an increase in ambient temperatures world-wide. Compounds that potentially contribute to global warming include six substances identified in the Kyoto Protocol. These substances are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (SF_6). These substances are all gases that have long lifetimes in the atmosphere, anywhere from a year to several thousand years depending on the gas (ARB-HC, 2007).

Climate research has identified other chemical molecules that also have potential to alter the Earth's climate. These other chemical molecules, which have much shorter atmospheric lifetimes than CO_2 (several days, or less, depending on the chemical molecules), have not been directly included in climate change-related emission reduction efforts due to the scientific uncertainty of their magnitude of potential climate changing impacts (ARB-HC, 2007).

The chemical species not cited in the Kyoto Protocol are primarily anthropogenic pollutants emitted principally as by-products of fossil fuel and biomass combustion. One of the confounding aspects associated with these non-Kyoto chemical pollutants is the scientific community's uncertainty as to whether some of these chemical molecules have a warming or cooling effect on the world-wide climate. The chemical species thought to result in net warming include carbon monoxide (CO), volatile organic compounds, hydrogen (H_2), and the black carbon fraction of particulate matter (PM). With the exception of PM, the potential net warming effect of these chemical species is the result of the formation of tropospheric ozone (O_3) and methane. Two non-Kyoto chemical molecules that may have a net cooling effect are oxides of nitrogen, NO_X, and sulfur dioxide (SO_2) (ARB-HC, 2007).

Typically, Global Warming Potential (GWP) is the metric used to compare the relative significance of pollutants with respect to their impacts on global warming. The GWP of a specific substance is a measure of the additional amount of heat trapped in the atmosphere when one kilogram of that substance is instantaneously released to the atmosphere, relative to the instantaneous release of one kilogram of CO_2. A GWP is calculated using computer models that incorporate the radiative heat balance of the atmosphere and the chemical kinetics of all the substances involved. The atmosphere is assumed to be in a steady-state when the GWP of a substance is modeled. Changes in atmospheric temperature are modeled based on the introduction of a kilogram of a potential global warming substance (ARB-HC, 2007).

This section provides a general description of the impact of the projected emissions reductions on climate change and a rough estimate of the effect of the fuel economy penalty.

1. Greenhouse Gases

The most important class of climate forcing agents responsible for global warming are greenhouse gases (GHG). GHG are predominantly comprised of CO_2, methane (CH_4) and nitrous oxide (N_2O). Other GHGs include H_2O, carbon monoxide (CO) and ozone (O_3). These gases are known as GHGs, due to their transparency to high frequency solar radiation and their opacity to low frequency infrared radiation emitted from the Earth's surface. The gases differ in their atmospheric warming potential, and as a result, the contribution of each gas is determined as equivalent CO_2 emissions using conversion factors approved by the Intergovernmental Panel on Climate Change. For example, methane has 21 times the warming potential of carbon dioxide and nitrous oxide has 310 times the warming potential of CO_2. Diesel engines offer better thermal efficiency and fuel economy than their spark ignited counterparts, which leads to lower tailpipe and lifecycle CO_2 emissions. Nitrous oxide is produced as a byproduct of NO reduction and CO/hydrocarbon (HC) oxidation on noble metal catalysts in gasoline vehicle exhaust systems. The effects of catalyzed diesel particulate filters and other diesel exhaust after-treatment devices on N_2O emissions are unknown. However, urea-SCR may generate N_2O (ARB-OR, 2007).

In evaluating the potential GHG emissions changes and their impacts on climate change, it is relevant to examine changes in CO_2 emissions associated with fuel economy impacts, as well as impacts of particle and aerosol formation and emissions (ARB-OR, 2007).

<u>Fuel Economy</u>

CO_2 emissions from vehicles are directly proportional to fuel consumption. Phase 1 of the proposed regulation requires fleet owners to replace pre-1994 MY trucks (mechanical fuel injection) with 1994 or newer vehicles (electronic fuel injection). The replaced trucks have a better fuel economy (4.5 miles per gallon for mechanical fuel injection versus 6.0 miles per gallon for electronic fuel injection) and as a result, staff estimates a diesel fuel savings of 11 million gallons per year. This fuel savings is expected to reduce carbon dioxide emissions by approximately 7 percent.

Most DPFs employ some means to periodically regenerate the filter (burn off the accumulated PM). A particulate filter can either be regenerated passively or actively. ARB staff recognizes that model year 2007 or newer vehicles have a two percent fuel penalty for diesel-fueled active regeneration system; however, other engine improvements are expected to offset that penalty. Passive systems have no net effect on fuel economy.

Net Effect on Greenhouse Gases

The overall impact of the regulation on climate change would be negligible; however, fuel economy is expected to increase with the Phase 1 requirements resulting in an approximate 7 percent reduction in CO_2 emissions.

Aerosols

Particles, especially those with diameters smaller than 1 μm, can affect the earth's temperature and climate by altering the radiative properties of the atmosphere. "Reflective aerosols" will scatter solar radiation so that a substantial portion of the radiation incident to the Earth's troposphere is returned to space, thereby cooling the climate. Examples of these are sulfates, nitrates, and organic carbon particles. "Absorbing aerosols" will absorb solar radiation, transfer the energy to the atmosphere, and prevent sunlight from reaching the ground. These aerosols warm the atmosphere, but cool the surface. Black carbon aerosols, or soot, formed by incomplete combustion are absorbing aerosols and cause a positive climate forcing of uncertain magnitude. Current investigations indicate that black carbon and associated organic matter play a major role in climate change, but this role has not been quantified reliably. Modeled estimates for radiative forcing by black-carbon-containing aerosols range widely. It may be the second or third largest individual warming agent, following CO_2 and perhaps methane. Since diesel PM is composed largely of black carbon and associated organic matter, the diesel PM emissions reduction obtained with the proposed regulation would have a positive climate change impact by reducing the black carbon component of global warming. Also, because the lifetime in the atmosphere for most black carbon is short compared to CO_2, the control of black carbon emissions can bring an immediate environmental benefit compared to the slower response to CO_2 emissions controls (ARB-OR, 2007).

Ozone Precursors

It is estimated that tropospheric ozone has had the third largest impact on radiative forcing (1750 to present) of all GHGs. Changes in tropospheric ozone are due to anthropogenic increases in the emissions of ozone precursors – NO_X and VOCs. However, the effect of reducing these precursors is still uncertain, as there are no agreed-upon methods for estimating the Global Warming Potential of ozone precursors. Also, ozone production leads to the formation of particulate nitrate and secondary organics which enhance cooling. However, there are no methods for accounting for the indirect effects of changes in tropospheric chemistry. Ozone is short lived in the troposphere, with an average lifetime on the order of weeks, and is typically treated as a regional pollutant with direct and indirect climate effects that vary considerably by location (ARB-OR, 2007).

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V. PROPOSED REGULATION AND ALTERNATIVES

In this chapter, we discuss the key requirements of the proposed regulation for drayage trucks at California's ports and intermodal rail yards. This chapter begins with a general overview of the regulation and each major requirement is discussed and explained. This chapter is intended to satisfy the requirements of Government Code section 11343.2, which requires that a non controlling "Plain English" summary of the regulation be made available to the public. Unless otherwise noted herein, all references to drayage trucks include drayage trucks at ports and intermodal rail yards, as defined in the regulation.

A. Overview of the Proposed Regulation

The proposed regulation for Drayage Trucks at Ports and Intermodal Rail Yards is included in Appendix A. The regulation is designed to use available control technologies and strategies to reduce the general public's exposure to diesel particulate matter (PM) and oxides of nitrogen (NOx) emissions from drayage trucks. In addition, the regulation would include recordkeeping and reporting requirements to provide staff up-to-date information on drayage trucks, dispatching activities and compliance status.

The regulation would set requirements for drayage trucks in port and intermodal rail service. The regulation would also set requirements for port and rail authorities, port terminals operators, rail yards located within 80 miles of ports, motor carriers, trucks owners and drivers, and potentially other businesses located on port and rail yard property. Drayage trucks that don't operate at ports or intermodal rail yards, military tactical vehicles, and specialty vehicles would not be covered by the rule. Additionally, ports or rail yards can apply for exemptions providing certain requirements are met.

The proposed regulation would require all drayage trucks to meet specific performance standards as follows:

<u>Drayage Fleet</u>

- Retire or replace all trucks with pre-1994 MY engines.
- Trucks with 1994 – 2003 MY engines would reduce PM emissions by a minimum of 85 percent by December 31, 2009.
- Trucks with 1994 – 2003 MY engines would further reduce emissions by meeting the 2007 California and federal heavy-duty diesel emission standards by December 31, 2013.

Owners and operators of drayage trucks with 2004 – 2006 certified model year engines would only be subject to the monitoring, recordkeeping, reporting, and registry requirements of this regulation. They would also be subject to the emission standard requirements of the forthcoming regulation for in-use on-road diesel private fleets that the Board is planning to consider in 2008.

Possible Compliance Options

The proposed regulation would require engine replacements and trucks to meet performance standards based on California and federal on-road engine standards (emission standards). To achieve this goal, staff anticipates compliance strategies would include a combination of truck replacements and the installation of emission after treatment retrofit technologies. Currently, the most likely scenarios for compliance are as follows:

- Retire or replace all Pre-1994 MY engines

- Replace the current engine (truck) with one that is certified to the California and federal engine standard for NOx and PM.

- Replace the older truck, for which there are no verified retrofits, with a truck with available retrofits and install the retrofit(s).

- Install a level three VDECS to reduce PM emissions by 85 percent.

Staff expects the above solutions would represent the majority of strategies used, however, the regulation will allow for the development of alternative strategies.

The proposal includes provisions that allow qualified truck owners to delay compliance if no VDECS are available. If no retrofit technologies are available prior to a compliance deadline, trucks could be granted a one-time, one-year Phase 1 compliance extension or until an applicable retrofit technology is approved, whichever is shorter. This extension would only be available for 1994 – 2003 model year engines.

Summary of Stakeholder Responsibilities Including Recordkeeping and Reporting Requirements:

Ensuring success of the regulation is critical to reducing adverse local health impacts and meeting the states SIP obligations. Summarized below are the responsibilities of the affected entities:

- The Air Resources Board would have primary enforcement responsibility. The ARB would also be responsible for creating and maintaining a drayage truck registry and the issuance of compliance labels.

- Motor carriers would ensure that all drayage trucks they dispatch meet the regulatory requirements and would keep drayage truck dispatch records for a period of five (5) years. Motor carriers would also be responsible for ensuring truck drivers are able to provide motor carrier contact information during enforcement inspections.

- Truck owners are responsible for their trucks meeting regulatory emission standards and making sure it is registered in the drayage truck registry. Truck owners would also be required to maintain emission control equipment and keep an up-to-date maintenance log in their truck for enforcement personnel.

- Truck drivers are required to relay, when asked by enforcement personnel, contact information for their dispatching motor carrier.

- Port terminals and rail yard operators would be required to check each truck for a drayage truck registry label and collect information from the drivers of trucks not bearing registry labels. This information shall be forwarded to their respective port or rail authority.

- Port and rail authorities would take the information collected by the terminals and rail yard operators and forward it to ARB enforcement according to a prescribed schedule.

B. Discussion of the Proposed Regulation

Purpose

As specified in subsection (a) of the proposed regulation, the purpose of the regulation is to reduce diesel PM, NOx, and air contaminants from drayage trucks that operate at ports and intermodal rail yards in California.

Applicability

As specified in subsection (b) of the proposed regulation, the regulation would apply to anyone who owns drayage trucks operating at California's ports and intermodal rail yards. Drayage truck parameters include:

- heavy-duty (33,000 GVRW or greater) - Drayage trucks are class 8 heavy-duty trucks due to the requirements of transporting loaded containers and weight limitations of California's roadways. Class 7, 6 etc. trucks are unable to transport the majority of the fully loaded containers due to engine axel and weight limitations.

- on-road - Drayage trucks typically use public roadways and are required to be certified as on-road. Drayage activities by off-road engines have already been addressed by the recently enacted Cargo Handling Equipment regulation.

- diesel-fueled in part or in whole - This regulation will apply to a vehicle using any portion of diesel fuel. For clarity, liquefied natural gas (LNG) fueled trucks that use a small amount of diesel for pilot injection would have to abide by the requirements of this regulation.

- <u>non-dedicated -</u> (See Exemptions for clarification)

- <u>any origin</u> - All trucks that service the ports and rail yards are affected by the requirements of this regulation regardless of ownership or state / country of origin. For clarity, all NAFTA, out-of-country plated, out-of-state plated, publicly owned, and privately owned tucks are affected by the regulation.

<u>Exemptions</u>

The proposed regulation would not apply to uni-body dedicated use vehicles such as dedicated auto transports, fuel delivery vehicles, concrete mixers etc. These uni-body vehicles are exempt from the proposed regulation because they represent less than five percent of the drayage truck population and differ from 'typical' drayage trucks in other aspects such as high replacement costs. Staff expects these trucks would be subject to the private fleet rule currently under development by the ARB. The proposed drayage truck rule would also not affect emergency vehicles or military tactical or combat support vehicles.

Staff realizes it is critically important to guarantee an uninterrupted flow of goods through the ports and rail yards. To that end, the regulation would also grant the ARB Executive Officer the ability to authorize an emergency decree that allows non-compliant vehicles into the ports and rail yards during instances such as natural disasters.

The proposed regulation provides a process for seeking an exemption for ports or rail yards in whole or in part providing certain criteria are met. All ports and rail yards are unique, with an eclectic array of land uses – many not drayage related. As the regulation applies to truck activities on all properties owned or managed by a port or rail authority, the proposed regulation could negatively impact properties that have no drayage truck traffic or interests. An example could be the financial outlays necessary (infrastructure and staffing) to monitor all truck traffic even though the trucks are exempted under the proposed regulation. As such, the proposed regulation would allow the Executive Officer to exempt ports where the overwhelming majority of drayage trucks are exempted under the rule (i.e. ports solely serviced by dedicated uni-body car carriers). The regulation would provide a mechanism with guidelines for port or rail authorities to apply for the annual exemption if desired.

<u>Definitions</u>

The proposed regulation provides definitions of all terms that are not self-explanatory. There are 40 definitions to help clarify and enforce the regulation requirements. Most of the definitions listed in subsection (c) of the proposed regulation were developed by staff, with input from the public during workshops and workgroup meetings. Staff working on this regulation also coordinated with staff working on other diesel PM regulations to provide consistency where it was practical. Please refer to Appendix A, subsection (c) for a list of definitions.

Requirements

As specified in subsection (d), the regulation would set requirements in two phases (listed below) for drayage trucks that operate at California ports and intermodal rail yards located within 80 miles of ports. By December 31, 2009, Phase 1 of the emission limits would achieve substantial near-term PM reductions to reduce adverse health affects in nearby local communities. Phase 2 of the limits would achieve additional emission reductions by December 31, 2013 that are necessary for the State to meet its SIP commitments in federal non-attainment areas. The South Coast and San Joaquin Valley air basins are both designated as nonattainment of the federal 8-hour ozone and federal PM2.5 National Ambient Air Quality Standards (NAAQS). Significant reductions of NOx are crucial to meet the federal standards for PM2.5 by 2014 and ozone by 2023. The regulation would also set requirements for port and rail authorities, port terminals operators, intermodal rail yards located within 80 miles of ports, motor carriers, trucks owners and drivers, and potentially other businesses located on port and rail yard property.

1. Drayage Trucks

Phase 1: By December 31, 2009, all drayage trucks must be equipped with:

(A) 1994 – 2003 model year engine certified to California and federal emission standards and a level 3 VDECS;

or,

(B) 2004 or newer model year engine certified to California and federal emission standards.

Phase 2: By December 31, 2013, all drayage trucks must be equipped with an engine that:

(A) meets or exceeds 2007 model year California and federal heavy-duty diesel-fueled on-road emission standards;

or,

(B) is certified to 2004 or newer model year California or federal emission standards.

Staff has determined that the 2004 emission standard compliant trucks (MY 2004 to 2006) should be handled under the general private fleets' rule that is currently under development by the ARB. Staff is investigating several retrofit technologies that could allow these MY trucks to meet or exceed the 2007 California and federal heavy-duty diesel-fueled on-road emission standards in the future. (EPA-refguide, 1997)

The proposal also includes reporting and recordkeeping requirements for port and rail authorities, port terminal and intermodal rail yard operators, motor carriers, and truck owners as discussed earlier. All recordkeeping and reporting requirements are necessary and specifically designed to aid enforcement and to ensure the success of the proposed regulation.

2. Truck Owners

Under the proposed regulation, truck owners engaged in port or rail yard operations would be responsible for ensuring that their trucks meet all emission requirements prescribed by the regulation. This responsibility would include any financial outlay necessary to purchase and install retrofits or purchase new trucks. Owners would also be responsible for ensuring that their trucks are registered in the Drayage Truck Registry (DTR), as administered by the State. Additionally, the regulation would require owners to ensure that their emission control devices are properly maintained and that they keep a VDECS maintenance log in the truck at all times. They would also be responsible (in addition to the driver and motor carrier) for ensuring that the driver is able to present motor carrier contact information upon request. Truck owners may be subject to financial penalties for any non-compliance.

3. Truck Operators

Upon request, drayage truck operators (drivers) engaged in port or rail yard operations would be responsible for presenting to enforcement personnel all motor carrier contact information that they have been provided by dispatching motor carriers and, if applicable, the VDECS maintenance log that drayage truck owners are required to have on-board the truck. As motor carriers are responsible for dispatching compliant trucks and can be fined for not doing so, the truck driver's responsibility for presenting motor carrier information is critical in tracking a non-compliant truck back to the dispatching carrier. As stated, the maintenance log is the primary responsibility of the truck owner, but the regulation would require that the driver has the responsibility of presenting it upon request. Truck operators may be fined for non-compliance.

4. Motor Carriers

Motor carriers are the conduit through which virtually all drayage trucks are dispatched. The regulation would assign motor carriers with the primary responsibility for ensuring that compliant drayage trucks are dispatched to the ports and intermodal rail yards. To ensure the truck is compliant, each motor carrier would be required check that the truck is registered and current in the drayage truck registry (DTR), which is explained in more detail below. Checking registry status provides a method for the motor carrier to easily determine the compliance status of any drayage truck. To aid in outreach and help ensure that truck owners are apprised of the regulatory requirements, motor carriers would be required to provide a copy of the regulation or an ARB approved summary to each drayage truck owner. Similar to the truck owner requirements mentioned above, the motor carrier would also be required to ensure the truck operator has the motor carrier's contact information at all times while engaged in drayage truck service.

Motor carriers would be required to keep records of all trucks they dispatch to the ports and rail yards for at least five years. This recordkeeping requirement is designed to aid enforcement efforts by providing a paper trial that can be audited for compliance. Motor carriers may be subject to financial penalties for any non-compliance.

5. Port Terminal and Rail Yard Operators

As previously stated, motor carriers would be required to dispatch only compliant trucks. To ensure compliance, terminal and rail yard operators would be required to collect and submit information on each truck that does not display a DTR compliance label (non-compliant truck). Every three months, the non-compliant truck information would be required to be sent from the terminal or rail yard to the port or rail authority as shown in schedule A. Terminal and rail yard operators would be required to keep these records for a minimum of five years.

The terminals and rail yards would not be required to turn around non-compliant trucks – just collect required information for ARB enforcement. ARB staff expects this information to be used in the initial stages as an outreach tool to inform stakeholders of their responsibilities under the proposed regulation. After the outreach stage, the non-compliant truck information is expected to be used to target non-compliant trucks and motor carriers with increasingly more stringent penalties and other actions necessary to ensure compliance. Port terminals and rail yards may be subject to penalties for non-compliance with these responsibilities.

Schedule A: Terminal / Rail Yard Reporting Schedule

Date Truck Enters Terminal or Rail Yard	Date by which Information is to be Reported to Port or Rail Authority
January 1 – March 31	April 15
April 1 – June 30	July 15
July 1 – September 30	October 15
October 1 – December 31	January 15

6. Port and Rail Authorities

Port and rail authorities are responsible for gathering all the non-compliant truck information from their terminals or rail yards and then relaying that information to the ARB according to a prescribed schedule as shown in Schedule B below. The regulation states that port and rail authorities can specify the format of the data that is reported by the terminals and rail yards to best minimize data or collecting efforts. Port authorities and rail authorities may be subject to penalties for non-compliance with these responsibilities.

Schedule B: Port and Rail Yard Authority Reporting Schedule

Date by which Information is to be Reported to the California Air Resources Board
May 15
August 15
November 15
February 15

Compliance Extensions

The proposed regulation includes a possible compliance extension for specific circumstances. Subsection (d)(3)(B) of the proposed regulation in Appendix A details the requirements for the compliance extension.

The only compliance extension allowed by the proposed regulation would be for model year 1994 – 2003 engines, for which no level 3 diesel particulate filters, have been verified by ARB by the 2009 compliance deadline. This extension would only apply to the Phase 1 compliance deadline requiring the installation of a level 3 VDECS on 1994 – 2003 engines. Truck owners would be responsible for applying for the one-time, one-year compliance extension from ARB by June 1, 2009. If granted by the ARB Executive Officer, the compliance deadline for the truck would be extended to December 31, 2010. This extension is designed to allow for the development of new technology needed to reduce PM emissions for that particular model year engine. However, the extension is only granted for one year and cannot be renewed. After expiration of the compliance extension and no device has been verified, the truck owner would need to cease using the existing truck at ports and rail yards.

Compliance Flexibility

The need for flexibility is important when considering options to reduce emissions from drayage trucks. The proposed regulation is structured to allow compliance flexibility by setting minimum emission reduction goals instead of prescribing exact compliance methods. For example, a truck owner could choose to install a level 3 VDECS by December 31, 2009 and then again modernize to a new 2007+ truck to meet the Phase 2 requirements, or, he / she could choose to immediately purchase a 2007+ truck and meet both requirements. The regulation also purposefully allows for the development of new emission reduction technologies by not generally requiring specific model year vehicles; rather, the regulation requires the trucks to meet certain emission levels. Alternative strategies can include exhaust treatment control, engine re-powering, truck replacement, and the use of alternative fuels or fuel additives.

Recordkeeping and Reporting Requirements

The proposal includes provisions for motor carrier, terminal, rail yard, port and rail authority, truck owner, and truck operator reporting and recordkeeping requirements as discussed earlier in this chapter. All recordkeeping and reporting requirements are specifically designed to aid enforcement and to ensure the success of the proposed regulation.

Drayage Truck Registry

Beginning January 1, 2010, any truck entering a port or intermodal rail yard must have a DTR label in order to show compliance with the proposed regulation. Drayage truck owners that presently operate at ports or intermodal rail yards and intend to continue to do so would be required to submit an application for registration in the ARB administered DTR by September 30, 2009. This would provide ample time for ARB staff to process the applications and issue DTR labels before the January 1, 2010 deadline.

Trucks for which owners have demonstrated compliance with the regulation would receive a DTR compliance label. Truck owners would be required to affix the label in a location specifically spelled out in the regulation. The label would be used by ports, terminals, and ARB to determine compliance with the regulatory requirements. Beginning January 1, 2010, drayage trucks that service ports and intermodal rail yards that do not have DTR compliance label would be deemed non-compliant and subject to potential enforcement action.

Additionally, the ARB staff envisions that the registry, being statewide, will eventually become an invaluable resource to motor carriers in determining the compliance status of drayage trucks.

Severability

The proposed regulation includes a Severability clause. As specified in subsection (k) of the proposed regulation, the Severability clause ensures that if any portion of the regulation is deemed invalid or unconstitutional, that portion would be deemed a separate, distinct, and independent provision, and will not affect the validity of the remaining portions of the regulation.

C. Enforcement and Fines

As the primary enforcement entity, the Air Resources Board is proposing to increase its enforcement staff by four staff to meet the demands of the regulation. The ARB would augment its existing port and rail activities to include more frequent and targeted field inspections of trucks entering the ports and rail yards. Once a truck is pulled over, enforcement personnel would utilize the required maintenance log to ascertain if emission control equipment is being properly maintained. The ARB would also audit motor carriers, terminals, and rail yards to ensure only compliant drayage trucks are used. To achieve this result, enforcement personnel will audit records that are required by the regulation and take appropriate action in the case of non-compliance.

The key to compliance is outreach. Initially, ARB enforcement would utilize the DTR, non-compliant truck reports from terminals and rail yards, and other avenues (e.g. advertising in industry periodicals) to broadcast the requirements of the regulation. These efforts are outreach focused and are not expected to include fines. After a period of time, the ARB may start issuing fines. These fines would likely start at a minimum of $300 per occurrence and can ramp up to the maximum allowed by law ($10,000) per occurrence depending on frequency of non-compliance. Fines would be issued by ARB enforcement and the monies will go to the Air Pollution Control Fund.

D. Alternatives Considered

The Government Code section 11346.2 requires the ARB to consider and evaluate reasonable alternatives to the proposed regulation and provide the reasons for rejecting those alternatives. ARB staff evaluated three alternative strategies to the current proposal. Based on the analysis, none of the alternative control strategies were considered more effective than the proposed regulation. Full implementation of the proposed regulation is necessary to achieve ARB's goals of reducing diesel PM emissions by 85 percent and reducing NOx emissions to meet the State's SIP commitments. The proposed regulation provides owners of drayage trucks with flexibility in determining the most cost-effective control strategy that will meet the proposed emission standards and operational requirements.

This section discusses each of the three alternatives and provides reasons for rejecting those alternatives.

The ARB staff considered alternatives to the proposed drayage truck regulation. One alternative would be to do nothing and rely on natural turnover to allow trucks meeting federal engine standards to gradually replace the existing fleet. Manufacturers and vendors of on-road heavy-duty diesel engines have been subject to California and federal emission standards for more than twenty years. As of January 1, 2007, new model year engines are subject to the 2007 California and federal emission standards. Unfortunately, under the current drayage business model, staff estimates that 2007+ standard trucks won't cycle into the drayage fleet in large numbers until approximately the 2020 time frame. While very cost effective, this alternative would not achieve ARB's goals of immediate PM reductions for the health of communities located near ports and rail yard facilities and would not achieve the PM and NOx reductions needed by the State to achieve national ambient air quality standards and its SIP commitments.

A second alternative would be to require all covered drayage trucks to meet California and federal 2010+ model year emission standards by the end of 2013. This option would achieve and surpass PM and NOx emission reductions from the proposed regulation. However, in 2013, there will be relatively few used 2010 trucks available in the marketplace, as most trucks don't cycle into the used truck market until four or more years after their build date. The only compliance option would be a new model year truck with a price that could exceed $130,000 (2006 dollars). For this alternative, staff estimates PM cost effectiveness to be $166 - $223 per pound and NOx cost effectiveness to be $8 - $11 per pound. Even with the greater annual NOx emission reductions, the cost effectiveness of the alternative would be less than staff's current proposal and could create significant economic hardship for drayage truck owners. Consequently, staff has determined that this alternative is not feasible.

A third alternative would be to require half the drayage truck fleet to operate 2007+ model year emission standard engines and half operate LNG fueled trucks by the end of 2013. Similar to option 2, this option would achieve and surpass PM and NOx emission reductions from the proposed regulation (Westport, 2007). Staff expects there would not be an adequate supply of used LNG trucks due to current low production numbers. Staff estimates costs for used 2007 model year trucks to be $38,000 and costs for new LNG fueled trucks to be $175,000. Staff estimates that this alternative would have a PM cost effectiveness of $132 - $178 per pound and a NOx cost effectiveness of $8 - $10 per pound. Additionally, significant challenges and costs would exist for the development of the required LNG fueling infrastructure for a fleet of this size (10,000+ trucks). Even with greater annual NOx emission reductions, the cost of this alternative is more than twice the cost of the proposed regulation which could create significant economic hardship for drayage truck owners. Consequently, staff has determined that this alternative is not feasible.

REFERENCES

(EPA-refguide, 1997) U.S. EPA, *Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines* http://www.epa.gov/otaq/hd-hwy.htm

(Westport, 2007) LNG System for Heavy-Duty Trucks http://LNGtrucks.westport.com/

VI. FEASIBILITY OF THE PROPOSED REGULATION

In this section, the Air Resources Board (ARB) staff reviews the particulate matter (PM) and oxides of nitrogen (NOx) reduction technologies currently available and projected to be available in the near future for diesel-fueled mobile engines. For each type of technology, staff provides a description, discusses potential limitations, describes any in-use experiences, and identifies solutions that have been verified by the ARB.

Throughout this report, the acronym DECS, or “diesel emission control strategy”, is used to refer to any device, system, or strategy employed with an in-use diesel vehicle that is intended to reduce PM and/or NOx exhaust emissions. Examples of DECSs include, but are not limited to, add-on hardware, such as a diesel particulate filter (DPF), a diesel oxidation catalyst (DOC), or flow-through filter; alternative diesel fuels or fuel additives; and integrated systems that combine hardware with an alternative diesel fuel or fuel additive. The effectiveness of a DECS to reduce PM emissions is verified by the ARB at three different levels (see Table VI-1). NOx emission control devices are required to reduce NOx emission by at least 15 percent to be considered a DECS and are verified in 5 percent increments.

ARB staff believes that truck replacements and retrofits would be the most likely compliance options chosen to meet the proposed regulation’s requirements. Staff estimates that Phase 1 would result in the replacement of up to 8,300 pre-1994 MY trucks and the installation of up to 31,000 PM retrofits between 2009 and 2012. Model year 1994 to 2003 trucks are expected to use a combination of replacements and or retrofits. For Phase 2 of the regulation, staff anticipates the replacement of up to 32,000 trucks. Staff has met with industry representatives and is confident that there will be an adequate supply of used trucks, retrofit technologies, and installation and maintenance facilities to comply with the proposed regulation.

To evaluate the feasibility of the proposed regulation, staff conducted a phone survey of retrofit manufacturers, used truck dealerships, and retrofit installation facilities in California to determine the annual statewide capacity for drayage truck replacements and retrofit installations. Based on the survey, staff has estimated the current State’s capacity at about 20,000 retrofit installations per year. In addition, staff anticipates additional capacity would be created based on increased demand.

Staff also believes that there will be an adequate supply of used 2007+ MY trucks available for the December 31, 2013 compliance deadline. Replacement trucks should be available nationwide and the regulation allows enough time for the 2007+ MY trucks to cycle in large quantities into the used truck market.

Verification of Diesel Emission Control Strategies

As a way to thoroughly evaluate the emissions reduction capabilities and durability of a variety of DECSs, ARB has developed the Diesel Emission Control Strategy Verification Procedure (Procedure)(ARB, 2002). The purpose of the Procedure is to verify strategies that provide reductions in diesel PM and NOx emissions. Control device verification for both PM and NOx are classified by level as listed in Table VI-1

Table VI-1: Verification Classifications for Diesel Emission Control Strategies

Pollutant	Reduction	Classification
PM	< 25%	Not verified
	> 25%	Level 1
	> 50%	Level 2
	> 85%, or < 0.01 g/bhp-hr	Level 3
NOx	< 15%	Not verified
	> 15%	Verified in 5% increments

A complete and up-to-date list of verified DECSs (ARB, 2007) and the engine families, for which they have been verified, along with letters of verification, may be found on our web site at: http://www.arb.ca.gov/diesel/verdev/verdev.htm

A variety of strategies can be used for controlling emissions from diesel engines, including after treatment hardware, fuel strategies, and engine modifications. The two main types of technologies discussed here are add-on technologies such as DPFs and DOCs, and fuel types or fuel additives. These technologies can also be combined to form additional DECSs. Additionally, this report will discuss re-powering to a cleaner engine.

A. Hardware Diesel Emission Control Strategies

Currently, hardware DECSs include the DOC, which has been used in both on- and off-road vehicles and other stationary equipment for many years, and both passive and active DPFs. Recently, a new hardware DECS has been developed, the flow through-filter (FTF).

1. Diesel Particulate Filter

A DPF consists of a porous substrate that permits gases in the exhaust to pass through but traps the PM. DPFs are very efficient in reducing PM emissions and achieve typical PM reductions in excess of 90 percent. Most DPFs employ some means to periodically regenerate the filter (burn off the accumulated PM). A particulate filter can either be regenerated passively or actively.

2. Passive Diesel Particulate Filter

A passive catalyzed DPF reduces PM, carbon monoxide (CO) and hydrocarbon (HC) emissions through catalytic oxidation and filtration. Most of the DPFs sold in the United States use substrates consisting of ceramic wall-flow monoliths to capture the diesel particulates. Some manufacturers offer silicon carbide or other metallic substrates, but these are less commonly used in the United States. These wall-flow monoliths are either coated with a catalyst material, typically a platinum group metal, or a separate catalyst is installed upstream of the particulate filter. The filter is positioned in the exhaust stream to trap or collect a significant fraction of the particulate emissions while allowing the exhaust gases to pass through the system.

Effective operation of a DPF requires a balance between PM collection and PM oxidation, or regeneration. Regeneration is accomplished by either raising the exhaust gas temperature or by lowering the PM ignition temperature through the use of a catalyst. The type of filter technology that uses a catalyst to lower the PM ignition temperature is termed a passive DPF, because no outside source of energy is required for regeneration.

Passive DPFs have demonstrated reductions in excess of 90 percent for PM, along with similar reductions in CO and HC. A passive DPF is a very attractive means of reducing diesel PM emissions because of the combination of high reductions in PM emissions and minimal operation and maintenance requirements.

The successful application of a passive DPF is primarily determined by the average exhaust temperature at the filter's inlet and the rate of PM generated by the engine. These two quantities are determined by a host of factors pertaining to both the details of the application and the state and type of engine being employed. As a result, the technical information provided to ARB for verification by the manufacturer serves as a guide, but additional information may be required to determine whether a passive DPF will be successful in a given application.

The rate of PM generation is influenced by a variety of factors and the engine certification level cannot be used, in all cases, to predict PM emission levels in-use. Testing done by West Virginia University, for example, shows that a given diesel truck can generate a wide range of PM emission levels depending on the test cycle. Engine maintenance is another factor in determining the actual PM emission rate. The ARB's informational package for the heavy-duty vehicle inspection programs lists sixteen different common causes of high smoke levels related to engine maintenance (ARB 1999).

The average exhaust temperature in actual use is also difficult to predict based on commonly documented engine characteristics, such as the exhaust temperature at peak power and peak torque. The exhaust temperature at the DPF inlet is highly application dependent, in that the particular duty cycle of the truck plays a prominent role, as do heat losses in the exhaust system. Very vehicle-specific characteristics enter the heat loss equation, such as the length of piping exhaust must travel through before it reaches the DPF. Lower average exhaust temperatures can also be the result of operating vehicles with engines oversized for the application.

3. Active Diesel Particulate Filter

An active DPF system uses an external source of heat to oxidize the accumulated PM trapped in the filter. The most common methods of generating additional heat for oxidation involve passing a current through the filter medium, injecting fuel, or adding a fuel-borne catalyst or other reagent. Some active DPFs induce regeneration automatically when a specified backpressure is reached. Others use an indicator, such as a warning light, to alert the operator that regeneration is needed, and require the operator to initiate the regeneration process. Still other active systems collect and store diesel PM during engine operation and are regenerated at the end of the shift when the vehicle or equipment is shut off. A number of the filters are removed and regenerated externally at a regeneration station.

For applications in which engine PM emissions are relatively high, and the exhaust temperature is relatively cool, actively regenerated systems may be more effective than passive systems because active DPFs are not dependent on the heat carried in the exhaust for regeneration.

4. Flow Through Filter

Flow-through filter technology is a relatively new method for reducing diesel PM emissions. Unlike a DPF, in which only gases can pass through the substrate, the FTF does not physically “trap” and accumulate PM. Instead, exhaust flows through a medium (such as a wire mesh) that has a high density of torturous flow channels, thus giving rise to turbulent flow conditions. The medium is typically treated with an oxidizing catalyst that is able to reduce emissions of PM, HC, and CO, or used in conjunction with a fuel-borne catalyst. Any particles that are not oxidized within the FTF, flow out with the rest of the exhaust and do not accumulate in the DECS.

Consequently, the filtration efficiency of an FTF is lower than that of a DPF, but the FTF is much less likely to plug under unfavorable conditions, such as high PM engine emissions and low exhaust temperatures. Therefore, the FTF is a candidate for use in some applications unsuitable for DPFs. It is expected that an FTF will achieve between 30 and 60 percent PM reduction.

Relative to a DOC, which typically has straight flow passages and laminar flow conditions; the FTF achieves a greater PM reduction because of enhanced contact of the PM with the catalytic surfaces and longer residence times. The better performance of an FTF when compared to a DOC may come at the cost of increased backpressure.

5. Diesel Oxidation Catalyst

A DOC reduces emissions of CO, HC, and the soluble organic fraction of diesel PM through catalytic oxidation alone. Exhaust gases are not filtered, as in the DPF. In the presence of a catalyst material and oxygen, CO, HC, and the soluble organic fraction undergo a chemical reaction and are converted into carbon dioxide and water. Some manufacturers integrate HC traps (zeolites) and sulfate suppressants into their oxidation catalysts. HC traps enhance HC reduction efficiency at lower exhaust temperatures and sulfate suppressants minimize the generation of sulfates at higher exhaust temperatures. A DOC can reduce total PM emissions up to 30 percent (level1 technology).

6. Fuels and Fuel Additives Diesel Emission Control Strategies

<u>Fuel Additives</u>

A fuel additive as a DECS is designed to be added to fuel or fuel systems so it is present in-cylinder during combustion and its addition causes a reduction in exhaust emissions. Additives can reduce the total mass of PM, with variable effects on CO, oxides of nitrogen (NO_x) and gaseous HC production. The range of PM reductions of fuel additives is from 15 to 50 percent reduction in mass. Most additives are fairly insensitive to fuel sulfur content and will work with a range of sulfur concentrations as well as different fuels and other fuel additives.

An additive added to diesel fuel in order to aid in soot removal in DPFs by decreasing the ignition temperature of the carbonaceous exhaust is often called a fuel borne catalyst (FBC). These can be used in conjunction with both passive and active filter systems to improve fuel economy, aid system performance, and decrease mass PM emissions. FBC/DPF systems are widely used in Europe and typically achieve a minimum of 85 percent reduction in PM emissions. Additives based on cerium, platinum, iron, and strontium is currently available, or may become available for use in the future in California.

B. NOx Emission Control Technologies

Currently, there are no verified NOx emission control technologies available. However, Selective Catalytic Reduction (SCR) has been used successfully in Europe to reduce NOx emission from diesel fueled mobile engines. The SCR system works by injecting urea is into the exhaust system. The urea, acting as a reducing agent, is transformed with the help of a catalytic converter into ammonia (NH_3). The ammonia then reacts with the NOx gases which are converted into harmless water and nitrogen. This system is capable of reducing NOx emissions as much as 80 percent.

C. Technology Combinations

A trend in technologies is to combine more than one technology to maximize the amount of diesel PM reduction. This section discusses some of these combinations. For example:

1. Diesel Particulate Filter with NOx Catalyst

The Clēaire Longview system for specific 1993 to 2003 model year diesel engines combines a catalyzed DPF and lean NOx catalyst to achieve 85 percent PM reductions (level 3) and 25 percent NOx reductions. (Clēaire)

2. Diesel Oxidation Catalyst plus Spiracle™

The Donaldson Company (Donaldson) has verified two combination systems at Level 1. Each system uses a different DOC, but both systems install a closed loop crankcase with the Donaldson Spiracle ™ closed crankcase filtration system. The systems are verified for use in certain 1991 and later model year collection vehicles. One system is verified for use with California diesel fuel and the other is verified for use with low sulfur diesel fuel.

3. Fuel-Borne Catalyst with Hardware Technology

A fuel-borne catalyst can be combined with any of the three hardware technologies discussed above, the DPF, DOC, or FTF. The combination of a FBC with a DPF functions similarly to a catalyzed DPF, but a FBC allows the DPF to be lightly catalyzed. The FBC enhances DPF regeneration by encouraging better contact between the PM and the catalyst material. The FBC plus DPF combination reduces both the carbonaceous and soluble organic fractions of diesel PM. The primary benefit of this combination is a reduction in the amount of NO_2 generated as a proportion of NO_x.

D. Engines

1. New Diesel Engine Meeting 0.01 g/bhp-hr for PM either as a Repower or as Original Equipment

Original Equipment

Heavy-duty diesel on road engines sold in California are required to meet engine exhaust standards shown in Table VI-2

Table VI-2: Heavy-Duty Diesel on Road Engine Standards

Emissions Standards (g/bhp-hr)		
Model Year	NOx	PM
2007-2009	1.2(a)	0.01
2010-plus	0.20	0.01

(a) Between 2007 and 2009 U.S. EPA requires 50 percent of the heavy-duty diesel engine family certifications to meet the 0.20 g/bhp-hr NOx standard. Averaging is allowed and it is expected that most engines will conform to the fleet NOx average of approximately 1.2 g/bhp-hr.

The particulate emission standard of 0.01 grams per brake horsepower-hour (g/bhp-hr) for heavy-duty highway diesel engines is in effect nationally and in California beginning with model year 2007. These standards are based on the use of high-efficiency catalytic exhaust emission control devices in conjunction with advanced engine technologies. Because the devices expected to be used to meet the standard are made less efficient by sulfur in the exhaust stream, the level of sulfur in highway diesel fuel was reduced by 90 percent, relative to California diesel fuel sulfur levels, in mid-2006 to less than 15 ppmw.

Engine Repower

Another option is to re-power an older vehicle by installing a pre-2007 model year (MY) engine along with a DECS. For example, any 1994 to 2006 MY engine with an aftermarket verified DPF would achieve PM emissions near 0.01 g/bhp-hr.

Re-powering to a 0.01 g/bhp-hr engine is not always possible. The engine compartment may not be large enough to install a newer, electronic controlled engine where previously a mechanical engine was housed. Otherwise, the cost of converting from mechanical to electronic fuel injection may outweigh the value of the vehicle or remaining vehicle life.

2. Heavy-Duty Pilot Ignition Engine

A heavy-duty pilot ignition engine (Westport) is a compression-ignition engine that operates on natural gas but uses diesel as a pilot ignition source. LNG (liquid natural gas) fuel is stored in the LNG tank and diesel fuel is stored in small pilot diesel tank. LNG is drawn from the tank and vaporized using heat from the engine coolant. It exits the tank module at 100 degrees F and 4,500 psi. Both the diesel and natural gas are sent to the fuel conditioning module, where they are pressure regulated and distributed to the fuel injectors via common fuel rails. The total use of diesel is around six percent of the fuel consumed. ARB has defined this engine in its fleet rule for transit agencies and in rule for solid waste collection vehicles as an engine that uses diesel fuel at a ratio of no more than one part diesel fuel to ten parts total fuel on an energy equivalent basis.

Furthermore, the engine cannot idle or operate solely on diesel fuel at any time. An engine that meets this definition and is certified to the lower optional PM standard (0.01 g/bhp-hr) would be classified as an alternative-fuel engine.

3. Engine Availability 2010 and Beyond

Diesel engine technology for 2010 will most likely relay on improvements in engine combustion technology and selective catalytic reductions (SCR) and NOx absorbers to reduce NOx emissions. SCR catalysts use ammonia as the NOx reductant. Urea may also be used as the source of ammonia. In recent years, considerable effort has been invested in developing urea SCR systems that could be applied to heavy-duty diesel vehicles. Urea SCR systems are being used to comply with the EURO IV heavy-duty diesel emission standards. (MICA, 2007)

E. Experience with Passive Diesel Particulate Filters

Passive DPFs have been successfully used in numerous applications and as of 2005, over 130,000 trucks and buses had been retrofitted worldwide (MECA 2005). In the United States, the use of DPFs is growing largely due to DPF retrofit programs underway in California, New York, and Texas. In California, diesel-fueled school buses, solid waist collection vehicles, urban transit buses, medium-duty delivery vehicles, and fuel tanker trucks have been retrofitted with DPFs through various demonstration programs.

ARCO, a BP (ARB, 2003) company, completed a one-year demonstration program in 2001 to evaluate low sulfur (<15 parts per million by weight sulfur content) diesel fuel and passive DPFs in five truck and bus fleets. The five fleets, all of which operated in southern California, included grocery trucks, tanker trucks, refuse haulers, school buses, and transit buses. Over the one-year demonstration period, DPF-equipped vehicles accumulated over 3,525,000 miles without any major incidents attributed to the DPFs or the low sulfur diesel fuel. Most of the grocery trucks and all of the tanker trucks accumulated over 100,000 miles of operation between test rounds. Diesel PM emission reductions were maintained after one year, with no signs of deterioration. The test vehicles retrofitted with passive DPFs and fueled with low sulfur diesel had over 90 percent lower PM emissions when compared to control vehicles with factory mufflers and operated on CARB diesel fuel.

F. Experience with Diesel Oxidation Catalysts

This technology is commercially available and devices have been installed on tens of thousands of mobile diesel-fueled engines. As a result of the United States Environmental Protection Agency’s (U.S. EPA’s) Urban Bus Retrofit/Rebuild program, several DOC models have been certified by the U.S. EPA and through ARB’s aftermarket parts certification program. Nationwide, thousands of DOCs are installed on urban transit buses with engines older than 1994. In general, DOCs functioned well on all of these vehicles.

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(ARB, 2007) John Gruszecki California Air Resources Board Personal communication with manufactures and installers of DPF September & October 2007

(Westport) LNG System for Heavy-Duty Trucks http://LNGtrucks.westport.com/

Cleaire Advanced Emission Controls
http://www.cleaire.com/index.html

Donaldson filtration solutions
http://www.donaldson.com/index.html

VII. HEALTH ASSESSMENT OF EMISSIONS FROM DRAYAGE TRUCKS

This chapter discusses the potential cancer and non-cancer health impacts due to the current level of emissions from drayage trucks.

A. Potential Health Impacts of Drayage Truck Emissions

Particulate matter (PM) and NOx emissions from drayage trucks are major contributors to the air quality and resulting health problems in and around California's ports and intermodal rail yards. To determine the potential cancer risk near port and intermodal communities, staff used dispersion modeling to estimate the average diesel PM concentrations. The potential cancer risks from exposures to these estimated ambient concentrations of diesel PM were then determined.

Non-cancer impacts are estimated based on the annual average concentration of PM. There are two sources of PM emissions. The first source of PM is the PM directly emitted in the exhaust from drayage trucks. This is referred to as directly emitted diesel PM. The second source of PM is the PM that is formed in the atmosphere when gases emitted in the exhaust from diesel engines, primarily NOx and SOx, react to form PM. This is referred to as secondary diesel PM.

Non-cancer impacts can also occur from exposures to NOx and hydrocarbon emissions from diesel-fueled engines. NOx and hydrocarbon emissions contribute to the formation of ozone, which also has associated non-cancer health impacts.

In 1998, the Board identified PM emissions from diesel-fueled engines as a toxic air contaminant (TAC). The Board concluded that long-term occupational exposures to diesel exhaust increases the risk of developing lung cancer. The Board also concluded that a number of adverse long-term non-cancer effects have been associated with exposure, including a greater incidence of respiratory irritation and chronic bronchitis.

Over the last several years, a substantial number of epidemiologic studies have found a strong association between exposure to elevated PM levels (of which diesel PM is a subset) and adverse non-cancer health effects (ARB, 2002; ARB, 2006b). These non-cancer health effects include premature death, increased hospitalizations for respiratory and cardiovascular causes, asthma and lower respiratory symptoms, acute bronchitis, work loss days, and minor restricted activity days. Non-cancer health effects linked to exposure to elevated levels of ozone include: premature deaths, hospital admissions for respiratory diseases, minor restricted activity days, and school absence days.

B. Estimating Potential Exposures and Cancer Risks from Drayage Trucks Operating on the I-710 Freeway near the Ports of Los Angeles and Long Beach

This section examines the exposures and potential cancer health risks associated with particulate matter (PM) emissions from drayage trucks transporting cargo to and from maritime ports in California. A brief qualitative discussion is provided on the potential exposures of Californians to diesel PM emissions from drayage trucks. In addition, we present the POLA/POLB and I-710 health risk assessments. The I-710 health risk assessment was conducted to determine the 70-year potential cancer risk associated with exposures to diesel PM emissions from drayage trucks operating on I-710 freeway near the ports of Los Angeles (POLA) and Long Beach (POLB).

In April 2006, ARB staff published a risk assessment for the Ports of Los Angeles and Long Beach (POLA/POLB). The POLA/POLB health risk assessment estimated that in-port drayage trucks emissions are a relatively small (three percent of all port specific emissions) when compared to other sources at the ports (ships, cargo handling craft etc.). The analysis shows that the in-port drayage truck ground-based localized impacts of 100 to 200 in a million occurs on port property and exposure risk levels to nearby residents are small (ARB, 2006). However, as this analysis does not include drayage truck emissions released beyond the port's boundaries, staff estimated off-port drayage truck emission health impacts in a subsequent localized health risk assessment detailed below. ARB staff believes that the results from this analysis provide quantitative results for exposures along a segment of the I-710 freeway and are generally applicable to other freeways in California near maritime ports, providing a qualitative estimate for those areas.

1. Exposures to Diesel PM

As discussed previously, drayage trucks transport containerized goods to and from maritime ports throughout California. The diesel PM emissions from drayage trucks contribute to ambient levels of diesel PM emissions. Based on the most recent emissions inventory, there are about 21,000 drayage trucks operating at ports in California on a frequent and semi-frequent basis. The majority of ports is in urban areas and, in most cases, is located near where people live, work, and go to school. This results in substantial exposures to diesel PM emissions from the operation of drayage trucks.

Because analytical tools to distinguish between ambient diesel PM emissions from drayage trucks and that from other sources of diesel PM do not exist, we cannot measure the actual exposures to emissions from drayage trucks. However, modeling tools can be used to estimate potential exposures. To investigate the potential risks from exposures to the emissions from drayage trucks, ARB staff used dispersion modeling to estimate the ambient concentration of diesel PM emissions that result from the operation of drayage trucks along the I-710 freeway near POLA and POLB. The potential cancer risks from exposures to these estimated ambient concentrations of diesel PM were then determined. The results from this study are presented below.

2. Health Risk Assessment

Risk assessment is a complex process that requires the analysis of many variables to simulate real-world situations. There are several parameters that can impact the results of a health risk assessment for drayage truck operations including the amount of diesel PM emissions from the drayage truck operation, the local meteorological conditions that affect the dispersion of diesel PM in the air, the inhalation rate of the receptor, the distance between the receptor and the emission source, and the duration of exposure to the diesel PM emissions. Diesel PM emissions are a function of the age and horsepower of the truck engine, the emissions rate of the engine, engine operating load, and the annual hours of operation. Older engines tend to have higher pollutant emission rates than newer engines, and the longer an engine operates, the greater the total pollutant emissions. Meteorological conditions can have a large impact on the resultant ambient concentration of diesel PM, with higher concentrations found along the predominant wind direction and under calm wind conditions. How close a person is to the emissions plume and how long he or she breathes the emissions (exposure duration) are key factors in determining potential risk, with longer exposures times typically resulting in higher risk.

To estimate the potential cancer risks from port trucks operating along the I-710 freeway, we conducted air dispersion modeling to estimate the ambient concentrations of diesel PM as a function of the total diesel truck traffic, speed, and emissions per mile traveled. The potential cancer risks were then estimated using standard risk assessment procedures based on the annual average concentration of diesel PM predicted by the model and a health risk factor (referred to as a cancer potency factor) that correlates cancer risk to the amount of diesel PM in the air. The methodology used to estimate the potential cancer risks is consistent with the Tier-1 analysis presented in the Office of Environmental Health Hazard Assessment (OEHHA) Air Toxics Hot Spots Program Risk Assessment Guidelines. Following the OEHHA guidelines, we assumed that the most impacted individual would be exposed to modeled diesel PM concentrations for 70 years with an inhalation rate of 302 liters/Kg-day. This exposure duration represents an "upper-bound" of the possible exposure duration. The potential cancer risk was estimated by multiplying the inhalation dose by the cancer potency factor (CPF) of diesel PM (1.1 $(mg/kg\text{-}d)^{-1}$). [OEHHA, 2003[1]] In this study, exposures were evaluated for diesel particulate via the breathing or inhalation pathway only.

[1] Office of Environmental Health Hazard Assessment (OEHHA, August 2003. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. www.oehha.ca.gov/air/hot_spots/GRSguide.html

3. Air Dispersion Modeling

Computer air dispersion modeling was used to estimate the ground level concentrations of diesel PM at receptors located near the I-710 freeway. The CAL3QHCR model was chosen for this exercise. CAL3QHCR is a Gaussian line source dispersion model and is able to model a variety of roadway characteristics. It can also process up to a year of hourly metrological, emission, and traffic data. CAL3QHCR is one of U.S. EPA's preferred/recommended dispersion models referenced in Appendix W of 40 CFR Part 51 (November 9, 2005).

Drayage truck emission rates were developed using emission parameters determined from Starcrest's drayage truck population distribution survey, site visits, and ARB's EMFAC2007 emission's model.

Caltrans provided the latest traffic information (2006) and the geometry configurations for I-710. The former includes truck counts by hour (Figure VII-1) or diurnal traffic data, truck speed, and truck lane usage. Truck traveling time per lane is 60 percent, 30 percent and 10 percent for lanes 1, 2, and 3 respectively. The latter includes the inside shoulder width, outside shoulder width, number of lanes, median width, and the width of I-710. A schematic representation of a segment of I-710 is represented in Figure VII-2.

Figure VII-1: HHDV Counts versus Diurnal Variation for I-710 Freeway

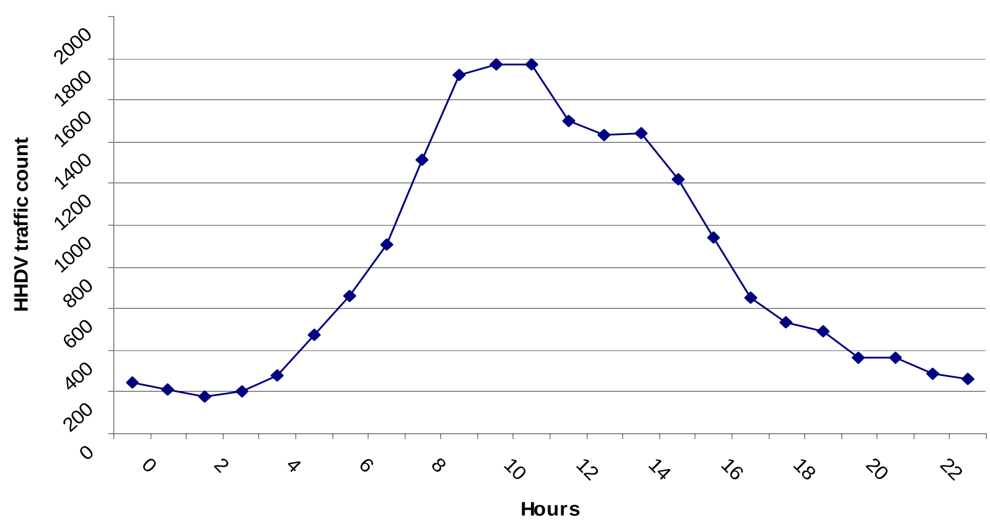
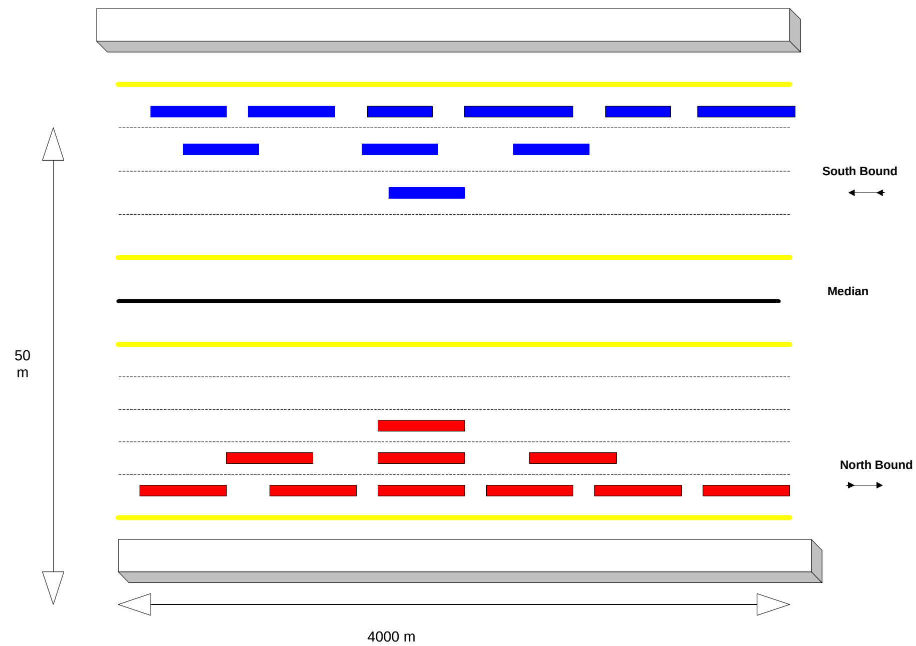


Figure VII-2: Schematic Representation of A Segment Of I-710 Freeway



Meteorological data for Long Beach (1981) was used and urban dispersion coefficients were selected in this study. To account for dispersion of diesel PM due to the mechanical and thermal mixing effect caused by the total volume of vehicles (gasoline and diesel) on the I-710, it was assumed that the drayage trucks account for 10 percent of the total traffic on the I-710 during the modeling period. A summary of the key modeling inputs is provided in Table VII-1.

Table VII-1: Modeling Parameters

Source Type	Line
Receptor Height	1.5 m
Truck Flow Type	Free flow (no queue)
Line Source Modeling: Release Height Number of Links, Type Each Link Length, Mixing Zone Width	 4.15 m 6, AG 4000 m, 11.7 m
PM Emission Factor Per 5-Axle Truck	1.16 grams/vehicle-mile (19,500 trucks/day)
Dispersion Coefficient	Urban
Meteorological Data	Long Beach 1981
Diurnal Traffic Variation	See Figure 1

4. Cancer Risk Characterization

The risk estimates show the magnitude of potential cancer risk resulting from drayage truck activity based on the truck traffic information, the geometry of the I-710, and the local meteorological conditions. Figure VII-3 shows the potential cancer risks to nearby receptors between 25 to 6400 meters from the edge of I-710 freeway for each side along the east-west direction. The two curves represent risks on the west and east sides of the I-710 freeway. As can be seen, the west side shows a slightly lower risk compared to the east side. This is primarily due to the eastwardly wind conditions in this region.

Figure VII-3: Potential Cancer Risks from Diesel Truck Operations from Freeway I-710

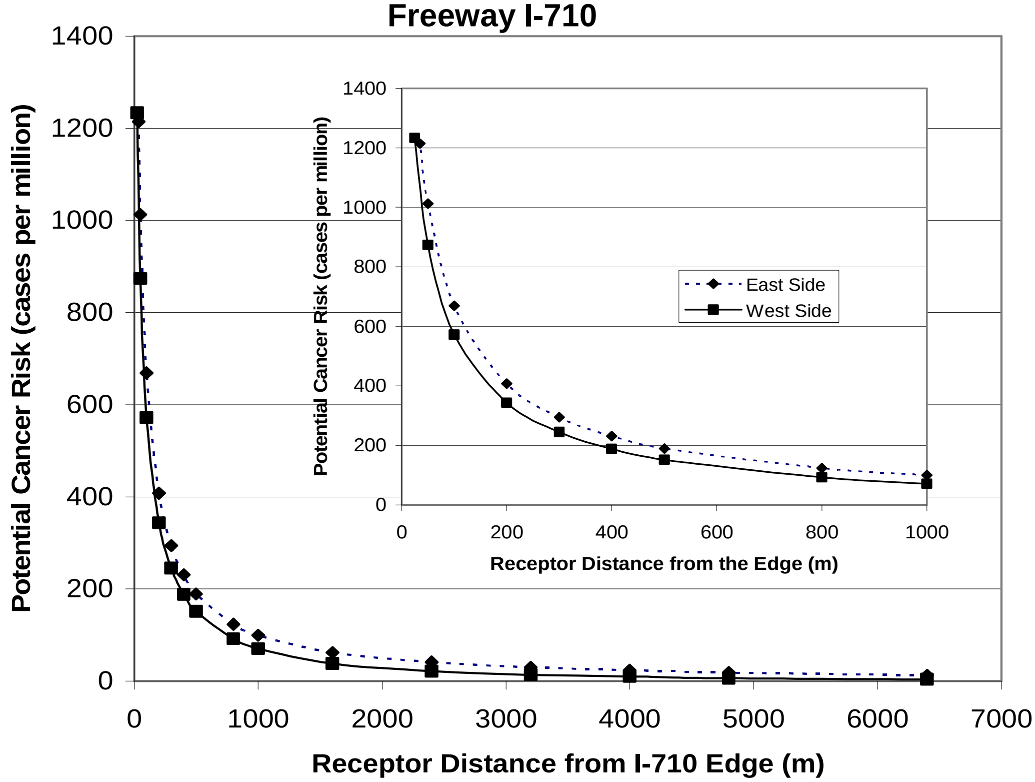


Figure VIII-3 assumptions:

- The total width of I-710 freeway is 50 meters, and an arbitrary segment length of 4000 meters is considered
- Each direction has three lanes (most outside lanes) for HDDV traveling. In reality, there are five lanes in North bound and 4 lanes in South bound.
- Emission factor used for diesel PM is 1.16 grams/vehicle-mile.

Figure VII-4 below graphically represents the residential areas surrounding the I-710 freeway. The coordinates of the sources were plotted and superimposed on a GIS map with isopleths representing different levels of risks as a function of distances from the source. Also included on this map are neighborhoods that may be affected by drayage truck traffic. Note that the isopleths are only plotted for an arbitrary 4 km segment of I-710 near the ports.

Figure VII-4: Isopleths Of Potential Cancer Risks From Drayage Truck Operations On I-710 Freeway – GIS Map

Note: The isopleths is plotted for a segment of 4km.

As can be seen in Figure VII-4, the diesel PM emissions resulting from the drayage truck operations along I-710 result in greater exposures to the residents that live nearby the freeway. Higher risk levels, greater than 500 in a million are seen parallel and close to the freeway, within 200 meters from the edge. The risk levels drop off fairly quickly. At 2,000 meters the risk levels are below 50 in a million. The 10 in a million risk contours can extend much further. On the west side of I-710, the risk contour of 10 in a million reaches about 4 km from the edge; while the contour of 10 in a million in the downwind direction (east side) exceeds 7 km from I-710 (not shown in Figure VII-4).

Using the U.S. Census Bureau's year 2000 census data, we estimated the population within the isopleths boundaries for a **one-mile segment** along I-710. The area impacted and the population affected within this one-mile segment for various risk ranges are presented in Table VII-2.

Table VII-2: Affected Population and Residential Areas by Different Risk Levels for One Mile Segment Of I-170

Risk Range	Affected area (acres/mi segment I710)	Affected population (residents/mi segment I710)
> 1000	35	1,000
> 500	110	3,350
> 100	700	21,000
> 10	4,450	134,000

The estimated potential cancer risk is based on a number of assumptions (detailed above); actual risks to individuals may be less than or greater than those presented here. For example, increasing the truck traffic would increase the potential risk levels. Decreasing the exposure duration or increasing the distance from the source to the receptor location would decrease the potential risk levels. The estimated risk levels would also decrease over time as lower-emitting diesel engines become more common within the fleet.

C. Estimating Potential Non-Cancer Impacts from Exposure to Drayage Truck Diesel PM and NOx Emissions

A substantial number of epidemiologic studies have found a strong association between exposure to ambient $PM_{2.5}$ and a number of adverse health effects (CARB, 2002). For this report, ARB staff quantified seven noncancer health impacts associated with the change in exposures to the diesel PM emissions. This analysis shows that the statewide cumulative health impacts of the emissions reduced through this regulation from year 2010 through 2014 are approximately:

- 580 premature deaths (160 – 990, 95% CI)
- 120 hospital admissions due to respiratory causes (78 – 170, 95% CI)
- 230 hospital admissions due to cardiovascular causes (140 – 350, 95% CI)
- 17,000 cases of asthma-related and other lower respiratory symptoms (6,700 – 27,000, 95% CI)
- 1,400 cases of acute bronchitis (0 – 3,100, 95% CI)
- 100,000 work loss days (86,000 to 120,000, 95% CI)
- 580,000 minor restricted activity days (480,000 to 690,000, 95% CI)

1. Primary Diesel PM

Consistent with U.S. EPA (2004), ARB has been using the PM-premature death relationship from Pope et al. (2002) since the approval of the Ports and Goods Movement Emission Reduction Plan (ARB, 2006). Using the study by Pope et al. (2002), a statewide population-weighted average diesel $PM_{2.5}$ exposure of 1.8 $\mu g/m^3$ can be associated with a mean estimate of 2,200 premature deaths per year in California, about 10 percent higher than previous estimates (Lloyd and Cackette, 2001). The diesel $PM_{2.5}$ emissions corresponding to the diesel $PM_{2.5}$ concentration of 1.8 $\mu g/m^3$ is 36,000 tons for the year 2000 based on the emission inventory developed for this rule. Using this information, we estimate that for every reduction of 17 tons per year of diesel $PM_{2.5}$ emissions, one fewer premature death would result. This factor is derived by dividing 36,000 tons of diesel PM by 2,168 deaths (unrounded number of deaths described above). Although a single statewide factor (tons per death) is discussed in this example, staff actually developed basin-specific factors for the health impacts assessment of emissions from port trucks. These basin-specific factors were developed using basin-specific diesel PM concentrations and emissions for the year 2000. After adjusting for population changes between each future year and 2000, staff estimates that the cumulative total of approximately 3,760 tons of emissions from port trucks reduced through the implementation of this regulation in years 2010-2014 are associated with a reduction of approximately 430 deaths (120 – 750, 95% CI). Estimates of other health benefits, such as hospitalizations and asthma symptoms, were calculated using basin-specific factors developed from other health studies. Details on the methodology used to calculate these estimates can be found in Appendix A of the Emission Reduction Plan for Ports and Goods Movement in California (ARB, 2006).

2. Secondary Diesel PM

In addition to directly emitted PM, diesel exhaust contains NOx, which is a precursor to nitrates, a secondary diesel-related PM formed in the atmosphere. Lloyd and Cackette (2001) estimated that secondary diesel $PM_{2.5}$ exposures from NOx emissions can lead to additional health impacts beyond those associated with directly emitted diesel $PM_{2.5}$. To quantify such impacts, staff developed population-weighted nitrate concentrations for each air basin using data not only from the statewide routine monitoring network, which was used in Lloyd and Cackette (2001), but also from special monitoring programs such as IMPROVE and Children's Health Study (CHS) in year 1998. The IMPROVE network provided additional information in the rural areas, while the CHS added more data to southern California. Staff calculated the health impacts resulting from exposure to these concentrations of PM and then associated the impacts with the basin-specific NOx emissions to develop basin-specific factors (tons per case of health endpoint). Using an approach similar to that used for primary diesel PM and adjusting for population changes between each future year and 1998 (the year with the greatest geographic extent of nitrate monitoring), staff estimates that the cumulative reduction of approximately 28,100 tons of emissions from port trucks in 2010-2014 are associated with the reduction of an estimated 140 premature deaths (40 – 250, 95% CI). Other health effects were also estimated as outlined above.

D. Health Benefits Analysis

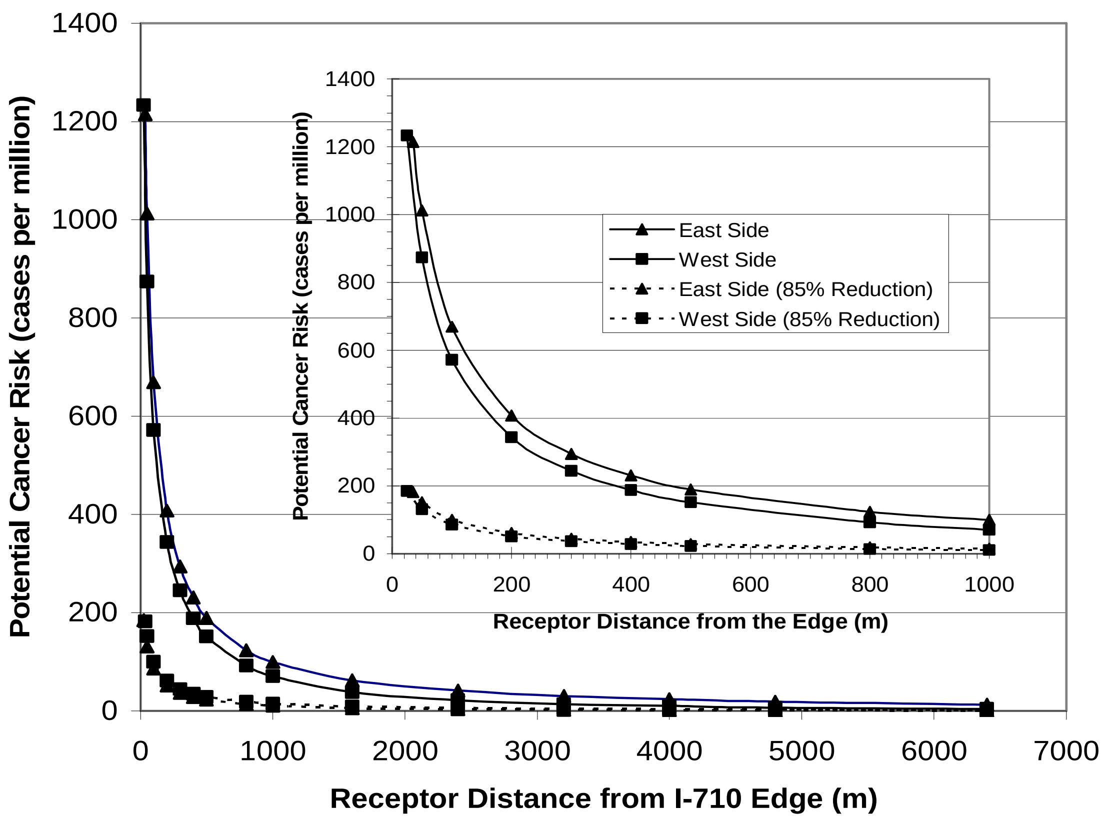
1. Reduction in Potential Cancer Risks

The reductions in diesel PM emissions that will result from implementation of the proposed regulation will reduce the public's exposures to diesel PM emissions and the potential cancer risks associated with those exposures. To investigate the potential risks from exposures to the emissions from drayage trucks, ARB staff used dispersion modeling to estimate the ambient concentration of diesel

PM emissions that result from the operation of drayage trucks along the I-710 freeway near POLA and POLB. ARB staff believes that the results from this analysis provide quantitative results for exposures around the Ports of Los Angeles and Long Beach and are generally applicable to other ports in California, providing a qualitative estimate for those areas.

To investigate the reductions in potential risks that will result as emissions from drayage trucks are reduced, ARB staff used the methodology discussed earlier in Chapter VII-B and assumed an 85 percent reduction in the emissions to estimate the above ambient concentration of diesel PM emissions that result from the operation of drayage trucks along a segment of the I-710 freeway near the Ports of Los Angeles and Long Beach. The potential cancer risks from exposures to the reduced emissions level were then estimated and compared to the uncontrolled levels to determine how the potential risks will change. As shown in Figure VII-5 and Table VII-3, we expect a significant decline in the number of people exposed to elevated risk levels from drayage truck emissions and the acres impacted as the proposed regulation is implemented.

Figure VII-5: Potential Cancer Risks from Diesel Truck Operations I-710 Freeway With and Without Control



This analysis estimates that the cancer risk is greater than 500 in a million for areas paralleling and within 200 meters of the freeway. The risk level drops off fairly quickly as the distance from the freeway increases. At 2,000 meters from the freeway, the risk levels fall below 50 in a million. The 10 in a million risk contours occurs at approximately the 4,000 – 7,000 meters from the freeway, depending on the side of the freeway.

Table VII-3: Affected Population and Residential Areas By Different Risk Levels For One Mile Segment Of I-710 After Control (Assumed 85% Emission Reduction)

Risk Range	Affected area (acres/mi segment I710)	Affected population (residents/mi segment I710)
> 1000	0 (100 %)	0 (100 %)
> 500	0 (100 %)	0 (100 %)
> 100	70 (90 %)	2,087 (90 %)
> 10	1,034 (80 %)	31,012 (77 %)

Note: The numbers in parenthesis above represent reduction percentages compared with those of without the proposed regulation.

2. Economic Valuation of Health Effects

This section describes the methodology for monetizing the value of avoiding adverse health impacts.

The U.S. EPA has established $4.8 million in 1990 dollars at the 1990 income level as the mean value of avoiding one premature death (U.S. EPA, 1999). This value is the mean estimate from five contingent valuation studies and 17 wage-risk studies. Contingent valuation and wage-risk studies examine the willingness to pay (or accept payment) for a minor decrease (or increase) in the risk of premature death. For example, if individuals are willing to pay $800 to reduce their risk of mortality by 1/10,000, then collectively they are willing to pay $8 million to avoid one certain death. This is also known as the "value of a statistical life" or VSL.[5]

As real income increases, people are willing to pay more to prevent premature death. U.S. EPA adjusts the 1990 value of avoiding a premature death by a factor of 1.201[6] to account for real income growth from 1990 through 2020, (U.S. EPA, 2004). Assuming that real income grows at a constant rate from

[5] U.S. EPA's most recent regulatory impact analyses, (U.S. EPA 2004, 2005), apply a different VSL estimate ($5.5 million in 1999 dollars, with a 95 percent confidence interval between $1 million and $10 million). This revised value is based on more recent meta-analytical literature, and has not been endorsed by the Environmental Economics Advisory Committee (EEAC) of U.S. EPA's Science Advisory Board (SAB). Until U.S. EPA's SAB endorses a revised estimate, CARB staff continues to use the last VSL estimate endorsed by the SAB, i.e., $4.8 million in 1990 dollars.
[6] U.S. EPA's real income growth adjustment factor for premature death incorporates an elasticity estimate of 0.4.

1990 until 2020, we adjusted VSL for real income growth, increasing it at a rate of approximately 0.6 percent per year. We also updated the value to 2006 dollars. After these adjustments, the value of avoiding one premature death is $8.2 million in 2007, $8.4 million in 2010 and $8.6 million in 2014, all expressed in 2006 dollars.

The U.S. EPA also uses the willingness-to-pay (WTP) methodology for some non-fatal health endpoints, including lower respiratory symptoms, acute bronchitis and minor restricted activity days. WTP values for these minor illnesses are also adjusted for anticipated income growth through 2014, although at a lower rate (about 0.2 percent per year in lieu of 0.6 percent per year).

For work-loss days, the U.S. EPA uses an estimate of an individual's lost wages, (U.S. EPA, 2004), which CARB adjusts for projected real income growth, at a rate of approximately 1.5 percent per year.

"The Economic Value of Respiratory and Cardiovascular Hospitalizations," (ARB, 2003), calculated the cost of both respiratory and cardiovascular hospital admissions in California as the cost of illness (COI) plus associated costs such as loss of time for work, recreation and household production. When adjusting these COI values for inflation, CARB uses the Consumer Price Index (CPI) for medical care rather than the CPI for all items.

Table VII-4 lists the valuation of avoiding various health effects, compiled from CARB and U.S. EPA publications, updated to 2006 dollars. The valuations based on WTP, as well as those based on wages, are adjusted for anticipated growth in real income.

Table VII-4: Undiscounted Unit Values for Health Effects (At Various Income Levels in 2006 Dollars) [1]

Health Endpoint	2007	2010	2014	References
Mortality				
Premature death ($ million)	8.2	8.4	8.6	U.S. EPA (1999, p. 70-72, 2000, 2004, p. 9-121)
Hospital Admissions				
Cardiovascular ($ thousands)	44	45	47	CARB (2003), p. 63
Respiratory ($ thousands)	36	37	39	CARB (2003), p. 63
Minor Illnesses				
Acute Bronchitis	452	455	458	U.S. EPA (2004), 9-158
Lower Respiratory Symptoms	20	20	20	U.S. EPA (2004), 9-158
Work loss day	192	201	213	2002 California wage data, U.S. Department of Labor
Minor restricted activity day (MRAD)	64	64	65	U.S. EPA (2004), 9-159

[1]The value for premature death is adjusted for projected real income growth, net of 0.4 elasticity. Wage-based values (Work Loss Days) are adjusted for projected real income growth, as are WTP-derived values (Lower Respiratory Symptoms, Acute Bronchitis, and MRADs). Health endpoint values based on cost-of-illness (Cardiovascular and Respiratory Hospitalizations) are adjusted for the amount by which projected CPI for Medical Care (hospitalization) exceeds all-item CPI.

Benefits from the proposed Port Trucks Rule are substantial. CARB staff estimates the value of these health benefits over the period from 2010 to 2014 to be nearly $4.3 billion using a 3 percent discount rate or nearly $3.5 billion using a 7 percent discount rate. CARB follows U.S. EPA practice in reporting results using both 3 and 7 percent discount rates. Nearly all of the monetized benefits result from avoiding premature death. The estimated benefits from avoided morbidity are approximately $64 million with a 3 percent discount rate and less than $53 million with a 7 percent discount rate. Approximately 75 percent of the benefits are associated with reduced PM from direct sources, and the remaining 25 percent with reduced NOx.

3. Reduced Ambient Ozone Levels

Emissions of NOx and ROG are precursors to the formation of ozone in the lower atmosphere. Exhaust from diesel engines contributes a substantial fraction of ozone precursors. Therefore, reductions in NOx and ROG from diesel engines would make a considerable contribution to reducing exposures to ambient ozone. Controlling emissions of ozone precursors would reduce the prevalence of the types of respiratory problems associated with ozone exposure and would reduce hospital admissions and emergency visits for respiratory problems.

E. Assumptions and Limitations of Health Impacts Assessment

Several assumptions were used in quantifying the health effects of PM exposure. They include the selection and applicability of the concentration-response functions, the exposure assessment, and the baseline incidence rates. These are briefly described below.

- For premature death, calculations were based on the concentration-response function of Pope et al. (2002). The ARB staff assumed that the concentration-response function for premature death in California is comparable to that developed by Pope and colleagues. This is supported by other studies (Dominici et al. 2005, Franklin et al. 2007) in California showing an association between $PM_{2.5}$ exposure and premature death similar to that reported by Pope et al. (2002). In addition, the Pope et al. (2002) study included subjects in several metropolitan areas of California. The U.S. EPA has been using the Pope et al. (2002) study for its regulatory impact analyses since 2004. For other health endpoints, the selection of the concentration-response functions was based on the most recent and relevant scientific literature. Details are in the Emission Reduction Plan for Ports and Goods Movement in California (ARB, 2006).

- The ARB staff assumed the model-predicted diesel PM exposure estimates published in the report titled "Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant" (ARB, 1998) could be applied to the entire population within each basin. That is, the entire population within the basin was assumed to be exposed uniformly to modeled concentration, an assumption typical of this type of assessment.

- The ARB staff assumed the baseline incidence rate for each health endpoint was uniform across each county and in many cases across each basin. This assumption is consistent with methods used by the U.S. EPA for its regulatory impact assessment, and the incidence rates match those used by U.S. EPA.

- Although the analysis illustrates that reduction in diesel PM exposure would confer health benefits to people living in California, we did not provide estimates for all endpoints for which there are C-R functions available. Health effects such as myocardial infarction (heart attack), chronic bronchitis, and onset of asthma were unquantified due to the potential overlap with the quantified effects such as lower respiratory symptoms and hospitalizations. In addition, estimates of the effects of PM on low birth weight and reduced lung function growth in children are not presented. While these endpoints are significant in an assessment of the public health impacts of diesel exhaust emissions, there are currently few published investigations on these topics, and the results of the available studies are not entirely consistent (ARB, 2006). In summary, because only a subset of the total number of health outcomes is considered here, the estimates should be considered an underestimate of the total public health impact of diesel PM exposure.

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VIII. ECONOMIC IMPACTS

A. Summary of Economic Impacts

The economic impact assessment of the proposed regulation to control emissions from in-use, on-road, diesel-fueled, heavy duty drayage trucks includes a determination of total present value regulation costs to businesses for retrofit and replacement measures proposed, a determination of the emissions control cost effectiveness, an assessment of the regulation cost impact on a typical, independently owned drayage operator, an assessment of the regulation's highest year annualized cost impact on the California economy, and specifically the truck transportation sector, and an estimate of the value of public health benefits obtained by controlling emissions from heavy duty diesel fueled drayage trucks.

Staff expect monitoring, data collection, recordkeeping, and reporting costs (including costs of infrastructure investment) associated with complying with the proposed regulation to port and intermodal terminal / gate operators, shipping and rail companies, and public and private port and railroad authorities to be absorbed into their existing budgets and incorporated into their programs for port / intermodal facility modernization and security upgrades.

Staff estimates that approximately 23,000 to 32,000 drayage trucks will be subject to vehicle retrofit and replacement requirements between 2009 -2013. The total present value cost of to comply with these requirements is determined to be between $1.1 and $1.5 billion (2006 dollars). These costs can be broken into two phases. Phase 1 requires the replacement of all pre-1994 MY trucks and the retrofit of all pre-2004 model year drayage vehicles with a level 3 VDECS by December 31, 2009. Phase 2 requires all pre-2004 model year drayage vehicles to meet 2007 California and federal emission standards by December 31, 2013.

The total Phase 1 costs were estimated to be $358 - $481 million (2006 dollars). The Phase 1 measure is expected to primarily reduce PM emissions by approximately 750 tons per year after the regulation takes effect December 31, 2009. The PM cost effectiveness, as measured by the ratio of total average annualized costs by the total annual amount of PM emissions reduced was found to be $57 - $77 per pound of PM controlled.

The total Phase 2 costs were estimated to be $777 - $1,044 million (2006 dollars). The Phase 2 measure is expected to primarily reduce NOx emissions by 11,900 tons per year after the regulation takes effect December 31, 2013. The NOx cost effectiveness, as measured by the ratio of total average annualized costs by the total annual amount of NOx emissions reduced was found to be $6 - $8 per pound of NOx controlled.

Staff then determined the impact of the total cost of the regulation on independent owner-operators engaged in port and intermodal drayage. The regulation is estimated to cost owners / operators approximately $10,000 - $31,000 for Phase 1 and a net cost of approximately $33,000 for Phase 2. Staff estimates owners / operators will incur annual costs of approximately $550 for emission control system maintenance and for recordkeeping and reporting requirements starting in 2009. All annualized costs are reported as net amortized costs of total present value costs (2006 dollars) using a discount rate of 15 percent, and a capital recovery period of 4 – 14 years. Staff then assessed the impact Phase 1 and Phase 2 costs would have on owner-operator business gross margins for typical owner-operators engaged in drayage at the Port of Oakland, and the Ports of Los Angeles and Long Beach. Staff analysis shows that with the Phase 1 retrofit requirements in place, gross income or margin would on average be lower than the benchmarked 2006 California per capita income by 4 percent, and with the Phase 2 replacement requirements in place, gross income or margin would be lower than the benchmarked 2006 California per capita income by 10 percent.

A regulation with annualized costs in excess of $100 million dollars is likely to have an impact on the California macro economy. As a worst case impact, staff assessed the impact of the highest year annualized costs resulting from implementation of Phase 1 and Phase 2 program costs during the years 2013 – 2014 on the overall California economy and the truck transportation sector. Staff modeled highest year regulation annualized costs of $352 - $476 million and determined that the negative impact on the California gross product, employment, and personal income was negligible (less than 0.1 percent). Correspondingly, the impact on the truck transportation sector was determined to be a reduction in gross output and employment of 1 to 2 percent.

As the proposed regulation achieves a reduction in PM and NOx emissions of approximately 750 and 11,900 tons per year annually when fully implemented, respectively, the public health benefits from reduced exposure to these pollutants is expected to increase as well. Staff determined that over the implementation of the proposed regulation in 2010 – 2014, the cumulative public health benefits will include a reduction in 580 premature deaths, 17,000 cases of asthma, 100,000 work-loss days, 580,000 minor restricted activity days, and reductions in other respiratory and cardiovascular illnesses associated with exposure to these pollutants. The monetary value of these health benefits achieved during 2010 -2014 has been estimated to be $4.3 billion (discounted at 3 percent), or $3.5 billion (discounted at 7 percent).

B. Legal Requirements

In this section, we explain the legal requirements that must be satisfied in analyzing the economic impacts of the regulation. Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed drayage truck regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with businesses in other states.

Also, State agencies are required to estimate the cost or savings to any State or local agency and school district in accordance with instructions adopted by the Department of Finance (DOF). The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State. In addition, Health and Safety Code section 57005 requires the Air Resources Board to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding ten million dollars. Because the estimated cost of the regulation does exceed 10 million dollars, we have conducted an economic analysis of submitted alternatives to the proposed regulation. The following is a description of the methodology used to estimate costs as well as ARB staff's analysis of the economic impacts on California businesses and State and local agencies.

C. Estimation of Total Present Value Costs of Regulation and Cost Effectiveness of Program Measures

In this Section, staff presents the total present value (PV) costs of proposed regulation to reduce emissions from in-use, on-road, diesel-fueled, heavy duty drayage trucks. Staff also presents the cost effectiveness (dollars per ton, or dollars per pound of pollutant controlled) of each regulation phase for which reductions in PM and NOx emissions are obtained.

Since future pollution control costs occur in a regulatory timeline, they must be discounted to the present value or time using the appropriate discount rate, which is usually the rate of inflation for a specific period, as measured by the Consumer Price Index (CPI), or is a rate used to reflect the opportunity cost of the investment plus the rate of inflation[7], or is another rate that can be justified for the analysis (for example, the internal rate of return for a project, or a specific

[7] This type of discount rate is the preferred rate for discounting cash flows to present value by the ARB Research Department. This rate typically hovers around 7% to reflect the core rate of inflation (~ 2.5%), plus the risk free rate (~ 4.5%, as measured by the yield on long term US treasuries).

interest rate to reflect risk of the business). This type of analysis is called discounted cash flow (DCF) analysis and total costs are determined as net present value (NPV). Alternatively, a cash flow (CF) analysis can be done in present value dollars and adjusted at a later date to account for inflation and opportunity cost. The CF analysis is the basis for determining the total costs of the proposed regulation. The present value date is determined to be a reference date in time to which all costs are normalized. For the purposes of this regulation, the reference date of December 31, 2006 was selected as the date for establishing net present value of all regulatory costs (outflows).

Cost estimates are derived in this section in tandem with the schedules and phases proposed in the regulation. In order to understand what the derived costs represent, it is first important to understand to whom the costs are attributed to, to what phase of the regulation does the cost apply, what are the primary assumptions associated with the cost analysis, and where did the input for the cost estimation come from. The explanation for some typical underlying assumptions such as the basis for the used truck price forecasting model and the prices for diesel particulate filters (DPF) utilized are presented in the appendix discussion on cost methodology (Appendix D). Other pertinent assumptions are stated along with the cost derivation.

Having once obtained the costs for each individual phase of the regulation, staff determined the annualized costs for each phase of the regulation. Simply stated, the annualized cost is the estimated annual payment or net business expense a firm must make with interest charges, over the capital recovery period (CRP) of the asset acquired or financed. The CRP is the estimated useful lifespan of the asset remaining, or other constrained lifespan of the asset such as the expected duration of use of the asset, and may differ from actual loan periods. For example, a bank may finance a new truck purchase for a period of six years, whereas staff assumes the useful economic life of a new truck to be 20 years. Therefore, staff established the CRP for a new truck purchase to be 20 years. In determining the annualized cost, an assumption on the residual value can be made at the end of the capital recovery period. If the residual value of the asset, or a portion thereof, can be claimed at the end of the useful life or at the end of the CRP, then that value is used to offset the annualized cost, and the annualized cost is then referred to as the net annualized cost. In most cases, staff assumed that the residual value at the end of the useful life is zero. In addition, staff included annual overhead and maintenance (O&M) charges, and expected annual compliance charges associated with recordkeeping and reporting requirements to be part of the total net annualized charges.

The program cost effectiveness for the individual phase is then determined to be the ratio of the annualized costs for each phase of the regulation, by the estimated annual tons (pounds) of pollutant reduced with the proposed regulatory measure in place, or when the regulation is fully implemented.

PHASE 1 PROGRAM COSTS

The first phase of the proposed regulation requires all trucks with pre-2004 model year engines to be retrofitted with a level 3 verified diesel emissions control system (VDECS) by December 31, 2009 (Table VIII-1).

Table VIII-1: Trucks with Pre-2004 Model Year Engines

Regulatory Phase	Compliance Deadline	Compliance Method
Phase 1	December 31, 2009	Install a level 3 VDECS

Staff determined that an estimated 21,000 – 29,000 drayage trucks will be required to comply with the Phase 1 requirements by December 31, 2009. In order to retrofit the vehicles with level 3 VDECS, all existing pre-1994 vehicles must be replaced to a 1994 or newer vehicle for which a level 3 VDECS is manufactured and readily available. Staff estimates that of the 21,000 - 29,000 drayage vehicles impacted by this phase of the regulation, an estimated 6,000 - 8,000, or 28 percent of the total impacted fleet will first be required to be replaced to a 1994+ or late model year truck before a retrofit product can be installed. For this event, staff believes that due to supply and older model year truck availability constraints, owner-operators of pre-1994 drayage trucks will choose to replace their vehicles with approximately a 10 year old vehicle in 2009. Staff estimated truck replacement costs for pre-1994 vehicles in drayage to be between $130 million and $175 million. Staff assumed zero trade-in allowance for the existing pre-1994 trucks. The cost derivation is presented in Table VIII-2 below:

Table VIII-2: Replacement Costs - Drayage Trucks with Pre-1994 Model Year Engines Date of Implementation: December 31, 2009

Age of Replacing Vehicle (Years)	Mean Predicted Used Truck Value [8] (2006 Dollars)	Drayage Population Subject to Replacement (Low Estimate)	Drayage Population Subject to Replacement (High Estimate)	Total Replacement Costs (2006 Dollars) (Low Estimate)	Total Replacement Costs (2006 Dollars) (High Estimate)
10	$21,150	6,143	8,259	**$129,923,016**	**$174,681,632**

After all pre-1994 legacy trucks are replaced with trucks for which a level 3 VDECS is readily and economically available, staff then determined total retrofit costs for trucks with Pre-2004 Model Year Engines and for trucks entering drayage service through 2012 (Phase 1 requirements). In addition to the estimated 21,000 – 29,000 trucks impacted by Phase 1 requirements, staff expects 1,700 – 2,200 owner-operators to enter the drayage business between the years 2010 – 2012. These new drayage market entrants will be subject to the same requirements of the proposed regulation as the number of current drayage truck owner-operators.

Staff determined that an estimated total 23,000 – 31,000 drayage trucks will be required to comply with the Phase 1 retrofit requirements in the years 2009 - 2012. Total retrofit costs for these trucks are presented in Table VIII-3.

[8] Mean Predicted Used Truck Value is the average price of the used truck prices predicted from the forecasting models developed in the 2005, Oct-Dec 2006, and July 2007 ARB Staff – Used Truck Marketplace Surveys. These models are presented in the appendix discussion on cost methodology (Appendix D). Staff notes that even though replacement vehicle costs occur on a future date in the regulatory timeline, prices from the 2006-2007 staff survey were unadjusted and reported as 2006 dollars. Staff believes that predicting more accurate future replacement costs would require development of complex price curves, depreciation schedules, and factor market supply and demand scenarios, and account for technological shifts in the marketplace, which are beyond the scope of this analysis.

Table VIII-3: Phase 1 Retrofit Costs - Trucks with Pre-2004 Model Year Engines and Pre-2004 Trucks Entering Service through 2012 Retrofit Requirement: Level 3 VDECS Implementation Period: 2009 - 2012

Drayage Truck Model Year Applicability	Retrofit Product & Installation Costs[9] (Present Value)	Drayage Population Subject to Retrofit (Low Estimate)	Drayage Population Subject to Retrofit (High Estimate)	Discounted Retrofit Costs (2006 Dollars) (Low Estimate)	Discounted Retrofit Costs (2006 Dollars) (High Estimate)
PRE-1994 Replaced with 1999+	$9,925	6,143	8,259	$60,969,563	$81,973,642
1994 thru 2003	$9,925	15,147	20,365	$150,332,893	$202,122,734
New to Drayage in 2010	$9,925	540	729	$5,357,277	$7,235,325
New to Drayage in 2011	$9,925	553	747	$5,489,756	$7,413,975
New to Drayage in 2012	$9,925	567	766	$5,625,532	$7,602,550
	Total	**22,950**	**30,866**	**$227,775,020**	**$306,348,226**

As shown in the table above, staff expects 6,143 to 8,259 drayage 1999+ model year trucks to be retrofitted in 2009 at a cost of $9,925 per truck (2006 dollars). The $9,925 cost of the DPF is based on average vendor quotes for Passive DPF with DOC product and installation costs obtained in 2007. The total cost for these retrofits is projected to be $60,969,563 to $81,973,642 (or $9,925 per DPF x 6,143 to 8,259 drayage 1999+ trucks). Since these total costs were determined in 2006 dollars or present value, no further discounting is required. Staff notes that future DPF prices at the time the retrofit is actually performed could vary and be subject to component prices and market conditions.

The total cost for retrofitting 23,000 – 31,000 drayage trucks during Phase 1 was estimated to be between $228 million - $306 million (2006 dollars). When the cost of upgrading pre-1994 drayage trucks to model year 1999 or newer is added to the total cost of retrofitting existing trucks and those trucks entering service between 2010- 2012, the total cost of Phase 1 of the proposed regulation is determined to be $358 million to $481 million. Since annualized costs incurred

[9] The Level 3 VDECS cost is based on the average price quote staff obtained for a Passive DPF with a DOC in 2007. The amount includes an estimate for installation costs as well.

vary by year, an average total annualized cost over Phase 1 of the regulation (2009 – 2013) must be determined. Annualized costs for every year during Phase 1 of the proposed regulation are presented in Table VIII-4 below:

Table VIII-4: Annualized Costs Associated With Trucks Replacement and Retrofit Programs during Phase 1 of Proposed Regulation (2009 - 2013)

YEAR ANNUAL COSTS INCURRED	PURPOSE	ANNUALIZED COST	
		LOW RANGE	HIGH RANGE
2010	Phase 1 Replacement & Retrofit Costs for PRE-2004 MY Trucks	$83,015,142	$111,613,946
2010	**Phase 1 Cumulative 2010 Costs**	**$83,015,142**	**$111,613,946**
2011	Phase 1 Retrofit Costs for New 2010 Drayage Trucks	$950,953	$2,244,800
2011	Phase 1 Replacement & Retrofit Costs for PRE-2004 MY Trucks	$83,015,142	$111,613,946
2011	**Phase 1 Cumulative 2011 Costs**	**$83,966,095**	**$113,858,746**
2012	Phase 1 Retrofit Costs for New 2010 Drayage Trucks	$950,953	$2,244,800
2012	Phase 1 Retrofit Costs for New 2011 Drayage Trucks	$974,469	$2,300,227
2012	Phase 1 Replacement & Retrofit Costs for PRE-2004 MY Trucks	$83,015,142	$111,613,946
2012	**Phase 1 Cumulative 2012 Costs**	**$84,940,564**	**$116,158,973**
2013	Phase 1 Retrofit Costs for New 2010 Drayage Trucks	$950,953	$2,244,800
2013	Phase 1 Retrofit Costs for New 2011 Drayage Trucks	$974,469	$2,300,227
2013	Phase 1 Retrofit Costs for New 2012 Drayage Trucks	$998,570	$2,358,733
2013	Phase 1 Replacement & Retrofit Costs for PRE-2004 MY Trucks	$83,015,142	$111,613,946
2013	**Phase 1 Cumulative 2013 Costs**	**$85,939,133**	**$118,517,706**
2010 - 2013	**Average Annual Phase 1 Costs**	**$84,465,233**	**$115,037,343**

Since the retrofitted trucks are subject to regulatory requirements in the year 2013, the retrofit and replacement costs for the trucks were capitalized for a period of 4 years only. Staff credited expected proceeds from disposal of pre-2004 vehicles in 2013 to offset the annualized costs. A discount rate of 15 percent was selected to reflect the higher occupation, turnover, and credit risk of a lower income sub-group of drayage workers (Monaco, 2007). The average total net annualized costs for the replaced and retrofitted vehicles were found to range from $84 million to $115 million.

Staff estimated that these replacement and retrofit costs represent, on average a cost of $3,700 per year to a drayage owner-operator between the years 2009 -2012. True annualized costs for some drayage owner-operators may be higher or lower, depending upon the applicability of retrofit with or without replacement requirements to their existing vehicles. Staff has further estimated that the proposed Phase 1 regulatory measure will primarily result in a reduction of PM emissions of 746 tons from pre-regulatory or baseline emissions levels when the regulation is fully implemented in 2014. Therefore, the cost effectiveness for Phase 1 of the proposed regulation was found to be $113,212 to $154,189 per ton PM reduced, or correspondingly $57 to $77 per pound of PM reduced. A summary of Phase 1 program costs and cost effectiveness are presented in Table VIII-5 below:

Table VIII-5: Summary of Phase 1 Costs and Cost Effectiveness Implementation Period: 2009 - 2012

Date of Implementation	Regulatory Applicability	Total Costs (Low Estimate)	Total Costs (High Estimate)
12/31/2009 thru 12/31/2012	Pre-2004 Model Year Engines & Trucks Entering Service through 2012 (Including Pre-1994 Model Year Upgrades)	$357,698,036 (2006 Dollars)	$481,029,858 (2006 Dollars)
12/31/2009 thru 12/31/2012	Pre-2004 Model Year Engines & Trucks Entering Service through 2012 (Including Pre-1994 Model Year Upgrades)	$84,465,233 AVERAGE TOTAL ANNUALIZED COSTS (4 Years)	$115,037,343 AVERAGE TOTAL ANNUALIZED COSTS (4 Years)
2010 - 2014	Estimated Reduction in PM Emissions Achieved (Tons)	746	746
2010 - 2014	Phase 1 Cost Effectiveness ($ / ton)	$113,212	$154,189
2010 - 2014	Phase 1 Cost Effectiveness ($ / pound)	**$57**	**$77**

PHASE 2 PROGRAM COSTS

The second phase of the proposed regulation requires that all trucks with pre-2004 model year engines meet or exceed 2007 federal heavy duty diesel-fueled engine standards (Tables VIII-6 and VIII-7).

Table VIII-6: Trucks with Pre-2004 Model Year Engines

Regulatory Phase	Compliance Deadline	Compliance Method
Phase 2	December 31, 2013	Meet or exceed 2007 federal heavy-duty diesel-fueled engine standards

Table VIII-7: Trucks Entering Drayage Service through 2013

Regulatory Phase	Compliance Deadline	Compliance Method
Phase 2	December 31, 2013	Meet or exceed 2007 federal heavy-duty diesel-fueled engine standards

Staff determined that an estimated 24,000 to 32,000 drayage trucks will be required to comply with the Phase 2 requirements in or before December 31, 2013, by replacing their existing vehicles with a minimum 2007 model year California and federal compliant vehicle. Staff determined that this estimate includes 2,300 – 3,000 owner-operators who are expected to enter drayage service during the years 2010 – 2013. Staff estimates the age of the replacement vehicle to be six (6) years old and projects that the vehicle will have a net replacement cost of $38,500 per truck (2006 dollars) less an estimated average trade-in allowance of $5,500 for the pre-2004 vehicle, or $33,000 per vehicle.

Staff estimated that the 24,000 – 32,000 truck replacements for pre-2004 vehicles in drayage service with model year 2007 federal compliant heavy duty diesel vehicles to be between $777 million and $1,044 million (2006 dollars). The Phase 2 cost derivation is presented in Table VIII-8 below.

Table VIII-8: Phase 2 Replacement Costs - Trucks with Pre-2004 Model Year Engines and Trucks Entering Drayage Service through 2013 Date of Implementation: December 31, 2013

Mean Predicted Truck Value for 6-Year Old[10] Less Trade-In Allowance (2006 Dollars)	Drayage Population Subject to Replacement (Low Estimate)	Drayage Population Subject to Replacement (High Estimate)	Total Replacement Costs (2006 Dollars) (Low Estimate)	Total Replacement Costs (2006 Dollars) (High Estimate)
$33,016	22,950 (2009 – 2012 Drayage Vehicles)	30,866 (2009 – 2012 Drayage Vehicles)	$757,700,177	$1,019,076,212
$32,328	595 (2013 New to Drayage Vehicles)	785 (2010 – 2013 New to Drayage Vehicles)	$19,235,189	$25,377,519
	23,545	**31,651**	**$776,935,366**	**$1,044,453,730**
		Annualized Costs (14 Years)	**$137,885,091**	**$185,362,363**

Staff will now illustrate how total present value replacement costs are derived. Staff estimate's that between 22,950 to 30,866 trucks will be required to be replaced with model year 2007 California and federal compliant vehicles by December 31, 2013. Staff determined that the mean cost of the used truck replacing the aged truck in drayage service is $38,437 (2006 dollars). This cost was obtained from used truck age - price forecasting models developed from ARB staff market surveys conducted in 2006 – 2007 (see Appendix D). An average trade-in allowance of $5,421 for existing pre-2004 model was applied to the replacement costs for a net cost of $33,016 per truck. Therefore, the total replacement costs are found to be (22,950 to 30,866 trucks x $33,016 per truck), or $757,700,177 to $1,019,076,212 (2006 dollars).

The annualized cost for that particular replacement item is obtained by amortizing, or capitalizing the total replacement costs, over a period of 14 years,

[10] Mean Predicted Used Truck Value is the average price of the used truck prices predicted from the forecasting models developed in the 2005, Oct-Dec 2006, and July 2007 ARB Staff – Used Truck Marketplace Surveys. These models are presented in the Appendix. Staff notes that even though replacement vehicle costs occur on a future date in the regulatory timeline, prices from the 2006-2007 Staff survey were unadjusted and reported as 2006 dollars. Staff believes that predicting more accurate future replacement costs would require development of complex price curves, depreciation schedules, and factor market supply and demand scenarios, and account for technological shifts in the marketplace, which are beyond the scope of this analysis.

at a pre-determined or applicable discount rate. Staff assumes the discount rate for drayage operators to be 15 percent (Monaco, 2007). Staff expects the vehicle to have a zero residual value at the end of the CRP. Staff estimates the total annualized costs for Phase 2 of the proposed regulation to be $138 million to $185 million.

Staff estimated that these Phase 2 costs represent, on average, a cost of $5,900 per year to a drayage owner-operator between the years 2014 - 2027. Staff has further estimated that the proposed Phase 2 regulatory measure will primarily result in a reduction of NOx emissions of 11,900 tons from the pre-regulatory baseline emissions levels. Therefore, the cost effectiveness for Phase 2 of the proposed regulation was found to be $12,000 - $16,000 per ton NOx reduced, or correspondingly a cost-effectiveness of $6 to $8 per pound of NOx reduced. A summary of Phase 2 program costs are presented in Table VIII-9 below:

Table VIII-9: Summary of Phase 2 Cost Effectiveness Implementation Period: December 31, 2013

Date of Implementation	Regulatory Applicability	Total Costs (Low Estimate)	Total Costs (High Estimate)
12/31/2013	All Phase 2 Replacement Total Costs (2006 Dollars)	$776,935,366	$1,044,453,730
12/31/2014 to 12/31/2027	All Phase 2 Replacement Annualized Costs	$137,885,091	$185,362,363
2013	Estimated Reduction in NOx Emissions Achieved (tons)	11,897	11,897
2013	Phase 2 NOx Cost Effectiveness ($ / ton)	**$11,590**	**$15,581**
2013	Phase 2 NOx Cost Effectiveness ($ / pound)	**$6**	**$8**

TOTAL REGULATION COSTS

Phase 1 and Phase 2 compliance costs were then combined to determine the total regulation cost for the regulatory timeline 2009 – 2013 established in the proposed regulation. These costs were determined to be between $1.13 to $1.53 billion (2006 dollars). The total annual emissions reduction achieved was found to be approximately 750 tons of PM per year, and 11,900 tons of NOx per year by the time the regulation is fully implemented in 2014. Total regulation costs estimated for the 2009 - 2013 regulatory timeline, and the corresponding total annualized costs for each phase of the proposed regulation, along with the estimated emissions reductions achieved for both PM and NOx are summarized in Table VIII-10 below:

Table VIII-10: Summary of Total Regulation Costs Date of Implementation: 2009 - 2013

Date of Implementation	Regulatory	Total Annualized Costs (Low Estimate)	Total Annualized Costs (High Estimate)
2009 - 2012	Total Phase 1 Costs	$357,698,036 (2006 Dollars)	$481,029,858 (2006 Dollars)
2013	Total Phase 2 Costs	$776,935,366 (2006 Dollars)	$1,044,453,730 (2006 Dollars)
2009 2013	**Total Regulation Costs**	**$1,134,633,402**	**$1,525,483,589**
2010 - 2013	Average Total Phase 1 Annualized Costs	$84,465,233	$115,037,343
2014 - 2027	Phase 2 Annualized Costs	$137,885,091	$185,362,363
2010	Annual PM Reductions Achieved (tons)	746	746
2010	**Phase 1 PM Cost Effectiveness ($ / pound)**	**$57**	**$77**
2014	Annual NOx Reductions Achieved (tons)	11,897	11,897
2014	**Phase 2 NOx Cost Effectiveness ($ / pound)**	**$6**	**$8**

ALTERNATIVES TO THE REGULATION

Staff considered two alternative strategies to the proposed regulation for which total present value costs, and PM and NOx cost effectiveness ratios were determined. Total costs and cost effectiveness of the alternative strategies were then compared to those of the proposed regulation. Both alternatives strategies considered can achieve an equivalent or greater reduction in diesel PM and NOx emissions from in-use, on-road, heavy-duty drayage trucks.

The first alternative considers replacing the entire existing in-use, on-road, heavy-duty diesel-fueled population of drayage trucks with new, heavy-duty, diesel-fueled drayage trucks that are compliant with federal heavy duty diesel engine standards for model year 2010 by the end of 2013. Staff assumes that the entire fleet of an estimated 24,000 – 32,000 in-use, heavy-duty diesel-fueled trucks will be replaced with new model year 2010 compliant heavy duty diesel vehicles by December 31, 2013. Staff estimated costs for replacement with new heavy duty diesel vehicles due to not being able to guarantee supply of used model year 2010 vehicles in the market until the vehicles come of program leases (~ 4 to 5 years after model year introduction). Table VIII-11 below summarizes the total present value costs (2006 dollars) of the regulation alternative strategy 1 considered. When compared to the proposed regulation, the total cost of $3.09 billion - $4.15 billion (2006 dollars) was found to be much higher than the one proposed, and at a higher cost effectiveness for both PM and NOx emissions control.

Table VIII-11: Regulation Alternative 1 Costs: Replace All Drayage Vehicles with New Trucks Compliant with Federal 2010 Heavy Duty Diesel Fueled Engine Emissions Standards by December 31, 2013

Mean Predicted Truck Value for New 2010 Compliant Truck (2006 Dollars)	**Drayage Population Subject to Replacement (Low Estimate)**	**Drayage Population Subject to Replacement (High Estimate)**	**Total Replacement Costs (2006 Dollars) (Low Estimate)**	**Total Replacement Costs (2006 Dollars) (High Estimate)**
$131,213[11]	23,545	31,651	**$3,089,398,313**	**$4,153,006,838**
		Annualized Costs (20 Years)	$495,545,410	$666,150,256
		2014 NOx Reductions Expected (tons)	15,777	15,777
		NOx Cost Effectiveness ($ / ton) (1/2 Cost Appropriation Method)	**$15,705 ($8 / pound)**	**$21,112 ($11 / pound)**
		2014 PM Reductions Expected (tons)	746	746
		PM Cost Effectiveness ($ / ton) (1/2 Cost Appropriation Method)	**$332,100 ($166 / pound)**	**$446,435 ($223 / pound)**

[11] Staff notes that the forecasted value (2006 dollars) of a new model year 2010 compliant truck includes an estimated cost of $10,000 for an urea-fed SCR system, or equivalent NOx reduction technology yet to be developed or commercialized (for example, a NOx adsorption catalyst).

Staff notes that methodology used to determine PM and NOx cost effectiveness for the regulation alternative considered is marginally different from the methodology used to determine cost-effectiveness of the proposed regulation. The difference arises due to one-half of the annualized cost of the regulation alternative being attributed to PM emissions control, and the other half to NOx emissions control. In the proposed regulation, cost effectiveness was determined at each phase of the regulation; with Phase 1 producing a PM reduction benefit, and Phase 2 producing a NOx reduction benefit.

Staff cautions that model year 2010 or newer vehicle owner-operators may incur additional operating costs for trucks with urea equipped SCR systems used to control NOx emissions levels, but this is not a requirement of the regulation being proposed. While staff anticipates an additional cost of $10,000 to the purchase price of a model year 2010 vehicle, staff believes that competing NOx control technologies being developed (for example, NOx adsorption catalysts) may dominate over urea-fed SCR systems in heavy duty diesel trucks, and these additional costs may not be a relevant concern in 2013. Life cycle operating costs for year 2010 compliant heavy duty diesel trucks with urea fed SCR systems were not determined as part of this regulatory comparison.

The second alternative to the regulation considers replacing and / or re-powering one-half the entire existing estimated population of in-use, heavy duty diesel-fueled drayage vehicles in port and intermodal rail service with liquefied natural gas (LNG) fueled vehicles, and the other half with new or used model year 2007 compliant heavy duty diesel-fueled vehicles. Staff assumes that one-half the entire fleet of an estimated 24,000 – 32,000 in-use, heavy-duty, diesel-fueled trucks will be replaced or re-powered with LNG fueled vehicles at a cost of $175,000 per vehicle (2006 dollars). This cost is based on a base diesel-fueled, Class 8 tractor cost of $95,000, and a charge of $80,000 to retrofit the tractor with a LNG fuel system (Cummins Westport, 2007). Costs for the other half of the estimated 24,000 – 32,000 drayage trucks in service were determined using the same methodology that was used in the proposed regulation.

Table VIII-12 summarizes the total present value costs (2006 dollars) of the regulation alternative 2 strategy considered. When compared to the proposed regulation, the total cost of $2.55 billion - $3.43 billion (2006 dollars) was found to be far greater than the one proposed, and at a higher cost effectiveness for both PM and NOx emissions control. Staff notes that methodology used to determine PM and NOx cost effectiveness for the regulation alternative considered is different from the methodology used to determine cost-effectiveness of the proposed regulation. The difference arises due to one-half of the annualized cost of the regulation alternative being attributed to PM emissions control, and the other half to NOx emissions control. In the proposed regulation, cost effectiveness was determined at each phase of the regulation; with Phase 1 producing primarily a PM reduction benefit, and Phase 2 producing primarily a NOx emissions reduction benefit.

LNG fuel dispensing infrastructure and fuel dispensing station annual operator costs were factored into the total cost determination as part of this regulatory comparison. LNG fuel dispensing station capital costs were based on a cost of $800,000 / station. Staff was advised that approximately 4 stations are needed to fuel 1,000 trucks, which is equivalent to a cost of $3,200,000 per 1,000 trucks. For an estimated 12,000 - 16,000 trucks, staff determined total capital (infrastructure) costs to be $38.4 - $51.2 million. When these costs are capitalized over a 20 year period (Plant, Property, and Equipment) at a discount rate of 7 percent, the annualized costs are expected to be $3,624,688 to $4,832,918. Staff estimates that the LNG fuel dispensing facilities would incur additional annualized labor costs of $5.2 million to $6.9 million for operator assisted fuel dispensing at the LNG stations. These costs are based on an operator wage rate of $21.65 per hour[12] and the assumption that the facility operates for 2 shifts per day, 6 days per week.

Staff notes that LNG fuel, on a per diesel gallon equivalent basis, is expected to be approximately 30 percent cheaper than diesel fuel between 2010 and 2014 (Tiax, 2005)[13]. This represents an incremental cost of approximately $0.60 - $0.70 per gallon of diesel over the cost of LNG fuel (with sensitivity analysis, the difference is expected to be $0.40 -$ 0.50 per gallon[14]). Life cycle operating costs for LNG trucks were not determined as part of this regulatory comparison.

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[12] LNG Fuel Dispensing Station Operator Wage Rate Based on 2007 25th Percentile (Entry Level) Hourly Wage for Chemical Plant and System Operators in California ($21.65) (http://www.labormarketinfo.edd.ca.gov).

[13] Tiax LLC, 2005, Figure 2-5: Incremental Cost of Diesel Over LNG, Comparative Costs of 2010 Heavy Duty Diesel and Natural Gas Technologies (Final Report).

[14] Tiax LLC, 2005, Figure 2-7: LNG Fuel Price Differential for Sensitivity Analysis, Comparative Costs of 2010 Heavy Duty Diesel and Natural Gas Technologies (Final Report).

Table VIII-12: Regulation Alternative 2 Costs: Replace One-Half of All Drayage Vehicles with New LNG Trucks, and Other-Half with Federal Model Year 2007 Compliant Heavy Duty Diesel Fueled Trucks by December 31, 2013

Mean Predicted Value, or Net Cost (2006 Dollars)	Drayage Population Subject to Replacement (Low Estimate)	Drayage Population Subject to Replacement (High Estimate)	Total Replacement Costs (2006 Dollars) (Low Estimate)	Total Replacement Costs (2006 Dollars) (High Estimate)
$175,000 (LNG Truck)	11,773	15,826	$2,060,187,500	$2,769,462,500
$38,437 (MY 2007 Diesel Truck)	11,773	15,826	$452,499,912	$608,285,187
LNG Fuel Dispensing Station Capital Costs	-	-	$38,400,000	$51,200,000
TOTAL	**23,546**	**31,652**	**$2,551,087,412**	**$3,428,947,687**
		Average Total Annualized Costs (Including LNG Fuel Dispensing Labor Costs) (2014 – 2033)	**$394,465,797**	**$530,174,827**
		2014 NOx Reductions Expected (tons)	12,843	12,843
		NOx Cost Effectiveness ($ / ton) (1/2 Cost App Method)	**$15,357 (6 per pound NOx)**	**$20,641 ($9 per pound NOx)**
		2014 PM Reductions Expected (tons)	746	746
		PM Cost Effectiveness ($ / ton) (1/2 Cost App Method)	**$264,360 ($132 per pound PM)**	**$355,308 ($178 per pound PM)**

EQUIVALENT TOTAL COST OF THE PROPOSED REGULATION

In this section, staff determined the equivalent cost of the proposed regulatory measure to a typical drayage truck owner at the ports of Los Angeles and Long Beach and the Port of Oakland. Staff previously reported that the estimated Phase 1 replacement and retrofit costs represent, on average, a cost of $3,700 per year to a drayage owner-operator between the years 2009 - 2012. With the assumption[15] that the drayage operator will make, on average, at least 2.4 container moves per day and work, on average, 250 days per year without impacting his or her quality of life, then the drayage truck owner is expected to make 2.4 x 250 or 600 container moves per year. When the annual cost of Phase 1 to the drayage truck owner is divided by the expected annual number of container moves per year, the impact of the cost of the regulation is determined to be approximately $6 per container (2009 - 2012).

Similarly, staff previously reported that the estimated Phase 2 replacement costs represent, on average, a cost of $5,900 per year to a drayage truck owner between the years 2013 - 2027. When the annual cost of Phase 2 is divided by the expected annual number of container moves per year (600), the impact of the cost of the regulation is determined to be approximately $10 per container (2013 - 2027).

Therefore, staff determined that the annual cost of the proposed regulation to a typical drayage truck owner at the Ports of Los Angeles and Long Beach and the Port of Oakland is approximately $6 per container move during the years 2009 - 2012, and approximately $10 per container move during the years 2013 - 2027. This container fee can be assumed to be on average $9 per container move for the service life of the proposed regulation (2009 - 2027). The results are summarized in Table VIII-13:

[15] These assumptions are discussed in detail in the chapter discussion on potential impacts of proposed regulation to small business.

Table VIII-13: Equivalent Cost of Proposed Regulation to Drayage Truck Owners at the Ports of Los Angeles, Long Beach, and Oakland

	Phase 1 Annual Costs (2009 – 2012)	**Phase 2 Annual Costs (2013 – 2027)**
Annual Cost to Drayage Operator	$3,727	$5,856
Estimated Average Number of Container Moves Per Day	2.4	2.4
Estimated Average Number of Workdays Per Year	250	250
Annual Number of Container Moves Per Year	600	600
Equivalent Container Fee ($ Per Container)	**$6.21 (2009 - 2012)**	**$9.76 (2013 – 2027)**
Average (Weighted) Equivalent Container Fee	**$9 (2009 – 2027)**	**$9 (2009 – 2027)**

Staff has also determined that the average container fee of $9 determined above represents less than 1 percent of standard sea-borne freight shipping rates applicable to containers (Air Parcel Express, 2005 and Maersk Sealand, 2005). This relevance is important when an assumption is made that the annual cost incurred by drayage operators for complying with the requirements of the proposed regulation can be passed on to the shipping companies, who may further pass on the costs to their customers.

D. Potential Impact on a Small Business (Port Truck Independent Operator)

This section evaluates the impact of the proposed regulation on the gross income of a typical port truck independent owner operator at the Port of Oakland, and the ports of Los Angeles and Long Beach. Tables VIII-14 and VIII-15 itemizes revenue and business expenses assumptions used to estimate the gross margin of a port drayage truck operator, and the resulting impact that the compliance cost of the proposed regulation may have on a typical port truck operator at each one of these ports. Revenue and expense assumptions are explained in the methodology for estimating port drayage operator gross margins.

METHODOLOGY FOR ESTIMATING POTENTIAL SMALL BUSINESS IMPACTS

The methodology for estimating potential small business impacts as a result of the proposed regulation is based on a simple premise of estimating annual revenues less business expenses before and after the regulation goes into effect. The difference of revenues less business expenses yields a “gross margin” for the typical drayage operator (Small Business). Staff assumes that margins are gross due to the assumption that some taxes (social security, income tax withholding, Medicare) must be paid on earned income, and some other expenses such as healthcare deductions must be made before the income can be qualified as net income.

Specifically, staff selected port drayage operators at the ports of Los Angeles and Long Beach, and the Port of Oakland to analyze the potential small business impact of the proposed regulation. Having once obtained the gross margins in the drayage business, staff compared decreases in gross margins as a result of proposed regulatory requirements in 2009, and in 2013 pre-regulatory margins. Since it is known that harbor drayage truck operators typically earn income in the mid thirties (Monaco, 2007), staff also compared changes in gross margins before and after the proposed regulation is implemented with the California per capita income level (BEA, 2005), and noted the impact of the proposed regulatory measure.

Staff observed that in the gross margin model, port operators at the ports of Los Angeles and Long Beach are expected to earn slightly more than the corresponding workers at the Port of Oakland. This is because the ports of Los Angeles and Long Beach are open for extended hours during the day, and on the weekend, whereas the Port of Oakland only maintains regular operating hours. The following other assumptions are critical to the estimation of the gross margins in the model:

1. Staff assumes that revenues are based on a minimum of two off-port container moves per day.

2. In addition to off-port container moves, staff assumes that the port drayage operator will maximize his or her schedule for the day, and additionally make some inter-terminal moves at a fraction of the off-port container move rate. Such a move may involve transporting a trailer chassis, or an empty container to a depot or terminal. The number of inter-terminal moves is determined from the ratio of inter-terminal to off-port container moves in the ARB 2005 emissions inventory for port and intermodal rail trucks.

3. The Income per Trip is based on the Tiax study referenced in the draft staff report “Evaluation of Port Trucks and Possible Mitigation Strategies” (ARB-PT, 2006).

4. The number of workdays drayage operators work per year is based on minimum quality of life assumptions and is not necessarily the number of days the ports are open for business during a given year. Staff assumes that drayage operators will take at least 10 vacation days per year, and not work on 12 state and federal holidays per year.

5. Fuel expense is based on California retail ULSD price obtained from 2007 USDOE survey, and a fuel economy of 7 miles/gallon. Staff notes that actual fuel expense may be higher based on a lower fuel economy derived from older trucks operating in port drayage.

6. Drayage operator commute to and from home is based on an average commute distance of 25 miles (one-way).

7. Business commute is based on an average 26,000 – 45,000 miles annual vehicle miles traveled per year (2002 POLA Emissions Inventory).

8. Annual drayage truck maintenance expenses are based on staff developed estimates of number of oil changes per year, and the cost to overhaul or rebuild truck engines at recommended mileage intervals. Additionally, miscellaneous vehicle parts and service is estimated to be 10% of mean truck residual value (staff estimate).

9. All other business expenses (such as Vehicle Insurance Expense (Federal and State), License, Motor Vehicle Registration Fees (DMV), and Other Vehicle Compliance & Permit Fees) are based on actual invoices (Tom Ward / Alliance Petroleum, 2003) for Class 8 commercial trucks, and adjusted for inflation (2006 dollars). Staff believes that these business expenses are likely to be overstated for port drayage (worst case assumption).

10. Staff estimated a pre-regulation depreciation expense based on the remaining useful life of the drayage truck, and assumed that the residual value of the truck would be depreciated equally over the remaining useful life of the truck.

Table VIII-14: Impact of the Proposed Regulation on the Gross Income of a Typical Port Drayage Truck Operator at the Port of Oakland

		Before Regulation	After Regulation (2009-12)	After Regulation (2013-27)
I	**Annual Vehicle Miles Traveled (VMT) (miles/year)**			
I.1	Business Commute for Container Transport (Lower Bound)	26,000	26,000	26,000
I.2	Business Commute for Container Transport (Upper Bound)	45,000	45,000	45,000
I.3	Commute To/From Home and Business (Round Trip)	11,950	11,950	11,950
I.4	Total Annual VMT (Lower Bound)	37,950	37,950	37,950
I.5	Total Annual VMT (Upper Bound)	56,950	56,950	56,950
II	**Revenue Assumptions**			
II.1	Annual Revenue (2.35 Trips dayx$125/Tripx239 Workdays/Year)	**$70,206**	**$70,260**	**$70,260**
III	**Vehicle Expenses**			
III.1	Fuel (Container Transport, Average 26k-45k VMT/Year)	$15,150	$15,150	$15,150
III.2	Fuel (Commute To/From Home and Business/Port/Intermodal)	$ 5,100	$ 5,100	$ 5,100
III.3	Total Fuel Expense	$20,250	$20,250	$20,250
III.4	Vehicle Insurance (Federal and State)	$ 8,607	$ 8,607	$ 8,670
III.5	License, Motor Vehicle Registration Fees (DMV)	$ 1,729	$ 1,729	$ 1,729
III.6	Other Vehicle Compliance & Permit Fees	$ 1,022	$ 1,022	$ 1,022
III.7	Vehicle Maintenance (2 Oil/Filter Changes Per Year on Average)	$ 522	$ 522	$ 522
III.8	Engine Maintenance (Overhaul/Rebuilt Every Million Miles)	$ 720	$ 720	$ 720
III.9	Miscellaneous Parts & Service (10% of Truck Value)	$ 1,609	$ 1,609	$ 1,609
III.10	Depreciation ("Fleet Distribution" Worksheet)	$ 2,506		
III.11	Regulatory Annual cost (2009-2012) (See Section V. 1-3)		$3,727	
III.12	Regulatory Annual cost (2023-2027) (See Section V. 4-6)			$5,856
III.13	Total Annual Expenses	**$36,994**	**$38,215**	**$40,344**
IV	**Drayage Truck Owner Operator Gross Income**			
IV.1	Gross Income (II.1 – III.13)	$33,212	$31,991	$29,862
IV.2	2006 California Per Capita Income	$38,127	$38,127	$38,127
IV.3	Percentage below Per Capita Income	-13%	-16%	-22%

As shown in the above table, staff estimates that a typical port truck operator at the Port of Oakland earned gross income of $33,212 pre-regulation in 2006. This income was about 13 percent below the 2006 California per capita income of $38,127. When the first phase of the proposed regulation becomes effective in 2009, the gross income of a typical port truck operator at Port of Oakland is expected to fall 16 percent below California per Capital income. When the second phase becomes effective in 2013, the gross margins are expected to be 22 percent below the California per capita income level. On average, staff expects gross margins for drayage at the Port of Oakland to decrease by $2,300 ($1,200 to $3,400).

Table VIII-15: Impact of the Proposed Regulation on the Gross Income of a Typical Port Drayage Truck Operator at the Ports of Los Angeles and Long Beach

		Before Regulation	After Regulation (2009-12)	After Regulation (2013-27)
I	**Annual Vehicle Miles Traveled (VMT) (miles/year)**			
I.1	Business Commute for Container Transport (Lower Bound)	26,000	26,000	26,000
I.2	Business Commute for Container Transport (Upper Bound)	45,000	45,000	45,000
I.3	Commute To/From Home and Business (Round Trip)	12,985	12,985	12,985
I.4	Total Annual VMT (Lower Bound)	38,985	38,985	38,985
I.5	Total Annual VMT (Upper Bound)	57,985	57,985	57,985
II	**Revenue Assumptions**			
II.1	Annual Revenue (2.45 Trips dayx$125/Tripx260 Workdays/Year)	**$79,625**	**$79,625**	**$79,625**
III	**Vehicle Expenses**			
III.1	Fuel (Container Transport, Average 26k-45k VMT/Year)	$15,150	$15,150	$15,150
III.2	Fuel (Commute To/From Home and Business/Port/Intermodal)	$ 5,541	$ 5,541	$ 5,541
III.3	Total Fuel Expense	$20,691	$20,691	$20,691
III.4	Vehicle Insurance (Federal and State)	$ 8,607	$ 8,607	$ 8,670
III.5	License, Motor Vehicle Registration Fees (DMV)	$ 1,729	$ 1,729	$ 1,729
III.6	Other Vehicle Compliance & Permit Fees	$ 1,022	$ 1,022	$ 1,022
III.7	Vehicle Maintenance (2 Oil/Filter Changes Per Year on Average)	$ 552	$ 552	$ 552
III.8	Engine Maintenance (Overhaul/Rebuilt Every Million Miles)	$ 736	$ 736	$ 736
III.9	Miscellaneous Parts & Service (10% of Truck Value)	$ 1,609	$ 1,609	$ 1,609
III.10	Depreciation ("Fleet Distribution" Worksheet)	$ 2,506		
III.11	Regulatory Annual cost (2009-2012) (See Section V. 1-3)		$3,727	
III.12	Regulatory Annual cost (2023-2027) (See Section V. 4-6)			$5,856
III.13	Total Annual Expenses	**$37,452**	**$38,673**	**$40,802**
IV	**Drayage Truck Owner Operator Gross Income**			
IV.1	Gross Income (II.1 – III.13)	$42,173	$40,952	$38,823
IV.2	2006 California Per Capita Income	$38,127	$38,127	$38,127
IV.3	Percentage below Per Capita Income	+11%	+7%	+2%

As shown in the above table, staff estimates that a typical port truck operator at Ports of Los Angeles and Long Beach earned gross income of $42,173 pre-regulation in 2006. This income was about 11 percent above the 2006 California per capita income of $38,127. When the first phase of the proposed regulation becomes effective in 2009, the gross income of a typical port truck operator at Ports of Los Angeles and Long Beach is expected to be only 7 percent above the California per capita income level. When the second phase of the proposed regulation becomes effective in 2013, the operator's gross income is expected to be only 2 percent above the California per capita income level. On average, staff expects gross margins for drayage at the ports of Los Angeles and Long Beach to decrease by $2,300 ($1,200 to $3,400).

E. Potential Impact on Employment, Business Creation, Elimination, or Expansion

ARB Staff assessed the overall impact the proposed regulation could potentially have on California's economy. Staff used E-DRAM, a model of the California economy, developed by the University of California, Berkeley, to estimate the potential impacts to gross state output, personal income, and employment. ARB has used E-DRAM to assess the economic impacts of several major regulations. The Department of Finance has previously used it in the past for purposes of policy and revenue analysis. The model is updated as industrial data becomes available. The current version is based on the industrial data obtained in 2003.

1. Annualized Cost of Compliance

The annualized cost of the proposed regulatory measure is the basic input parameter that is modeled in E-DRAM. The inputs used in this E-DRAM analysis represent the range of total annualized regulatory costs for the year with the greatest potential for adverse impact on affected businesses.

In 2009, there is a requirement in the proposed regulation to have all pre-2004 drayage trucks retrofitted with a level 3 VDECS. Staff estimates 21,000 – 29,000 drayage trucks to be impacted by this requirement. In addition, all new to local drayage trucks entering the business (new market entrants) between the years 2010 and 2012 is also expected to meet the same retrofit requirement. Staff anticipates that 1,700 – 2,200 trucks will enter the drayage business and will be required to retrofit their trucks with a level 3 VDECS. The total truck replacement (for some pre-1994 trucks) and retrofit costs less estimated proceeds from residual value of the truck in 2013, in 2006 dollars, were annualized over a period of 4 years (2009 - 2013) using a 15 percent discount rate (Monaco, 2007). The 2009 – 2012 requirements to retrofit all drayage trucks with level 3 VDECS are collectively termed as Phase 1 regulatory requirements.

In 2013, there are additional requirements for drayage trucks to meet 2007 MY emission standards. The requirement to replace drayage trucks with minimum model year 2007 federally compliant heavy duty diesel trucks by December 31, 2013 is collectively termed as Phase 2 requirements. Assuming that owner-operators will choose to replace their vehicles with a six year old vehicle to meet the 2013 requirements, staff determined replacement costs for an estimated 24,000 – 32,000 vehicles in drayage service. This estimate includes 600 – 800 new to local drayage trucks that enter the business in the year 2013. The year 2013 costs were then annualized over a period of 14 years, which represents the remaining useful life of the model year 2007 vehicle, at a discount rate of 15 percent. Staff assumed no residual value at the end of its remaining useful life of 14 years.

Additionally, in the year 2014, there is a cost to drayage truck owner-operators from having to dispose of their pre-2004 model year vehicles. Staff anticipates an average trade-in allowance of 50 percent of the predicted residual value for drayage trucks which have approximately 5 years of economic life remaining. The net loss to the owner is approximately $5,500 per truck. Therefore, in the year 2013 - 2014, there is an overlap of annualized costs from the 2009 and 2013 requirements. Due to this cost overlap, the year 2013 - 2014 represents the year with the highest annualized costs, or greatest potential for adverse impact on the state economy and the truck transportation sector.

Table VIII-16 presents a summary of the total annualized regulatory costs for Phase 1 retrofit and replacement requirements, Phase 2 replacement requirements, and for disposal of pre-2004 model year vehicles in the year 2013 - 2014.

The total annualized costs for 2013-2014 were assigned to the truck transportation sector in the E-DRAM model. In 2006, the truck transportation sector represented about $22 billion (0.76 percent) of the California economy. The cost increases are expected to be partially passed on to consumers gradually over several years, pursuant to financial rules of cost apportionment and market conditions. An annualized cost pass through is used for the E-DRAM modeling because the cost must be spread over the number of years that benefits accrue.

Table VIII-16: Highest Year Annualized Regulatory Costs for the Proposed Drayage Trucks Regulation (2006 dollars)

Itemized Cost	Year Cost Incurred	Annualized Costs to Truck Transportation Sector ($ millions)
Phase 1 Replacement & Retrofit Requirements for Drayage Trucks (2009 – 2012)	2013	$85,939,133 to $118,517,706
Phase 2 Replacement Costs for Drayage Trucks	2014	$137,885,091 to $185,362,363
Total Phase 1 and Phase 2 Annualized Costs	2014	$223,824,224 to $303,880,069
Disposal of Pre-2004 Model Year Vehicles in 2013 - 2014	2014	$128,050,015 to $172,128,943
Total Annualized Costs	**2013 – 2014**	**$351,874,239 to $476,009,012**

2. Economic Impacts

The proposed plan will require increased spending by the truck transportation sector for vehicle replacements and retrofits. These expenditures will in turn have secondary effects on other sectors of the California economy. Using E-DRAM to model these impacts, it is possible to estimate the net effects of the proposed regulatory plan on the aggregate California economy.

E-DRAM represents the economic conditions in California in the year 2003. In order to estimate future year impacts, it is necessary to produce a representation of the 2013 California economy. The 2003 data are extrapolated to 2013 based on forecasts of state population, personal income, and industry-specific growth from the California Department of Finance and the UCLA Anderson School of Business. Regulatory changes are then introduced into the model and impacts are measured as the difference between the 2013 representation with and without the proposed regulation.

The E-DRAM estimates that gross state output, personal income, and employment will grow by $528 billion (22 percent), $313 billion (23 percent), and 1.5 million (10 percent), respectively between 2006 and 2013. The implementation of the proposed rule would result in the state economy to growing at a slightly slower rate.

Table VIII-17 summarizes the impacts of the proposed regulation on the California economy for the year 2013. The results of the analysis indicate the gross state output would be reduced by $650 - $870 million (less than 0.03

percent), and personal income would be reduced by roughly $190 - $250 million (less than 0.02 percent) in 2013. California employment growth would be reduced by 2,400 to 3,400 (less than 0.02 percent) in 2013. Therefore, the impacts of the proposed regulation are small compared to the growth that is expected to occur in California over the next 7 years.

Staff also believes that Phase 2 of the regulation would provide truck owners the benefits associated with owning newer equipment. For example, newer vehicles tend to be more fuel efficient, require less maintenance, and have better reliability (less down time).

Table VIII-17: Economic Impacts of the Proposed Regulation on the California Economy in 2013

California Economy	Without Regulation	With Regulation	Difference	Percent of Total
Impacts if annualized cost is $352 million				
Real Gross State Output (billions of 2006 dollars)	$2,922	$2,921	-0.6	-0.02
Personal Income (billions of 2006 dollars)	$1,694	$1,694	-0.2	-0.01
Employment (thousands of jobs)	17.6	17.6	0.0	-0.01
Impacts if annualized cost is $476 million				
Real Gross State Output (billions of 2006 dollars)	$2,922	$2,921	-0.9	-0.03
Personal Income (billions of 2006 dollars)	$1,694	$1,694	-0.3	-0.01
Employment (thousands of jobs)	17.6	17.6	0.0	-0.02

Many of the goods imported into California pass through the state on their way to a destination beyond California. Likewise, many of the exports from California ports have originated outside of California and have traveled across the state. The E-DRAM results displayed in the tables do not capture any of the out-of-state economic impacts.

A source of uncertainty in the E-DRAM analysis is the industry data that the model is dependent upon. The model uses data for 2003, provided by Professor Peter Berck of UC Berkeley and the data are extrapolated to future years based on growth forecasts from the California Department of Finance and the UCLA Anderson School of Business. These growth rates apply to all E-DRAM sectors.

If the truck transportation sector grows faster than the rate used in E-DRAM, this analysis would overstate the relative impact of the regulation. Conversely, if growth is slower than anticipated, this analysis would understate the relative impact of the regulation.

Additional Issues

There is not a requirement to address the individual sector impacts in the Initial Statement of Reasons (ISOR); however, it is important to be aware of these potential impacts. The following results are information items only.

The E-DRAM estimates that sector output and employment in the Truck Transportation sector will grow by $4.2 billion (23 percent), and nine thousand (10 percent), respectively, between 2006 and 2013. The results of analysis indicate the sector output would be reduced by $210 - $280 million (0.9 – 1.3 percent) in 2013. Sector employment would be reduced by 1,000 to 1,300 (0.9 – 1.2 percent) in 2013. These results are summarized in Table VIII-18 below.

Table VIII-18: Economic Impacts of the Proposed Regulation on the Truck Transportation Sector in 2013

California Economy	Without Regulation	With Regulation	Difference	Percent of Total
Impacts if annualized cost is $352 million				
Sector Output (billions of 2006 dollars)	$22.5	$22.3	-0.2	-0.9
Sector Employment (thousands of jobs)	0.1	0.1	0.0	-0.9
Impacts if annualized cost is $476 million				
Sector Output (billions of 2006 dollars)	$22.5	$22.2	-0.3	-1.3
Sector Employment (thousands of jobs)	0.1	0.1	0.0	-1.3

F. Summary of Current Public Fleet Modernization Financial Assistance and Grant Programs

Staff acknowledges that supplemental funding, a change in the drayage rate fee structure, or both would be critical in meeting the requirements of the proposed regulation. In implementing the proposed regulation, it is expected that staff would continue discussions with the ports, terminal and rail yard operators, shippers, local districts, and other parties to identify potential funding strategies and other mechanisms to ensure the emission reduction targets are met without an interruption in drayage service throughout the State. In the event that funding or other potential sources of income do not materialize or are delayed, staff would update the Board and may consider proposing amendments to the proposed regulation for the Board's consideration at that time.

Examples of existing potential funding mechanisms include a number of federal and State programs that may be utilized by program administrators or truck owners.

State and Federal Financial Assistance for Truck Replacement & Retrofits

In order to update heavy duty diesel trucks to meet the emission standards set forth by this regulation, a number of federal and state programs may be utilized by program administrators or truck owners to off-set the financial cost of this regulation. Please note that each program listed here has its own set of guidelines. Some funding sources will not allow an admixture of monies, i.e., only one funding source is pliable. It is the responsibility of the entity applying for funding to understand the details of each funding guideline. Furthermore, by no means is this an exhaustive list of funding sources available to an entity.

1. Federal Funding Sources

Congestion Mitigation and Air Quality Improvement (CMAQ) Program

Congestion Mitigation and Air Quality Improvement (CMAQ) Program is administrated by the U.S. Department of Transportation, Federal Highway Administration. This program provides funding to state and local governments to support transportation projects as well as programs to improve air quality and reduce traffic congestion. The U.S. Congress amended this program in 1990 to help achieve National Ambient Air Quality Standards. This amendment includes reductions in the amount of permissible tailpipe emissions and provides for a stronger, more rigorous linkage between transportation and air quality planning. The CMAQ program was established under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, and reauthorized under the Transportation Equity Act for the 21^{st} Century (TEA-21) in 1997. In August 2005, CMAQ was again reauthorized under the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), also known as 2005 provision. The SAFETEA-LU placed a renewed focus on advancing cost-effective transportation projects that improve air quality. Specifically, the provision, states that diesel engine retrofits as a priority for CMAQ expenditures, due to the cost-effective emissions reduction benefits that can be achieved through many retrofit technologies. Although, SAFETEA-LU does not change how State and local agencies distribute CMAQ funds, they are encouraged to give priority to projects and programs that finance diesel retrofits and other cost-effective emission-reduction activities, in addition to cost-effective congestion-mitigation activities that provide air quality benefits.

U.S. EPA: EPA's National Clean Diesel Campaign

The U.S. EPA's National Clean Diesel Campaign (NCDC) offers funding and technical assistance to foster the adoption of cleaner diesel technologies and strategies. NCDC encompasses several U.S. EPA regional clean diesel collaboratives that implement NCDC projects at the local levels. Grant opportunities can be announced at the national level or through the U.S. EPA regional collaborative. The following web address has additional information on this program: http://www.epa.gov/cleandiesel/

2. State Funding Sources

Carl Moyer Program

The Carl Moyer Program is a grant program that is implemented by a partnership between the ARB and local air districts. This grant program provides funds for early or extra emissions reductions from: on-road heavy-duty vehicles, idle reduction technologies, off-road diesel equipment, transportation refrigeration units, off-road spark ignition equipment, marine vessels, locomotives, and agricultural engines. Additionally, legislative changes enacted in 2004 expanded this grant program to include light-weight heavy duty trucks, and on-road fleet modernization projects as well as programs aided at previously unregulated agricultural sources. The fleet modernization category provides real emission benefits by retiring the high polluting vehicles earlier than would have been expected through normal attrition. Air districts that choose to participate in the heavy-duty on-road fleet modernization programs must replace the oldest trucks in the fleet by scrapping these trucks and providing a monetary incentive towards the purchase of a newer truck with fewer emissions. Project funds may also pay for emissions reductions device such as diesel particulate filter. The Gateway Cities Council of Governments and Sacramento Metropolitan Air Quality Management District administered and implemented fleet modernization programs through ARB's Carl Moyer Program. These pilot programs used a myriad of administrative tools needed to implement a fleet modernization plan.

Proposition 1B Bond Funding

In November 2006, California voters approved Proposition 1B, the *Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act* of 2006. The passing of this proposition authorized the Legislature to appropriate $1 billion to fund projects that reduce air pollution and consequently the resulting health risk associated from freight movement along California’s trade corridors. California’s budget for fiscal year 2007-2008 includes a $250 million installment, of the $1 billion Bond, appropriated to the Air Resources Board. This first installment also includes implementing legislation via Senate Bill (SB) 88 (Chapter 181, Statutes of 2007) and Assembly Bill (AB) 201 (Chapter 187, Statutes of 2007). SB 88 and AB 201 list heavy-duty diesel trucks as an eligible equipment project to receive funding.

The Goods Movement and Emission Reduction Program (Program) is a partnership between the ARB and local agencies, such as ports, air districts, and local transportation agencies. In September 2007, ARB began development on both the Program as well as the guidelines for funding lower emission equipment projects. According to the implementing legislation, SB 88, local agencies contract with equipment owners to purchase equipment; equipment owners will not apply with ARB for funds through this program.

REFERENCES:

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(Maersk Sealand, 2005) Ocean Freight Transportation Charges (20-foot Container Shipped from Tokyo to Los Angeles),

(Tiax LLC 2005), Comparative Costs of 2010 Heavy-Duty Diesel and Natural Gas Technologies, Final Report,

(ARB 2007) Kamal Ahuja, California Air Resources Board Personal communication with Cummins Westport,

(Monaco, Kristen 2007), The Economics of Port Drayage and the Implications for Clean Air, California State University Long Beach,

Bureau of Economic Analysis (US Department of Commerce), Regional Economic Accounts (California Per Capita Personal Income), 2005 (http://www.bea.gov/regional/reis/drill.cfm).

(ARB 2003) Tom R. Ward / Alliance Petroleum, Memorandum to John Kato (ARB)

(ARB 2006) , Evaluation of Port Trucks and Possible Mitigation Strategies,

Appendix A:

Proposed Regulation to Control Emissions from In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks

Regulation to Control Emissions from In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks

Adopt section 2027 of article 3, chapter 1, division 3 title 13, California Code of Regulations to read as follows:

Section 2027 Purpose and Definitions of Control Measure

(a) ***Purpose***. The purpose of this regulation is to reduce emissions and public exposure to diesel particulate matter (diesel PM), oxides of nitrogen (NOx), and other air contaminants by setting emission standards for in-use, heavy-duty diesel-fueled vehicles that transport cargo to and from California's ports and intermodal rail facilities.

(b) ***Applicability***

(1) This regulation applies to owners and operators of on-road diesel-fueled heavy-duty drayage trucks operated at California ports and intermodal rail yard facilities. This regulation also applies to "motor carriers," "marine or port terminals," "intermodal rail yards," and "rail yard and port authorities."

(2) This regulation does not apply to:

(A) dedicated use vehicles;

(B) vehicles operating under an ARB authorized emergency decree;

(C) authorized emergency vehicles;

(D) military tactical support vehicles;

(E) vehicles that operate at port or rail yard properties in which the ARB Executive Officer has granted an annual exemption under the provisions of subsection (f) to local port or rail yard authorities; and

(F) yard trucks.

(c) ***Definitions***. For purposes of this section, the definitions of Health and Safety Code section 39010 through 39060 apply except to extent that such definitions may be modified by the following definitions that apply specifically to this regulation.

(1) “ARB” means the California Air Resources Board.

(2) “ARB Designees” are defined as those entities that ARB designates or contracts with to perform certain functions or provide specific services on its behalf under this regulation.

(3) “Authorized Emergency Vehicle” is as defined in Vehicle Code section 165.

(4) “Beneficial Cargo Owner” is a cargo owner, the person for whose account the ocean or rail transportation is provided, the person to whom delivery is to be made, a shippers' association, or an ocean or rail transportation intermediary that accepts responsibility for payment of all applicable charges.

(5) “Bill of Lading” is a document that states the terms of the contract between a shipper and a transportation company. It serves as a document of title of the goods shipped, a contract of carriage, and a receipt for goods.

(6) “CARB Diesel Fuel” is diesel fuel certified by ARB as meeting the fuel specification standards set forth at title 13, California Code of Regulations (CCR) section 2280 et seq.

(7) “Class I Railroad” is a freight railway based on large revenues ($250 million or more) in comparison to the revenues of Class II (which ranges from greater than $20 million but less than $250 million) and Class III (less than $20 million) railways, as defined by the Surface Transportation Board (STB).

(8) “Compliance Label” is a tag issued by ARB or its designee under the Drayage Truck Registry for heavy-duty drayage trucks operated at the ports and intermodal rail yards that meet the requirements and compliance schedules of subsection (d) of this regulation.

(9) “Dedicated Use Vehicles” are uni-body vehicles that do not have separate tractor and trailers and include but are not limited to:

(A) Dedicated auto transports;
(B) Dedicated fuel delivery vehicles;
(C) Concrete mixers;
(D) On-road Mobile Cranes

(10) “Diesel Fuel” means any fuel that is commonly or commercially known, sold, or represented by the supplier as diesel fuel, including any mixture or primarily liquid hydrocarbons (HC) – organic

compounds consisting exclusively of the elements carbon and hydrogen – that is sold or represented by the supplier as suitable for use in an internal combustion, compression – ignition (CI) engine.

(11) “Diesel-Fueled” means a CI engine fueled by diesel fuel, CARB diesel fuel, or jet fuel, in whole or part, including liquid natural gas (LNG) engines using diesel-fuel for pilot injection are subject to the requirements of this regulation.

(12) “Diesel particulate matter (diesel PM)” means the particles found in the exhaust of diesel-fueled compression ignition engines. Diesel PM may agglomerate and adsorb other species to form structures of complex physical and chemical properties. ARB has identified diesel PM as a toxic air contaminant.

(13) “Drayage Truck” means any in-use on-road vehicle with a gross vehicle weight rating (GVWR) of 33,000 pounds or greater operating on or transgressing through port or intermodal rail yard property for the purpose of loading, unloading or transporting cargo, such as containerized, bulk or break-bulk goods.

(14) “Drayage Truck Owner” means:

(A) the person registered as the owner of a drayage truck as shown by the Department of Motor Vehicles, or its equivalent in another state, province, or country; or the International Registration Plan.

or

(B) the lessee of the truck, as indicated on the drayage truck’s registration pursuant to Vehicle Code section 4453.5.

(15) “Drayage Truck Operator” means the driver of the vehicle or any person, party or entity that controls operation of a drayage truck at a port or intermodal rail yard facility.

(16) “Drayage Truck Registry (DTR)” is an ARB database that contains information on all trucks that conduct business at California ports and intermodal rail yards.

(17) “Drayage Truck Registry Number” is a unique identifier issued to the owner of a drayage truck upon registering in the DTR and corresponds to the truck registered.

(18) “Emergency Event” means any situation arising from sudden and reasonably unforeseen natural disaster such as earthquake, flood, fire, or other acts of God, or other unforeseen events beyond the control drayage truck owners and operators that threatens public health and safety or the reasonable flow of goods movement.

(19) “Emergency Decree” means a determination by the Executive Officer that an emergency event has occurred that requires the immediate temporary operation of drayage trucks at ports and rail yard facilities.

(20) “Executive Officer” is the Executive Officer of ARB or his/her authorized representative.

(21) “Gross Vehicle Weight Rating (GVWR)” is as defined in Vehicle Code Section 350.

(22) “Heavy-Duty” is a manufacturer’s gross vehicle weight rating of greater than 33,000 or more pounds.

(23) “Intermodal Rail Yard” is any rail facility within 80 miles of a port where cargo is transferred from truck to train or vise versa. Intermodal rail yards include, but are not limited to, the following facilities: Union Pacific (UP) Oakland, Burlington Northern Santa Fe (BNSF) Hobart, LATC Union Pacific, Commerce UP, Richmond BNSF, Commerce Eastern BNSF, ICTF UP, San Bernardino, Stockton Intermodal BNSF, Lathrop Intermodal UP, and BNSF Oakland.

(24) “International Registration Plan” is a registration reciprocity agreement among states of the United States and provinces of Canada providing for payment of license fees on the basis of total distance operated in all jurisdictions.

(25) “Lessee” has the same meaning as in Vehicle Code section 371.

(26) “Liquid Natural Gas (LNG) Fueled Trucks” are drayage trucks that utilize a heavy-duty pilot ignition engine that is designed to operate using an alternative fuel, except that diesel fuel is used for pilot ignition at an average ratio of no more than one part diesel fuel to ten parts total fuel on any energy equivalent basis. An engine that can operate or idle solely on diesel fuel at any time does not meet this definition.

(27) “Marine or Port Terminals” means wharves, bulkheads, quays, piers, docks and other berthing locations and adjacent storage or adjacent areas and structures associated with the primary

movement of cargo or materials from vessel to shore or shore to vessel including structures which are devoted to receiving, handling, holding, consolidating and loading or delivery of waterborne shipments or passengers, including areas devoted to the maintenance of the terminal or equipment. For the purposes of this regulation, the term includes but is not limited to production or manufacturing areas, warehouses, storage facilities, and private or public businesses or entities located on or surrounded by port property.

(28) "Military Tactical Support Vehicles" is as defined in title 13, CCR, section 1905.

(29) "Motor Carrier" is a business intermediary that contracts with beneficial cargo owners, ship companies, port terminals or Class I railroads for pick-up and delivery of goods and with drayage truck owners, who it dispatches to ports and/or intermodal rail yards to pick up and deliver such goods.

(30) "On-road" means a vehicle that is designed to be driven on public highways and roadways and that is registered or is capable of being registered by the California Department of Motor Vehicles (DMV) under Vehicle Code sections 4000 et seq. – or DMV's equivalent in another state, province, or country; or the International Registration Plan. A vehicle covered under ARB's In-Use Off-Road Regulation, title 13, CCR, section 2449 is not an on-road vehicle.

(31) "Oxides of nitrogen (NOx)" means compounds of nitric oxide, nitrogen dioxide, and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition.

(32) "Port" is any facility used for water-borne commerce which typically consists of different terminals, where cargo is loaded onto and unloaded from ocean-going vessels. For the purposes of this regulation, ports include, but are not limited to, the Port of Long Beach, Port of Los Angeles, Port of Humboldt Bay, Port of San Diego, Port of Hueneme, Port of Oakland, Port of San Francisco, Port of Sacramento, Port of Stockton, Port of Redwood City, Port of Crockett, Port of Richmond, Port of Pittsburg, and the Port of Benicia.

(33) "Port Authority" means those entities, either public or private, that are responsible for the operation of the ports.

(34) “Port Property” means the property constituting the physical boundaries, either contiguous or non-contiguous, of a port. For the purposes of this regulation, port property also includes privately owned property located within port boundaries.

(35) “Rail Yard Authority” means those entities, either public or private, that are responsible for the operation of Class I rail yards.

(36) “Rail Yard Property” means the property constituting the physical boundaries of intermodal rail yards. For the purposes of this regulation, rail yard property also includes privately owned property located within rail yard boundaries.

(37) “Uni-Body Vehicles” are vehicles that do not have separate tractor and trailer and include but are not limited to:

(A) concrete mixers;

(B) on-road mobile cranes;

(C) on-road construction equipment.

(38) “Vehicle” is as defined in Vehicle Code Section 670.

(39) “Verified Diesel Emission Control Strategy (VDECS)” is an emission control strategy that has been verified pursuant to the “Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines” in Title 13, California Code of Regulations, commencing with section 2700, and incorporated by reference.

(40) “Yard Truck” means an off-road mobile utility vehicle used to carry cargo containers with or without chassis; also know as utility tractor rig (UTR), yard tractor, yard goat, yard hustler, or prime mover.

(d) ***Requirements and Compliance*** **Deadlines.** Drayage trucks subject to this regulation must meet the following requirements by the compliance deadlines detailed in both Phase 1 AND Phase 2.

(1) ***Phase 1***: By December 31, 2009, all drayage trucks must be equipped with a:

(A) 1994 – 2003 model year engine certified to California or federal emission standards and a level 3 VDECS for PM emissions;

or,

(B) 2004 or newer model year engine certified to California or federal emission standards.

(2) ***Phase 2***: By December 31, 2013, all drayage trucks must be equipped with an engine that:

(C) meets or exceeds 2007 model year California or federal heavy-duty diesel-fueled on-road emission standards; or,

(D) is certified to 2004 or newer model year California or federal emission standards.

(3) *Drayage Truck Owner requirements*

(A) Drayage truck owners shall:

1. meet all applicable requirements and deadlines set forth in Phases 1 and 2 above;

2. register with the DTR, according to subsection (e);

3. upon receipt of ARB issued DTR compliance label, affix label as required under subsection (e)(5);

4. ensure that all emission control devices are functioning properly;

5. maintain all installed VDECS per manufacturer's specifications;

6. maintain and keep VDECS maintenance log in the drayage truck and available upon request;

7. ensure that the drayage truck(s) has all information required under subsection (d)(5)(A)(4) for the dispatching motor carrier available and accessible in the vehicle and that the driver of the vehicle be instructed to provide the information upon demand to any enforcement personnel listed in subsection (i).

(B) Phase 1 compliance deadline extension:

1. Drayage truck owners may apply for a one-time, one-year, per-truck Phase 1 compliance deadline extension. The compliance deadline application must be either electronically filed or postmarked by June 1, 2009. To receive the Phase 1 compliance deadline extension, a drayage truck owner must demonstrate all of the following:

   i. the engine installed on his/her current truck is a California or federally certified 1994 – 2003 model year engine;

   ii. the truck was registered with the DTR prior to June 1, 2009;

   iii. no Level 3 diesel emission control technology verified by ARB for use on that combination of truck and engine was available at the time the extension was filed.

2. Compliance extension applications shall be submitted to ARB at:

   California Air Resources Board
   c/o Drayage Truck Phase1 Extension
   P.O. Box 2815
   Sacramento, CA, 95812

   or electronically through ARB's drayage truck website;

   http://www.arb.ca.gov/drayagetruck

3. If after the one-year extension ARB verified technology is still unavailable, the truck owner must comply with the regulation within 90 days of the expiration of the extension by replacing the existing heavy duty truck and / or engine with a truck or engine that meets or exceeds the Phase 1 requirements .

(4) *Drayage Truck Operator Requirements*

Drayage truck operators shall, upon demand, provide the following information to authorized enforcement personnel as set forth in subsection (i):

(A) the dispatching motor carrier's contact information as detailed in subsection (d)(5)(A)(4);

(B) the VDECS maintenance log of the drayage truck.

(5) *Motor Carrier requirements*

(A) Each motor carrier shall:

1. provide a copy of this regulation or an ARB approved summarized version to each drayage truck owner that it contracts with for deliveries to ports and intermodal rail yards;

2. ensure that all trucks dispatched to a port or intermodal rail yard meet emission standards and compliance deadlines set forth in Phases 1 and 2 in subsection (d);

3. ensure that all drayage trucks dispatched to ports and intermodal rail yards are registered and in good standing with the Drayage Truck Registry (DTR) and are properly affixed with an ARB issued compliance label according to subsection (e);

4. ensure the motor carrier information listed below is available and accessible on each drayage truck covered by this regulation that it contracts with and that the driver of the vehicle is instructed to provide a copy of the information, upon demand, to enforcement personnel, as listed in subsection (i).

i. the motor carrier's business name;
ii. contact person's name;
iii. motors carrier's street address, state, and zip code;
iv. contact person's business phone number.

5. keep a record of all dispatched drayage trucks containing the information set forth in i through iv below for a minimum of five years from the dispatch date. Dispatch records are to be made available to enforcement personnel within 72 hours of an official written or oral request.

   i. truck dispatch date and time;
   ii. bill of lading or tracking number;
   iii. truck license plate number and issuing state;
   iv. Drayage Truck Registry number.

(6) *Marine or Port Terminals and Rail Yard Requirements*

(A) Starting January 1, 2009, marine or port terminals and rail yards shall collect the following information for each dispatching motor carrier and each drayage truck subject to this regulation that enters the facility not displaying a valid and current compliance label that does business at its facility.

1. Dispatching motor carrier:

   i. business name of dispatching motor carrier;
   ii. contact person's name;
   iii. street address, state, zip code of the dispatching motor carrier;
   iv. phone number of the dispatching motor carrier;
   v. bill of lading or tracking number.

2. Drayage truck:

   i. entry date and time;
   ii. registered owner's name;
   iii. driver's name;
   iv. driver's license number;
   v. drayage truck's license plate number and state of issuance;
   vi. drayage truck's vehicle identification number (VIN).

All information collected in subsection (d)(6) shall be kept for a period of not less than five years from the truck entry date and is to be made available to enforcement personnel within 72 hours of an official written or oral request.

(B) Marine or port terminals and rail yards shall report the information collected in subsection (A) above to their respective authorities according to schedule (A) below and in a format acceptable to their respective authority.

Schedule A: Terminal Reporting Schedule

Date Truck Enters Terminal or Rail Yard	Date by which Information is to be Reported to Port or Rail Authority
January 1 – March 31	April 15
April 1 – June 30	July 15
July 1 – September 30	October 15
October 1 – December 31	January 15

(7) *Port Authorities and Rail Yard Authorities Requirements*

(A) Port and rail yard authorities shall respectively report the information collected by the port terminals and rail yards, as detailed in subsection (d)(6), to, and in a manor and format prescribed by, ARB according to Schedule B below. ARB reporting parameters are detailed on ARBs website http://www.arb.ca.gov/drayagetruck.

Schedule B: Port and Rail Yard Authority Reporting Schedule

Date by which Information is to be Reported to the California Air Resources Board
May 15
August 15
November 15
February 15

(B) Port and rail yard authorities shall ensure their respective terminals and/or rail yards abide by all Schedule A reporting deadlines.

(e) *Drayage Truck Registry and Compliance Label Requirements*

(1) *Truck Owner Requirements*

(A) Owners of all drayage trucks doing business at a port or intermodal rail yard prior to September 30, 2009 and intending to continue operations after that date must register with the DTR database by September 30, 2009.

(B) Drayage trucks intending to begin operations at a port or intermodal rail yard after September 30, 2009 must be registered with the DTR database prior to commencing operations.

(C) Owners of all drayage trucks covered by the regulation must provide the following information to ARB or its designee by mail to the address in subsection (e)(2) or electronically through ARB's DTR website http://www.arb.ca.gov/drayagetruck. The information shall include but may not be limited to:

1. truck owner name, address, and contact information (e.g. phone number, email address, fax number);

2. engine make, model, and model year;

3. vehicle identification number (VIN);

4. vehicle license number and state of issuance;

5. compliance status, which shall include:

   i. identifying whether the drayage truck has complied with the requirements of Phases 1 and 2, set forth in subsection (d) above;
   ii. if so, how was compliance achieved (e.g. new compliant truck or description of the level 3 VDECS that was used), who did the installation work, and when was it completed;
   iii. if not, identifying when the drayage truck is scheduled to come into compliance under Phases 1 or 2.

(D) After filing the initial application, the drayage truck owner shall within 30 days of bringing a truck into compliance with Phase 1 or 2, update the DTR with the vehicle's compliance status information and any other changes to the vehicle's ownership, DMV registration status, or participation status in IRP.

(E) Upon receipt of a DTR compliance label from ARB or its designee, the drayage truck owner must affix the label in accordance with subsection (e)(5).

(2) *Mailing Address for Filing Initial Applications and Updates.* Drayage truck owners shall submit DTR applications and any updated information to ARB at:

California Air Resources Board
c/o Drayage Truck Registry
P.O. Box 2815
Sacramento, CA, 95812

(3) Failure to register with the DTR or submittal of false information is a violation of state law and subject to civil or criminal penalty.

(4) ARB or its designee shall issue a DTR compliance label upon verification of compliance with the requirements of this regulation. The DTR label will be number coded by year to show compliance through that year. For example: a compliant truck issued a 2013 coded label will be able to access ports and rail yards through 2013. After 2013, the truck will again have to demonstrate regulatory compliance and apply for a new compliance label.

(5) All DTR compliance labels shall be:

(A) located on or near the lower left hand corner on the outside of the driver's side door; and,

(B) affixed to the truck in clear view, correct side up, un-obstructed; and kept and maintained in a manner that retains legibility.

(f) *Annual Port or Rail Yard Exemption*

(1) *Annual Exemption.* An annual exemption may be granted, under limited circumstances, by the ARB Executive Officer to ports or rail yards. An exemption may cover a clearly defined portion or the entirety of a port or rail yard. The Executive Officer has sole discretion in issuing an exemption, which will be issued to ports or rail yards that are able to demonstrate one or more of the following:

(A) port or rail yard land is not typically used for truck traffic and its primary function or location does not include or attract drayage trucks covered under this regulation (e.g. a shoreline animal sanctuary);

(B) the overwhelming majority of trucks accessing the port or rail yard are exempted under this regulation (e.g. a port where only dedicated auto transports are in service).

(2) *The Exemption Application*

(A) may be obtained from the ARBs' website http://www.arb.ca.gov/drayagetruck or by mail from;

California Air Resources Board
c/o Drayage Truck Port / Rail Yard Exemption App.
P.O. Box 2815
Sacramento, CA, 95812

(B) must be completed and submitted annually (via the same website or address listed above) no later than January 1 of the year prior to the exemption year (e.g. a 2009 year exemption application must be completed and submitted by January 1, 2008);

(C) will be approved or disapproved by the Executive Officer no later than July 1, of the year prior to the exemption year. The Executive Officer will then issue an exemption to be valid for the specified port or rail yard for the specified exemption year.

(g) ***Penalties.*** Any person who fails to comply with the performance requirements of this regulation, who fails to submit any information, report, or statement required by this regulation, or who knowingly submits any false statement or representation in any application, report, statement, or other document filed, maintained, or used for the purposes of compliance with this regulation may be subject to civil or criminal penalties under sections 39674, 39675, 42400, 42400.1, 42400.2, 42402,.2, and 43016 of the Health and Safety Code. In assessing penalties, the Executive Officer will consider factors, including but not limited to the willfulness of the violation, the length of time of noncompliance, whether compliance was attempted, and the magnitude of noncompliance.

(h) ***Right of Entry.*** For the purpose of inspecting on-road vehicles covered in this regulation, and their records to determine compliance with these regulations, an agent or employee of ARB, upon presentation of proper credentials, has the right to enter any facility (with any necessary safety clearances) where on-road vehicles are located or on-road vehicle records are kept.

(i) ***Enforcement***. Enforcement of this section may be carried out by authorized representatives of ARB, port and rail yard authorities; peace officers as defined in California Penal Code, Title 3, chapter 4.5, sections 830 et seq. and their respective law enforcement agencies; and authorized representatives of air pollution control or air quality management districts.

(j) ***Relationship to Other Law****.* Nothing in this section allows drayage trucks to operate in violation of other applicable law, including, but not limited to:

(1) California Vehicle Code;

(2) California Health and Safety Code;

(3) division 3, title 13, California Code of Regulations;

(4) any applicable ordinance, rule, or requirement as stringent as, or more stringent than, than the requirements of subsection (d) of this regulation.

(k) ***Severability*****.** If any subsection, paragraph, subparagraph, sentence, clause, phrase, or portion of this regulation is, for any reason, held invalid, unconstitutional, or unenforceable by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of the regulation.

Authority Cited: Sections 39600, 39601, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42402.2., 42410, 43013, 43016, 43018, 43023, 43600, California Health and Safety Code.

Reference: Sections 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42402,.2, 42410, 40717.9, 43013, 43016, and 43018, 43023, 43600, California Health and Safety Code.