

## **VII. ECONOMIC IMPACTS**

In this chapter, we present the estimated costs and economic impacts associated with implementation of the proposed regulation for cargo handling equipment. The expected capital and recurring costs for potential compliance options are presented, the cost and associated economic impacts for businesses, as well as an analysis of the cost effectiveness of the proposed regulation.

### **A. Summary of the Economic Impacts**

Air Resources Board (ARB) staff estimates the cost for compliance with the regulation to be approximately 61 million dollars for the total capital and recurring costs. This corresponds to about 6.8 million dollars annually on average for the years 2007 through 2015. This cost, which is based on 2004 dollars, represents the capital cost of equipment, maintenance and replacement, and reporting costs from 2007 through to 2015.

The cost for a business to comply with this regulation will vary depending on the number and type of cargo handling equipment and whether the equipment is equipped with a verified diesel exhaust control system (VDECS) and/or later replaced with a new Tier 4 engine in 2015. For example, the costs for a typical crane engine (rated at 210 hp operated 1370 hours per year) with a diesel particulate filter (DPF) is about \$17,500 for equipment and installation. The estimated annual ongoing costs are based on a reporting cost of about \$500 per terminal with the cost spread over many pieces of equipment. To determine the cost a typical business may incur, we used the ARB Survey data on the average number and type of equipment operated by a port container terminal, a port bulk handling terminal, and an intermodal rail yard and applied the annual average costs for the various equipment types. Based on our analysis, we estimate that the total 2007 to 2015 costs to a typical business will be in the range of \$153,000 to \$1,344,000.

### **(Placeholder – add discussion ROE)**

Staff does not have access to financial records for most of the companies that responded to the survey. However, the small business status of the survey respondents was determined by including a query on the ARB Survey for the owner of the equipment to indicate if their business was a small business (annual gross receipts of \$10,000,000 or less per California Government Code Section 14837(d)(1)). Approximately 10% (7 out of 68) of the respondents identified themselves as small businesses. Six of these small businesses provided sufficient data on their equipment inventory to allow an estimation of the estimated costs for compliance with the proposed regulation. Based on our analysis, the total 2007-2015 costs to small businesses ranged from \$33,800 to \$458,000 with an average cost of \$180,000.

Cost effectiveness is expressed in terms of control costs (dollars) per unit of air emissions reduced (pounds). The cost effectiveness for the proposed regulation is determined by dividing the total capital costs plus the annual operation and maintenance and reporting costs by the total pounds of diesel PM reduced during the years 2007 to 2015. All costs are in 2004 equivalent expenditure dollars. With a total cost of 61 million dollars reducing approximately 1.24 million pounds of diesel PM, we estimate the overall cost effectiveness of the proposed regulation to be about \$49 per pound of diesel PM reduced, considering only the benefits of reducing diesel PM. Because the proposed regulation will also reduce NOx emissions, we could allocate half of the costs of compliance against these benefits, resulting in cost effectiveness values of approximately \$25/lb of diesel PM and \$1/lb of NOx reduced.

**(Placeholder – add discussion on premature death benefits)**

ARB staff performed the cost analysis relative to the year 2004 (current value of the control costs), and unless otherwise stated, all costs are given in 2004 dollars. Where future costs are mentioned in the cost effectiveness and mortality sections, they are based on 2004 dollars. In addition, all cost estimates are based on currently available technology as described below; staff believes it is likely that the costs will decrease as technology improves and production and sales volumes increase. Additional details on the cost analysis can be found in Appendix X.

**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 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 in any single year. Because the estimated cost of the regulation does not exceed 10 million dollars in a single year, the proposed regulation is not a major 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. Methodology for Estimating Costs Associated with Implementation**

In this section, we describe how we estimated the costs associated with the proposed regulation. Briefly, the methodology entailed:

- estimating capital and recurring costs in 2004 dollars associated with various compliance options i.e. purchasing a new engine, repowering, using a VDECS;
- identifying the preferred compliance option for the different equipment types and age of engine;
- projecting the 2004 emissions inventory to future years using the OFFROAD model to determine the number of new engines in each year and the number of pre-2007 engines remaining that need to comply with the regulation in that year; and
- assuming all terminals have 4 or more pieces of equipment, apply the estimated costs to the distribution of engines in each future year that need to come into compliance.

Based on the ARB Survey and updated emissions inventory, we estimate that in 2004 approximately 120 private companies having about 3,700 pieces of equipment using diesel engines will be affected by this regulation. Businesses will incur compliance costs to the extent that they have equipment that must meet the performance standards in the regulation. The compliance costs will vary depending on the number and operating parameters of the cargo handling equipment operated and the approach taken to comply with the proposed regulation. Costs were estimated for all categories of equipment except "other." The other category contains a diverse set of equipment such as aerial lifts, railcar movers, and other off-highway trucks. ARB staff believes that the costs for this equipment should fall within the range of costs estimated for the other more well-defined categories. Details of the cost analysis are provided in the following sections and in Appendix XX.

#### Capital and Recurring Costs

The cost evaluation considers both capital and on-going or recurring operating costs. Costs associated with application of VDECS, early retirement of equipment and any incremental costs associated with the purchase of cleaner equipment were considered as described below.

**VDECS:** The capital investment costs for purchase and installation of VDECS were determined from actual costs of installing VDECS on cargo handling equipment diesel-fueled engines or similar equipment in California over the last 3-5 years as shown in Table VII-1. Costs were developed for each type of cargo handling equipment. The VDECS costs were estimated for those VDECS likely to be available for compliance in the regulation timeframe.

**Table VII-1: Capital Costs Assumptions for VDECS**

Equipment Category	VDECS*	Average Cost (\$)
Crane	Passive DPF	\$ 17,520
Excavator	DOC	\$ 2,269
Forklift	Active DPF	\$ 6,000
Container Handling Equip	DOC	\$ 2,269
Sweeper/Scrubber	DOC	\$ 2,269
Tractor/Loader/Backhoe	DOC	\$ 2,269
Yard Tractor	NA	

\*DPF means a diesel particulate filter and DOC is a diesel oxidation catalyst.

Fuel costs, in cases where operators of container handling equipment with 2003 to 2006 model year engines choose to install a Level 2 DECS that uses emulsified diesel, were also estimated. In some cases, this may be the preferred compliance option since by using a Level 2 DECS with 2003 to 2006 model year engines, the owner/operator would not have to replace the equipment in 2015. The 2003 to 2006 model year container handling equipment are candidates for this Level 2 DECS. The cost estimate assumed an additional cost of \$0.20 per gallon of emulsified fuel applied to the average fuel consumption estimate of 9625 gallons per year. The resulting recurring additional fuel cost of \$1925 per piece of equipment is applied.

**Early Retirement:** For many categories, one compliance option is for accelerated turnover (early retirement) of an engine to a cleaner engine. The cost associated with early equipment retirement is the remaining residual value of the old equipment based on straight line depreciation according to the following equation:

$$\text{Residual Value} = \frac{(\text{New Equipment Costs} - \text{Used Equipment Costs}) \times \# \text{ Years Early Retirement}}{\text{Expected Useful Life}}$$

The assumptions used for the average costs for new and used equipment i.e. equipment at the end of its useful life, are presented in Table VII-2 below. These cost values are used to calculate the residual value of equipment subject to early retirement. For example, the residual value for a top pick (container handling equipment) being replaced 3 years before the end of its normal expected life (16 years) is estimated to be:

$$\$65,625 = \frac{(\$400,000 - \$50,000) \times 3 \text{ years}}{16 \text{ years/useful life}}$$

In this case, the early retirement costs attributed to compliance with the regulation for this top pick would be \$65,625.

**Table VII-2: Estimated Value of New and Used Equipment<sup>1</sup>**

<b>Equipment Type</b>	<b>New 2004 \$</b>	<b>Used</b>
Crane	\$ 1,200,000	\$ 0
Excavator	\$ 350,000	\$ 50,000
Forklift*	NA	NA
Container Handling Equip	\$ 400,000	\$ 50,000
Sweeper/Scrubber	\$ 50,000	\$ 5,000
Tractor/Loader/Backhoe	\$ 75,000	\$ 10,000
Yard Tractor	\$ 60,000	\$ 6,000

\*The estimated forklift values were difficult to establish due to the wide range of forklift sizes and costs. Only five forklifts in the state were estimated to be subject to early retirement near the end of their modeled natural attrition. The costs for these two forklifts are expected to be very low and were not included in the analysis.

*Incremental Costs Associated with Cleaner Engines:* With the exception of yard trucks, it was assumed that there would be no additional incremental costs attributable to the regulation associated with purchasing a new cleaner off-road engine (i.e. replacing a tier 1 engine with a tier 3 engine). For yard trucks, which will be in most cases transitioning from an off-road engine to an on-road engine, we assumed an incremental cost differential of \$1,500 per yard truck. This cost difference is based on the current cost difference quoted by manufacturers for yard trucks with an off-road engine versus specifying an on-road engine. It is assumed that after 2010, when Tier IV engines are expected to become available, there will be no capital costs attributed to the purchase of yard trucks with on-road engines.

*Recurring Costs:* Operating or recurring costs include expenditures for recordkeeping and reporting and possibly incremental fuel costs. Reporting costs for compliance with the record keeping and reporting requirements in the proposed regulation was assumed to be \$500 per terminal or business per year. Staff estimated approximately 5 hours would be needed to collect and send this information at a pay rate of \$100 per hour. ARB staff believes this is a conservative assumption since many companies already keep these records. For both the passive and active DPF, additional operating and recurring costs for cleaning and replacement is expected to be \$3,020 and \$1,100 annually for the cranes and forklifts, respectively. This additional operating and recurring costs for the cranes and forklifts is based on a \$300 cleaning once every three years and replacement every six years. Staff estimates that the passive and active DPFs will last longer than the 4200 hours given in the warranties and six years is approximately two to one and a half times this warranty period. The DPFs may have to be cleaned so the \$300 was used to cover a couple of hours of labor. These recurring

<sup>1</sup> Placeholder - Add a footnote on how we determined the value of new and used equipment

fuel, DPF replacement, and cleaning costs are included in the annual costs presented in Table VII-7, Table VII-8, and Table VII-9.

### Preferred Compliance Option

Based on our understanding of the technology available to comply with the proposed regulation and the compliance options, we identified likely compliance pathways that were then assumed for the cost analysis. While the proposed regulation provides flexibility to operators in determining what compliance option to pursue and the costs will vary with the approach chosen, we believe that the assumptions used in this cost analysis provide a representative picture of the potential costs associated with compliance. Tables VII-3 and VII-4 below summarize the assumptions for new and in-use equipment respectively.

**Table VII-3: Compliance Assumptions for New Equipment**

Equipment Category	Compliance Path Assumed in Cost Analysis
Cranes	Until 2011, purchase new crane with current model year off-road engine. Apply passive DPF within one year of purchase. After 2010, purchase crane equipped with Tier IV off-road engine.
Excavators	Until 2011, purchase new excavator with current model year off-road engine. Apply DOC within one year of purchase. After 2010, purchase excavator equipped with Tier IV off-road engine.
Forklifts	Until 2011, purchase new forklift with current model year off-road engine. Apply active DPF within one year of purchase. After 2010, purchase forklift equipped with Tier IV off-road engine.
Container Handling Equipment	Until 2011, purchase new container handling equipment with current model year off-road engine. Apply DOC within one year of purchase. After 2010, purchase container handling equipment equipped with Tier IV off-road engine.
Sweeper/Scrubber	Until 2011, purchase new sweeper/scrubber with current model year off-road engine. Apply DOC within one year of purchase. After 2010, purchase sweeper/scrubber equipped with Tier IV off-road engine.
Tractor/Loader/Backhoes	Until 2011, purchase new tractor/loader/backhoe with current model year off-road engine. Apply DOC within one year of purchase. After 2010, purchase tractor/loader/backhoe equipped with Tier IV off-road engine.
Yard Trucks	Purchase yard truck with current model year on-road engine until 2010. After 2010, purchase Tier IV off-road engine equipped yard truck.

**Table VII-4: Compliance Assumptions for In-Use Equipment**

Equipment Category	Compliance Path Assumed in Cost Analysis
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Cranes	For Tier 0 engines, early retirement, either the equipment or just the engine depending on age. For Tier 1-3, assume 91% apply passive DPF and 9% early retirement until 2012 when Tier IV engines become available.
Excavators	For Tier 0 engines, early equipment retirement. For Tier 1-3, assume 100% apply DOC until 2012 when Tier IV engines become available.
Forklifts	For Tier 0 engines, early equipment retirement. For Tier 1-3, assume 100% apply Active DPF until 2012 when Tier IV engines become available.
Container Handling Equipment	For Tier 0 engines, early equipment retirement. For Tier 1-3, assume 100% apply DOC until 2012 when Tier IV engines become available.
Sweeper/Scrubber	For Tier 0 engines, early equipment retirement. For Tier 1-3, assume 100% apply DOC until 2012 when Tier IV engines become available.
Tractor/Loader/Backhoes	For Tier 0 engines, early equipment retirement. For Tier 1-3, assume 100% apply DOC until 2012 when Tier IV engines become available.
Yard Trucks	Early equipment retirement following the compliance phase-in schedule starting in 2007 replacing with new onroad engine yard trucks. Assume 65% of the 1996 – 2005 model years yard trucks are offroad engines with an ECS, 10% have offroad engines without any ECS, and 25% have onroad engines.

Future Year Equipment Populations Subject to the Regulatory Requirements

To determine the distribution of engines in future years and the number of engines needing to come into compliance in each year, the 2004 port and intermodal rail yard cargo handling equipment inventory was projected to future years using the OFFROAD model. The OFFROAD model calculates equipment growth, annual use, age distribution, and attrition for eight categories of equipment at ports and intermodal rail yards. Built into the model is the estimate of equipment by model year, by engine type (on-road or off-road) and with emissions control systems. Because the proposed regulation phases in compliance over several years, compliance with the proposed regulation in the early years will modify the distribution of engines in future years. To ensure the cost analysis was representative of future year equipment populations once the regulation takes affect, equipment populations in each year were evaluated after the compliance schedule for the previous year(s) had been incorporated into the model.

When determining the percent of engines needing to come into compliance in a given year, it was assumed that all facilities had four or more pieces of equipment. For example, in 2007, 50% of yard trucks without VDECS which are 2002 model year or older need to come into compliance. To estimate the number of yard trucks in this group required to come into compliance, the population of yard trucks remaining in 2007 with model years 2002 or older, that do not have VDECS, is multiplied by 0.50. Tables VII-5 and VII-6 below provide summaries of the yard truck and non yard truck equipment populations in each year (2007-2015) that resulted in compliance costs attributable to the proposed regulation. Additional details on the population distributions are provided in Appendix XX.

**Table VII-5: Population of Yard Trucks Having Compliance Costs Associated with the Proposed Regulation**

Year	Yard Truck Population	
	New	In-Use
2007	290	83
2008	213	329
2009	195	259
2010	192	46
2011	201	89
2012	218	266
2013	215	303
2014	215	218
2015	226	83

Notes: New includes new yard trucks added to the fleet due to growth and new yard trucks added due to replacement of yard trucks at the end of their life (not required by the regulation)

**Table VII-6: Population of Non-Yard Truck Equipment Having Compliance costs Associated with the Proposed Regulation**



Year	Population											
	Crane		Excavator		Forklift		Container Handling Equipment		Sweeper/ Scrubber		Tractor/ Loader/ Backhoe	
	New	IU	New	IU	New	IU	New	IU	New	IU	New	IU
2007	35	3	3	0	42	0	66	0	4	0	10	0
2008	37	14	5	0	38	4	63	5	4	0	12	1
2009	37	29	5	3	32	27	72	55	4	3	14	15
2010	41	86	4	5	32	99	83	107	5	6	15	20
2011	21	88	4	5	32	95	68	98	4	6	24	17
2012	26	81	4	5	34	90	64	90	4	5	19	13
2013	28	46	5	3	38	59	71	55	4	3	13	6
2014	25	0	5	0	42	0	75	0	4	0	12	0
2015	28	0	18	0	64	0	117	0	20	0	50	0

Notes: IU = In-Use. New includes new yard trucks added to the fleet due to growth and new yard trucks added due to replacement of yard trucks at the end of their life (not required by the regulation).

### Estimated Capital and Recurring Costs 2007-2015

The costs for compliance with the proposed regulation were estimated using the cost estimates outlined previously, the compliance assumptions provided in Table VII-3 and VII-4, and the populations of equipment subject to the requirements for each year. The detailed calculations are provided in Appendix XX and a summary of the total annual costs for the various types of equipment at ports and intermodal rail yards is provided in Table VII-7.

**Table VII-7: Estimated Statewide Annual Costs for Businesses**

Annual Costs (\$)									
Years	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Port</b>									
Crane	650,977	1,233,056	1,376,309	2,109,698	1,868,347	1,572,138	1,292,111	792,553	792,553
Excavator	4,791	16,222	13,385	16,811	15,906	10,420	5,773	-	1,086,971
Forklift	224,202	223,008	342,408	865,985	943,684	843,735	739,460	392,288	392,288
Container Handling Equip	150,604	324,865	321,960	536,765	582,917	516,350	543,034	423,533	2,134,138
Sweeper/ Scrubber	9,228	11,884	16,396	23,841	20,641	11,868	7,336	-	210,910
Tractor/ Loader/ Backhoe	22,624	35,133	66,701	79,509	90,851	29,989	13,854	-	650,386
Yard Tractor	1,694,673	6,668,378	4,787,993	964,678	1,762,313	4,500,234	4,976,988	3,201,918	1,083,030
<b>Port Total:</b>	<b>2,757,098</b>	<b>8,512,546</b>	<b>6,925,151</b>	<b>4,597,288</b>	<b>5,284,659</b>	<b>7,484,733</b>	<b>7,578,557</b>	<b>4,810,292</b>	<b>6,350,275</b>
<b>Rail</b>									
Crane	165,493	224,103	239,763	396,092	351,870	230,304	126,865	-	-
Forklift	8,327	25,532	38,395	47,993	50,400	40,109	26,897	18,529	18,529
Container Handling Equip	10,090	89,300	42,306	26,154	21,429	9,630	6,170	-	1,950,325
Sweeper/ Scrubber	299	337	545	932	1,002	496	348	-	9,171

Tractor/ Loader/ Backhoe	299	349	548	932	1,002	496	348	-	13,247
Yard Tractor	124,077	266,602	134,197	96,825	154,285	31,232	38,446	-	-
<b>Rail Total:</b>	308,585	606,223	455,754	568,929	579,989	312,267	199,076	18,529	1,991,273
Reporting Cost	1,200,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
<b>Reporting , Port &amp; Rail Total:</b>	4,265,682	9,178,768	7,440,905	5,226,217	5,924,648	7,857,000	7,837,632	4,888,821	8,401,548

## E. Estimated Costs to Businesses

In this section, we summarize the costs and economic impacts on businesses. The analysis estimates the overall total statewide cost to businesses and the total costs to different sectors of the industry. We also estimate the overall impact on business competitiveness, employment, and other business impacts as required by state law.

Using the available information from the ARB Survey on the engine population and current in-use and expected PM emission rates, staff determined the percent of engines that would potentially incur capital costs (either from installing a DECS or purchasing new cargo handling equipment) when complying with the proposed regulation. We estimate the statewide total costs to businesses to be approximately \$61 million dollars. The annual costs range from \$4.3 million to about \$9.2 million per year. The total statewide cost to businesses is derived from the combined capital and installation costs, using 2004 capital cost values, reporting costs and equipment operating and maintenance costs associated with compliance with the regulation. A summary of the expected annual costs was presented previously presented in Table VII-7.

### Costs to a Typical Business

For those businesses that operate at ports or intermodal rail yards and have diesel powered cargo handling equipment, the cost will vary depending on the age, number and type of equipment operated. To provide some perspective on the costs that may be incurred by a business, ARB staff estimated the average annual costs to comply with the regulation for the various types of equipment per year. This average annual cost is calculated by dividing the total annual statewide cost for each equipment type by the statewide inventory of that equipment type in a given year. This average annual cost can be used to determine the expected costs to a business for compliance with the regulation (2007-2015). The annual average reflects the fact that, while a single piece of equipment may incur a higher cost during a particular year if it needs to be retrofitted or replaced, not all pieces of equipment need to be retrofitted or replaced. To estimate the costs for a business, the average annual cost is summed over the consecutive 2007 to 2015 years and multiplied by the number of pieces of equipment a business operates. For example, a business with 4 cranes would potentially incur a cost of 9yrs X \$5,236/yr X 4 cranes or approximately \$188,500. The annual average values used to estimate the costs for businesses are provided in Table VII-8.

**Table VII-8: Estimated Statewide Average Costs per Equipment Type**

<b>Annual Costs (\$)</b>										
<b>Years</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>Annual Avg</b>
<b><i>Port</i></b>										
Crane	2,625	4,972	5,550	8,507	7,534	6,339	5,210	3,196	3,196	5,236
Excavator	171	579	478	600	568	372	206	0	38,820	4,644
Forklift	508	506	776	1,964	2,140	1,913	1,677	890	890	1,251
Container Handling Equip	327	705	698	1,164	1,264	1,120	1,178	919	4,629	1,334
Sweeper/ Scrubber	342	440	607	883	764	440	272	0	7,811	1,284
Tractor/ Loader/ Backhoe	246	382	725	864	988	326	151	0	7,069	1,195
Yard Tractor	852	3,353	2,407	485	886	2,263	2,502	1,610	545	1,656
<b><i>Rail</i></b>										
Crane	2,267	3,070	3,284	5,426	4,820	3,155	1,738	0	0	2,640
Forklift	362	1,110	1,669	2,087	2,191	1,744	1,169	806	806	1,327
Container Handling Equip	388	3,435	1,627	1,006	824	370	237	0	75,013	9,211
Sweeper/ Scrubber	299	337	545	932	1,002	496	348	0	9,171	1,459
Tractor/ Loader/ Backhoe	299	349	548	932	1,002	496	348	0	13,247	1,914
Yard Tractor	431	926	466	336	536	108	133	0	0	326
Reporting Cost	10,000	500	500	500	500	500	500	500	500	1,556

Using these average costs, we estimated the costs that would be incurred by typical businesses. To determine a typical business, we used the ARB Survey to determine the average number and type of equipment operated by a port container terminal, a port bulk handling terminal and an intermodal rail yard. As shown in Table VII-9, total costs to a typical business can range from about \$286,000 to \$1,220,000 depending on the type and numbers of equipment.

**Table VII-9: Estimated Costs for Typical Businesses**

<b>Equipment Type</b>	<b>Port Container Terminal</b>		<b>Port Bulk Terminal</b>		<b>Intermodal Rail Yard</b>	
	<b>Pop</b>	<b>2007-2015 Cost (\$)</b>	<b>Pop</b>	<b>2007-2015 Cost (\$)</b>	<b>Pop</b>	<b>2007-2015 Cost (\$)</b>
Crane	4	188,512	2	94,256	4	95,041
Excavator	0	0	2	85,586	0	0
Forklift	5	56,316	4	45,053	1	11,944
Container Handling Equipment	13	156,924	1	12,071	2	170,238
Sweeper/ Scrubber	1	11,714	1	11,714	0	0
Tractor/ Loader/ Backhoe	0	0	2	21,727	0	0
Yard Truck	54	804,711	1	14,902	17	49,918
Reporting Costs		500		500		500
<b>Total</b>	<b>77</b>	<b>1,218,678</b>	<b>13</b>	<b>285,809</b>	<b>24</b>	<b>327,640</b>

### Small Business Costs

Staff does not have access to financial records for most of the companies that responded to the survey. However, the small business status of the survey respondents was determined by including a query on the ARB Survey for the owner of the equipment to indicate if their business was a small business (annual gross receipts of \$10,000,000 or less per California Government Code Section 14837(d)(1)). Approximately 10% (7 out of 68) of the respondents identified themselves as small businesses. Looking at these seven businesses, six provided sufficient data on their equipment inventory to estimate the costs using the average equipment cost data presented in Table VII-8. Based on our analysis, the total 2007-2015 costs to small businesses ranged from \$33,800 to \$458,000 with an average cost of \$180,000. The company with the highest cost identified on the survey as owning nine cranes and four forklifts. The cranes are assumed to be rubber tired gantry cranes with the potential high cost of retrofitting a DPF. The company with the lowest cost has only three forklifts.

### Potential Business Impacts

In this section, we analyze the potential impacts of the estimated costs of the proposed regulation on business enterprises in California. Section 11346.3 of the Government Code requires that, in proposing to adopt or amend any administrative regulation, state agencies shall assess the potential for adverse economic impact on California business enterprises and individuals. The assessment shall include a consideration of the impact of the proposed or amended regulation on the ability of California businesses to compete with businesses in other states, the impact on California jobs, and the impact on California business expansion, elimination, or creation.

This analysis is based on a comparison of the annual return on owner's equity (ROE) for affected businesses before and after the inclusion of the equipment costs, associated recurring costs, and fees. The analysis also uses publicly available information to assess the impacts on competitiveness, jobs, and business expansion, elimination, or creation. ARB staff does not have access to financial records for most of the privately-owned companies that responded to the ARB Survey. However, the small business status of the survey respondents was determined by including a query on the ARB Survey for the respondent to indicate if their business was a small business (annual gross receipts of \$10,000,000 or less per Government Code section 14837 (d)(1)). Based on the ARB Survey responses, staff identified approximately 10 percent of the businesses (7 out of 68 of the respondents) identified themselves as small businesses.

The types of businesses that may be impacted include stevedoring, major shipping lines, rail lines, and equipment rental. Based on the ARB Survey, staff estimates approximately 120 businesses will be affected by this regulation.

The approach used in evaluating the potential economic impact of the proposed regulation on California businesses is as follows:

- (1) All affected businesses are identified from responses to the ARB surveys. Standard Industrial Classification (SIC) codes identified by these businesses.
- (2) Annual costs for the regulation are estimated for each of these businesses based on the assumptions previously discussed.
- (3) The total annual cost for each business is adjusted for both federal and states taxes.
- (4) These adjusted costs are subtracted from net profit data and the results used to calculate the Return on Owners' Equity (ROE). The resulting ROE is then compared with the ROE before the subtraction of the adjusted costs to determine the impact on the profitability of the businesses. A reduction of more than 10 percent in profitability is considered to indicate a potential for significant adverse economic impacts. This threshold is consistent with the thresholds used by the U.S. EPA and others.

Using Dun and Bradstreet financial data from 1999 to 2001, staff calculated the ROEs, both before and after the subtraction of the adjusted annual costs, for the typical businesses from each industry category. These calculations were based on the following assumptions.

- All affected businesses are subject to federal and state tax rates of 35 percent and 9.3 percent, respectively.
- Affected businesses neither increases the prices of their products nor lowers their costs of doing business through cost-cutting measures because of the regulation.

These assumptions, though reasonable, might not be applicable to all affected businesses.

California businesses are affected by the proposed annual cost of the regulation to the extent that the implementation of the proposed regulation reduces their profitability.

**(Placeholder – ROE analysis results)**

#### Potential Impact on Employment, Business Creation, Elimination or Expansion

The proposed regulation is expected to have no noticeable impacts on employment and business' status. Businesses that manufacture, sell, install, repair, or clean diesel particulate emission control systems may experience an increase in demand for their products or services, resulting in an expansion of those businesses or the creation of new businesses. Staff believes used engine dealers would not be eliminated; instead, we believe the dealers would adapt to incorporate additional refurbishment and upgrading of the engines for resale.

ARB staff believes jobs will not be eliminated as a result of the regulation, but it may lead to the augmentation or alteration of job duties, leading to no net result change in the number of jobs. For example, a mechanic who previously worked on muffler installation would now be installing a VDECS. Staff believes additional training and emissions testing may be required for these additional duties, if not provided by the VDECS manufacturers. To the extent that VDECS are manufactured in California, some jobs may also be created. Some jobs will be created to install, repair, or clean DECS.

## F. Potential Costs to Local, State, and Federal Agencies

This regulation does not directly affect any local, State, or Federal agencies. We anticipate some costs to the ARB to assist in implementation of the regulation; however, we believe these costs can be absorbed in our current and future budgets.

## G. Cost Effectiveness

In this section, the cost-effectiveness of the regulation is estimated. Cost effectiveness is expressed in terms of control costs (dollars) per unit of air emissions reduced (pounds). As described below, for example, the cost effectiveness for the proposed regulation is determined by dividing the total capital costs plus the annual operation and maintenance costs by the total pounds of diesel PM reduced during the years 2007 to 2015. All costs are in 2004 equivalent expenditure dollars.

### Expected Emission Reductions

We estimated the projected total emission reductions under the regulation using the statewide inventory. The following Table VII-10 provides a summary of the annual statewide diesel PM reductions that will result from the proposed regulation. The total diesel PM reduced by this regulation is expected to be 1.2 million pounds over the calendar years 2007 to 2015. Table VII-11 provides a summary of the annual statewide diesel NOx reductions that will result from the proposed regulation. Negative values in the table represent NOx increases compared to the baseline. These slight NOx increases represent slight changes in the equipment age distribution and the resulting increased activity for newer equipment and little change in NOx emission factors. The total NOx reduced by this regulation is expected to be 26.5 million pounds over the calendar years 2007 to 2015.

**Table VII-10: Estimated Statewide Diesel PM Annual Emission Reductions**

<b>Annual Diesel PM Reductions (lbs)</b>									
<b>Years</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
<i>Port</i>									
Crane	1,952	4,636	7,520	11,672	13,792	13,845	13,781	13,066	12,128
Excavator									

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	57	294	528	739	765	848	871	794	1,751
Forklift	381	944	1,516	2,486	3,165	3,701	3,896	3,701	3,413
Container Handling Equip	1,588	5,161	9,967	16,076	19,257	22,072	23,685	22,284	24,953
Sweeper/ Scrubber	27	83	173	275	331	378	385	350	759
Tractor/ Loader/ Backhoe	68	213	531	891	1,032	956	946	892	1,321
Yard Tractor	22,664	63,316	97,848	106,072	106,200	113,659	120,423	126,311	114,189
<b>Port Total:</b>	<b>26,737</b>	<b>74,646</b>	<b>118,082</b>	<b>138,212</b>	<b>144,542</b>	<b>155,460</b>	<b>163,987</b>	<b>167,399</b>	<b>158,516</b>
<b>Rail</b>									
Crane	361	1,008	1,586	2,167	2,329	2,525	2,580	2,332	2,262
Forklift	11	89	165	203	224	233	218	191	161
Container Handling Equip	99	750	1,024	1,272	1,430	1,460	1,170	1,165	1,883
Sweeper/ Scrubber	1	3	5	9	11	12	13	13	27
Tractor/ Loader/ Backhoe	0	1	3	6	8	9	10	9	21
Yard Tractor	1,210	3,517	5,436	7,255	9,551	9,964	9,987	9,300	7,919
<b>Rail Total:</b>	<b>1,682</b>	<b>5,368</b>	<b>8,219</b>	<b>10,911</b>	<b>13,552</b>	<b>14,203</b>	<b>13,977</b>	<b>13,009</b>	<b>12,273</b>
<b>Port &amp; Rail Total:</b>	<b>28,419</b>	<b>80,014</b>	<b>126,300</b>	<b>149,123</b>	<b>158,094</b>	<b>169,662</b>	<b>177,964</b>	<b>180,408</b>	<b>170,789</b>



**Table VII-11: Estimated Statewide Cargo Handling Equipment NOx Annual Emission Reductions**

<b>Annual NOx Reductions (lbs)</b>									
<b>Years</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
<b>Port</b>									
Crane	11204	22919	34214	53154	69561	42473	28739	16391	0
Excavator	0	2657	3651	3103	567	-515	-511	-499	53427
Forklift	0	2184	1980	997	446	-81	-79	-74	-70
Container Handling Equip	0	27842	37884	66627	88567	111192	146843	143493	325862
Sweeper/ Scrubber	0	372	510	433	157	-31	-30	-29	10796
Tractor/ Loader/ Backhoe	0	914	1044	1291	1452	-193	-192	-189	24985
Yard Tractor	636829	1738421	2540635	2585306	2518664	2999365	3446610	3694956	3182828
<b>Port Total:</b>	<b>648033</b>	<b>1795310</b>	<b>2619918</b>	<b>2710911</b>	<b>2679412</b>	<b>3152209</b>	<b>3621380</b>	<b>3854049</b>	<b>3597828</b>
<b>Rail</b>									
Crane	0	4245	7084	6395	4196	3283	2557	-1950	-1917
Forklift	0	783	1375	1274	1192	938	714	355	-5
Container Handling Equip	0	7130	8658	9955	11585	10711	5853	5818	47142
Sweeper/ Scrubber	0	10	11	12	7	-2	-2	-2	853
Tractor/ Loader/ Backhoe	0	2	3	3	2	0	0	0	201
Yard Tractor	18,571	62,796	88,214	120,082	176,468	246,560	306,195	337,829	314,572
<b>Rail Total:</b>	<b>18,571</b>	<b>74,965</b>	<b>105,346</b>	<b>137,721</b>	<b>193,449</b>	<b>261,490</b>	<b>315,316</b>	<b>342,051</b>	<b>360,847</b>
<b>Port &amp; Rail Total:</b>	<b>666,605</b>	<b>1,870,275</b>	<b>2,725,263</b>	<b>2,848,633</b>	<b>2,872,861</b>	<b>3,413,699</b>	<b>3,936,696</b>	<b>4,196,100</b>	<b>3,958,675</b>

**Cost Effectiveness**

To determine the cost-effectiveness of the proposed regulation, we divided the annual costs by the diesel PM emission reductions attributable to the regulation. The resulting cost effectiveness in each year of implementation up to 2015 is listed in Table VII-12. The estimated overall annual cost effectiveness, total PM reduced divided by total cost, is \$49 per pound of diesel PM reduced, if all the costs of compliance are allocated to diesel PM reduction. The annual range is from \$27 to \$150 per pound of diesel PM reduction.

**Table VII-12: Summary of Annual Diesel PM Cost Effectiveness for the Cargo Handling Equipment Regulation**

<b>Annual Cost Effectiveness (\$/lbs)</b>									
<b>Years</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
<b>Port</b>									
Crane	\$333	\$266	\$183	\$181	\$135	\$114	\$94	\$61	\$65
Excavator	\$84	\$55	\$25	\$23	\$21	\$12	\$7	\$0	\$621
Forklift	\$589	\$236	\$226	\$348	\$298	\$228	\$190	\$106	\$115
Container Handling Equip	\$95	\$63	\$32	\$33	\$30	\$23	\$23	\$19	\$86
Sweeper/ Scrubber	\$336	\$142	\$95	\$87	\$62	\$31	\$19	\$0	\$278
Tractor/ Loader/ Backhoe	\$334	\$165	\$126	\$89	\$88	\$31	\$15	\$0	\$492
Yard Tractor	\$75	\$105	\$49	\$9	\$17	\$40	\$41	\$25	\$9
<b>Port Total:</b>	<b>\$103</b>	<b>\$114</b>	<b>\$59</b>	<b>\$33</b>	<b>\$37</b>	<b>\$48</b>	<b>\$46</b>	<b>\$29</b>	<b>\$40</b>
<b>Rail</b>									
Crane	\$459	\$222	\$151	\$183	\$151	\$91	\$49	\$0	\$0
Forklift	\$749	\$287	\$233	\$237	\$225	\$172	\$124	\$97	\$115
Container Handling Equip	\$102	\$119	\$41	\$21	\$15	\$7	\$5	\$0	\$1,035
Sweeper/ Scrubber	\$329	\$133	\$113	\$110	\$95	\$41	\$27	\$0	\$344
Tractor/ Loader/ Backhoe	\$615	\$302	\$195	\$167	\$132	\$55	\$36	\$0	\$620
Yard Tractor	\$103	\$76	\$25	\$13	\$16	\$3	\$4	\$0	\$0
<b>Rail Total:</b>	<b>\$182</b>	<b>\$112</b>	<b>\$55</b>	<b>\$52</b>	<b>\$43</b>	<b>\$22</b>	<b>\$14</b>	<b>\$1</b>	<b>\$160</b>
<b>Port &amp; Rail Total:</b>	<b>\$150</b>	<b>\$115</b>	<b>\$59</b>	<b>\$35</b>	<b>\$37</b>	<b>\$46</b>	<b>\$44</b>	<b>\$27</b>	<b>\$49</b>

A summary of the overall average cost effectiveness for the period 2007 through 2015 is presented in Table VII-13. Overall, the cost effectiveness for all equipment averages about \$49 per pound of PM reduction. Since the regulation will also result in reductions in oxides of nitrogen (NOx) emissions, staff conducted a second cost effectiveness analysis in which half of the cost of compliance was allocated to PM benefits and half the cost was allocated to NOx benefits. This results in cost effectiveness values of \$25/lb diesel PM and \$1/lb of NOx.

**Table VII-13: Summary of Average Cost Effectiveness for the Period 2007-2015**

<b>Equipment Type</b>	<b>Total Capital Cost 2007 – 2015</b>	<b>Total PM Reduced (lbs) 2007 - 2015</b>	<b>Total PM Cost Effectiveness (\$/lb)</b>	<b>Total NOx Reduced (lbs) 2007 - 2015</b>
<b><i>Port</i></b>				
<b>Cranes</b>	\$ 11,687,742	92,392	\$ 127	278,655
<b>Excavators</b>	\$ 1,170,277	6,647	\$ 176	61,879
<b>Forklifts</b>	\$ 4,967,059	23,202	\$ 214	5303
<b>Container Handling Equipment</b>	\$ 5,534,165	145,043	\$ 38	948,309
<b>Sweeper/ Scrubber</b>	\$ 312,102	2,763	\$ 113	12,178
<b>Tractor/ Loader/ Backhoes</b>	\$ 989,047	6,851	\$ 144	29,113
<b>Yard Tractor</b>	\$ 29,640,206	870,682	\$ 34	23,343,615
<b><i>Intermodal Rail</i></b>				
<b>Crane</b>	\$ 1,734,489	17,150	\$ 101	23,893
<b>Forklift</b>	\$ 274,712	1,494	\$ 184	6,626
<b>Container Handling Equip</b>	\$ 2,155,406	10,253	\$ 210	106,851
<b>Sweeper/Scrubber</b>	\$ 13,131	91	\$ 144	888
<b>Tractor/Loader/ Backhoes</b>	\$ 17,222	67	\$ 258	210
<b>Yard Tractor</b>	\$ 845,664	64,138	\$ 13	1,671,289
<b>Reporting</b>	\$ 1,680,000			
<b>Total</b>	\$ 61,021,222	1,240,774	\$ 49	26,488,807