



SECTION 6: FUTURE EMISSIONS PROJECTIONS

As discussed and presented in Section 5, initial implementation of the Clean Air Action Plan measures focuses on heavy-duty trucks, cargo handling equipment, and ocean going vessels. This section discusses and presents the emission reduction estimates for the implementation of these initial measures over the five-year period covered by this edition of the Clean Air Action Plan. Additional reductions may be achieved during this period as additional measures are developed and implemented, rail and harbor craft measures become quantifiable, and as existing measures are reviewed and amended.

With respect to growth, the Clean Air Action Plan's measures were developed with two basic approaches: 1) emission reductions based on defined levels of funding, and 2) emission reductions based on phased-in lease requirements.

The first approach is not affected by growth in activity levels, but is based on unit costs and defined levels of activity. For example, SPBP-OGV2 emission reductions are based on a discrete number of shore-power stations and a defined number of participating vessel calls. If the level of activity in the Ports grows, the estimated tons of emission reductions associated with this measure will remain the same because the measure is based on a defined number of shore-power stations and vessel calls. The measure does include additional features that will encourage additional reductions that would react to growth, such as the focus on alternatives to shore-power, and additional shore-powered vessel calls will be sought. These additional reductions are not reflected in the number presented in this section because they have not been quantified.

In the second approach, the amount of emissions reduced would be proportional to any growth that might occur. This is because these measures will apply to all of an affected activity, such as all of a certain type of equipment. If more equipment is used, or if existing equipment is used to a greater extent, then the reductions associated with the measure will increase to the same extent. For example, if a terminal is required to replace its equipment with new equipment that reduces emissions by 90%, then regardless of any increase in number of pieces of equipment or hours of equipment operation, the emission reduction will remain at 90%. Since the emission reductions discussed in Section 5 are based on an assumption of no emissions growth from 2005, they can be adjusted to incorporate any assumption of growth such as that included in the Goods Movement Plan, the NNI report, or a projected per-year increase. After completion of the 2005 emissions inventory updates and development of a growth forecast, the Clean Air Action Plan will be updated in later years to the agreed upon growth projections.

This section presents the emission reductions in two subsections that address different aspects of the reductions and their relationship to port growth, and to other emission reduction studies/plans such as CARB's GMP and City of Los Angeles' NNI. Subsection 6.1 looks at the effect of the measures on emissions, taking into account the assumptions of growth in activity and emissions used by CARB in their GMP. While actual growth may not be the same as these estimates, the use of these estimates allows an evaluation of how the measures will react to the same growth



assumptions as in the GMP, which in turn provides insight on how the Clean Air Action Plan will perform under those assumptions. Section 6.2 provides a qualitative comparison between the Clean Air Action Plan and the GMP, and the Clean Air Action Plan and NNI.

6.1 Effects of Growth on Emission Reduction Measures

One issue that affects the presentation of emission reductions over a multi-year period is that of growth in port operations and the resulting change in emissions. The growth in emissions is the net change in emissions over time due to changes in port activity (usually an increase) and changes in emissions per unit of activity (an increase or decrease depending on the effectiveness of emission control requirements, fleet turnover, and efficiencies/inefficiencies in operations from one year to the next). It is difficult to reliably estimate the change in emissions related to port operations over the period covered by the plan because of significant unknowns such as new technology and technology implementation rates, operational changes that can affect operating efficiencies, emission reduction programs implemented voluntarily by the private businesses operating within the ports, and other factors.

Initial findings from the 2005 emissions inventories for the Ports indicate that for some source categories, even with the increase in cargo throughput over the past few years, emissions are lower due to purchases of new equipment, more efficient operations, and application of emission control technologies. After the conclusion of the 2005 emissions inventories, the Ports will work with agencies to compare the baseline inventories (2001 and 2002 for the Port of Los Angeles and the Port of Long Beach, respectively) with the inventory updates. The goal will be to establish a better methodology for predicting cargo activity and emissions growth by source category. In lieu of this methodology, the emission growth estimates in the Goods Movement Plan have been used in an evaluation of the effect of growth on the Clean Air Action Plan measures.

The GMP projections that have been used are those for the South Coast ports and international goods movement, which is a domain that, while not identical, most closely reflects the San Pedro Bay Ports' emissions inventories. The GMP projections, which were provided by staff of the South Coast Air Quality Management District, include an increase in DPM and NO_x emissions from OGVs and decreases in emissions of these pollutants from CHE and HDVs. The decreases are due to existing emission control regulations, but not including recently enacted standards affecting OGV fuels and CHE replacements, and are projected to occur due to normal equipment and vehicle turnover. In developing the emission projections with growth for this section, the decrease has not been included (the "base" emissions have been held constant instead of being reduced each year). This has been done as a conservative assumption because it is possible that normal turnover will be inhibited as terminal operators and vehicle owners prepare to comply with Clean Air Action Plan measures. To count reductions from turnover as well as reductions from plan measures may be double counting, which is to be avoided.

The following tables detail the projected emissions from the three source categories for which emission reductions have been estimated in this initial version of the Clean Air Action Plan. Each



table lists projected emissions as if there were no plan (emissions with growth, no control measures) and the targeted emissions remaining after implementation of the plan (emissions with growth and Clean Air Action Plan control measures). By the fifth year of the plan (2011) the tables shows an annual targeted reduction of 47% of DPM, 45% of NO_x, and 52% of SO_x from OGV, CHE, and HDV sources (annual targeted reductions identified for each year of the plan are also identified). As noted above, the emissions growth estimates that underlie CARB's GMP have been used to project the emissions growth shown in these tables.

Table 6.1: Effect of Growth & Clean Air Action Plan on DPM Emissions

Category	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
DPM Emissions with Growth, no Control Measures											
OGVs	1,231	1,436	1,641	1,847	2,052	2,175	2,298	2,421	2,544	2,667	2,780
CHE	181	174	166	159	152	152	152	152	152	152	152
HDVs	1,236	1,168	1,101	1,033	966	966	966	966	966	966	966
Total	2,648	2,778	2,909	3,039	3,170	3,293	3,416	3,539	3,662	3,785	3,898
DPM Emissions with Growth and CAAP Control Measures											
OGVs	1,231	1,436	1,641	1,847	2,052	2,175	2,196	2,116	1,921	1,864	1,836
CHE	181	174	166	159	152	152	138	100	67	58	48
HDVs	1,236	1,168	1,101	1,033	966	966	944	730	524	354	184
Total	2,648	2,778	2,909	3,039	3,170	3,293	3,278	2,946	2,512	2,276	2,068
Percent Reduction							4%	17%	31%	40%	47%

Table 6.2: Effect of Growth & Clean Air Action Plan on NO_x Emissions

Category	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
NO_x Emissions with Growth, no Control Measures											
OGVs	13,574	15,452	17,329	19,207	21,085	22,207	23,329	24,451	25,573	26,696	27,800
CHE	4,352	4,243	4,134	4,025	3,916	3,916	3,916	3,916	3,916	3,916	3,916
HDVs	9,569	9,744	9,919	10,094	10,269	10,269	10,269	10,269	10,269	10,269	10,269
Total	27,495	29,439	31,383	33,326	35,270	36,392	37,514	38,636	39,758	40,881	41,985
NO_x Emissions with Growth and CAAP Control Measures											
OGVs	13,574	15,452	17,329	19,207	21,085	22,207	20,174	19,255	17,653	17,304	16,828
CHE	4,352	4,243	4,134	4,025	3,916	3,916	3,665	2,949	2,330	2,279	2,163
HDVs	9,569	9,744	9,919	10,094	10,269	10,269	10,102	8,498	6,940	5,491	4,041
Total	27,495	29,439	31,383	33,326	35,270	36,392	33,940	30,703	26,924	25,074	23,032
Percent Reduction							10%	21%	32%	39%	45%

Table 6.3: Effect of Growth & Clean Air Action Plan on SO_x Emissions

Category	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
SO_x Emissions with Growth, no Control Measures											
OGVs	7,749	8,902	10,054	11,207	12,360	13,119	13,878	14,638	15,397	16,157	16,916
CHE	8	8	8	8	8	8	8	8	8	8	8
HDVs	9	9	9	9	9	9	9	9	9	9	9
Total	7,766	8,919	10,071	11,224	12,377	13,136	13,895	14,655	15,414	16,174	16,933
SO_x Emissions with Growth and CAAP Control Measures											
OGVs	7,749	8,902	10,054	11,207	12,360	13,119	11,939	10,174	8,895	8,474	8,046
CHE	8	8	8	8	8	8	8	8	8	8	8
HDVs	9	9	9	9	9	9	9	8	8	7	7
Total	7,766	8,919	10,071	11,224	12,377	13,136	11,956	10,191	8,910	8,490	8,061
Percent Reduction							14%	30%	42%	48%	52%



The following figures are based on the tables above that compare the forecast emission reductions of the Clean Air Action Plan with the growth in emissions that would occur with the growth rate projections used in the GMP. The starting points in terms of emissions are the “assumed base emissions” listed in Tables 5.27, 5.28, and 5.29, which are the base emissions from which the Clean Air Action Plan reductions have been calculated. Growth of these emissions is based on the emission growth rates in CARB’s GMP projections of changes in emissions without the GMP measures.

Each figure shows the growth line of emissions (assuming CARB’s GMP growth assumptions) of the specified pollutant without the effect of Clean Air Action Plan measures, and the reductions of emissions that are forecast to occur with implementation of plan measures. In each figure, the triangle-shaped area at the upper right side of the chart represents the emissions eliminated by the plan measures.

Figure 6.1: Effect of Growth & Clean Air Action Plan on DPM Emissions

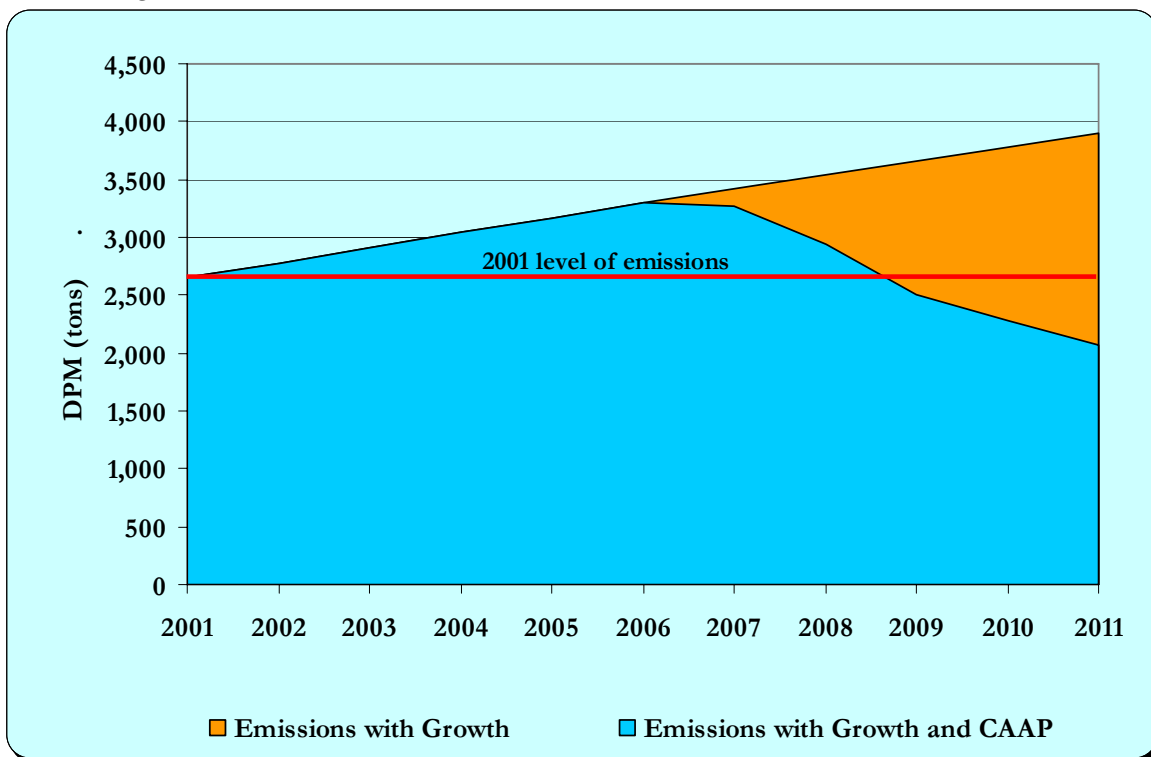




Figure 6.2: Effect of Growth & Clean Air Action Plan on NOx Emissions

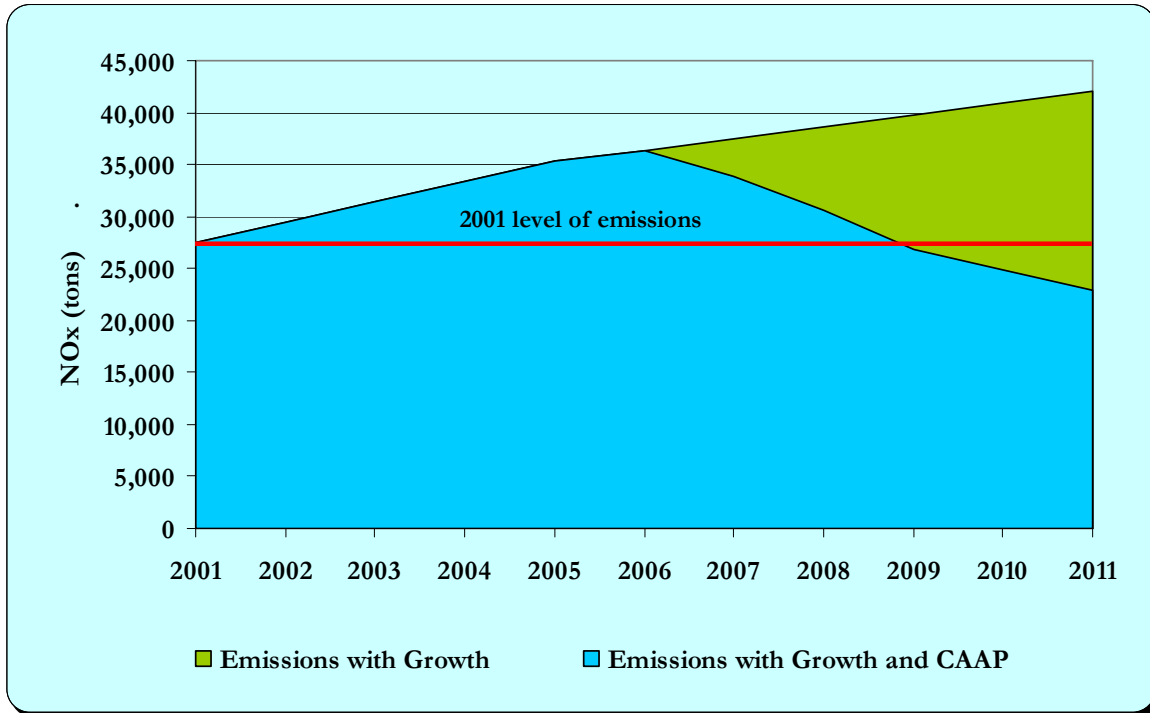
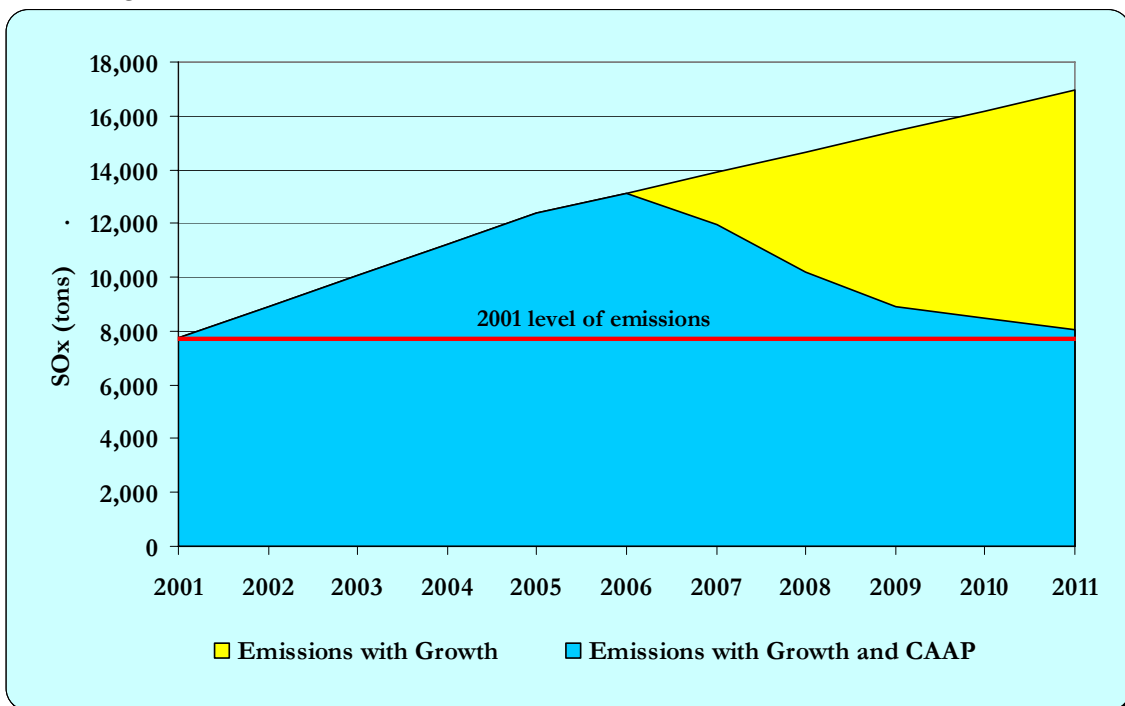


Figure 6.3: Effect of Growth & Clean Air Action Plan on SOx Emissions





6.2 Comparison with Other Programs

This section compares the relative emissions reductions achieved in the first five years of initial implementation (2007 to 2011) of the San Pedro Bay Clean Air Action Plan (CAAP), the CARB's state-wide Goods Movement Plan (GMP), and the City of Los Angeles' NNI Task Force Report. Qualitative comparisons are presented in Tables 6.4 and 6.5 below, for CAAP against GMP and CAAP against NNI, respectively. The tables present assessments based on (a) Source Categories, (b) Control Strategies, and (c) Overall Source Category Emissions Reductions for DPM and NOx.

A comparison of the first five years' overall emission reductions is also provided in each table. Relative evaluations are tabulated with respect to CAAP compared to the other plans, so that CAAP reductions are either "greater than" (>), "equal to" (=), or "less than" (<) projected GMP or NNI reductions. Multiple indicators are used (e.g., >>) to represent large differences between the plans. Where appropriate, "TBD" appears in the tables to denote a comparison "To Be Determined" at a future date when additional information becomes available.

As stated above, CAAP and GMP are compared in Table 6.4. It's important to note that CAAP and GMP are complementary approaches, in that the plans rely on each other to ensure that health risk and mass emissions goals are met in a timely manner. Because of this approach, the tabulated results may unavoidably include some double counting of emissions reductions. This is because the estimated benefits of the GMP assume that local plans and measures (like the CAAP) will be adopted and implemented. A more complete assessment of the combined effects of the two plans is currently being developed by the CARB and SCAQMD, but is not available at this time. When this more complete assessment is complete, it will be added to the next CAAP update.

The comparison of CAAP with NNI also merits special comment. Table 4.2 (Section 4) outlines how proposed NNI control measures were integrated into the CAAP. The resulting NNI reductions were estimated to be greater than those projected for the CAAP, suggesting that the CAAP falls short of the NNI results. However, Port staff believes that several NNI measures include either unsupported or unspecified assumptions regarding implementation and/or funding mechanisms (amounting to some \$15 billion for just the Port of Los Angeles). In contrast, the CAAP is a living plan with implementation schedule, specific/detailed strategies and milestones, includes identified funding mechanisms to cover the Ports' cost, and has a strong Technology Advancement Program.



Table 6.4: Ports' Comparison of Clean Air Action Plan (CAAP) and CARB's Near-Term GMP Strategies

<i>Source Categories</i> Control Strategies/Overall Reductions	CAAP Compared w/ Near-Term GMP (Cumulative Benefits 2007-2011)	Comments
<i>Heavy-Duty Vehicles (Trucks)</i>		
Modernization & Retrofits	>	CAAP focuses on replacing all frequent caller & older semi-frequent caller trucks to MY2007+
Overall DPM Emission Reductions	=	CAAP and GMP are basically the same reductions
Overall NOx Emission Reductions	>>	CAAP replaces all of frequent callers & 1/3 of semi-frequent callers w/MY2007 trucks
<i>Ocean-Going Vessels</i>		
Vessel Speed Reduction	>	CAAP boundary goes to 40 nm by 1st quarter 2008; GMP goes out to 24 nm
At-Berth Emission Reductions	=	CAAP has earlier implementation
Aux Engine Fuel Changes	>	CAAP first 4 years lower sulfur fuel than GMP, has no exemptions for shore power, & 40 nm
Main Engine Fuel Changes	>>	CAAP has lower sulfur fuels & starts sooner than GMP
Advanced Technologies	>	CAAP includes comprehensive & funded Technology Advancement Program
Overall DPM Emission Reductions	>	CAAP reductions are greater within the first five years of implementation
Overall NOx Emission Reductions	>	CAAP reductions are greater within the first five years of implementation
<i>Cargo Handling Equipment</i>		
Modernization	>	CAAP & GMP work together; CAAP targets CHE not in GMP & focuses on modernization
Overall DPM Emission Reductions	>	CAAP has earlier implementation
Overall NOx Emission Reductions	>	CAAP has earlier implementation



Table 6.4: Ports' Comparison of Clean Air Action Plan (CAAP) and CARB's Near-Term GMP Strategies (cont'd)

<i>Source Categories</i> Control Strategies/Overall Reductions	CAAP Compared w/ Near-Term GMP (Cumulative Benefits 2007-2011)	Comments
<i>Harbor Craft</i>		
Performance Standards	=	CAAP & GMP similar reductions; HC has been significantly reduced through Carl Moyer
Overall DPM Emission Reductions	TBD	CAAP probably same levels as GMP in first five years
Overall NOx Emission Reductions	TBD	CAAP probably same levels as GMP in first five years
<i>Rail Locomotives</i>		
PHL Switch Engine Moderization	N/A	
Existing Class 1 Rail Operations	=	CAAP & GMP consistent for switchers & helpers
New Class 1 Rail Yard Standards	N/A	CAAP has stringent new rail yard standards
Overall DPM Emission Reductions	TBD	CAAP probably greater reductions than GMP
Overall NOx Emission Reductions	TBD	CAAP probably greater reductions than GMP
<i>5-Year Reductions</i>		
Overall DPM Emission Reductions	>	CAAP higher reductions over first five years than GMP
Overall NOx Emission Reductions	>	CAAP higher reductions over first five years than GMP



Table 6.5: Ports' Comparison of Clean Air Action Plan (CAAP) and City of Los Angeles' NNI Task Force Report

<i>Source Categories</i> Control Strategies/Overall Reductions	CAAP Compared with NNI (Cumulative Benefits 2007-2011)	Comments
<i>Heavy-Duty Vehicles (Trucks)</i>		
Modernization & Retrofits	>>	CAAP focuses on replacing all frequent & older semi-frequent caller trucks to MY2007+
Overall DPM Emission Reductions	>	CAAP focuses on replacing all frequent & older semi-frequent caller trucks to MY2007+
Overall NOx Emission Reductions	>>>	CAAP focuses on replacing all frequent & older semi-frequent caller trucks to MY2007+
<i>Ocean-Going Vessels</i>		
Vessel Speed Reduction	=	CAAP & NNI basically the same
At-Berth Emission Reductions	=	CAAP & NNI basically the same
Aux Engine Fuel Changes	<	NNI assumed faster fuel implementation based on % call targets; CAAP evaluating tariffs
Main Engine Fuel Changes	<	NNI assumed faster fuel implementation based on % call targets; CAAP evaluating tariffs
Advanced Technologies	>	CAAP & NNI call for aggressive reductions; CAAP has funded Technology Advancement Prog.
Overall DPM Emission Reductions	<	NNI reductions keyed to high % of calls being at 0.2% S starting in 2007 through first five years
Overall NOx Emission Reductions	<	CAAP technologies through lease changes; NNI assumes quick introduction of retrofit technology
<i>Cargo Handling Equipment</i>		
Modernization	=	CAAP primary focus DPM then NOx; NNI primary focus NOx then DPM
Overall DPM Emission Reductions	>	CAAP has slightly more DPM reductions in first five years
Overall NOx Emission Reductions	<	NNI has slightly more NOx reductions in first five years



Table 6.5: Comparison of Clean Air Action Plan (CAAP) and City of Los Angeles' NNI Task Force Report (cont'd)

<i>Source Categories</i> Control Strategies/Overall Reductions	CAAP Compared with NNI (Cumulative Benefits 2007-2011)	Comments
<i>Harbor Craft</i>		
Performance Standards	=	
Overall DPM Emission Reductions	TBD	CAAP probably will achieve the same levels as NNI in first five years
Overall NOx Emission Reductions	TBD	CAAP probably will achieve the same levels as NNI in first five years
<i>Rail Locomotives</i>		
PHL Switch Engine Moderization	=	CAAP & NNI basically the same
Existing Class 1 Rail Operations	=	CAAP & NNI basically the same
New Class 1 Rail Yard Standards	>	CAAP incorporates stringent requirements on new or modified rail yards on Port properties
Overall DPM Emission Reductions	TBD	CAAP probably similar to NNI until new/modified rail yard standards take effect
Overall NOx Emission Reductions	TBD	CAAP probably similar to NNI until new/modified rail yard standards take effect
<i>5-Year Reductions</i>		
Overall DPM Emission Reductions	<	NNI fuel change penetration assumptions much higher than CAAP in first five years
Overall NOx Emission Reductions	=	CAAP & NNI basically the same