Draft Report

DIESEL PARTICULATE MATTER MITIGATION PLAN FOR THE BNSF RAILROAD HOBART RAIL YARD

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DIESEL PARTICULATE MATTER MITIGATION PLAN FOR THE BNSF RAILROAD HOBART RAIL YARD

I. Introduction

In accordance with the 2005 California Air Resources Board (CARB)/Railroad Statewide Agreement (MOU), BNSF has prepared this Mitigation Plan for the Los Angeles - Hobart Rail Yard. The purpose of this Plan is to outline the potential mitigation measures that can be used reduce Diesel particulate matter (DPM) emissions from the Los Angeles - Hobart Rail Yard. The Plan also contains sections detailing how the baseline and projected emissions were calculated and mechanisms that will be used to track progress. The baseline emissions were described in great detail in a series of reports that are publicly available (http://www.arb.ca.gov/railyard/hra/hra.htm).

As discussed below, the proposed Mitigation Measures, when fully implemented, will reduce the DPM emissions from the Los Angeles - Hobart Yard by 76% from 2005 baseline. These emission reductions will concurrently lower any existing predicted health risk associated with the facility operations. Other federal, state, and Port of Los Angeles/Port of Long Beach (Ports) related air pollution control measures and plans, and existing railroad voluntary agreement measures will supplement the current and future emission reduction discussed in this Plan.

II. Summary of Rail Yard Operations

The Los Angeles – Hobart yard is a large dedicated intermodal rail yard located at the north end of the Alameda Corridor. BNSF gathers and delivers containers and some truck trailers on rail, and transfers containers and other freight from and onto rail cars with cargo handling equipment. The locomotive operations at this yard function as a classification yard, handling arriving trains and preparing trains for departure. In addition, the mainline rail carries BNSF freight and passenger (AMTRAK and Metrolink) trains with a small amount of foreign freight operated by other carriers.

III. Emissions Summary

Table 3-1 below, shows the DPM emissions from the Los Angeles - Hobart Yard, by equipment category, for the 2005 baseline year, and for future years as the mitigation measures proposed in this Plan are implemented over time. As shown in Table 3-1, when the proposed mitigation measures are implemented DPM emissions will be reduced by approximately 83 percent without considering activity growth. These emission reductions will concurrently lower any existing predicted health risk related to facility operations. A detailed discussion of each mitigation measure is provided in Section VI.

The projected emission reduction calculations shown in Table 3-1 do not assume a gradual increase in freight handled at the Los Angeles - Hobart Yard but estimates with activity growth are provided in Section 4. The assumptions and methodologies used to predict the rate of growth are discussed in Section V. In addition, the analysis takes into account certain other future regulatory measures and voluntary agreements, which will be implemented and effective by

2020 (e.g., CARB's Cargo Handling Equipment and Intermodal Truck regulations, federal truck emission rules, 1998 and 2005 CARB MOUs).

In summary the emission totals for all rail yards were compiled using the adjustments to the emission inventory projecting fleet turnover and future year emission rates. The totals, by source category, are provided in Table 3-1 for Hobart. The 2005 cargo handling equipment was revised with new activity data, and the truck emissions were revised with the EMFAC version2.3 emission rates. A different growth rate was applied to the mainline freight and passenger traffic from that for the activity within the yard.

Table 3-1. Estimated total annual DPM emissions associated with the operations at the Los Angeles - Hobart facility with 2005 activity levels.

Hobart - Los Angeles	**PM Emissions (metric tonnes)**				
Facility Operations	**2005**	**2005 - Revised**	**2010**	**2015**	**2020**
Basic Services	0	0	0	0	0
Basic Engine Inspection	0	0	0	0	0
Full Engine Service/Inspection	0	0	0	0	0
Switching running	1.34	1.34	1.33	1.05	0.925
Switching idling	0.67	0.67	0.47	0.28	0.245
Arriving and Departing Trains	1.95	1.95	1.35	1.00	0.605
Adjacent Freight Movements	0.94	0.94	1.00	0.75	0.45
Adjacent Commuter Rail Operations	0.46	0.46	0.46	0.46	0.46
Cargo Handling Equipment	3.40	5.31[1]	2.12	1.36	0.60
On-Road Container Truck Operations	8.49	9.10[2]	0.80	0.28	0.34
On-Road Container Truck Operations, Contractors	0.64	0.60[2]	0.072	0.068	0.068
On-Road Fleet Vehicle	0	0	0	0	0
Other Off-Road TRU	3.24	1.95[3]	0.90	0.49	0.08
Other Off-Road Track Maintenance	0.03	0.03	0.03	0.02	0.01
Other Off-Road Portable Engines	0	0	0	0	0
Stationary Sources	0.07	0.07	0.07	0.07	0.07
Total	**21.24**	**22.42**	**8.60**	**5.83**	**3.85**

[1] – Cargo handling activity (hours per year) and load factor adjusted
[2] – Truck emission factors update to EMFAC v2.3
[3] – TRU relative engine on time incorporated in the calculations

IV. Emission Inventory Methodology

In forecasting emissions at rail yards, ENVIRON projected the impact of several rulemakings and voluntary initiatives. These rulemakings and initiatives include emission reductions expected to result from Federal, State, and voluntary emission reduction strategies from all sources. The emission reductions will primarily result from normal and accelerated fleet turnover to engines meeting more stringent new engine emission standards. Normal fleet turnover is the fleet replacement expected due to retirement of older equipment for mechanical or other business reasons. Accelerated turnover of equipment is the centerpiece of many California rulemakings and some voluntary initiatives and is expected to result in emission reductions in years immediately after a change in the new engine emission standards. Retrofit of older equipment is often available as an alternative element to comply with accelerated turnover.

The emission sources affected include the following source categories:

- Locomotives (Line-Haul & Switching)
- HHD Diesel-Fueled Drayage Trucks
- Cargo Handling Equipment
- Heavy Equipment
- Transport Refrigeration Units (TRU) and Refrigerated Railcars
- Other Miscellaneous Diesel-Fueled Equipment

The emissions consider a constant 2005 level of activity and apply activity changes after the fact. Overall ENVIRON expects emissions from rail yards to have significant reductions in the years 2005 through 2020 as a result of Federal, State, and local initiatives affecting new engines and of replacement or retrofit of older equipment with engines and equipment using low emission technology. The projected emission reductions without considering growth range from 62% to 83%, and adding the expected growth results in emission reductions from 58% to 76%. A no growth scenario was run to determine the emission reduction due to fleet turnover or other measures prior to applying any growth estimate. The growth estimates for this yard consist of two primary activity indicators, container lifts on site and mainline traffic passing the yard. The lifts are a measure of the intermodal traffic, which directly correlates to the number of trains stopping, switching engines use, cargo handling equipment, and truck traffic. The mainline traffic is unrelated to the yard but was another emission source within the boundaries of the site studied. The no growth and growth scenarios are shown in Table 4-1 and in Figure 4-1 for Hobart rail yard.

Table 4-1. DPM emission (metric tonnes per year) projection summary for BNSF Hobart.

Yard (condition)	2005	2010	2015	2020
No growth	22.42	8.60	5.83	3.85
With growth	---	9.51	7.20	5.37

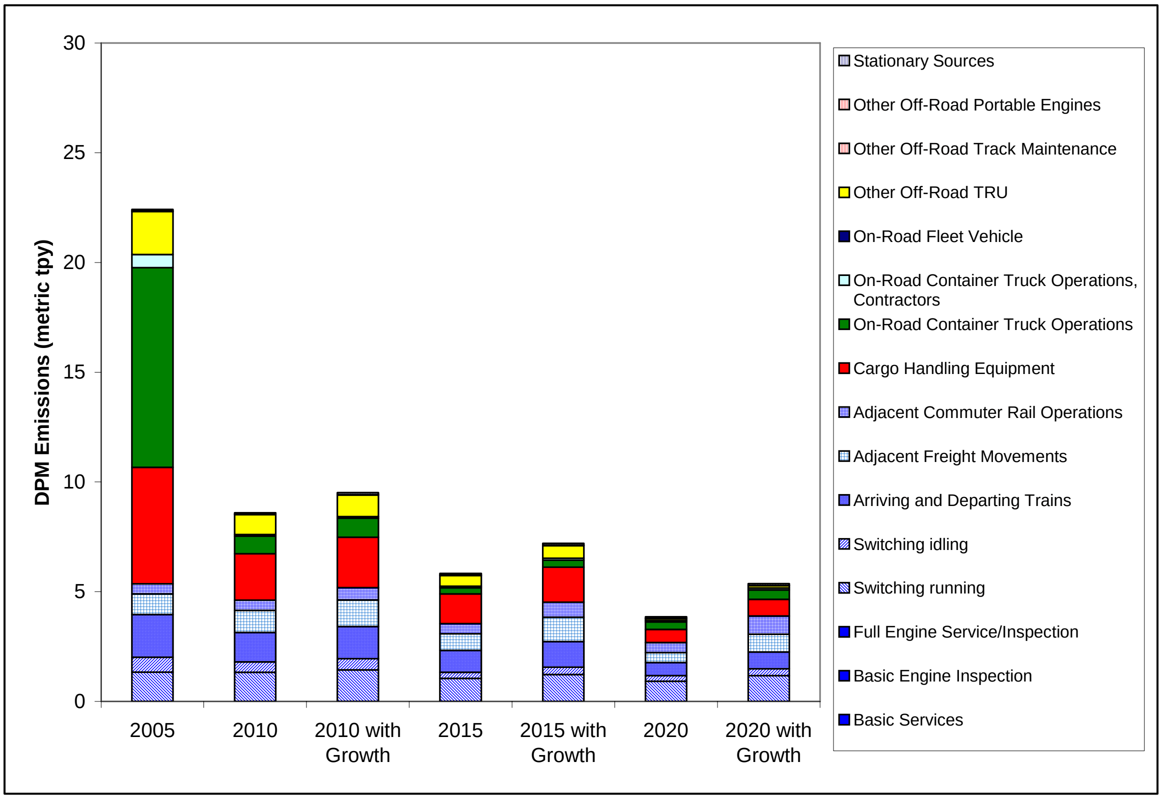

Figure 4-1. BNSF Los Angeles - Hobart emission summary (With and without growth).

A general discussion of the analytical methodology and assumptions used to calculate the 2005 baseline emissions and to forecast emissions for calendar years 2010 through 2020, for each equipment category is provided below. Detailed emission calculations for the 2005 baseline year can be found in the Hobart – Los Angeles Toxic Air Contaminants Emissions Inventory with modifications for the revised emission inventory methods described in this report.

1. Locomotives

BNSF has agreed ("Memorandum of Mutual Understandings and Agreements," July 2, 1998) to meet Tier 2 fleet average emissions for all locomotives operating in the South Coast. This agreement may be met in variety of ways through averaging very low emitters with engines not meeting Tier 2 levels.

In addition, BNSF has agreed in the MOU (ARB/Railroad Statewide Agreement, "Particulate Emission Reduction Program at California Rail Yards," June 2005) to reduce idling and to use lower sulfur fuels for locomotives based and refueled in California.

The reduced idling agreement calls for engines based in California to be refit with idle shut-off devices, limiting each idle event to no more than 15 minutes. This will affect all switching engines at California yards and likely most line-haul engines operating in the South Coast where many line-haul engines may be dedicated to that area. ENVIRON assumed that all BNSF new engines are fitted with idle shutoff; so at least all Tier 2 engines were expected to use these devices.

BNSF agreed to accelerate the use of low sulfur fuel in California ahead of the Federal standard for 15 ppm sulfur starting in 2012. By agreement, BNSF will use 15 ppm sulfur in 80% of the California refueling gallons with the remaining assumed to be at the 2007 Federal standard of 500 ppm. Based on an assessment of the in-bound engines using Federal fuel and out-bound engines using California fuel along with refueling rates at locations inside and outside of California, ENVIRON calculated the average sulfur level to be no higher than 0.034% in 2007-2011 time frame compared with 0.105% in 2005 due to the agreement.

EPA announced final emission standards (EPA, 2008) that include an analysis of the expected benefit of normal fleet turnover and the additional benefit of the EPA rule. The emission standards include a retrofit of existing equipment as well as new engine emission standards. Existing Tier 0, 1, and 2 engines will be subject to retrofit at the time of rebuild; so the engines will be rebuilt gradually throughout their remaining useful life.

The emissions standards and projected EPA emission factors are shown in Tables 4-2 and 4-3, depending on the duty cycle chosen to certify the engines - either line-haul or switching engine duty cycles. The duty cycle for line-haul engines typically leads to lower emission on a gram per horsepower-hour (hp-hr) basis because the switching engine duty cycle has a considerable idling time (no hp-hr generated). In some cases the uncontrolled emissions are much lower than some of the emission standards, so no emission reduction would be expected from those standards especially for HC and CO emissions. The relative emission factors provided by EPA were used to adjust the locomotive emission rates. For instance, for the Tier 2 remanufactured engines the PM emissions were reduced by 55.6% that reflect the expected emission reduction from 0.08 g/hp-hr for remanufactured locomotives compared to 0.18 g/hp-hr for the baseline Tier 2 locomotives in Table 4-2b.

Table 4-2a. Locomotive – Emission standards (g/hp-hr) for line-haul (duty cycle) engines.

Emission Standard	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NOx (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	**Pre-1973**	**0.48**	**1.28**	**13.0**	**0.32**
Tier 0 – original	1973 – 2001	1.00	5.0	9.5	0.60
Tier 0 – final[1]	2008 / 2010	1.00	5.0	8.0	0.22
Tier 1 – original	2002 – 2004	0.55	2.2	7.4	0.45
Tier 1 – final[1]	2008 / 2010	0.55	5.0	7.4	0.22
Tier 2 – original	2005	0.30	1.5	5.5	0.20
Tier 2 – final[1]	2013	0.30	1.5	5.5	0.10
Tier 3	2012 – 2014	0.30	1.5	5.5	0.10
Tier 4 [2]	2015	0.14	1.5	1.3	0.03

[1] These are retrofit standards at the time of rebuild and phased in as retrofit kit availability.
[2] The Tier 4 NOx standard can be a 1.4 NOx + HC standard.

Table 4-2b. Locomotive – EPA projected emissions factors (g/hp-hr) for line-haul engines.

Engine Type	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NOx (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	**Pre-1973**	**0.48**	**1.28**	**13.0**	**0.32**
Tier 0 – original	1973 – 2001	0.48	1.28	8.60	0.32
Tier 0 – final[1]	2008 / 2010	0.30	1.28	7.20	0.20
Tier 1 – original	2002 – 2004	0.47	1.28	6.70	0.32
Tier 1 – final[1]	2008 / 2010	0.29	1.28	6.70	0.20
Tier 2 – original	2005	0.26	1.28	5.50	0.18
Tier 2 – final[1]	2008 / 2013	0.13	1.28	4.95	0.08
Tier 3	2012 – 2014	0.13	1.28	4.95	0.08
Tier 4 [2]	2015	0.04	1.28	1.00	0.015

[1] These are estimated emissions with retrofit with some exceptions for older Tier 0 engines.
[2] The Tier 4 NOx standard would not apply until 2017, while the other standards would apply starting in 2015. The Tier 4 NOx standard would apply, however, at remanufacture for model year 2015 and 2016 locomotives.

Table 4-3a. Locomotive – Emission standards for switching (duty cycle) engines.

Emission Standard	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NOx (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	**Pre-1973**	**1.01**	**1.83**	**17.4**	**0.44**
Tier 0 – original	1973 – 2001	2.10	8.0	14.00	0.72
Tier 0 – final[1]	2008 / 2010	2.10	8.0	11.80	0.26
Tier 1 – original	2002 – 2004	1.20	2.5	11.00	0.54
Tier 1 – final[1]	2008 / 2010	1.20	2.5	11.00	0.26
Tier 2 – original	2005	0.60	2.4	8.10	0.24
Tier 2 – final[1]	2008 / 2013	0.60	2.4	8.10	0.13
Tier 3	2011 - 2015	0.60	2.4	5.00	0.10
Tier 4 [2]	2015	0.14	2.4	1.30	0.03

1 These are retrofit standards at the time of rebuild and phased in as retrofit kit availability allows.
2 The Tier 4 NOx standard can be a 1.3 NOx + HC standard.

Table 4-3b. Locomotive – EPA projected emission factors for switching (duty cycle) engines.

Engine Type	Applicable Year	HC (g/hp-hr)	CO (g/hp-hr)	NOx (g/hp-hr)	PM (g/hp-hr)
Uncontrolled Emissions	**Pre-1973**	**1.01**	**1.83**	**17.4**	**0.44**
Tier 0 – original	1973 – 2001	1.01	1.83	14.0	0.44
Tier 0 – final[1]	2008 / 2010	0.57	1.83	10.62	0.23
Tier 1 – original	2002 – 2004	1.01	1.83	9.9	0.43
Tier 1 – final[1]	2008 / 2010	0.57	1.83	9.9	0.23
Tier 2 – original	2005	0.51	1.83	7.3	0.19
Tier 2 – final[1]	2008 / 2013	0.26	1.83	7.3	0.11
Tier 3	2011 - 2015	0.26	1.83	5.4	0.08
Tier 4 [2]	2015	0.08	1.83	1.00	0.015

1 These are estimated emissions with retrofit with some exceptions for older Tier 0 engines.
2 The Tier 4 NOx standard would not apply until 2017, while the other standards would apply starting in 2015. The Tier 4 NOx standard would apply, however, at remanufacture for model year 2015 and 2016 locomotives.

a) Line-haul Locomotives

Line-haul locomotives are responsible for long-haul trips that pass rail yards on the mainline tracks and also enter classification and intermodal yard pulling arriving and departing trains (TA/TD). The two types of activities, passing and TA/TD, were treated uniquely in the assessment of the rail yards because the spatial allocation of the activity and the engine duty cycles are unique to each type of train.

Because the South Coast agreement is an averaging standard, the exact fleet composition may change from day to day. For the purposes of this work, ENVIRON assumed a fleet mix of locomotives such that 75% of the fleet were GE ES44DC engines that meet NOx and other pollutant emission levels below the Tier 2 standard, and 15% were GE Dash 9 engines meeting the Tier 1 standard. The remaining 10% of line-haul locomotives were Tier 0 GE Dash 9. This assumption of the fleet make-up somewhat overstates future year emissions because Dash 9 and the Tier 2 engines have higher rated power than some of the engines used in 2005. Therefore either fewer engines or lower power notch settings would be used to perform the same work.

For 2015 and 2020, ENVIRON estimated the fleet turnover to Tier 3 and Tier 4 engines to be 3% per year with the equivalent fleet replacement of Tier 0, Tier 1, and Tier 2 engines by the Tier 3 and Tier 4 engines. ENVIRON assumed that the Tier 3 and 4 engines percentage emissions reductions would occur equivalently for all modes (idle and notches) from the Tier 2 engines.

The Tier 3 PM emission standard is essentially the same as the rebuilt Tier 2, but the engines meeting Tier 4 standards have a lower PM emission standard.

BNSF estimated that the remaining Tier 0 and Tier 1 engines would undergo engine rebuilds every 6 years or 17% of the fleet per year. Likewise because Tier 2 engines would be rebuilt every 8 years, 12.5% of the Tier 2 fleet would be rebuilt per year. The final rebuild kits would be available for all engines starting in 2010 for Tier 0 and Tier 1, and 2013 for Tier 2. Some emission reductions could occur earlier, but ENVIRON chose to ignore the phase-in period for rebuild kits. The emission reduction was calculated to be 37.5% for Tier 0 and 1 rebuilds (0.20 g/hp-hr compared to the baseline PM emission rate of 0.32 g/hp-hr) and 50% for Tier 2 rebuilds from Tier 2 base emissions (0.20 to 0.10 g/hp-hr PM emission rate reduction).

Table 4-4 provides expected fleet composition with introduction of the Tier 3 and Tier 4 engines replacing the South Coast fleet. ENVIRON assumes that the introduction of Tier 3 and 4 engines could replace the fleet of Tier 0 / 1 / 2 engines in equal proportion and so the fleet fraction of remaining Tier 0, 1, and 2 engines were proportionally reduced.

Table 4-4. Fleet composition estimate in the South Coast in future years.

Engine Model	2010	2015	2020
Tier 0	10%	1.3%	0.0%
Tier 0 rebuild	0%	7.5%	7.3%
Tier 1	15%	2.0%	0.0%
Tier 1 rebuild	0%	11.2%	11.0%
Tier 2	75%	49.5%	6.8%
Tier 2 rebuild	0%	16.5%	47.9%
Tier 3	0%	9.0%	9.0%
Tier 4	0%	3.0%	18.0%
Overall	100%	100%	100%

Idle emission reductions are difficult to predict. Past locomotive idle times were found to be short and result from main line congestion and speed limits forcing engineers to back off power, but no idle emission reductions are expected for this activity category. The TA/TD engines however do spend more time in the yard where engines can idle a significant amount of time. ENVIRON assumed that the idle shut-off devices would reduce TA/TD engines idle time to 1 hour (15 minutes for each event; arrival and train cut out, move to refueling area, arrival at ready track awaiting assignment, and prior to leaving with a new train) per arrival of new Tier 2 engines with factory installed idle limiting timers.

b) Switching Locomotives

Based on conversation with BNSF, the switching engines will continue to be Tier 0 compliant and remanufactured according to the schedule that EPA has finalized. The emissions for switching engines will be affected by the MOU idle reduction measure in addition to the remanufacturing emissions reductions. It will take a study to determine the idle reduction due to idle shut off devices installed on these engines. Because some emission reduction will be realized with these devices, ENVIRON assumed 30% reduction of the idle mode.

2. HHD Diesel-Fueled Drayage Trucks

BNSF has little control over private owner/operators who carry most of the containers to and from the site. The vehicle types are the heaviest trucks on the road and often are not the most modern or recent model years. However, there is a California rule making (http://www.arb.ca.gov/regact/2007/drayage07/modtext.pdf) mandating complete fleet turnover for container trucks that meet or exceed 2007 model year California or federal emission standards by December 31, 2013 with an interim control scenario implemented by December 31, 2009.

At the BNSF Hobart site, ENVIRON used the default truck age distribution from the Port of Los Angeles study because the primary activity is movement of Port traffic. Significant emission reductions are expected from port trucks due to the 2007 new engine emission standards (that result in very low PM emission rates) and to the California "Regulation to Control Emissions from In-Use On-Road Diesel-Fueled Heavy Duty Drayage Trucks." Trucks arriving at the Hobart yard would be responsible for fleet turnover to 2007 and later model years by December 31, 2013. In addition, any measures implemented by the Ports of Los Angeles and Long Beach will produce comparable emission reductions at Hobart.

Since the CARB HRA report was released in November of 2007, the EMFAC2007 v2.3 has become the standard model to estimate emissions from on-road vehicles. The base was revised using this version of EMFAC instead of a prerelease version of EMFAC used in the CARB HRA.

In order to estimate the impact of the rule on emissions from trucks arriving at Los Angeles – Hobart, the age distribution was modified to reflect the implementation of the rule and 85% PM control from VDECS devices applied to the EMFAC emission factors for the 2010 average fleet complying with the rule. Otherwise the fleet composition was adjusted to reflect the rule, and the Appendix provides a summary of the emission calculations for truck emission rates.

3. Cargo Handling Equipment (CHE)

BNSF cargo handling equipment (CHE) emissions were projected to 2010, 2015, and 2020 based on 2005 annual emission estimates generated by ARB and control factors by equipment type to account for decreases in emissions due to fleet turnover. The ARB CHE Port Regulation requires that in addition to natural fleet turnover, an accelerated turnover of older engines to newer cleaner engines and/or Verified Diesel Emission Control Systems (VDECS) be implemented in CHE fleets. The control factor estimates used to generate future year emission estimates incorporate emissions reductions due to natural and accelerated-regulation driven fleet turnovers. Note that BNSF CHE activity and population were assumed equivalent to 2005 levels in all future years for the initial analysis, and a growth factor was applied after the no growth emission levels to calculate emissions with growth.

Fleet turnover reductions were estimated based on data included in the ARB Proposed Regulation For Mobile Cargo Handling Equipment At Ports And Intermodal Rail Yards, Initial Statement of Reasons (ISOR) (Data source: CHE ISOR, http://www.arb.ca.gov/regact/cargo2005/isor.pdf, 10/2005: Table VI-1: Projected Annual Emissions for Cargo Handling Equipment Used in Ports and Intermodal Rail Yard Applications with Implementation of the Proposed Regulation For Mobile Cargo Handling Equipment At Ports And Intermodal Rail Yards). These data include: 1) statewide emissions reductions by equipment type, 2) ARB Port Regulation population and activity growth estimates, and 3) ARB Port Regulation port and rail population fractions by equipment type. Fleet turnover control factors were assumed to be equivalent for Port and Rail equipment and were estimated according to the methodology outlined in the example below, where yard truck control factors are estimated for the period from 2004 to 2010:

$$FC_{04\text{-}10,yt} = E_{2010,yt} / (AF_{,yt} * PF_{,yt} * E_{2004,yt})$$

Where:

$FC_{04\text{-}10,yt}$=Fleet turnover control factor from 2004 to 2010 for yard trucks
E_{2004} = CA statewide 2004 annual yard truck emissions
E_{2010} = CA statewide 2010 annual yard truck emissions
AF = Average activity growth factor by equipment type weighted by Port and Rail population:
$AF_{,yt}=A_{port,yt}*FP_{port,yt}+A_{rail,yt}*FP_{rail,yt}$
A = Rail or port activity growth factor
FP = Rail or port Population Fraction
PF = Average population growth factor by equipment type weighted by Port and Rail population: $PF_{,yt}=P_{port,yt}*FP_{port,yt}+P_{rail,yt}*FP_{rail,yt}$
P = Rail or port population growth factor
FP = Rail or port Population Fraction

The control factor above was assumed to be linear, and future year emissions were estimated according to the fleet turnover correction factor, scaled to the number of years between the base year and future year. 2010 to 2020 control factors were calculated in similar fashion to the 2004 to 2010 control factors and all control factors are shown in Table 4-6.

Table 4-6. CHE emission reduction with ARB rulemaking.

	Emission Reduction	
Equipment Type	**2004 to 2010**	**2010 to 2020**
Crane	71%	67%
Forklift	75%	72%
Material Handling Equip	68%	73%
Yard Tractor offroad	77%	77%

Since the CARB HRA reports were released in November of 2007, additional information has become available, and the 2005 baseline emission inventory, as shown in Table 1, has been adjusted accordingly. Specifically, the default engine load factor for yard hostlers has been adjusted based on new data. The default load factor (65%) for yard hostlers contained in the OFFROAD model is based on data collected for equipment operating at various facilities and not specifically at an intermodal rail yard. Additional data have been collected by both UPRR and BNSF Railway to determine an appropriate engine load factor for yard hostlers operating at intermodal rail yards. The data collected by both railroads show that the default load factor from the OFFROAD model and the load factor from the Ports study are too high for yard hostlers operating at intermodal rail yards. Based on the UPRR and BNSF data, a more appropriate load factor for yard hostlers operating at intermodal rail yards is between 15 and 20%. Therefore, the 2005 baseline emission estimates for yard hostlers that were presented in the CARB HRA report have been recalculated using a load factor of 19%.

For Hobart, the hostler hours were adjusted upward from the default value used in the original analysis to 3,341 hours per year based on the sum of all hours of activity from hostlers divided by the number of hostlers included in the emission inventory analysis.

With adjustment in hours and load factor of the hostlers, the CHE emissions estimates at Hobart for 2005 were revised to 5.23 from 3.40 tonnes per year.

4. Heavy Equipment

Locomotives are refueled on site from tanker trucks driving into the yard. These trucks by and large are a relatively minor source category. The tanker trucks were largely controlled through fleet turnover though the emissions were small in 2005.

Other on-road vehicle fleets based at the site are used by BNSF and contractor staff for crew changes, errands, and other general uses. The vehicle types are mostly gasoline-fueled vehicles. The vehicle mileage on site for these vehicles is a very small portion of the vehicle's annual mileage and therefore results in little emissions in 2005. To estimate the emission reduction in future years, the EMFAC model was run to determine the expected emission reduction percentage using the default age distribution and fleet turnover in the county. For light-heavy duty diesel trucks, the minimum emission reduction that occurs from normal fleet turnover is 11% for 2005 to 2010, about 21% to 2015, and 24% to 2020.

5. Transport Refrigeration Units (TRUs) and Refrigerated Railcars (Reefers)

Transport refrigeration units (TRU) use small diesel generators to run refrigeration compressors on containers and refrigerated boxcars. By far more emissions are derived from containers than from boxcars in general. BNSF submitted emission estimates for its sites using the time on site of loaded containers and boxcar, however later it was realized that the engines running the refrigeration compressors only run 60% of the time on average. BNSF and ENVIRON conducted a survey of several dozen TRU units and compared the hours the TRU was working to the engine hours, both read from individual hour meters on each unit. Because ENVIRON overestimated the on-site TRU diesel generator engine emissions, the total emissions were adjusted downward for this analysis prior to assessing future year emissions.

ARB has written a rulemaking to address TRU emissions (2003). From this rulemaking, ARB estimated TRU emission reductions.

2005 BNSF TRU PM emission estimates were projected to 2010, 2015, 2020 based on emission factor reduction estimates that were drawn from the 2003 TRU ATCM ISOR, Figure VII-2 (ARB, ATCM ISOR, Figure VII-2, October 2003, website: http://www.arb.ca.gov/regact/trude03/trude03.htm). The emission reduction control factors are shown in Table 4-7.

Table 4-7. ENVIRON estimated ARB PM emission reductions for TRU.

Year	<25 HP	25-50HP	Combined
2000 to 2010	-18%	-70%	-66%
2010 to 2020	-28%	-91%	-79%

For each site, future year activity and population were assumed to be equivalent to 2005 activity and population. ENVIRON estimated the emission reduction for TRU for the years 2010, 2015 (through interpolation), and 2020.

6. Other Miscellaneous Diesel-Fueled Equipment

Other offroad equipment primarily consists of track maintenance equipment with portable engines occasionally used for general industrial purposes. Track maintenance equipment is comprised of any number of various equipment types from small pumps and generators to larger, specially designed equipment for rail line maintenance. However, equipment based at each site is used over the entire rail network, so a low fraction of this equipment activity and emissions occur on site.

To estimate emission reductions from this equipment, an OFFROAD model run using construction and industrial equipment was made to determine the relative emission reduction. The emission reduction equipment with rated power of 50 – 500 hp (the breadth of the equipment found at rail yards) are typically similar even though the standards and phase-in schedules for new emission standards vary by engine power. ENVIRON estimated the average emission reduction for 2010 at 14%, 2015 at 36%, and 2020 at 59%.

V. Projected Growth Rates

Historic activity data from calendar years 1999 through 2008 were reviewed to determine the expected activity growth rate for the Hobart Yard. Table 5-1 summarized the historic activity data for the Hobart Yard.

Table 5-1. Historic Activity Data for Diesel-Fueled Equipment Hobart Rail Yard.

Activity	Historic Actual Data										Growth Rate (%)
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008 (half- year extrapolated)	
Container (Lifts)				1,069,698	1,216,652	1,318,367	1,338,374	1,366,535	1,374,480	1,317,917	0.0, 1.6, or 3.5%
Mainline traffic MMGT	73	75	71	72	84	86	91	102	100		4.0%

As shown in Table 5-1, based on historic actual data activity at the Hobart Yard has grown at a rate of 3.5% per year from 2002 through 2008, but 1.6% per year from 2003 through 2008, and 0% from 2004 through 2008 with the 2008 activity projected to be 1.5% less than 2005. Therefore the midpoint 1.6% per year estimate was chosen to represent a mid-range estimate for the yard's activity forecasts. The mainline traffic moving past Hobart has been increasing at a rate of about 4% per year based on data from 1999 through 2007.

VI. Mitigation Measures

1. Current Mitigation Measures

BNSF has implemented all measures in the MOU with the state and works to comply with all rules as quickly as possible.

2. Proposed Future Mitigation Measures

BNSF will work with local and state authorities to investigate additional mitigation measures.

VII. Evaluation of Additional Mitigation Measures

The evaluation of the current and proposed mitigation measures will be conducted once the mitigation measures have been specifically defined.

VIII. Mechanisms for Tracking Progress

BNSF will work with state officials to determine a method for tracking the emissions reductions achieved through the implementation of the Mitigation Measures.

IX. Conclusions

The emissions at the Los Angeles-Hobart yard will be reduced by at least 76% by 2020 without considering any additional mitigation measures.

APPENDIX A.

Detailed Emission Forecasts

Drayage Trucks

Table A-1. 2005 Truck Age Distribution.

Age	Model Year	General Fleet Fraction	Dedicated BNSF Contractor Fleet	Idling Emissions (g/min)	In Motion Emission Rate at 16.5 mph (g/mile)
Age01	2005	0.27%	32%	1.03	0.342
Age02	2004	0.36%	11%	1.03	0.388
Age03	2003	0.73%	56%	1.03	0.434
Age04	2002	0.94%		1.33	1.261
Age05	2001	1.06%		1.33	1.388
Age06	2000	2.62%		1.33	1.508
Age07	1999	5.33%		1.33	1.621
Age08	1998	7.18%		1.33	1.726
Age09	1997	9.45%		1.93	1.864
Age10	1996	9.27%		1.93	1.962
Age11	1995	6.49%		1.93	2.051
Age12	1994	6.91%		1.93	2.133
Age13	1993	7.23%		2.57	3.052
Age14	1992	8.52%		2.57	3.141
Age15	1991	5.91%		2.57	3.222
Age16	1990	4.37%		3.43	4.715
Age17	1989	3.59%		3.43	4.802
Age18	1988	6.19%		3.43	4.883
Age19	1987	5.47%		4.28	5.015
Age20	1986	1.84%		6.88	5.270
Age21	1985	1.26%		6.88	5.342
Age22	1984	1.02%		6.88	5.409
Age23	1983	1.02%		6.88	5.471
Age24	1982	0.84%		6.88	5.529
Age25	1981	0.49%		6.88	5.582
Age26	1980	0.36%		6.88	5.630
Age27	1979	0.18%		6.88	5.673
Age28	1978	0.25%		6.88	5.711
Age29	1977	0.27%		6.88	5.745
Age30	1976	0.17%		6.88	5.774
Age31	1975	0.13%		6.88	5.799
Age32	1974	0.11%		6.88	5.819
Age33	1973	0.10%		6.88	5.836
Age34	1972	0.00%		6.88	5.850
Age35	1971	0.00%		6.88	5.862
Age36	1970	0.00%		6.88	5.873
Age37	1969	0.03%		6.88	5.885
Age38	1968	0.00%		6.88	5.896
Age39	1967	0.00%		6.88	5.908
Age40	1966	0.00%		6.88	5.919
Age41	1965	0.06%		6.88	5.931
Age42	1964	0.00%		N/A	N/A
Age43	1963	0.00%		N/A	N/A
Age44	1962	0.00%		N/A	N/A
Age45	1961	0.00%		N/A	N/A
		Fleet Average	**Fleet Average not Shown**	**1.20**	**3.00**
				g/hour	**g/mile**

Table A-2. 2010 Truck Age Distribution.

Age	Model Year	General Fleet Fraction	Dedicated BNSF Contractor Fleet	LEVEL 3 VDECS % reduction*	Idle Emission Rate (g/hour)	In Motion Emission Rate at 16.5 mph (g/mile)
Age01	2010	0.27%	32%	0%	0.11	0.04
Age02	2009	6.95%	11%	0%	0.11	0.05
Age03	2008	7.32%	56%	0%	0.11	0.06
Age04	2007	7.53%		0%	0.11	0.07
Age05	2006	1.06%		0%	0.99	0.51
Age06	2005	2.62%		0%	0.99	0.55
Age07	2004	5.33%		0%	0.99	0.58
Age08	2003	7.18%		85%	0.99	0.62
Age09	2002	9.45%		85%	1.28	1.75
Age10	2001	9.27%		85%	1.28	1.84
Age11	2000	6.49%		85%	1.28	1.92
Age12	1999	6.91%		85%	1.28	1.99
Age13	1998	7.23%		85%	1.28	2.05
Age14	1997	8.52%		85%	1.85	2.19
Age15	1996	5.91%		85%	1.85	2.25
Age16	1995	4.37%		85%	1.85	2.30
Age17	1994	3.59%		85%	1.85	2.35
Fleet Average					**0.26**	**0.26**
					g/hour	**g/mile**

* - Model years 1994 – 2003 emission rates here are reduced by 85% to reflect the implementation of Level 3 VDECS prior to the average emissions calculations.

Table A-3. 2015 Truck Age Distribution.

Age	Model Year	General Fleet Fraction	Dedicated BNSF Contractor Fleet	Idle Emission Rate (g/hour)	In Motion Emission Rate at 16.5 mph (g/mile)
Age01	2015	0.27%	32%	0.11	0.038
Age02	2014	0.36%	11%	0.11	0.045
Age03	2013	11.02%	56%	0.11	0.053
Age04	2012	11.23%		0.11	0.067
Age05	2011	11.36%		0.11	0.076
Age06	2010	12.92%		0.11	0.084
Age07	2009	15.63%		0.11	0.093
Age08	2008	17.47%		0.11	0.100
Age09	2007	19.75%		0.11	0.107
Fleet Average				**0.11**	**0.09**
				g/hour	**g/mile**

Table A-4. 2020 Truck Age Distribution.

Age	Model Year	General Fleet Fraction	Dedicated BNSF Contractor Fleet	Idle Emission Rate (g/hour)	In Motion Emission Rate at 16.5 mph (g/mile)
Age01	2020	0.27%	32%	0.11	0.038
Age02	2019	0.36%	11%	0.11	0.045
Age03	2018	0.73%	56%	0.11	0.052
Age04	2017	0.94%		0.11	0.059
Age05	2016	1.06%		0.11	0.066
Age06	2015	2.62%		0.11	0.073
Age07	2014	5.33%		0.11	0.079
Age08	2013	11.98%		0.11	0.084
Age09	2012	14.26%		0.11	0.106
Age10	2011	14.08%		0.11	0.112
Age11	2010	11.30%		0.11	0.117
Age12	2009	11.72%		0.11	0.123
Age13	2008	12.04%		0.11	0.128
Age14	2007	13.32%		0.11	0.132
Fleet Average				**0.11**	**0.11**
				g/hour	**g/mile**