Summary and Analysis of Comments: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder

Chapter 2
Air Quality and Health Impacts

Assessment and Standards Division
Office of Transportation and Air Quality
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2. AIR QUALITY AND HEALTH IMPACTS

What We Proposed:

The comments in this section correspond mainly to Section II of the preamble to the proposed rule, and are therefore targeted at the air quality and health impacts of the rule. A summary of the comments received, as well as our response to those comments, is located below.

2.1 Public Health Impacts of PM, Ozone and Air Toxics

What Commenters Said:

At one of the public hearings, the Natural Resources Defense Council (NRDC) noted that locomotive yards and marine ports are major hubs of economic activity and major sources of pollution. The commenter noted that a typical freight railyard or marine port hosts enormous diesel engines running on some of the highest-sulfur diesel fuel available, thousands of related truck trips per day, and other polluting equipment and activities—together these engines emit huge amounts of PM and NOx, as well as other toxic air contaminants that can cause or exacerbate an array of environmental impacts (e.g., increased asthma attacks and emergencies, chronic bronchitis, emphysema, heart disease, and premature death) that seriously affect millions of Americans.

The Oregon Environmental Council (OEC) commented that pollution from dirty diesel trains and boats contributes to a myriad of public health threats including asthma, heart attacks, heart disease and cancer.

Letters:
Natural Resources Defense Council (NRDC) OAR-2003-0190-0489
Oregon Environmental Council (OEC) OAR-2003-0190-0652

Our Response:

We agree with the commenters that emissions from locomotives and marine diesel engines generate significant emissions of fine particulate matter ($PM_{2.5}$) and oxides of nitrogen (NOx) that contribute to nonattainment of the National Ambient Air Quality Standards for $PM_{2.5}$ and ozone. NOx is a key precursor to ozone and secondary PM formation. We estimate that today these engines account for about 20 percent of national mobile source NO_x emissions and about 25 percent of mobile source diesel $PM_{2.5}$ emissions. Ozone and $PM_{2.5}$ are associated with serious public health problems including premature mortality, aggravation of respiratory and cardiovascular disease, aggravation of existing asthma, acute respiratory symptoms, chronic

bronchitis, and decreased lung function. These engines also emit hazardous air pollutants or air toxics, which are also associated with serious adverse health effects. These engines emissions are of particular concern, as exposure to diesel exhaust has been judged likely to pose a lung cancer hazard for humans as well as a hazard from noncancer respiratory effects. Finally, emissions from locomotive and marine diesel engines cause harm to public welfare, including contributing to visibility impairment and other harmful environmental impacts across the U.S.

2.1.1 Health Effects Related to Diesel Exposure

What Commenters Said:

The Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, and Northwest District Association Health and Environment Committee (Commenters) commented that since 2002, EPA has classified diesel exhaust as a likely carcinogen. Diesel exhaust contains more than 40 different toxic chemicals, many of which are known or suspected carcinogens, such as benzene, 1,3-butadiene, and polycyclic aromatic hydrocarbons.

The American Lung Association (ALA) of the Northwest noted that the National Toxicology Program's Report on Carcinogens classified diesel exhaust particulates as "reasonably anticipated to be a human carcinogen." The commenter further noted that numerous studies link diesel exhaust to increased incidence of lung cancer.

Environmental Defense, NRDC, et al. commented that diesel exhaust contains more than 40 different toxic chemicals and has been classified as a probable/known human carcinogen—the commenter noted that dozens of toxic air contaminants are found in diesel exhaust, many of which are known or suspected to cause cancer. The commenter noted various diesel constituents and stated that some of these have been associated with increased risk of a variety of cancers (OAR-2003-0190-0592.1, Appendix B).

In Appendix C of their comments, Environmental Defense, NRDC, et al. noted various health studies and toxicological reviews that consider diesel to be, or likely to be, a human carcinogen (OAR-2003-0190-0592.1, p. 43- Appendix C). The commenter noted that the National Institute for Occupational Safety and Health, the International Agency for Research on Cancer, the Health Effects Institute, the World Health Organization, the U.S. Department of Health and Human Services National Toxicology Program, and the U.S. Environmental Protection Agency have all determined that diesel exhaust is a probable or likely human carcinogen, and that California EPA has classified it as a known human carcinogen. Appendix C of their comments lists some of the major documents pertaining to the carcinogenicity of diesel exhaust.

Environmental Defense, NRDC, et al. commented that diesel air pollution adds to cancer risk all around the country. For example, in Washington approximately 87% of the cancer risk due to air pollutants comes from mobile sources like cars, trucks, ships and trains. In New York

County 96% of the air cancer risk is due to mobile sources. The commenters stated that diesel emissions are the hazardous air pollutant with the highest contribution to cancer risk.

The Puget Sound Clean Air Agency commented that it believes diesel exhaust is a serious public health concern. The commenter prepared a toxic risk evaluation with the Washington Department of Ecology which shows that, of the toxics in our ambient air, diesel particulate matter accounts for 70 to 80% of the cancer risk. The commenter stated that this rule is an important addition to EPA's National Clean Diesel Campaign and that it believes the rule will bring needed improvements in public health to the central Puget Sound region as a result of reducing diesel exhaust exposure.

The Clean Air Task Force (CATF) commented that diesel engine exhaust from locomotives and marine engines causes substantial harm to public health and the environment. The commenter stated that diesel exhaust is a hazardous mix of toxic and carcinogenic pollutants, including fine particulates, nitrogen oxides, toxic organic gases, and heavy metals; and causes premature death, lung cancer, heart attacks, strokes, and many other heart and lung problems. The commenter stated that it believes that the reduction of diesel pollution is one of the most pressing public health problems in our country today.

Environmental Defense cited that EPA and the World Health Organization (WHO) have classified diesel exhaust as a probable or likely human carcinogen; and the California EPA has classified it as a known human carcinogen.

The National Association of Clean Air Agencies (NACAA) noted that many additional areas of the country are adversely affected by unacceptably high levels of toxic air pollution, much of which is caused or exacerbated by diesel engine emissions. Lastly, the commenter noted that diesel exhaust is a likely human carcinogen, leading to increased risk of lung cancer from emissions from these engines.

Letters:
American Lung Association of the Northwest OAR-2003-0190-0482 (hearing)
Clean Air Task Force OAR-2003-0190-0499
Environmental Defense, NRDC, et al. OAR-2003-0190-0592.1
Environmental Defense OAR-2003-0190-0487 (hearing)
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, and Northwest District Association Health and Environment Committee (Commenters) OAR-2003-0190-0593.1
Puget Sound Clean Air Agency OAR-2003-0190-0484 (hearing)

Our Response:

We agree that exposure to diesel exhaust has been classified by EPA as being likely carcinogenic to humans, and our Assessment Document for Diesel Engine Exhaust (Diesel

HAD) provides substantial evidence to support this claim.[1] We have reviewed the documents cited that provide a numerical estimate of cancer risk attributable to exposure to diesel exhaust. The Agency does not believe that at this time the data support a confident determination of a unit risk for diesel exhaust and therefore the cancer-related mortality or morbidity associated with diesel exhaust exposure cannot be determined quantitatively. However, the Agency has determined that the carcinogenic risk from diesel exhaust may be as high as 10^{-3} to 10^{-5} but a zero risk cannot be ruled out. The basis for these determinations is provided in Chapters 8 and 9 of the Diesel HAD.

We also agree that diesel exhaust from diesel engines is a serious public health concern and that there are public health benefits from the final rule as described in Chapter 2 of the Regulatory Impact Analysis (RIA). The final rule will reduce harmful emissions and protect sensitive groups such as outdoor workers, children, asthmatics and those with existing heart and lung disease, as well as those in close proximity to rail yards and marine ports.

2.1.2 Health Effects Related to PM Exposure

What Commenters Said:

At one of the public hearings, NRDC noted that locomotive yards and marine ports are major hubs of economic activity and major sources of pollution. The commenter noted that a typical freight railyard or marine port hosts enormous diesel engines running on some of the highest-sulfur diesel fuel available, thousands of related truck trips per day, and other polluting equipment and activities—together these engines emit huge amounts of PM and NOx, as well as other toxic air contaminants that can cause or exacerbate an array of environmental impacts (e.g., increased asthma attacks and emergencies, chronic bronchitis, emphysema, heart disease, and premature death) that seriously affect millions of Americans.

ALA of Metropolitan Chicago commented that it believes that study after study add to the conclusion that air pollutants like fine particles are much more dangerous, and cause health problems at far lower concentrations, than previously thought. The commenter stated that these new studies validate the overwhelming scientific consensus that particle pollution causes illness, hospitalization and death (estimated at 70,000 per year); and breathing particulate air pollution can trigger asthma attacks and cause wheezing, coughing, and respiratory irritation. The commenter also stated that children who breathe particle pollution face changes in lung function that can limit them for life.

Environmental Defense, NRDC, et al. stated that that fine PM is a constituent of diesel exhaust. The commenters noted that particulate pollution is a mixture of soot, smoke and tiny particles formed in the atmosphere from sulfur dioxide ($S0_2$), NOx, and ammonia (NH_3). The commenters further noted that sooty particles are most dangerous when very small (less than

[1] U.S. EPA. Health Assessment Document for Diesel Engine Exhaust. EPA/600/8-90/057F. http://www.epa.gov/ncea.

around 2.5 microns in diameter), as they are easily inhaled and reach deep into the lungs where they can trigger an inflammatory response. The smallest particles (those less than around 0.1 microns) can enter the circulatory system and damage blood vessels. The commenters stated that breathing in air heavy with tiny particles can be dangerous, even over a short time, and that children are especially vulnerable because their lungs are still developing. The commenters stated that $PM_{2.5}$ is associated with a host of adverse health effects including decreased lung function, allergic responses, chronic obstructive pulmonary disease, lung cancer, and both acute and chronic cardiovascular effects. The commenters noted that current ambient concentrations of particulate matter are considered a health risk in many locations throughout the country; and pointed out that EPA has stated that locomotive and marine diesel engines emit substantial quantities of $PM_{2.5}$. PM toxicity may be attributed to the particle's physical presence in biological tissues, its chemical constituents, including chemicals adsorbed on the particle, or a combination of these factors. Despite the considerable regional variability in the constituents of particulate matter, the commenters stated that they believe epidemiological evidence that ambient exposures to PM are associated with numerous adverse health effects is remarkably clear and consistent, and the consistency of the data make it feasible to quantify the benefits for a suite of health indicators (e.g., premature mortality, bronchitis, hospital admissions for both respiratory and cardiovascular events, emergency room visits for asthma, nonfatal heart attacks, lower and upper respiratory illness, minor restricted-activity days, work loss days, asthma exacerbations, respiratory symptoms (asthmatic population), and infant mortality). The commenters stated that the accumulation of published studies (noted in the Draft RIA) serve to strengthen the case for an association between PM exposure and respiratory inflammation and infection leading to premature mortality in children under 5 years of age. The commenters pointed to the findings of the Science Advisory Board-Health Effects Subcommittee (SAB-HES), which references numerous corroborating studies linking PM exposure to numerous adverse health outcomes. Lastly, the commenters stated that the extended observational period of these studies, combined with more sophisticated exposure assessments continue to strengthen the evidence that particulate matter poses a significant health threat at current levels of exposure. The commenters noted that more than 100 scientists called on EPA to significantly strengthen the National Ambient Air Quality Standard (NAAQS) for fine particulates.

Particulate matter can aggravate respiratory conditions such as asthma and chronic bronchitis and has been associated with cardiac arrhythmias (heartbeat irregularities), heart attacks and premature deaths. People with heart or lung disease, the elderly and children are at highest risk from exposure to particulate pollution. When EPA revised the national health-based air quality standards for fine particles in 2006, EPA estimated that the revised standards would result in an estimated reduction in:

- 1,200 to 13,000 premature deaths in people with heart or lung disease,
- 2,600 cases of chronic bronchitis,
- 5,000 nonfatal heart attacks,
- 1,630 hospital admissions for cardiovascular or respiratory symptoms,
- 1,200 emergency room visits for asthma,
- 7,300 cases of acute bronchitis,
- 97,000 cases of upper and lower respiratory symptoms,
- 51,000 cases of aggravated asthma,

–350,000 days when people miss work or school, and
–2 million days when people must restrict their activities because of particle pollution-related symptoms.

ALA commented that trains and boats are a large source of particulate pollution. The commenter noted that particles of special concern to the protection of lung health are those known as fine particles, less than 2.5 microns in diameter ($PM_{2.5}$); and explained that fine particles are easily inhaled deeply into the lungs where they can be absorbed into the bloodstream or remain embedded for long periods of time. The commenter cited studies showing the dangers of particle pollution and stated that these studies validate the overwhelming scientific consensus that particle pollution causes illness, hospitalization and premature death. The commenter noted that breathing particulate air pollution can trigger asthma attacks and cause wheezing, coughing, and respiratory irritation, and specifically noted that children who breathe particle pollution face changes in lung function that can limit them for life.

ALA also commented that ozone and particulate matter air pollution are especially harmful to children and teens, anyone over age 65, people with lung diseases, and anyone with cardiovascular disease or diabetes. Lastly, the commenter stated that even healthy adults who work or exercise outdoors-including probably employees of the railroads and marine industry-are also demonstrably affected by these pollutants.

NESCAUM noted that ground-level ozone and particulate matter have been linked to a range of serious respiratory health problems and they increase the risk of premature death, and diesel exhaust has also been classified as a probable carcinogen.

NACAA commented that the substantial levels of emissions from locomotive and marine diesel engines contribute to unhealthful concentrations of fine particles and ozone; which can translate into startling health impacts, including premature deaths, as well as heart disease, aggravated asthma and other respiratory conditions.

ALA of the Northwest stated that it believes that trains and boats are a significant source of particulate pollution. The commenter also noted that a substantial body of research now exists establishing that particle pollution causes illness, hospitalization, and premature death.

At the public hearing, ALA of the Northwest commented that there are one million people in its region living with lung disease that are vulnerable to the harmful effects of air pollution. The commenter stated that it is concerned about pollution in the form of dirty soot from diesel engines, fine particulate matter, and NOx.

ALA of the Northwest also commented that children breathing particle pollution can limit their lung function for life; and particle pollution harms anyone over the age of 65, people with lung diseases such as asthma and chronic obstructive pulmonary disease (COPD), as well as those at risk for cardiovascular disease or diabetes. The commenter pointed out that even healthy adults who work or exercise outdoors are affected by these pollutants. In Washington State, the commenter noted, 10% of the entire population (over 500,000 people) has asthma, and reducing diesel emissions would improve the quality of life for these people. The commenter

stated that it knows that ozone and particulate pollution have been linked to premature death and that diesel exhaust has been linked to cancer.

The South Coast Air Quality Management District (SCAQMD) commented that numerous local, national, and international studies confirm that ozone and particulate pollution have a direct impact on respiratory health, increasing asthma attacks, bronchitis, emphysema, COPD, lung cancer, and premature death. Studies in Southern California have found a significant risk of irreversible decline in lung function among children growing up in areas with relatively high particulate pollution. The California Air Resources Board (CARB) estimated that particulate pollution in the Basin causes as many as 5,400 premature deaths, 2,400 hospital admissions, 140,000 asthma and respiratory symptoms, 980,000 lost workdays, and 5 million restricted activity days for minors, every year.

The Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, and Northwest District Association Health and Environment Committee (Commenters) commented that these two pollutants (NOx and $PM_{2.5}$) contribute to serious health problems, including premature mortality, aggravation of respiratory and cardiovascular disease, aggravation of existing asthma, acute respiratory symptoms, and chronic bronchitis.

Letters:
American Lung Association OAR-2003-0190-0509 (hearing)
American Lung Association of Metropolitan Chicago OAR-2003-0190-0518 (hearing)
American Lung Association of the Northwest OAR-2003-0190-0482 (hearing)
Environmental Defense, NRDC, et al. OAR-2003-0190-0592.1
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495 (hearing)
Natural Resources Defense Council (NRDC) OAR-2003-0190-0489 (hearing)
Northeast States for Coordinated Air Use Management (NESCAUM) OAR-2003-0190-0551.1
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, Northwest District Association Health and Environment Committee OAR-2003-0190-0593.1
South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0558.1

Our Response:

We agree with commenters that there are significant health concerns associated with PM emissions. Scientific studies show ambient PM is associated with a series of adverse health effects. These health effects are discussed in detail in the 2004 EPA Particulate Matter Air

Quality Criteria Document (PM AQCD), and the 2005 PM Staff Paper.[2,3] Further discussion of health effects associated with PM can also be found in the RIA for this rule.

Health effects associated with short-term exposures (hours to days) to ambient PM include premature mortality, increased hospital admissions, heart and lung diseases, increased cough, adverse lower-respiratory symptoms, decrements in lung function and changes in heart rate rhythm and other cardiac effects. Studies examining populations exposed to different levels of air pollution over a number of years, including the Harvard Six Cities Study and the American Cancer Society Study, show associations between long-term exposure to ambient $PM_{2.5}$ and both total and cardiovascular and respiratory mortality.[4] In addition, a reanalysis of the American Cancer Society Study shows an association between fine particle and sulfate concentrations and lung cancer mortality.[5]

The health effects of $PM_{2.5}$ have been further documented in local impact studies which have focused on health effects due to $PM_{2.5}$ exposures measured on or near roadways. These studies take into account all air pollution sources, including both spark-ignition (gasoline) and diesel powered vehicles, and indicate that exposure to $PM_{2.5}$ emissions near roadways, which are dominated by mobile sources, are associated with potentially serious health effects. For instance, a recent study found associations between concentrations of cardiac risk factors in the blood of healthy young police officers and $PM_{2.5}$ concentrations measured in vehicles.[6] Also, a number of studies have shown associations between residential or school outdoor concentrations of some fine particle constituents that are found in motor vehicle exhaust, and adverse respiratory outcomes, including asthma prevalence in children who live near major roadways.[7,8,9] Although the engines considered in this rule differ from those in these studies with respect to their applications and fuel qualities, these studies provide an indication of the types of health effects that might be expected to be associated with personal exposure to $PM_{2.5}$ emissions from large marine diesel and locomotive engines.

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[2] U.S. EPA (2004) Air Quality Criteria for Particulate Matter (Oct 2004), Volume I Document No. EPA600/P-99/002aF and Volume II Document No. EPA600/P-99/002bF. This document is available in Docket EPA-HQ-OAR-2003-0190.

[3] U.S. EPA (2005) Review of the National Ambient Air Quality Standard for Particulate Matter: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper. EPA-452/R-05-005. This document is available in Docket EPA-HQ-OAR-2003-0190.

[4] Dockery, DW; Pope, CA III: Xu, X; et al. 1993. An association between air pollution and mortality in six U.S. cities. N Engl J Med 329:1753-1759.

[5] Pope, C. A., III; Burnett, R. T.; Thun, M. J.; Calle, E. E.; Krewski, D.; Ito, K.; Thurston, G. D. (2002) Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. J. Am. Med. Assoc. 287:1132-1141.

[6] Riediker, M.; Cascio, W.E.; Griggs, T.R.; et al. (2004) Particulate matter exposure in cars is associated with cardiovascular effects in healthy young men. *Am J Respir Crit Care Med* 169: 934–940.

[7] Van Vliet, P.; Knape, M.; de Hartog, J.; Janssen, N.; Harssema, H.; Brunekreef, B. (1997). Motor vehicle exhaust and chronic respiratory symptoms in children living near freeways. Env. Research 74: 122-132.

[8] Brunekreef, B., Janssen, N.A.H.; de Hartog, J.; Harssema, H.; Knape, M.; van Vliet, P. (1997). Air pollution from truck traffic and lung function in children living near roadways. Epidemiology 8:298-303.

[9] Kim, J.J.; Smorodinsky, S.; Lipsett, M.; Singer, B.C.; Hodgson, A.T.; Ostro, B (2004). Traffic-related air pollution near busy roads: The East Bay children's respiratory health study. Am. J. Respir. Crit. Care Med. 170: 520-526.

EPA recently conducted an initial screening analysis study of 47 selected marine port areas and 30 rail yards[10,11] to begin to better understand the populations that are living near these rail yards and marine ports. The results indicate that at least 13 million people live near these facilities, including a high percentage of low-income African-Americans and Hispanics, whom are being exposed to elevated levels of diesel exhaust, and will benefit from the controls being finalized in this action. In addition, recent new studies[12] from the State of California provide evidence that $PM_{2.5}$ emissions within marine ports and rail yards contribute significantly to elevated ambient concentrations near these sources. A substantial number of people experience exposure to locomotive and marine diesel engine emissions, raising potential health concerns. The controls finalized in this action will help reduce exposure to $PM_{2.5}$, specifically exposure to marine port and rail yard related diesel $PM_{2.5}$ sources. Additional information on marine port and rail yard emissions and ambient exposures can be found in Chapter 2 of the RIA.

2.1.3 Health Effects Related to Ozone Exposure

What Commenters Said:

The Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, and Northwest District Association Health and Environment Committee (Commenters) commented that These two pollutants (NOx and $PM_{2.5}$) contribute to serious health problems, including premature mortality, aggravation of respiratory and cardiovascular disease, aggravation of existing asthma, acute respiratory symptoms, and chronic bronchitis.

ALA commented that NOx from diesel engines contribute to ozone, (or 'smog'), and ozone is a powerful respiratory irritant which can cause shortness of breath, chest pain, wheezing and coughing. The commenter also noted that ozone can trigger an asthma attack. The commenter stated that people with existing lung disease like COPD already suffer from reduced lung function, and these people cannot tolerate an additional reduction in lung function due to ozone exposure, so they are especially at risk. ALA also commented that there is a growing body of strong evidence that warns that breathing ozone at levels currently seen in the U.S. can lead to premature death; the researchers have found that the risk of premature death increased with higher levels of ozone, even on days when ozone levels were below the current national

[10] ICF International. September 28, 2007. Estimation of diesel particulate matter concentration isopleths for marine harbor areas and rail yards. Memorandum to EPA under Work Assignment Number 0-3, Contract Number EP-C-06-094. This memo is available in Docket EPA-HQ-OAR-2003-0190.

[11] ICF International. September 28, 2007. Estimation of diesel particulate matter population exposure near selected harbor areas and rail yards. Memorandum to EPA under Work Assignment Number 0-3, Contract Number EP-C-06-094. This memo is available in Docket EPA-HQ-OAR-2003-0190.

[12] State of California Air Resources Board. Roseville Rail Yard Study. Stationary Source Division, October 14, 2004. This document is available in Docket EPA-HQ-OAR-2003-0190. This document is available electronically at: http://www.arb.ca.gov/diesel/documents/rrstudy.htm. Diesel Particulate Matter Exposure Assessment Study for the Ports of Los Angeles and Long Beach, April 2006. This document is available in Docket EPA-HQ-OAR-2003-0190. This document is available electronically at: ftp://ftp.arb.ca.gov/carbis/msprog/offroad/marinevess/documents/portstudy0406.pdf

standard.

ALA also commented that ozone and particulate matter air pollution are especially harmful to children and teens, anyone over age 65, people with lung diseases, and anyone with cardiovascular disease or diabetes. Lastly, the commenter stated that even healthy adults who work or exercise outdoors-including probably employees of the railroads and marine industry-are also demonstrably affected by these pollutants.

Environmental Defense, NRDC, et al. commented that the 2007 Air Quality Criteria Document for ozone confirms that the adverse effects of ozone (O_3) are noncontroversial and compelling. The commenters stated that adverse effects that have been observed in controlled exposure and field/panel studies include respiratory effects (e.g., reduced pulmonary function), among both healthy and asthmatic children and adults exposed acutely for 1 - 8 hours to 0.08 ppm while physically active. The commenters also noted that more recent studies indicate that sensitive individuals are affected at concentrations below 0.08 ppm. The commenters pointed to laboratory animal studies, which they stated have boosted the biological plausibility of other adverse outcomes identified in human epidemiological studies, including cardiovascular effects and mortality, and provide a mechanistic understanding for accepted adverse outcomes related to pulmonary function. The commenters cited a study (Bell and colleagues) which examined the concentration-response curve for the ozone-mortality relationship; the study, using data from 98 urban communities, found "strong and consistent evidence" that ozone exposure is associated with premature mortality, and indicated there was no evidence of a threshold above 'background' concentrations. The commenters stated that they believe this new data demonstrates the need to reduce ozone levels below current levels. The commenters stated that, according to EPA's Clean Air Scientific Advisory Committee (CASAC) and Children's Health Protection Advisory Committee, the ozone standard should in fact be reduced to a level that is below 70 ppb (they further noted that EPA's "more than 100 air researchers and physicians have indicated their support for strengthening the ozone standard").

The commenters also noted that diesel air pollution contributes to harmful smog levels. Nationwide monitoring similarly indicates that 157 million people living in 461 counties are exposed to levels of ground-level ozone or 'smog' that exceed the national health-based standard. Furthermore, the ozone NAAQS are in the process of being updated. If they are updated to reflect the state of the science, it will expand the number of areas with ozone concentrations at levels that do not protect public health and the environment (see page 5 of Docket Number 0592.1 for the map). High ozone levels cause acute respiratory problems, aggravated asthma, decreased lung function, inflammation of lung tissue, an increase in hospital admissions and emergency room visits for respiratory causes, and crop damage. Children with asthma are most at risk. Ozone is also associated with premature death.

NESCAUM noted that ground-level ozone and particulate matter have been linked to a range of serious respiratory health problems and they increase the risk of premature death, and diesel exhaust has also been classified as a probable carcinogen.

NACAA commented that the substantial levels of emissions from locomotive and marine

diesel engines contribute to unhealthful concentrations of fine particles and ozone; which can translate into startling health impacts, including premature deaths, as well as heart disease, aggravated asthma and other respiratory conditions.

ALA of Metropolitan Chicago stated that although ozone grades did improve slightly in several counties in the Chicago area, it has to be seen in context of the current EPA process for re-evaluating the ozone NAAQS itself. The commenter noted that the CASAC has stated that "There is no scientific justification for retaining the current primary 8-hr NAAQS...." And further, CASAC head Rogene Henderson wrote to EPA Administrator Johnson, noting that "Ozone Panel members were unanimous in recommending that the level of the current primary ozone standard should be lowered from 0.08 ppm to no greater than 0.070 ppm." The commenter also noted that EPA's Children's Health Protection Advisory Committee has told the Agency that it "strongly recommends setting the proposed standard at 0.060 ppm, the lowest value of the range offered by the [EPA] staff paper, and a level which is supported by the scientific literature."

ALA of Metropolitan Chicago believes that study after study add to the conclusion that air pollutants like ozone and fine particles are much more dangerous, and cause health problems at far lower concentrations, than previously thought.

SCAQMD commented that numerous local, national, and international studies confirm that ozone and particulate pollution have a direct impact on respiratory health, increasing asthma attacks, bronchitis, emphysema, COPD, lung cancer, and premature death.

ALA of the Northwest commented that NOx emissions from diesels contribute to ozone, which can trigger an asthma attack; and that ozone causes people with existing lung disease like COPD, chronic bronchitis, and emphysema to suffer from reduced lung function.

At the public hearing, the American Lung Association of the Northwest commented that there are one million people in its region living with lung disease that are vulnerable to the harmful effects of air pollution. The commenter stated that it is concerned about pollution in the form of dirty soot from diesel engines, fine particulate matter, and NOx.

The American Lung Association of the Northwest also commented that children breathing particle pollution can limit their lung function for life; and particle pollution harms anyone over the age of 65, people with lung diseases such as asthma and COPD, as well as those at risk for cardiovascular disease or diabetes. The commenter pointed out that even healthy adults who work or exercise outdoors are affected by these pollutants. In Washington State, the commenter noted, 10% of the entire population (over 500,000 people) has asthma, and reducing diesel emissions would improve the quality of life for these people. The commenter stated that it knows that ozone and particulate pollution have been linked to premature death and that diesel exhaust has been linked to cancer.

Letters:
American Lung Association OAR-2003-0190-0509 (hearing)

American Lung Association of Metropolitan Chicago OAR-2003-0190-0518 (hearing)
American Lung Association of the Northwest OAR-2003-0190-0482 (hearing)
Environmental Defense, NRDC, et al. OAR-2003-0190-0592.1
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495 (hearing)
Northeast States for Coordinated Air Use Management (NESCAUM) OAR-2003-0190-0551.1
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, Northwest District Association Health and Environment Committee OAR-2003-0190-0593.1
South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0558.1

Our Response:

As discussed in Section II of the Preamble and Chapter 2.2.2 of the RIA, exposure to ambient ozone contributes to a wide range of adverse health effects.[13] These health effects are well documented and are critically assessed in the EPA ozone air quality criteria document (ozone AQCD) and EPA staff paper.

We agree that ozone-related health effects include premature mortality, lung function decrements, respiratory symptoms, aggravation of asthma, increased hospital and emergency room visits, increased asthma medication usage, inflammation of the lungs, a variety of other respiratory effects, and possibly cardiac-related effects. People who are more susceptible to effects associated with exposure to ozone include children, asthmatics and the elderly. Those with greater exposures to ozone, for instance due to time spent outdoors (e.g., children and outdoor workers, including workers of locomotive and marine activities), are also of concern. Based on a large number of scientific studies, EPA has identified several key health effects associated with exposure to levels of ozone found today in many areas of the country.

The current ozone NAAQS has an 8-hour averaging time.[14] The 8-hour ozone NAAQS is met at an ambient air quality monitoring site when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration over three years is less than or equal to 0.08 ppm. EPA's review of the ozone NAAQS is currently underway, the proposal was released in June 2007 (72 FR 37818, July 11, 2007) and the final rule is scheduled for March 2008. This review process is considering the comments of the Clean Air Scientific Advisory Committee and Children's Health Protection Advisory Committee to strengthen the ozone standard. If the ozone NAAQS is revised then new nonattainment areas could be designated. While EPA is not relying on it for purposes of justifying this rule, the emission reductions from this rulemaking will also be helpful to states if EPA revises the ozone NAAQS to be more stringent. The locomotive and

[13] Human exposure to ozone varies over time due to changes in ambient ozone concentration and because people move between locations which have notable different ozone concentrations. Also, the amount of ozone delivered to the lung is not only influenced by the ambient concentration but also by the individuals breathing route and rate.
[14] EPA's review of the ozone NAAQS is underway, the proposal was published in June 2007 and the final rule is scheduled for March 2008.

marine engine emission reductions will assist 8-hour ozone nonattainment areas in reaching the standard by each area's respective attainment date and/or assist in maintaining the 8-hour ozone standard in the future.

2.2 Environmental Impacts of PM, Ozone and Air Toxics

What Commenters Said:

NACAA commented that emissions from locomotive and marine engines lead to a host of environmental harms, such as visibility impairment, crop damage and acid rain.

The National Park Service (NPS) noted that environmental effects are potentially significant due to the proximity of emission sources to large number of Class 1 areas, sensitive ecosystems and cultural resources, and the synergistic effects of pollutants and multiple stressors.

Letters:
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495 (hearing)
National Park Service-Pacific West Region OAR-2003-0190-0480 (hearing)

Our Response:

We agree that emissions from locomotive and marine engines contribute to environmental effects. In the preamble EPA states "There are a number of public welfare effects associated with the presence of ozone, NOx and $PM_{2.5}$ in the ambient air. The impact of NOx and $PM_{2.5}$ on ecosystems, visibility, and materials and the impact of ozone on plants, including trees, agronomic crops and urban ornamentals are discussed". The emissions reductions being finalized in this rule will help to reduce environmental effects associated with the emissions from locomotive and marine engines.

2.2.1 Visibility

What Commenters Said:

The Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, and Northwest District Association Health and Environment Committee noted that NOx and PM from diesel engines contribute to visibility impairment in the Columbia Gorge National Scenic Area and federal class I areas in the Northwest. The commenters stated that they agree that visibility has a direct impact on people's enjoyment of daily activities and their well-being in general (72 FR 15960), and visibility also contributes to the economic resources of a community. The commenters cited an estimate that each extreme bad visibility day in Vancouver, British Columbia represents $7.45 million in lost

future revenue, and stated that it would be expected that poor visibility days in the Columbia Gorge National Scenic Area would result in an analogous loss of revenue. The commenters noted that NOx is emitted from line haul locomotives in the Columbia River Gorge National Scenic Area in an amount that is over two thirds as much as the NOx emitted from the PGE Boardman coal-fired power plant (which is recognized as the area's largest single contributor to regional haze and is currently undergoing Best Available Retrofit Technology (BART) analysis under EPA's Regional Haze Rule). The commenters stated that recent modeling suggests that improvement in visibility would occur in all U.S. federal class I areas through implementation of this proposed diesel engine rule (72 FR 15961).

The Columbia River Gorge Commission noted that emissions from railroads and marine engines contribute to impairment of visibility and other air quality impacts in the Columbia River Gorge National Scenic Area. The commenter noted that 60 freight trains and many boats and barges traverse the Columbia Gorge daily and that protecting and improving the visibility of this nationally protected region is a high priority.

The Oregon Department of Environmental Quality (ODEQ) noted that visibility is a prime air quality goal for the Scenic Area of the Columbia River Gorge.

Environmental Defense commented that diesel air pollution impairs visibility; the same fine particles that cause adverse health effects cause the haze that pollutes scenic vistas in national parks and wilderness areas, and creates 'brown clouds' in our urban centers.

The Southwest Clean Air Agency commented that it believes that an important need for this rule is its ability to improve air quality in the Columbia River Gorge National Scenic Area (CRGNSA). The commenter stated that the rule will benefit the public health of citizens in the adjacent Portland, Oregon and Vancouver, Washington metropolitan area. The commenter noted that the CRGNSA is a conduit for significant amounts of inter- and intrastate commerce and that Congress directly appropriated $1.1 million for air quality studies in this National Scenic Area. The commenter believes that the rule will assist Washington and Oregon in achieving compliance with EPA's Regional Haze rule and reducing impacts on the Class 1 areas that are adjacent to the CRGNSA.

Letters:
Columbia River Gorge Commission OAR-2003-0190-0516
Environmental Defense OAR-2003-0190-0487 (hearing)
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, Northwest District Association Health and Environment Committee OAR-2003-0190-0593.1
Oregon Department of Environmental Quality, Air Quality Division (ODEQ) OAR-2003-0190-0506
Southwest Clean Air Agency OAR-2003-0190-0468

Our Response:

EPA agrees that locomotives and marine engines contribute to visibility concerns in $PM_{2.5}$ nonattainment areas and mandatory class I federal areas through both their primary $PM_{2.5}$ emissions and their NOx emissions, which contribute to the formation of secondary $PM_{2.5}$. The emissions reductions being finalized in this rule will help to improve visibility in mandatory class I federal areas and across the country.

2.2.2 Deposition

What Commenters Said:

Environmental Defense stated that diesel air pollution threatens revered ecosystems, and the constituents of diesel exhaust contribute to the acid rain that continues to harm sensitive ecosystems across Washington (the commenter cited a recent report by the Puget Sound Maritime Air Forum which demonstrated that maritime activity produces about 40% of all sulfur dioxide (SO_2) in the region).

The Oregon Department of Environmental Quality (ODEQ) noted that reducing damage to ecosystems and Native American rock images from acid rain is very important. The commenter noted that recent studies by the U.S. Forest Service have documented damage to ancient rock images resulting from NOx and other emissions from sources in and around the Columbia River Gorge. The commenter stated that it believes that the loss of these cultural resources is a serious blow to the native peoples that still utilize the Columbia River and its tributaries for subsistence fishing and gathering.

The Northwest Environmental Defense Center, et al. noted that recent Forest Service studies have shown that NOx and other emissions from sources in and around the Columbia River Gorge contribute to acid rain formation, resulting in damage to crops, ecosystems, and cultural artifacts, including ancient Native American rock images. Further, the commenter notes that acid rain and acidification have been shown to impact tree and crop growth, and can impact marketability of the product.

The Columbia River Gorge Commission noted that the Columbia Gorge contains very significant cultural and natural resources that are vulnerable to impacts from air pollution.

The Southwest Clean Air Agency commented that acid deposition within the Columbia River Gorge National Scenic Area has been studied by the U.S. Department of Agriculture (USDA) Forest Service and their concerns about ecosystem damage have been clearly made known to the Washington and Oregon Clean Air Agencies through USDA Forest Service's Fog Water Impacts Study.

At the Seattle public hearing, NPS noted the Preamble cites only to extreme aquatic eutrophication effects with regards to nitrogen deposition. The commenter believes that changes in aquatic communities and terrestrial effects are also important and that alpine lakes and vegetation are sensitive to nitrogen inputs.

Environmental Defense, NRDC, et al. commented that diesel air pollution threatens ecosystems across the country. The constituents of diesel exhaust contribute to the acid rain that continues to harm sensitive ecosystems in the Adirondack Mountains, the southern Appalachians and high elevation ecosystems in the western United States.

Letters:
Columbia River Gorge Commission OAR-2003-0190-0516
Environmental Defense OAR-2003-0190-0487 (hearing)
Environmental Defense, NRDC, et al. OAR-2003-0190-0592.1
National Park Service-Pacific West Region OAR-2003-0190-0480 (hearing)
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, Northwest District Association Health and Environment Committee OAR-2003-0190-0593.1
Oregon Department of Environmental Quality, Air Quality Division (ODEQ) OAR-2003-0190-0506
Southwest Clean Air Agency OAR-2003-0190-0468

Our Response:

EPA agrees that emissions from locomotive and marine diesel engines contribute to deposition effects and that the emissions reductions being finalized in this rule will help reduce the adverse effects of deposition. We disagree that extreme aquatic eutrophication effects are the only effects of nitrogen deposition cited in the preamble of the rule. The preamble for the proposed, and final rule, describes that adverse impacts on soil chemistry and plant life such as species shifts, loss of biodiversity and forest decline and damage to forest productivity have been observed for areas heavily impacted by atmospheric deposition of nutrients, metals and acid species. There is also more detailed information on acid deposition included in the RIA for this final rule.

EPA appreciates the comments about the USDA Forest Service report. The results of the Forest Service's Fog Water Impacts Study are referenced in Section 2.1.5.2.1 of the RIA for this final rule as follows: "A study conducted in the Columbia River Gorge National Scenic Area (CRGNSA), located along a portion of the Oregon/Washington border, indicates that lichen communities in the CRGNSA have shifted to a higher proportion of nitrophilous species and the nitrogen content of lichen tissue is elevated. Lichens are sensitive indicators of nitrogen deposition effects to terrestrial ecosystems and the lichen studies in the Columbia River Gorge clearly show that ecological effects from air pollution are occurring".

Section 2.2.4 of this document specifically addresses damage to materials, including culturally important articles like ancient Native American rock images, from deposition.

2.2.3 Environmental Effects Caused by Ozone

What Commenters Said:

Environmental Defense, NRDC, et al. commented that tropospheric O_3 at the surface can exert adverse effects on nonhuman animal species, and vegetation.

The Northwest Environmental Defense Center, et al. noted that NOx is one of the ingredients in the formation of tropospheric ozone (called "the air pollutant most damaging to agricultural crops").

The National Park Service noted that there are several areas of synergy, for instance nitrogen deposition and ozone together cause 'major physiological disruption' (CA) and increase bark beetle activity and tree mortality in drought conditions (CA). The NPS also noted that ozone contributes to global warming and exacerbates the effects of drought on forest growth and stream health (Appalachia).

Letters:
Environmental Defense, NRDC, et al. OAR-2003-0190-0592.1
National Park Service-Pacific West Region OAR-2003-0190-0480 (hearing)
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, Northwest District Association Health and Environment Committee OAR-2003-0190-0593.1

Our Response:

EPA agrees that ozone contributes to many environmental effects, with impacts to plants and ecosystems being of most concern. Ozone can produce both acute and chronic injury in sensitive species depending on the concentration level and the duration of the exposure. Ozone effects also tend to accumulate over the growing season of the plant, so that even lower concentrations experienced for a longer duration have the potential to create chronic stress on vegetation.

We understand that air pollutants can also work synergistically and that the impacts of ozone or nitrogen deposition separately are much less than the impacts that would be felt by an ecosystem being exposed to both ozone and nitrogen deposition. In this rule we address synergistic effects by indicating that there are ecosystems and species which could be more sensitive to the impacts of ozone, for instance those impacted by nitrogen deposition, and vice versa.

The emissions reductions being finalized in this rule will help reduce ozone and therefore the adverse environmental effects of ozone, including global warming.

2.2.4 Materials Damage and Soiling

What Commenters Said:

The Northwest Environmental Defense Center, et al. noted that the Columbia River Treaty Tribes have expressed their concern about the air quality impacts on their subsistence fishing and other cultural resources.

The Southwest Clean Air Agency noted four Tribal Nations in the area that have Treaty Rights within the Columbia River Gorge National Scenic Area and have expressed firmly their concern about air quality impacts on their cultural resources and fishing rights within the Gorge. The commenter stated that under EPA's Nation-to-Nation consultation responsibilities with the Tribal Nations, EPA has the ability within this rulemaking to be responsive to the concerns of these four Tribal Nations.

ODEQ noted that reducing damage to ecosystems and Native American rock images from acid rain is very important. The commenter noted that recent studies by the U.S. Forest Service have documented damage to ancient rock images resulting from nitrogen oxides and other emissions from sources in and around the Columbia River Gorge. The commenter stated that it believes that the loss of these cultural resources is a serious blow to the native peoples that still utilize the Columbia River and its tributaries for subsistence fishing and gathering.

Letters:
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, Northwest District Association Health and Environment Committee OAR-2003-0190-0593.1
Oregon Department of Environmental Quality, Air Quality Division (ODEQ) OAR-2003-0190-0506
Southwest Clean Air Agency OAR-2003-0190-0468

Our Response:

The deposition of airborne particles can reduce the aesthetic appeal of culturally important articles through soiling, and can contribute directly (or in conjunction with other pollutants) to structural damage by means of corrosion or erosion. In addition, excess nutrient inputs into aquatic ecosystems (i.e. streams, rivers, lakes, estuaries or oceans) either from direct atmospheric deposition, surface runoff, or leaching from nitrogen saturated soils into ground or surface waters can contribute to conditions of severe water oxygen depletion; eutrophication and algae blooms; altered fish distributions, catches, and physiological states; loss of biodiversity; habitat degradation; and increases in the incidence of disease. Severe and persistent eutrophication often directly impacts human activities. For example, losses in the nation's fishery resources may be directly caused by fish kills associated with low dissolved oxygen and toxic blooms. We believe that reducing emissions from locomotive and marine diesel engines is important for reducing air quality impacts on cultural and fishery resources.

2.2.5 Other Environmental Effects

What Commenters Said:

NPS commented that particulate pollution decreases snowfall in some areas of the west (Colorado and California) and contributes to drought.

Letters:
National Park Service-Pacific West Region OAR-2003-0190-0480 (hearing)

Our Response:

EPA believes that the emission reductions being finalized in this rule will reduce particulate pollution and its associated environmental impacts, including potential precipitation suppression.

2.3 Reducing Emissions of PM, Ozone, and Air Toxics from Locomotive and Marine Diesel Engines

What Commenters Said:

The Puget Sound Clean Air Agency commented that rail and marine activities in the central Puget Sound region generate significant fine particle pollution; and further cited the Puget Sound Maritime Emission Inventory, which stated that "harbor craft" (vessels that would be affected by the EPA proposal) are responsible for 14% of the regional diesel PM and 2% of the region's total $PM_{2.5}$ emissions. The commenter stated that these percentages are based on total regional contributions and the contributions of inland marine and locomotive engines are much greater in neighborhoods near ports and rail yards where these emissions are concentrated. The commenter also noted that the rapid increase in Asian trade could double the current number of containers at the Port of Seattle, and increase by 4 to 5 times the current number of containers at the Port of Tacoma over the next ten to twenty years; resulting in very large increases in both total mass emissions and the percentage contribution of these sources to our regional NOx, SOx, PM and diesel particulate emissions.

At the public hearing, NRDC noted that locomotive and marine engines emit huge amounts of PM and NOx, as well as other toxic air contaminants, that can cause or exacerbate an array of environmental impacts that seriously affect millions of Americans. The commenter stated that locomotive and marine diesel engines are the last of the dirty diesel engines, and noted that existing EPA programs will reduce sulfur levels in diesel fuel used at rail yards and marine ports, and will dramatically reduce emissions from any new trucks and nonroad equipment servicing these facilities over the next few years. NRDC commented that cars, light trucks, and sport-utility vehicles are getting cleaner and soon, new diesel cars will emit at the same level as the typical new gasoline car. The commenter contrasted these with locomotive and marine diesel engines, which it believes are en route to an alarmingly large share of the nation's vehicle-related PM and NOx emissions. The commenter cited figures which show that, from current trends, train and ship engines will emit more than 765,000 tons of NOx and 28,000 tons

of PM every year by 2030. The commenter noted the strong regulatory programs promulgated over the past decade (for trucks, buses, nonroad diesel engines, and cars) which will render these engines at least 90 percent cleaner than previous engines. The commenter stated that it is time to close the last dirty diesel loopholes and clean up the trains, ships, and ferries. The commenter also noted that it believes that locomotive and marine diesel engines will more than double their share of vehicle-related NOx emissions and increase their share of vehicle-related PM emissions more than fourfold by 2030 unless EPA acts now.

Environmental Defense, NRDC, et al. commented that the locomotive and marine engines covered by the proposed rule currently account for about 17% of mobile source diesel $PM_{2.5}$ emissions in Seattle, and left unchecked this percentage would increase to 43% in 2020 and 60% in 2030. The commenters stated that they believe this rule can help address the important air quality challenges the nation and Seattle face. The commenters pointed out that by 2030, "these engines would become a large portion of the total mobile source emissions inventory constituting 35% of mobile source NOx emissions and 65% of diesel PM emissions."

Environmental Defense noted that the U.S. Department of Transportation (DOT) estimated that rail carried 1.95 million tons of freight in 1998 and that by 2030 the industry will transport nearly 3 million tons, an increase of about 50%, and that railroad transport has more than doubled in the last 35 years.

Environmental Defense noted that NRDC's March 2004 report, "Harboring Pollution: the Dirty Truth about U.S. Ports" stated that more than 95 percent of the PM and NOx pollution at a typical port comes from the ships, cargo handling equipment, and heavy trucks that service the cargo. The commenter further stated that air pollution from ports rivals or exceeds that from cars, power plants, and refineries in many urban areas. Additionally, the combination of expected future growth at ports and cleaner highway and nonroad diesel engines will make the relative contribution from locomotives and marine diesel engines grow significantly over time. The commenter cited 2001 EPA data which stated that trains and ships (excluding ocean-going vessels) contributed 16 percent of vehicle-related NOx and 18 percent of vehicle-related $PM_{2.5}$, and this contribution would rise to 34% and 63%, respectively, by 2030 without any further pollution controls.

At the public hearing, Environmental Defense commented that locomotive engines release voluminous amounts of NOx emissions, which contribute to lethal particulate pollution. The commenter noted that in Seattle alone, locomotives emit nearly 3500 tons of NOx air pollution each year, comparable to the pollution from about 3.7 million new cars. The commenter noted that numerous diesel engine manufacturers (those who make heavy duty trucks, buses, construction equipment, agricultural equipment, and mining equipment) are addressing the harmful NOx pollution from their engines, and now locomotive engine manufacturers must do the same.

The Port of Seattle commented that it believes EPA should not consider relaxing the proposed locomotive and marine diesel engine standards which are estimated to achieve PM emissions reductions of 90 percent and NOx reductions of 80 percent compared to engines

meeting the current Tier 2 standards. The commenter stated that these emissions reductions, along with the anticipated reductions of non-methane hydrocarbons (NMHC), carbon, and air toxics, will be needed in the Puget Sound region and other areas to assure protection of public health and the environment in the future.

NACAA commented that it believes that diesel-fueled locomotives and marine engines are among the largest and most dangerous under-regulated sources of pollution in the U.S. The commenter also noted that, as stated in the proposal, emissions from these engines currently represent about 20 percent of all mobile source NOx and 25 percent of all mobile source diesel fine particulate matter. The commenter further stated that, because these engine categories are subject only to minimal controls, unless they are subject to more stringent regulation, their relative contribution to emission inventories is anticipated to increase by 2030 to more than one-third of mobile source NOx emissions and two-thirds of diesel PM emissions.

CARB noted that emissions from locomotive and marine engines are major contributors to California's ozone and fine particle smog problems. The commenter stated that California locomotive and marine engines contribute 30 percent of smog-forming NOx and 35 percent of toxic diesel PM from mobile sources that move goods around and through California. The commenter further noted that the current statewide emissions inventory estimates that commercial harbor craft contribute about 4 tons per day (tpd) of PM and 90 tpd of NOx, and ocean-going vessel auxiliary engines contribute another 4 tpd of PM and 44 tpd of NOx. Of the combined 8 tpd of PM and 134 tpd NOx, approximately 40 percent of these emissions come from engines that are less than 600 kilowatts (kW).

CARB also commented that the impact of emissions from Category 1 and 2 engines is greater than the statewide figures indicate because the emissions are concentrated in California's coastal non-attainment districts, particularly in port areas. The commenter also stated that the Los Angeles region (South Coast) is in non-attainment for both $PM_{2.5}$ and ozone, and attainment requires extensive emission reductions from all sources. The commenter noted that air pollution from international trade and domestic goods movement in California is a major public health concern at both the regional and community levels—goods movement is now the dominant contributor to transportation emissions in the State. The commenter's "Emission Reduction Plan for Ports and Goods Movement in California" identifies the many actions necessary to reduce these emissions, and addresses all significant emissions sources involved in international and domestic goods movement, including trucks, locomotives, marine vessels, harbor craft, and cargo handing equipment. The commenter noted that rules for sources under its direct authority have been adopted and more are under development. Also, the commenter noted that a significant amount of existing incentive funds have been applied to goods movement emission sources and it has prioritized continued funding on this source of statewide significance. The commenter noted that for locomotives, the plan proposes to control NOx and PM by 90 percent; and it relies heavily on new EPA Tier 4 locomotive emission standards combined with accelerated fleet turnover of locomotives once the new standards are established. (The commenter noted that accelerating the introduction of Tier 4 locomotives into California service is a similar approach to the 1998 Memorandum of Understanding (MOU) it has with the Class 1 railroads for locomotives in the South Coast Air Basin, which requires a Tier 2 NOx fleet

average in the South Coast Basin by 2010). For marine engines the Plan relies upon reductions of 25 percent in reactive organic gas (ROG), NOx, and PM by 2010 and 40 percent by 2020. Lastly, the commenter stated that Tier 4 standards for these engines are critical to meeting its goals.

The North Carolina Division of Air Quality (NCDAQ) noted that commercial marine vessels with diesel engines operating in North Carolina were estimated to emit 3,526 tons of NOx and 135 tons of $PM_{2.5}$ in 2005. The commenter predicted (using Table II-5 from the NPRM) that $PM_{2.5}$ can be expected to be reduced 13.7%, 30%, 56%, and 72% in years 2015, 2020, 2030, and 2040, respectively, compared to what is anticipated without the regulations. The commenter similarly predicted (from Table II-7) estimated NOx reductions of 5.1% in 2015, 18.5% in 2020, 48% in 2030, and 66% in 2040.

The Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, and Northwest District Association Health and Environment Committee commented that they believe that without the proposed reductions, locomotive and marine diesel engines will likely contribute more than 65 percent of national mobile source diesel $PM_{2.5}$ emissions and 35 percent of national mobile source NOx emissions.

TCEQ noted that locomotives and marine diesel engines are important contributors to Texas' air pollution composition. The commenter stated that the locomotive sources affected by the proposed rule are estimated to have generated approximately 5.5 tpd of PM and 140.8 tpd of NOx emissions within Texas. Further, the commenter noted, marine sources are estimated to generate approximately 2.68 tpd of PM emissions and 68.9 tpd of NOx emissions.

People for Puget Sound commented that the recent Puget Sound Maritime Emission Inventory shows that harbor crafts are responsible for 14% of the regional diesel PM and 2% of the region's total fine particulate emissions.

The American Lung Association (ALA) of Metropolitan Chicago stated that, according to ALA's annual "State of the Air Report", air quality (specifically due to particle pollution) declined in the Chicago area; and specifically noted that Cook County, which contains approximately 5.5 million people, continued to receive a grade of "F."

The Southwest Clean Air Agency posed the following questions to EPA regarding NOx and PM emissions:

(1) How would EPA respond if it knew that locomotives were annually releasing 8,363 tons of NOx within the Columbia River Gorge National Scenic Area?
(2) How would EPA respond if it knew that towboats were annually releasing another 768 tons of NOx emissions within the Columbia River Gorge National Scenic Area?
(3) How does EPA believe its Nation-to-Nation Tribal consultation responsibilities should be handled for air quality impacts caused by locomotives and marine diesel engines traveling through the Columbia River Gorge National Scenic Area?

The commenter also requested that EPA consider that the Columbia River Gorge National Scenic Area has been designated by Congress and set aside in perpetuity for its beauty and the

enjoyment of future generations and it has locomotive and marine diesel engine annual emissions totaling approximately 9,131 tons of NOx and 296 tons of $PM_{2.5}$. The commenter stated that it believes that clearly some additional action by EPA is needed.

NESCAUM commented that it believes that the need to reduce locomotive and marine diesel engine emissions is indisputable. The commenter noted that these engines are significant contributors to elevated levels of ozone, $PM_{2.5}$, and the primary emission sources of several toxic air pollutants of concern in the NESCAUM region. The commenter cited 2002 emissions inventories which stated that these source categories are responsible for around 10 percent of mobile source NOx and 10 percent of mobile source $PM_{2.5}$. NESCAUM further stated that it particularly takes note of EPA's conclusion that, barring further controls, $PM_{2.5}$ emissions from locomotive engines and Category 1 and 2 marine diesel engines will comprise 20 percent of mobile source fine particulate pollution in 2030.

OEC stated that exposure to diesel exhaust is widespread in Oregon, with diesel PM exceeding health benchmarks in 25 counties.

Letters:
American Lung Association of Metropolitan Chicago OAR-2003-0190-0518 (hearing)
California Air Resources Board (CARB) OAR-2003-0190-0596.1
Environmental Defense OAR-2003-0190-0487 (hearing), 0592.1
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495 (hearing)
Natural Resources Defense Council (NRDC) OAR-2003-0190-0489 (hearing)
North Carolina Division of Air Quality (NCDAQ) OAR-2003-0190-0565.1
Northeast States for Coordinated Air Use Management (NESCAUM) OAR-2003-0190-0551.1
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, Northwest District Association Health and Environment Committee OAR-2003-0190-0593.1
Oregon Environmental Council OAR-2003-0190-0652
People for Puget Sound OAR-2003-0190-0649
Port of Seattle OAR-2003-0190-0469.1
Puget Sound Clean Air Agency OAR-2003-0190-0484 (hearing)
Southwest Clean Air Agency OAR-2003-0190-0468
Texas Commission on Environmental Quality (TCEQ) OAR-2003-0190-0612.1

Our Response:

We appreciate the comments that these commenters provided. We agree with commenters that emissions from nonroad engines account for substantial portions of the country's ambient PM and NOx levels. We estimate that today these engines account for about 25 percent of total NOx emissions and about 35 percent of total direct PM emissions. We believe that reducing emissions from locomotive and marine engines is critically important.

With expected growth in the locomotive and marine sector, the relative emissions contribution from nonroad diesel engines without today's final rule is projected to be approximately 65% of the mobile source diesel $PM_{2.5}$ and 35% of the mobile source NOx emissions in 2030. Locomotives and marine diesel engines designed to the standards finalized in this rulemaking will achieve PM reductions of 90 percent and NOx reductions of 80 percent, compared to engines meeting the current Tier 2 standards. We also note that we are finalizing this program on the same time frame as we proposed in the NPRM.

2.3.1 Protection of Public Health and NAAQS Attainment

What Commenters Said:

CARB stated that the Los Angeles region (South Coast) is in non-attainment for both $PM_{2.5}$ and ozone, and attainment requires extensive emission reductions from all sources.

Environmental Defense, NRDC, et al. commented that while they support the proposed locomotive standards (Table III-1 and Table III-2 of the NPRM), they strongly encourage EPA to secure deeper NOx reductions more quickly than proposed. The commenters stated that finalizing a proposal that will reduce NOx as much and as quickly as possible will give help U.S. cities and states to meet maintain the NAAQS.

Environmental Defense, NRDC, et al. commented that nationwide monitoring data indicate that 88 million people in 208 countries are currently exposed to levels of fine particles that exceed the national health-based air quality standard. The commenters stated that more than half of the American population lives in communities out of compliance with the nation's current health-based ambient air quality standards for ozone and particulate pollution (OAR-2003-0190-0592.1, p.6). The commenters noted that states and localities across the United States are working to clean the air and protect the health of their citizens. Because both locomotives and ships are significant contributors to the NOx and $PM_{2.5}$ emission inventories in many nonattainment areas, reducing their emissions engines will help states and local governments meet their Clean Air Act obligations and restore healthy air.

NACAA noted that this proposal comes at a time when states and localities across the U.S. face the challenge of developing strategies to achieve and maintain health-based NAAQS for ozone and $PM_{2.5}$. The commenter also noted that air quality in approximately 120 areas of the nation currently violate the 8-hour ozone and/or $PM_{2.5}$ standards, exposing well over 150 million people to unhealthful levels of air pollution. The commenter stated that clear that considerable efforts by EPA and state and local agencies will be needed to reduce the health and environmental impacts of sources of pollution contributing to these widespread problems. The commenter noted that EPA has already taken action to tighten the $PM_{2.5}$ ambient air quality standard and is considering similar action for the ozone standard; thus, the commenter stated, increasing the potential challenges facing states and localities.

ALA noted that in its recent annual State of the Air Report, the data reveal a split picture

along either side of the Mississippi River, as particle pollution (soot)—"the most dangerous pollutant"—increased in the East but decreased in the West, while ozone (smog) decreased nationwide from peaks reported in 2002. The commenter noted that the number of counties scoring an A grade for ozone levels increased from 82 in 2000 to 145 this year, but particle pollution levels show an ominous trend, with F grades nearly doubling in just one year. The commenter noted that the estimates in its report show that 46% of the U.S. population (136 million people) lives in 215 counties where they are exposed to unhealthful levels of ozone or particulate air pollution; and about 38.3 million Americans live in 32 counties with unhealthful levels ozone and both short-term and year-round particle pollution. The commenter stated that it believes that today, 37 years after the passage of the Clean Air Act (CAA), we should be seeing much greater reductions of pollution levels.

The Puget Sound Clean Air Agency further stated that it believes that achieving reductions in diesel emissions is critical to managing ozone and fine particle pollution levels and related public health risks - especially in areas that will soon fall out of attainment in the Puget Sound region. The commenter noted that the Central Puget Sound region will have one or more nonattainment areas for the revised $PM_{2.5}$ NAAQS and will benefit substantially from emission reductions due to more stringent standards for locomotive and inland marine engines. The region is in marginal attainment of the current ozone standard. Any further tightening of the ozone standard by EPA is very likely to put us in nonattainment. Again, more stringent standards for locomotives and inland marine engines will help us address potential nonattainment challenges.

The City of Houston Bureau of Air Quality Control (BAQC) noted that air pollution impacts the health and welfare of the residents of Houston. The commenter stated that a reduction in ozone precursors like NOx and hydrocarbons (HC) from marine and locomotive engines which will result from these proposed rules will be an important step towards attaining compliance with the ozone NAAQS. Additionally, the commenter noted that reducing $PM_{2.5}$ emissions in the Houston area will help reduce health impacts associated with exposure to $PM_{2.5}$.

SCAQMD noted that the South Coast Air Basin was designated a nonattainment area for the federal annual $PM_{2.5}$ and 8-hour ozone ambient air quality standards and must attain these standards no later than 2015 and 2024, respectively. The commenter stated that, compared to the other national nonattainment areas, the South Coast Air Basin has the highest population-weighted ozone exposure, representing 24 percent of the nation's 8-hour ozone exposure as well as its highest ozone design value. The commenter noted that almost 90 percent of the nation's total population-weighted exposure to fine particulates occurs in California, and 52 percent of the nation's total exposure to fine particulates occurs in the South Coast Air Basin alone. These pollutant exposures result in severe public health impacts in the South Coast Air Basin. At the public hearing, SCAQMD commented that, as proposed, the rule will not provide NOx emission reductions needed in the South Coast region to timely meet its federal attainment deadlines for $PM_{2.5}$.

SCAQMD noted that the region is moving ahead with planning to attain the federal 8-hour ozone and annual $PM_{2.5}$ standards with the recent adoption of the 2007 Air Quality Management Plan (AQMP) for the South Coast Air Basin. The commenter noted that the

attainment challenges are significant given that stationary sources are now generally controlled to over 90 percent, and about 80 percent of particulate-related emissions in the Basin are caused by mobile sources. The commenter further stated that national transportation sources such as locomotives, marine vessels, and aircraft represent 24 percent of the emissions contribution to the Basin's air quality problem; and 2007 AQMP computer modeling shows that the Basin cannot timely attain federal air quality standards without significant emission reductions from all sources, in particular, marine vessels and locomotives. The commenter stated that for locomotives, the AQMP relies on advanced technology controls achieving 90 percent plus control for particulates and NOx (a precursor to $PM_{2.5}$) commencing in 2012.

SCAQMD also noted that In addition, the South Coast Air Basin's two major marine ports (Ports of Los Angeles and Long Beach) combined represent the largest marine container port in the U.S. and the fifth largest in the world. The commenter stated that these ports have adopted the San Pedro Bay Ports Clean Air Action Plan (SPBCAAP), which calls for the cleanest locomotives to operate out of the ports—locomotives that are 90 percent cleaner than the existing Tier 2 locomotive emission standards, to be phased in between 2012 and 2014. SCAQMD noted that the Ports are also developing emissions performance standards for new marine vessels and existing marine vessels, which include harbor craft.

A number of private citizens commented that they believe that cleaning up locomotive and marine diesel engines will reduce air pollution and prevent thousands of premature deaths. The commenters stated that they strongly support the clean up of locomotive and marine diesel engines, as the public health benefits from cleaning up diesel engines are enormous; and EPA must act now.

The New York State Department of Environmental Conservation noted that emissions from diesel engines are significant contributors to several important air pollution problems, including ozone formation, fine particulate matter, and toxic air emissions. The commenter noted that it has long advocated applying technology forcing emissions standards to a wide variety of diesel engine applications to reduce their health and environmental impact.

The Wyoming Outdoor Council commented that it believes that full regulation of NOx and PM emissions is essential. The commenter noted that in Wyoming, there are thousands of trains annually moving in and out of the Powder River Basin in the northeast part of the state hauling coal, and thousands more trains traverse the Union Pacific rail line corridor that roughly parallels Interstate 80 across the entire southern part of the state. The commenter noted that air pollution is of increasing concern in Wyoming, ozone levels are increasing even in rural areas, and have reached levels that are at or near the NAAQS for ozone in several areas in Wyoming (such as Yellowstone National Park, where the National Park Service has determined that ozone conditions in are degrading). The commenter further noted that the State of Wyoming has been forced to adopt a Natural Events Action Plan for Coal Mines of the Powder River Basin due to monitored exceedances of the 24-hour NAAQS for PM10 in the Powder River Basin. The Wyoming Outdoor Council commented that it believes that emissions from diesel locomotives are a significant source of air pollution in Wyoming, and are of great concern relative to impacts to the public health and welfare.

The Missouri Department of Natural Resources (MDNR) noted that Kansas City, Missouri is home to one of the largest rail yards in the United States. The commenter also noted that Kansas City and its surrounding Missouri counties are considered to be a maintenance area under the 8-hour standard, and the region has had a history of ozone issues under the previous one-hour standard and current 8-hour standard. The commenter stated that, based on recent air quality data that still needs to be quality assured, Kansas City has violated the 8-hour ozone standard. However, once the violation has been quality assured, additional measures to reduce emissions associated with high ozone levels will need to be implemented; thus the commenter stated that it believes that the reduction of emissions from all types of locomotives will have a positive impact on improving the air quality in the area.

Environmental Defense commented that States across the country are under firm deadlines for achieving cleaner air and EPA's own numbers show that each year of delay is paid for in early deaths, children's asthma attacks, and lost work days that could have been prevented.

NESCAUM commented that it believes that reducing diesel engine emissions to attain federal standards is first and foremost a matter of public health. The commenter also noted that from 2004 and 2006, 117 monitors in the NESCAUM region recorded exceedances of the current ozone NAAQS (0.08 ppm). Further, over the same period, 98 monitors in the NESCAUM region measured exceedances of the daily $PM_{2.5}$ air quality standard. NESCAUM commented that if it is to address these public health needs, additional timely and aggressive programs to reduce NOx and $PM_{2.5}$ are essential. NESCAUM commented that there is the need to reduce locomotive and marine engine emissions in order for states to achieve and maintain air quality standards and reduce public exposure to ozone, particulates, and toxics, but States are preempted from regulating locomotive and new marine engine emissions. The commenter stated that it therefore strongly urges EPA to finalize the emission standards by the end of 2007.

NRDC stated that these diesel engines hamper state and local efforts to attain and maintain EPA's NAAQS for PM and ozone.

The San Joaquin Valley Unified Air Pollution Control District commented that significant progress has been made in improving air quality in the region. However, the commenter noted, the region faces a daunting challenge in meeting federal ambient air quality standards for ozone and particulates. The commenter stated that meeting the health-based 8-hour ozone standard will require another 75% reduction in emission of NOx from 2005 levels. The commenter further stated that, since the regulation of locomotive emissions falls under the authority of the federal government, it strongly supports the implementation of the most effective rule that will control locomotive emissions to the full extent required by the Clean Air Act as expeditiously as possible. The commenter urged EPA to assure that locomotive NOx emissions in the San Joaquin Valley are reduced by at least 75% from 2005 levels; as, without this level of reduction from all of the Valleys significant NOx source categories, the Valley will not attain the current or proposed ozone NAAQS.

NCDAQ noted that the portions of North Carolina where marine vessel emissions occur

do not currently have problems with high levels of ozone or fine particulate, the commenter stated that it believes the proposed controls for marine diesel engines will help maintain good air quality in these coastal areas into the future and therefore are welcomed by NCDAQ.

Letters:
American Lung Association OAR-2003-0190-0509 (hearing)
California Air Resources Board (CARB) OAR-2003-0190-0596.1
City of Houston Bureau of Air Quality Control (BAQC) OAR-2003-0190-0561.1
Environmental Defense OAR-2003-0190-0487 (hearing)
Environmental Defense, NRDC, et al. OAR-2003-0190-0592.1
Missouri Department of Natural Resources, Air Pollution Control Program (MDNR) OAR-2003-0190-0658
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495 (hearing)
Natural Resources Defense Council (NRDC) OAR-2003-0190-0489 (hearing)
New York State Department of Environmental Conservation, Office of Air Resources OAR-2003-0190-0583.1
North Carolina Division of Air Quality (NCDAQ) OAR-2003-0190-0565.1
Northeast States for Coordinated Air Use Management (NESCAUM) OAR-2003-0190-0551.1
Private Citizens (*various*)
Puget Sound Clean Air Agency OAR-2003-0190-0484 (hearing)
San Joaquin Valley Air Pollution Control District OAR-2003-0190-0556.1
South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0558.1
Wyoming Outdoor Council OAR-2003-0190-0467

Our Response:

We agree that the rule is a crucial component of the effort to meet health based air quality standards, such as the NAAQS. For the final rule we project that reductions of $PM_{2.5}$, NO_x, and volatile organic compound (VOC) emissions from locomotive and marine diesel engines will produce nationwide air quality improvements. According to air quality modeling performed in conjunction with this rule, all 39 current $PM_{2.5}$ nonattainment areas will experience a decrease in their projected 2030 design values. Likewise the 134 mandatory class I federal areas that were modeled will all see improvements in their visibility. This rule will also result in nationwide ozone benefits. In 2030, 573 (of 579) counties experience at least a 0.1 ppb decrease in their ozone design values. Also, see Sections 3.1.1 and 3.2.1 for further discussion on the timing and stringency of the standards.

2.3.2 Near Port/Railyard/Shipping Lanes and Environmental Justice

What Commenters Said:

The Puget Sound Clean Air Agency commented that rail and marine activities in the

central Puget Sound region generate significant fine particle pollution; and further cited the Puget Sound Maritime Emission Inventory, which stated that "harbor craft" (vessels that would be affected by the EPA proposal) are responsible for 14% of the regional diesel PM and 2% of the region's total $PM_{2.5}$ emissions. The commenter stated that these percentages are based on total regional contributions and the contributions of inland marine and locomotive engines are much greater in neighborhoods near ports and rail yards where these emissions are concentrated. The commenter also noted that the rapid increase in Asian trade could double the current number of containers at the Port of Seattle, and increase by 4 to 5 times the current number of containers at the Port of Tacoma over the next ten to twenty years; resulting in very large increases in both total mass emissions and the percentage contribution of these sources to our regional NOx, SOx, PM and diesel particulate emissions.

NESCAUM commented that it is concerned about the impacts on public health from direct, short-term exposure to locomotive and marine diesel emissions. The commenter cited recent Clean Air Task Force reports which found that ultrafine particle levels inside commuter train coaches, where the locomotive is leading the train, have been measured at levels as much as 17 times higher than what is measured in the ambient air. The commenter also stated that $PM_{2.5}$ and ultrafine particle levels in ferry passenger compartments average about three times the simultaneous levels in the ambient air, and levels of polycyclic aromatic hydrocarbons and black carbon in ferry passenger compartments are even higher relative to the ambient air.

NRDC also commented that it believes that locomotive and marine diesel pollution disproportionately affects the people and communities who live closest to the rail yards and ports. The commenter stated that in those communities, exposure to these emissions is likely to be far greater; and many of these communities are low-income and/or communities of color, giving rise to significant environmental justice concerns that underlie its interest in this rule-making.

People for Puget Sound cited recent studies by CARB that have shown elevated cancer risk for populations living near rail yards. The commenter noted that in the city of Commerce, risk is increased by 69 percent, and other human health impacts such as heart and other diseases have also been shown to be increased due to fine particulate pollution.

SCAQMD noted that diesel PM emissions from railyards and ports also have been found to cause significant cancer risks in neighboring communities.

Environmental Defense, NRDC, et al. commented that the presence of pollution 'hot spots' resulting from geographical density of ships and trains (e.g., rail yards and ports) challenges the capacity to equally protect human health -highlighting just how important it is to clean up these high polluting engines. The commenters stated that locally, ship emissions can have a major impact on air quality. The commenters noted that areas like Houston-Galveston, Los Angeles, and Baton Rouge have serious ozone problems and heavy shipping traffic. The commenters noted that SCAQMD's emissions inventory shows that oceangoing ships, tugs and other commercial watercraft collectively emit 48 tons a day of smog-forming NOx in the Los Angeles area. The commenters also cited an Environ International Corporation report

("Commercial Marine Emission Inventory Development", April 2002) which estimated that in the Lower Mississippi area commercial marine vessels emit 23,204 tons of NOx each year, and in the Houston-Galveston area ports ships emit 8,810 tons of NOx each year.

The commenters also stated that the major marine port facilities in California contribute a great deal to overall regional pollution as well as create local pollution hot spots in the communities nearby. A recent CARB study of diesel pollution from port terminals in Los Angeles and Long Beach concluded that cancer risks associated with this pollution exceeded 500 in a million. In fact, the same study indicated that cancer risks remained elevated, at 50 per million, as far as 15 miles away from the terminals. The CARB study also estimated a number of non-cancer health impacts from the two ports, including 67 premature deaths and 41 hospital admissions for respiratory and cardiovascular causes in 2005 alone.

Environmental Defense, NRDC, et al. also commented that emissions from commercial marine vessels are not restricted to port areas. The commenters stated that nearly all emissions in U.S. waters occur in shipping channels outside of port regions; and provided the example that in Santa Barbara County—up the West Coast from Los Angeles area ports but next to major shipping lanes—the 1999 emissions inventory indicated that ships emit more than 29 tons of NOx each day, well more than the almost 26 tons of NOx from on-road motor vehicles in the county. The commenters noted that air toxics are also a concern for marine ports and shipping channels, citing a recent study by the University of Texas which identified increased incidence of leukemias in children living within two miles of the Houston Ship Channel compared to those living from 2-10 miles from the Ship Channel. Preliminary data indicates that the leukemia is associated with exposure to 1,3-butadiene in the diesel exhaust, and the levels of benzene in the Channel's vicinity are also a concern. The commenters noted that in 2003, EPA made Tier 1 standards mandatory for many engines, and added some other requirements for some engines, but these standards yielded only a 27% NOx reduction for Category 1 and 2 engines (paling in comparison with the 90-95 percent reductions that were required in EPA's highway and truck rules that were being developed at roughly the same time).

The commenters state that the locomotives and off-road equipment used at rail yards can be extremely polluting and are especially problematic where these yards are in or close to residential areas. In 2004 the California Air Resources Board published the results of a health risk assessment for airborne particulate matter emissions from diesel-fueled locomotives at the Union Pacific J.R. Davis Yard (Yard) located in Roseville, California. The Roseville rail yard is a 950-acre facility surrounded by commercial, industrial, and residential development. Being the largest rail yard in the West with over 30,000 locomotives moving through the facility each year, it is an ideal case study for the evaluation of localized health risks associated with diesel pollution.

With regard to locomotive hot spots, the commenters noted that a 2004 CARB report estimated diesel PM emissions from locomotive operations at the Union Pacific J.R. Davis Yard in Roseville, CA averaged approximately 25 tons per year. The commenters noted that moving locomotives accounted for half of the emissions, idling locomotives accounted for about 45 percent, and locomotive testing accounted for about 5 percent of the total diesel PM emissions.

Using computer modeling, predicted cancer risks were above 500 per million (based on 70 years of exposure) in the neighborhoods receiving the highest exposures, affecting an estimated 500 - 700 people. Cancer risk levels between 100 and 500 per million affect 14,000 to 26,000 people and cancer risk levels between 10 and 100 in a million affect approximately 140,000 to 155,000 people. These cancer risks are in addition to the regional background cancer risk, which is 360 per million (CARB 2004). Recent health risk assessment studies done by the major rail companies in conjunction with CARB indicate similarly high risk levels of up to 1,000 per million impacting over 5,000 residents near the Commerce rail yards. While most railyards do not pose as great a health risk as the Roseville rail yard, the CARB studies demonstrate that the 10 rail yards evaluated in addition to Roseville contribute nearly 70 tons of diesel PM to the atmosphere each year. Depending on the specific conditions surrounding these rail yards, locomotive PM emissions place thousands of lives at risk. For example, at the BNSF Railyard, located in Hobart, California, CARB estimated that 7,000 people are exposed to railyard-related diesel particulate matter at concentrations that result in cancer risks up to 500 per million, whereas nearly 7,000 people living adjacent to the BNSF Railyard in Richmond, California experience increased cancer risks of 10 - 25 per million. The commenters noted the Draft RIA estimates that locomotives were responsible for more than 31,000 short tons of $PM_{2.5}$ and more than 942,000 short tons of NOx. The commenters also noted that currently more than 22,000 freight and 270 passenger locomotives operate in the U.S., and approximately 100,000 miles of track crisscross the country (see OAR-2003-0190-0592.1, p. 16 for map).

The commenters also note that hundreds of thousands of Californian's live close enough to ports and rail facilities to suffer highly elevated exposures to this pollution. Millions of other Californians live further downwind from these facilities but still have elevated risks. CARB recently published studies to quantify risks from mobile source emissions of diesel PM. One study covers emissions from the combined ports of Los Angeles and Long Beach. The second covers one of California's largest railyards located in Roseville, a suburb northeast of Sacramento. CARB just released draft similar studies for ten additional railyards and are currently developing a study for the Port of Oakland to be released as a draft this fall. Seven additional railyard studies are scheduled to be completed by the end of this year.

The commenters and CARB all noted that the Health Risk Assessment (HRA) for the Los Angeles / Long Beach ports determined that the elevated cancer risk from all port-related PM emissions is greater than 500 cases per million cases for approximately 50,000 people who reside within up to two miles of the ports and a risk of greater than 10 cases per million for about eight million residents within about 60 miles. The commenters further stated that Category 1 and 2 marine engine emissions in commercial harbor craft produce a significant fraction of port-related exposure. The HRA estimated that the commercial harbor craft contribution to these emissions (NOx & PM) produce an elevated cancer risk of greater than 200 cases per million for about 5,000 residents and greater than 10 cases per million for about 1.5 million residents.

Letters:

California Air Resources Board (CARB)	OAR-2003-0190-0596.1
Environmental Defense, NRDC, et al.	OAR-2003-0190-0592.1
Natural Resources Defense Council (NRDC)	OAR-2003-0190-0489 (hearing)

Northeast States for Coordinated Air Use Management (NESCAUM) OAR-2003-0190-0551.1
People for Puget Sound OAR-2003-0190-0649
Puget Sound Clean Air Agency OAR-2003-0190-0484 (hearing)
South Coast Air Quality Management District (SCAQMD) OAR-2003-0190-0558.1

Our Response:

In regards to the comments related to near rail yard, near port, and/or environmental justice, the EPA has appropriately addressed these items in Sections II, IX.G, and IX.J of Preamble as well as Chapters 2 and 6 of the Final RIA.

In short, EPA recently conducted an initial screening analysis of selected marine port areas and rail yards to begin to understand the populations living near rail yards and marine ports. This screening analysis indicated that at the 40 marine ports and 37 rail yards studied, at least 13 million people, including 3.5 million children and a high percentage of low-income households, African-Americans, and Hispanics, living near these facilities, are being exposed to elevated levels of diesel particulate matter. These populations will benefit from the controls being finalized in this action because this rulemaking increases the level of environmental protection for all affected populations.

With regard to children, the screening analysis shows that the age composition of the total affected population near both the marine ports and rail yards matches closely the age composition of the overall U.S. population. However, for some individual facilities the young appear to be over-represented in the affected population compared to the overall U.S. population. See section VI of the preamble to the final rule and Chapters 2 and 6 of the RIA for a discussion on the air quality and monetized health benefits of this rule, including the benefits to children's health.

This rulemaking will achieve significant reductions of various emissions from locomotive and marine diesel engines, including NOx, PM, and air toxics. These pollutants raise concerns regarding environmental health or safety risks that EPA has reason to believe may have a disproportionate effect on children, such as impacts from ozone, PM, and certain toxic air pollutants.

EPA has evaluated several regulatory strategies for reductions in emissions from locomotive and marine diesel engines, and we believe that we have selected the most stringent and effective control reasonably feasible at this time (in light of the technology and cost requirements of the Clean Air Act). The programs being finalized today address both new engines and existing fleets of engines which will benefit the populations, including children, minority, and low-income populations, who live in proximity to marine ports and rail yards. In fact, the emission reductions from the stringent new standards finalized in the locomotive and marine diesel rule will have large beneficial effects on communities in proximity to port, harbor, waterway, railway, and rail yard locations, including children, low-income, and minority communities. In addition to stringent exhaust emission standards for new and remanufactured

engines, the final rule includes provisions targeted to further reduce emissions from regulated engines that directly impact low-income and minority communities. The idle reduction provision is one example: "Even in very efficient railroad operations, locomotive engines spend a substantial amount of time idling, during which they emit harmful pollutants, consume fuel, create noise, and increase maintenance costs. A significant portion of this idling occurs in rail yards, as railcars and locomotives are transferred to build up trains. Many of these rail yards are in urban neighborhoods, close to where people live, work, and go to school" (from preamble section III.C(1)(c)). The final rule includes a mandatory locomotive idle reduction requirement that will begin to take effect as early as 2008. Another example is the emission standards for newly-built switch locomotives. Switch locomotives are major polluters in urban rail yards. These standards are earlier and more stringent than the line-haul locomotive standards, and include incentives for introducing cleaner switchers using Tier 4 nonroad engines. Further examples can be found in averaging, banking, and trading program provisions aimed at ensuring that emissions are not shifted from line-haul locomotives operating in rural areas to rail yards in urban communities.

2.3.3 Benefits of Emissions Reductions from Locomotive and Marine Engines

What Commenters Said:

Nationwide, using EPA's methodology, Environmental Defense estimated that the 2006 particulate and NOx emissions from locomotives will be associated with more than 3,000 premature deaths this year. Exposure to this pollution may also contribute to, among other health effects, more than 4,000 non-fatal heart attacks, approximately 61,000 cases of acute bronchitis and exacerbated asthma in children, and nearly 290,000 lost workdays. The economic impact of these adverse health effects will total over $23 billion this year.

Last year, NACAA published a study in which they estimated that emissions from locomotives and marine diesel engines are responsible for more than 4,000 premature deaths each year, as well as a host of other serious public health and welfare consequences (*Danger in Motion: It's Time to Clean Up Trains and Boats, February 2006*).

The Oregon Department of Environmental Quality noted that in February 2006, NACAA (of which Oregon is an active member) issued a report estimating that emissions from commercial marine and locomotive engines may account for more than 4,000 premature deaths per year, as well as a multitude of other health and environmental impacts.

The Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, and Northwest District Association Health and Environment Committee cited a study in which the National Association of Clean Air Agencies (NACAA) estimated the current number of premature deaths from locomotive and marine diesel emissions to be about 4,000. (*Danger in Motion: It's Time to Clean Up Trains and Boats, February, 2006.*)

A group of private citizens noted that State and local air pollution control directors estimate that locomotive and marine diesel emissions are responsible for 4,000 premature deaths and 2,000 ER visits for children with asthma attacks annually. The commenters stated that the public health benefits from cleaning up diesel engines are enormous, and they believe that all diesel engines - including locomotive and marine engines - should be cleaner to help improve air quality so all Americans can have air that is safe to breathe. The commenters stated that they believe EPA must act now.

The Wisconsin Department of Natural Resources (WDNR) commented that it believes that locomotive and marine diesel engines are among the largest and most dangerous under-regulated sources of pollution in the U.S. The commenter noted that the 2006 NACAA study estimates that locomotives and marine diesel engines are responsible for more than 4000 premature deaths each year, as well as other serious public health and welfare consequences. The commenter believes that the rule will significantly reduce harmful emissions of diesel PM and NOx emissions from these engines.

Several private citizens commented that because soot from trains and boats causes lung cancer, heart attacks, chronic bronchitis, asthma attacks, and premature deaths, cleaning up these two sources now will prevent over 4,000 deaths annually and reduce cases of the other aforementioned health problems.

NRDC noted that state and local air regulators estimate that cleaning up these engines will prevent more than 4,000 premature deaths a year.

The Oregon Environmental Council noted that the Oregon Department of Environmental Quality calculates that the public health and environmental impacts of diesel pollution cost Oregonians nearly $2 billion a year in rising health insurance costs, costs to employers and costs to taxpayers associated with respiratory and cardiovascular hospitalizations, lost work days, and premature deaths triggered by diesel pollution.

Letters:
Environmental Defense, NRDC, et al. OAR-2003-0190-0592.1
National Association of Clean Air Agencies (NACAA) OAR-2003-0190-0495 (hearing)
Natural Resources Defense Council (NRDC) OAR-2003-0190-0489 (hearing)
Northwest Environmental Defense Center, Oregon Toxics Alliance, Columbia Riverkeeper, Friends of the Columbia Gorge, Northwest District Association Health and Environment Committee OAR-2003-0190-0593.1
Oregon Department of Environmental Quality, Air Quality Division OAR-2003-0190-0506 (hearing)
Oregon Environmental Council OAR-2003-0190-0652
Private Citizens (*various*)
Wisconsin Department of Natural Resources, Bureau of Air Management OAR-2003-0190-0552

Our Response:

We agree with the commenters that the requirements in this rule will result in substantial benefits to public health and welfare through significant reductions in NOx and PM, as well as NMHC and air toxics. Diesel exhaust is of specific concern because it has been judged to likely pose a lung cancer hazard for humans as well as a hazard from noncancer respiratory effects. EPA projects these reductions will annually prevent up to 1,100 PM-related premature deaths, 280 ozone-related premature deaths, 120,000 lost work days, 120,000 school day absences, and 1.1 million minor restricted-activity days.

2.4 Other

2.4.1 Reducing Air Pollution from Locomotives

What Commenters Said:

Tacoma Public Utilities noted that Tacoma Rail is a utility within Tacoma Public Utilities. Tacoma Rail has 73 customers, most of them located in the Tideflats Division (which serves the Port of Tacoma's main facilities on Commencement Bay) and operates 18 diesel locomotives. The commenter noted that Tacoma Rail has worked to reduce air emissions in a number of ways in recent years, such as the reduction of particulate air emissions since November 2005 through exclusive use of the Eco-Tip Super-Stack Fuel Injectors. The commenter also noted that in June 2006, Tacoma Rail converted to the use of ultra-low sulfur diesel (ULSD) to reduce air emissions, and has installed idle reduction systems using a combination of Diesel Driven Heating System (DDHS) and Smart Start System (electronic start and stop) to reduce overall idle time on four of its locomotives. Tacoma Public Utilities commented that it believes this will reduce significantly overall emissions and diesel fuel emissions; and the commenter looks forward to working with EPA on environmentally sound and cost-effective measures to reduce air pollution from locomotion activities.

Letters:
Tacoma Public Utilities OAR-2003-0190-0517

Our Response:

EPA believes that this final rule is both environmentally sound and cost-effective. EPA also looks forward to working with Tacoma Public Utilities, and other members of the American public, on environmentally sound and cost-effective measures to reduce air pollution.

2.4.2 Emissions from Offshore Vessels

What Commenters Said:

The Offshore Marine Service Association (OMSA) noted that offshore vessels operate primarily offshore, outside of territorial waters, at distances of up to 200 miles offshore. The commenter stated that these vessels typically operate from remote shore-based locations with limited emission sources and outside non-attainment areas; and as such, offshore support vessels provide a minimal contribution to the exhaust emissions this rule is designed to address.

Crowley Maritime Corporation (Crowley) commented that it believes EPA should recognize the need to establish more stringent air emission standards near populated coastal zones with serious air quality issues than on the high seas and other areas. Crowley stated that while it supports regulations to be implemented on an international level rather than on a local level, CARB requirement to switch from residual fuel to diesel fuel 24 miles offshore for the high density area populated of large California ports may have merit. The commenter stated that these measures would of course be considered excessive for ports in less populated areas; these stricter standards needed for those identified coastal zones do not need to be required in all coastal areas of the high seas.

Letters:
Crowley Maritime Corporation OAR-2003-0190-0641
Offshore Marine Service Association OAR-2003-0190-0611.1

Our Response:

Although offshore vessels can operate from remote locations and outside non-attainment areas, EPA believes that emissions from offshore vessels still have a negative impact. In the preamble we note that emitted particles can remain in the atmosphere for days to weeks and travel through the atmosphere hundreds to thousands of kilometers. We also state that ozone can be transported into an area from pollution sources found hundreds of miles upwind.

2.4.3 "Green" Transportation—Waterborne Commerce

What Commenters Said:

The Lake Carriers' Association (LCA) noted that in the early 1990s, LCA, and other members of the Great lakes maritime community, commissioned a study of the environmental benefits of Great lakes shipping and the impacts of switching to land-based modes of transportation. The commenter stated that the findings were conclusive—utilizing ships and tug/barge units had the fewest environmental impacts. The commenter noted the following examples:

- For the 11 commodity movements studied, the shifting of 25 million tons of cargo from vessel to rail would result in the additional consumption of 14 million gallons of fuel and the generation of an extra 4,321 ton of carbon monoxide (CO), HC, and NOx pollutants.
- For the rail movements, total fuel use was 44 percent greater than for the marine movements. Vessel fuel efficiencies were considerably higher in some of the movements, ranging up to 100 percent greater than for rail.

- Total rail emissions were more than 47 percent greater than for the marine movements.
- In the three commodity flows where truck transportation was a feasible alternative to vessel delivery, the shifting of less than one million tons of waterborne cargo to highway would increase fuel consumption by 3.4 million gallons and generate an additional 570 tons of air pollutants.

Letters:
Lake Carriers' Association (LCA) (0567.1)

Our Response:

EPA appreciates the comment. The commenter did not provide a copy of the report cited above, and EPA does not have a copy, and as the analysis for this rule does not include a comparison of land and marine based transportation, we are unable to comment on its conclusions.